

Significant risks facing agriculture in the Netherlands

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Preface

Commissioned by the Agro Chain Knowledge Foundation (AKK), LEI carried out the project 'Significant Risks Facing Agriculture in the Netherlands'. The purpose of this project is to help shape the research agenda for topics on risk in agriculture for the coming years. This report is the result of the consolidated thoughts of agricultural experts, who shared their views on important topics of risk in agriculture in the Netherlands. We are grateful their willingness to participate in the discussion on risk. This is a challenging topic and clearly an important one as we all seek to help build a strong future for the agricultural industry.

A handwritten signature in black ink, appearing to be 'J.C. Blom', written in a cursive style.

Dr J.C. Blom
Director General LEI B.V.

Summary

The purpose of this report is to identify and select significant risks facing agriculture in the Netherlands in order to help establish a future research agenda for these topics. We present current thinking about significant risks facing agriculture in the Netherlands by a group of expert participants representing a broad cross section of agriculture.

The greatest risk seen by many of the experts is the risk of plant or animal disease. The experts felt that the strategic areas of consideration for risk of disease were the continuing development of technical knowledge about disease control, access to the knowledge by chain managers, and the development of enhanced measurement, tracing and tracking tools. Furthermore, experts felt it is important to recognise the subjective aspects of food and perceptions about food and disease risk and to communicate relevant information about food and disease risks.

Nearly every expert participant highlighted the continued and important trend of food production moving from a supply driven chain to a demand driven chain. The change to a more market and demand driven chain means the chain members will need to respond to consumer demands faster and probably more dramatically than they may have been called to do in the past. There are several strategic areas which were highlighted by the experts in the area of consumer risks. Strategic knowledge about the consumer and the chain will be increasingly important. There should be a strong two-way information highway linking the consumer and other chain members. Knowledge about the consumer can help to keep the production chain aligned with consumer demand. The bi-directional traffic should also carry information to the consumer about the agriculture chain. The consumer will likely need to be more informed about agro chains and that could help to dispel myths and create a better understanding of the real and perceived risks in a chain.

Policy is an important aspect of food and agriculture production. There are several strategic risks in the area of policy. First, it was generally felt by the experts that it is important for policy makers to lead with a strong vision for agriculture in the Netherlands. Second, there should be a policy and regulatory climate conducive for competitive and innovative production by entrepreneurs and agribusiness. Finally, food security and climate change were also raised as long term policy risks.

Liability risks are the risks of costs arising from adverse risk events. Liability costs for a given party are the direct and unassignable costs incurred by the party plus the costs assigned to the party by other participants. This area was raised by the experts as an important emerging category of risks. Aspects to be considered in the product liability area are that policy should be designed and implemented so that it links responsibility and liability, and tracing and tracking systems need to be consistent and supported across the whole agricultural chain.

Production risks often intersect in some way with risks already mentioned. Food and agriculture production is changing rapidly and reorganising by increasing in scale and specialisation which can concentrate certain risks. Strategic risks in the production area are the

increasing scale and specialisation, the increasing volatility of commodity inputs and outputs, the chain structure and the commitment of policy makers to fundamental research, knowledge access and policy consistency.

The Netherlands has comparative advantages that permit agriculture production and processing to flourish. The cluster concept is being used in the horticulture sector to organise very efficient production facilities through cooperative efforts. The Netherlands is geographically well situated in relation to many European consumers. The country is further blessed with educated and critical consumers who can provide an enduring edge for its agriculture industry by imposing harsh judgment of new products and creating incentive for innovation. The experts in our study highlighted the advantage of innovative thinking among entrepreneurs in the Netherlands. Skilled management has been a hallmark of agriculture in the Netherlands. The drive for product quality improvement has contributed to innovation in agriculture in the Netherlands historically and especially in the last several years. The advantage of systems and infrastructure are historic and transportation and logistics advantages provide an edge in many sectors of agriculture.

More activity on risk is expected as agribusiness becomes more exposed to international markets. There were several broad themes of risk which, in the view of the experts, are important topics for additional research and development of expertise. These themes of risk are in the areas of consumers and citizens, robust food chains and market oriented risks.

1. Introduction

Almost 450 years ago, in 1559, Conrad Giestner brought the first tulip bulbs from Constantinople to the Netherlands. People fell in love with the tulip and soon tulips became a status symbol for the wealthy. Over the next seven decades trading interest in tulips broadened to include the middle class and speculators who purchased tulip bulbs with the expectation that the prices would continue to rise. In 1636 prices for tulip bulbs peaked at the present day equivalent of approximately €50,000. From their peak, prices slipped back slowly until full scale panic set in and prompted a precipitous fall in bulb prices which led to numerous contract defaults and stories of financial ruin. Prices eventually fell to €1 per bulb ending the infamous 'tulip mania'. From this rather precarious beginning, the Dutch created a position of global leadership and a comparative advantage in flower trade which remains to this day.

The tulip story is one of risk and opportunity. Risk and opportunity are linked such that often a goal of business is to manage risk well, but not to eliminate all risk so that the opportunity also disappears. Policy makers also face trade-off dilemmas between risk and opportunity, but generally through policy actions they do not want to rid their constituents of all risk because, in so doing, they would also be slamming the door of opportunity closed.

Today, agriculture continues to face risks and it also has opportunities through the extension or development of comparative advantages. In this report we present current thinking about significant risks facing agriculture in the Netherlands by a group of expert participants who discussed their views on this topic with us.¹ We are grateful to the participants for sharing their views and insights to help advance and shape the important agenda for risk. We recognized that understanding the comparative advantages of Netherlands agriculture can, in itself, be an advantage in constructing a response to the risks facing the industry and to help insure that the comparative advantages in agriculture endure. Therefore, in this analysis we devote a part of the report to discussing comparative advantages and competitive potential.

¹ The semantics of risk terminology may vary for different people and situations. The expert participants in this report took a broad, holistic view of risks in agriculture. They included tactical risks faced by members of the chain where there may be knowledge of the distribution of outcomes but where the actual outcome is uncertain. The experts also discussed strategic risks which sometimes can be viewed as strategic decision making issues. A single area or issue may have tactical and strategic risks associated with it for a farm or business.

2. Process

Our objective in this analysis was to receive the most candid and direct feedback as possible on risks facing agriculture in the Netherlands. We discussed a number of possible approaches to accomplish this objective. We decided on a subjective, interview approach. This method has the advantage of being an open, unassuming process where participants are unconstrained in the discussion of risks. Admittedly, an unconstrained discussion oriented method leads to subjectivity in the analysis. Other methods, such as a survey, might lend themselves to more objective analysis and more easily quantifiable results, but those alternative methods have the likely disadvantage of imposing greater initial constraints on the participants.

2.1 The expert participants

In our approach we elected to interview leaders in agriculture. We selected individuals who, in our judgment, were likely to have expert insight into the current agriculture situation and also a sense of some of the possible issues and opportunities which may lie ahead for Netherlands agriculture. While this selection process was clearly non-random, the participants intentionally included a broad cross section of agricultural leaders.¹ Participants came from positions in agribusiness research, operations, management and public relations, as well as, senior policy and academic posts. The participants have notable backgrounds and experiences as evidenced by their leadership positions and service on industry and public sector boards of governance. The combined experiences of the participants provided them with a useful and important background for purposes of this analysis.

2.2 Interview discussion

As a framework for discussion with each participant, we designed a general discussion agenda to be used in the meeting with each participant. We held a separate, one on one, discussion with each participant which lasted approximately one hour.

¹ The expert participants represented a broad array of agriculture in the Netherlands. Looking at the participants by sector there were 4 experts from the animal sector, 2 experts from the plant sector and 3 experts with general backgrounds that were not sector specific. If we look at the expertise by activity within a chain we see that there were 2 experts involved in production, 4 experts in processing aspects of a chain, 1 expert representing the consumer aspects and 2 experts with backgrounds in research and policy.

2.3 Discussion section one - risk assessment

The first section of the discussion dealt with identifying the important risks facing agriculture in the Netherlands. There are a number of ways to categorise risk in a broad sense for discussion purposes. We chose to consider risk in three broad categories. The categories considered were individual farm or firm risks, chain and network risks and external risks.

Individual risks are the risks facing an individual farm or firm and are generally isolated to the farm or firm. The consequences of risk events in this category are that an individual firm would be adversely affected but there would be little or no material affect on other firms in the sector or industry.

Chain and network risks are the risks to a farm or firm brought on by actions of another party in the chain. Chain and network risks may include direct chain partners as well broader network connections such as consumers and national or regional public policy. The consequences of a chain or network risk event can be to adversely affect other parties in the chain or network.

External risks are the risks to a farm or firm that are completely outside of the farm or firm's scope of business. External risk is risk which originates in a different country or industry which can include risks such as disease or global public or trade policy. The risk can have an adverse impact on individual firms, the chain and even an entire sector or industry.

In our discussion with participants about risk, we also discussed characteristics of a risk in the context of a risk being either an everyday risk or an extreme risk. Everyday risks are normal risks found in a farm or firm on a regular basis. These risks can have implications for the success or failure of a farm or firm over time. However, generally this is not due to one single decision or event. Extreme risks are those risks faced by a farm, firm, chain or industry that can significantly and suddenly adversely affect the firm, chain or industry. These risks are generally rare and can have an extreme adverse impact upon a party's ability to continue to operate.

2.4 Discussion section two - comparative advantages

A firm's comparative advantage is the edge the firm has over other firms. In an open and trading nation, a firm must maintain its comparative advantage to insure its competitiveness in the industry. Absent an advantage, a likely outcome is that the firm will disappear either through consolidation or rationalisation. Comparative advantages also exist in sectors or industries. A comparative advantage may be the result of a natural advantage, a developed advantage, or a facilitated advantage.

A risk faced by the public is that of losing an existing advantage which may have adverse repercussions on a sector, industry and ultimately the nation's economy. In this section of the discussion, we asked the experts their views about the current comparative advantages of agriculture in the Netherlands.

2.5 Discussion section three - competitive potential

Competitive potential is a potential future comparative advantage. Through the right structures, investment or possible facilitation, competitive potential can be converted to comparative advantage. In this section of our discussion we focused on getting participant's views of competitive potential that may exist in agriculture. This could be useful in identifying areas of potential that can be developed into comparative advantages.

3. Views of participants

3.1 Risks

The expert participants identified a number of risks facing agriculture. In our discussions several strong themes emerged as the most significant areas of risk facing agriculture. The major themes of risk the participants raised were the risk of disease, consumer risks, policy risks, product liability risks and production risks. Most of the enumerated risks are multifaceted, and thus are found in more than one of the categories listed here. Furthermore, many of the risks affect several parts of a chain, sector or industry. In this section we discuss the major risk themes and offer anecdotal support in the form of comments made by the expert participants. Appendix II contains a complete table of the risks mentioned by the experts.

Risk of Disease

The greatest risk seen by many of the experts is the risk of plant or animal disease. Several of the experts said, 'the number one risk facing agriculture is the risk of plant or animal disease.' There are technical aspects of plant and animal disease and non-technical aspects. It was universally felt that agriculture has done a good job of dealing with the technical aspects of disease control and management. This is an area where the job is never done, so technical work on ways to identify and manage disease risk is important and will need to continue. 'The strength of the chain and knowledge within the chain are critical factors in battling disease on an ongoing basis', cited one expert.

The other, non-technical, aspects of disease risk present some opportunity for improvement. An expert voiced the concern that 'there is a great deal of difference in the perceived risks and the actual risks.' It was generally felt that more could be done to help create a better understanding of the real risks of disease in food and agriculture. Stated another way, there is not enough done to communicate the activities of a chain to insure safe, healthy food is available for consumers. Better communication strategies with the consumer and public could help build a better understanding of food in general and specifically the implications of disease risks. There is a general skepticism among the public and consumers about the objectivity of institutions which stifles the ability to conduct a productive dialogue with these constituents. One expert stated that for consumers, 'food is emotional.' A consumer is often making decisions relating to food based on some emotional or subjective aspect and this needs to be more broadly recognised.

The experts felt that the strategic areas of consideration for risk of disease were the importance of continuing to develop technical knowledge about disease and its control, access to knowledge by chain managers, as well work on the development of enhanced measurement, tracing and tracking tools. Furthermore, experts felt it is important to recog-

nise the subjective aspects of food and perceptions about food and disease risk and to develop and communicate relevant information about food and disease risks.

Consumer Risks

The consumer risks are those risks which relate to the marketing and consumer activities of agriculture chains. One important observation is that nearly every expert participant highlighted the continued and important trend of agriculture production moving from a supply driven chain to a demand driven chain which was characterised by the comment, 'there is a shift of power in the food chain to the market or consumer side.'

The supply driven chain was well supported by research work in genetics, agronomy and livestock breeding, as well as, farm management practices such as a focus on maximising production quantities. The change to more market and demand driven chains means the chains will need to respond to consumer demands faster and probably more dramatically than they may have been called to do in the past. This continuing shift raises the importance of understanding the changing demands of the consumer but there is concern which was voiced in phrases by experts such as, 'do we really know what the consumer wants?' Experts raised a concern that an important point of the chain is to translate the demand characteristics back to production members efficiently so that appropriate chain partners can respond effectively.

Some agricultural sectors can provide excellent examples of consumer driven changes which have created an edge in production. In horticulture, consumer signals have prompted the development of new floral colors. In the livestock sector, it has meant lower fat meat. And, in chicken production it has meant a change to less intensive production methods. Food safety is also seen as a key risk issue in the consumer category. The shifting demographics of the consumer create another consumer oriented risk. One statement highlighted this: 'In the past a housewife may have spent 2 hours preparing the evening meal, now it is 20 minutes and we believe it is going to be 8 minutes in the future.' This is one example of how changing demographics and behavior will drive change in the types of food products which could be developed and offered.

There are several strategic areas which were highlighted. Strategic knowledge about the consumer and the chain will be increasingly important. There needs to be a strong two-way information highway linked to the consumer. It will be very important to listen to the consumer and understand his or her concerns and preferences. Fundamental knowledge about the consumer can help to keep the production chain aligned with consumer demand. However, the bi-directional information traffic should also carry more information to the consumer about the agriculture chain. The consumer will likely need to be more informed and that could help to dispel myths and create a better understanding of the real risks in the chain.

Policy Risks

Policy is an important aspect of food and agriculture production. Policy and regulatory risks rated as one of the top risk categories in agriculture by the experts. One of the most important roles of leaders in policy as stated by experts was to, 'help provide a vision for

agriculture. The Flowers and Food project is a great example of that leadership.' Our experts cited that an aspect of the policy role of government in agriculture was to 'create a healthy business climate for entrepreneurs.' Change in the Common Agriculture Policy in the European Union or possible changes in global trade policy through upcoming World Trade Organization negotiations were listed as policy risks. Regulation and regulatory policy contributed to the risk in this area also. The lack of policy and regulatory harmonisation was a concern for many of the experts especially as it relates to the long term competitiveness of agriculture in the Netherlands. Technical aspects of policy risk were items such as insuring adequate research into the food and feed utility of newly available by products and the emerging issue of obesity as a health issue among the human population. Several times we heard that, 'the Netherlands is a trading nation.' This point obviously has policy implications not only with respect to trade, but also for considering how to control the technical risks openness carries such as the risk of disease. Another significant policy risk recognised by the experts is that of making policy decisions. It, in itself, is risky business. There is a risk of how and what ought to be facilitated or supported. It was suggested that any facilitation ought to be strategic and fit with the overall vision and goals of the citizenry and not be tactical or incidence sensitive.

There are several strategic risks in the area of policy. First, it was generally felt by the experts that it is important for policy makers to lead with a strong vision for agriculture in the Netherlands. The vision needs to help establish the important link between agriculture production and food which was voiced most succinctly by one expert in the statement 'we don't just produce pigs, we feed people!' Second, there should be a policy and regulatory climate conducive for competitive and innovative production by entrepreneurs and agribusiness. Finally, food security and climate change were also raised as longer term strategic policy risks.

Liability Risks

Liability risks are the risks of costs arising from adverse risk events. Liability costs for a given party are the direct and unassignable costs incurred by the party plus the costs assigned to the party by other participants. This area was raised by the experts as an important emerging category of risks and they suggested that there is a need to 'link responsibility and accountability.' Risks in this section have practical and policy implications dealing with responsibility and accountability. For example, the experts lamented that liability risks seem to increase when policies such as 'non-vaccination' could change the resistance profile of animal production. Plant production has similar issues in the area of plant disease resistance. Another related item recognised by the experts was 'the need to match policy changes with gains in technology.' Technological advances seem to have outpaced the policy area surrounding product liability, measurement, and risk tolerance of the presences of adverse elements. It was noted that in some areas there are 'zero tolerance' policies for micro nutrients or organisms but as measuring equipment improves so that levels of micro nutrients and organisms can be measured at extremely low levels of presence, the policies and regulations have not changed. While 'zero tolerance' may be appropriate for certain organisms, it could also be that there are some very low 'safe levels' which now

or in the near future may be measurable so the important point is to keep policies aligned with advancing technology to avoid unintended consequences.

Strategic risks in this category are the commitment of aligning accountability and responsibility in the chain. Another issue is creating incentive for the chain to use tools to manage liability risk in the areas of measurement, tracing and tracking. Also, there will likely need to be risk management products that can be used by chain members to insure against adverse events.

Production Risks

The experts listed a number of risks which relate to agriculture production. A primary producer is considered to be involved in agriculture production. However, the experts were quick to point out that the view of production ought to be broad and virtually every step of the food chain contains production elements. Here production risks are risks incurred in production aspects of the food chain. The experts mentioned the 'risks which accompany the increase of production scale and specialisation', as important production risks. Increasing scale and specialisation compounds the ensuing risk of increasing volatility of input and output prices. An entrepreneur of the future will likely need to be well versed in managing complex commodity procurement and sales strategies. Producers will directly feel the pressure of changing trade and support policies within the country, the European Union and globally. Another point made by the experts and viewed as a risk was the recognition that in the Netherlands 'most of agriculture is very spot driven market.' There will likely need to be changes in the chain marketing structure to strengthen the chain and insure that the right investments are made. In the area of production risks there was a concern about the long term commitments for support of research, knowledge dissemination and policy consistency.

Strategic risks in the production are increasing scale and specialisation, the increasing volatility of commodity inputs and outputs, the chain structure and the commitment of policy makers to fundamental research, knowledge access and policy consistency. One of the experts noted with a certain tinge of pride, 'this is a very hard business - thank goodness!' There can be plenty of challenges in agriculture production but from a producer viewpoint as long as there is opportunity commensurate with the challenges and risks there will be talented entrepreneurs willing and able to fill agriculture production roles.

3.2 Views of Comparative Advantage

Comparative advantages in agriculture are the 'edges' that allow agriculture businesses to be successful in the Netherlands. A comparative advantage may be a natural advantage of resources or climate, or a comparative advantage may be derived from human development, such as an infrastructure good. The experts noted that 'agriculture is really important to the Netherlands and too often misunderstood.' 'We have a number of very good examples of changing a disadvantage into an advantage, this can be easily seen in the horticulture sector', stated another expert. The Netherlands clearly has comparative advantages that permit agriculture production and processing to flourish. Participants in our study identi-

fied a number of advantages of the Netherlands. There were six common themes of comparative advantages which were enumerated by the experts.

Clusters

The current concept of a cluster is a group of production facilities set up in close proximity to each other to allow for sharing infrastructure investments. While this cluster concept is relatively new, the general idea of cooperation in activities is quite an old concept in the Netherlands. Producers have long organised to jointly purchase inputs, sell outputs, obtain financing or even to manage water levels. These cooperative concepts are ingrained in the culture and history of agriculture in the Netherlands. The cluster concept is being used in the horticulture sector to organise very efficient production facilities through cooperative efforts. The horticulture sector has levered the cluster concept to out-innovate other country's horticulture producers by decreasing energy costs, considering access to transportation, incorporating risk-sharing techniques into plant breeding and developing cooperative marketing schemes. Traditional cooperatives are essentially a form of a cluster. As an example, these cooperatives may provide marketing services or other specialised activities for dairy and potato farmers. A part of the cooperative's role in the past has been to translate demand factors back to the producers through their purchasing schemes and ownership structure.

The cluster concept may be organised in many different ways, but one common theme is that they develop what was either a neutral factor or a disadvantage into an advantage. The cluster activity does this through a combination of innovation, economies of scale, activity specialisation or brand development.¹

Consumer

Europe is among the most important consumer regions in the world. The Netherlands is geographically well situated in relation to many European consumers. The country is further blessed with educated and critical consumers who can provide an enduring edge for its agriculture industry by imposing harsh judgment of new products and creating incentive for innovation. The base of critical consumers is only one aspect of this advantage. The other aspect is that, in the view of our experts, the demand side of the equation is in a position of market power. The experts in our study clearly articulated the need for continual

¹ The cluster concept is one that was discussed here by the experts as important in both plant and animal production. Several of the experts talked about the value of the cooperative aspects of clusters in helping to bring knowledge, productivity and efficiency to a sector. The early development of cooperatives in banking, water management and agriculture processing has helped spawn other cluster developments to create competitive advantages. Dr. Michael Porter, Harvard University, has also done research on the clusters in Dutch Agriculture.

change toward a more consumer oriented mentality. The proximity of the consumer coupled with the shift from demand side power to consumer side market power will aid the Netherlands in this advantage.¹

Innovation

The experts in our study highlighted the advantage of innovative thinking among entrepreneurs in the Netherlands. This is highlighted as an advantage but an advantage such as innovation will need to be fostered by policy which rewards entrepreneurship and innovation.

Management

Skilled management has been a hallmark of agriculture in the Netherlands. This advantage is partially the result of years of public and private investment through strong education and research institutions.

Quality

Agriculture in the Netherlands has been keen on incorporating quality improvements as a part of the production process. The drive for product quality improvement has contributed to innovation in agriculture in the Netherlands historically and especially in the last several years.

Systems

The advantage of systems and infrastructure are historic. The transportation and logistics advantages provide an edge in many sectors of agriculture. The Netherlands sits at the intersection of the European river system and the Atlantic Ocean. It is host to the busiest port in the world, Rotterdam, and one of the busiest airports, Schipol near Amsterdam. The food chain also has invested in other systems such as tracing and tracking.

3.3 Views of Competitive Potential

Regionally competitive

The Netherlands is a competitive regional player. Perhaps it will not be cost competitive globally, at least in some agriculture sectors, but against other countries in the region, it can compete very well on cost and value. It was felt by some experts that there is more po-

¹ Europe is characterised by variation and diversification of consumer preferences. Even over relatively small geographic areas consumer preferences may differ significantly. The proximity of the Netherlands to so many consumers can be a valuable advantage in designing and delivering food and agriculture products to the complex and diverse preferences of these consumers.

tential to focus on developing agriculture in the Netherlands as a pan European competitive industry.

Broad view of food chain

The broad view of food can be a point of competitive potential. Agriculture in the Netherlands takes a very holistic view of the food supply chain where each participant is privileged to be a part of the chain. Each chain participant has opportunity coupled with responsibility in the chain's quest to produce and deliver better food, more efficiently. The participant experts mentioned the people, planet and profit view of a number of participants in the food production chain as a area of competitive potential. While there was certainly a concern about the weak links in the chain, the fact that everyone considers themselves a part of a the food chain is a potential advantage. This way of thinking can present opportunities into the future.

3.4 Reflections of guidance distilled from the discussions

Innovation and imagination

To create meaningful improvement and advancement will take innovation and imagination across the food chain. Not only must industry innovate to succeed but so must policy makers and researchers. The expert participants highlighted innovation as an important characteristic of Netherlands agriculture which will need to continue in the whole chain.

Multidisciplinary approach

Risk is complicated and often affects many participants in a chain. It is doubtful that enduring solutions will be simple, monolithic and tidy. Researchers and practitioners will need to consider many aspects.

Comparative advantages

Any investment, directives or facilitation of risk should carefully consider its impact on the existing or emerging comparative advantages which can be as or more important to agriculture in the long run. It is not always the goal to get rid of risk but rather to manage it. Often opportunity is disguised as risk and businesses will find success by not running from risk but rather by managing it well.

Risk of decision making

One of the greatest risks faced by policy makers and, indeed also, business leaders is the risk involved with making a decision. The decision may have profound affects on many constituents and therefore leaders need to consider their decisions diligently.

4. Analysis and reflection

Food products are more and more processed and traded over long distances, making it difficult for consumers and/or citizens to control and observe relevant quality attributes in a direct manner. Consumers and citizens do not always see food-related risks in the way that experts do, as is illustrated several times during the last decade. More evidence about consumers' perceptions of the sources of food-related risks and their responses to those risks is needed. Who bears the risk and captures the reward in the increasingly more tightly aligned food demand chain? The dispersion and/or concentration of risk merits analysis from a policy as well as a management strategy perspective. Access to information, transparency, risk sharing, and the risk associated with market access are important issues. The risk environment of farmers is also changing, due to less government intervention (market liberalisation and less regulation). Although government itself still is considered to be a main source of risk. Entrepreneurs adopt a range of strategies to manage the risks they face, including on farm measures as well as risk sharing strategies (market contracts, insurance).

There is a growing interest in risk sharing, and hence in the structure, conduct and performance of markets for risk. Moral hazard, adverse selection and information asymmetry can undermine policy intervention measures in agricultural and related markets. The economic losses due to contagious disease outbreaks can be very high. The occurrence and frequency of epidemics are almost impossible to predict. Cost-effective policy intervention measures need to manage information asymmetry.

In this analysis of significant risks facing agriculture in the Netherlands, we discussed risk with agriculture leaders in the Netherlands. The discussions were open, free flowing dialogues about significant risks facing agriculture in the Netherlands, the comparative advantages and the competitive potential. From our discussions, we have identified some of the significant risks facing agriculture in the Netherlands as well as the areas of comparative advantage and competitive potential. In many cases the significant areas of risk also represent areas of great opportunity for the Netherlands to extend its comparative advantages or develop its competitive potential in agriculture within the European region. Therefore the important research questions which emerge are linked to some element of risk and some element of opportunity. In appendix II we present the risks which were identified by the expert participants. This table was created from the notes taken during the discussions. In compiling this list of risks we have chosen to be as inclusive as possible when participants mentioned a risk they felt was relevant and significant for agriculture. The greatest risk concerns expressed by the experts were disease risk, consumer risk, policy risk, liability risk and production risk.

4.1 Comparative advantages and competitive potential

The experts in our discussions highlighted the importance of considering risk as one side of a two-sided coin. The other side of the coin is opportunity. Understanding the trade-off between risk and reward is key to designing effective risk management strategies for entrepreneurs and policy makers. Because risk and opportunity are linked, thinking about risk can provide useful insight into where opportunities for agriculture may be found. In this section we reflect on the comments by the expert participants and offer strategic considerations for each of the categories identified by the experts as significant risks facing agriculture.

In the long run successful businesses, sectors and industries will achieve and maintain comparative advantages. In one sense the best risk management strategy is to focus on developing the comparative advantage of the farm or firm. This can be true for firms, sectors, industries and even countries. As we look at how to proceed, any action should carefully consider the likely impact on one's comparative advantages and competitive potential.

5. Recommendations for further research

5.1 An approach for a future Research and Development Agenda

There were several broad themes of risk which, in the view of the experts, are important topics for additional research and development of expertise. These themes of risk are in the areas of consumers and citizens, market oriented risks and robust food chains. Building expertise around each of these themes of risk will likely play an important role in the future of agriculture in the Netherlands. Increasing risk in the areas identified will be, in part, a result of consumers and citizens becoming even more discerning about food, escalating pressure on chains to be efficient and productive in a competitive environment as well as increasingly global and liberalized markets. We conclude by proposing strategic areas of research where additional work could help to mitigate some of the risks which were identified by the expert participants, or which can help extend the existing comparative advantages or develop the competitive potential. Important policy issues for a future research and development agenda are therefore:

5.2 Consumer and Citizen

- How can existing consumer values be utilised to strengthen the added value of food-demand chains?
- What perceptions do consumers have of the use of technology in the production of food and other agricultural products?
- How can the lives and health of people be improved by dealing with the emerging issues of obesity and food related allergies?
- What education initiatives can help to create realistic expectations of food among consumers and the public?
- Which institutional arrangements and communication strategies can strengthen consumer and public trust of institutions and information?

5.3 Market Oriented Risk

- What are the potential market impacts of WTO and CAP changes?
- What market based tools are available for managing risk of commodity price volatility?
- For commodity inputs such as energy and weather?
- For commodity outputs such as pork and arable crops?
- How do producers determine optimal pricing strategies for their commodity input and output prices?

- What are the implications of scale and specialisation in agriculture food chains with increasing commodity price volatility?

5.4 Robust Food Chains

- How can ex-ante assessments of the alternative policy interventions be improved (to prevent them from being ineffective or counter-productive)?
 - In which areas should there be policy and regulatory harmonisation for the Netherlands and EU?
 - What is the cost, effect and value of supporting regulatory harmonisation?
- Product liability research topics?
 - What actions are needed by chains to insure participant responsibility and accountability (an assessment by chain)?
 - What market based tools can be designed and offered to insure product liability risk?
- Where are the greatest technical exposures to plant and animal disease and what steps can be taken by a chain to manage these risks (by chain assessment)?
 - What is the impact of 'non-vaccination' policies on the resistance profile of animal production?
 - How to keep 'zero tolerance' policies for micro nutrients or organisms aligned with advancing measurement technology?
- How to lever the cluster concept to out-innovate other country's agibusiness?
- What are the distributional consequences of the structural changes in agribusiness: which consumers, which producers, and which of the other participants in and around the food chain win and who is left behind?
- What are the policy drivers for creating a conducive environment for entrepreneurship, clustering and innovation in agriculture chains?
 - For large chains and systems
 - For micro chains and systems
- Which institutional arrangements can support better access for all chain participants to available knowledge within research institutions?

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Appendix II Table of Risks Mentioned by Experts

The risks listed below are those risks that were mentioned by the expert participants. The categories of risks typically listed by participants were the risk of plant or animal disease, consumer related risks, policy risks, product liability risks and production risks.

Risk	Disease	Consumer	Policy	Liability	Production
Access to knowledge	X	X	X	X	X
Food safety	X	X	X	X	X
Knowledge development, research	X	X	X	X	X
Policy of non-vaccination - long term effect and risk	X	X	X	X	X
Global risks of macro-economics, war, disease	X	X	X		X
Objective knowledge	X	X	X	X	
Organizing production for multi-functionality	X	X	X		X
Actual risk and response	X	X		X	X
Communication plan	X	X	X		
Disease risk, animal and plant	X	X		X	X
Individual farm or firm sales and marketing risks	X	X		X	X
Knowledge integration in supply chain	X	X		X	X
Knowledge management	X	X		X	X
Lack of education about risks	X	X		X	X
Perceptions of risk and response	X	X		X	X
Sensitivity of consumer	X	X		X	X
Share of risk and reward in chains	X	X		X	X
Supply chain organisation	X	X		X	X
Emotional aspects of food	X	X		X	
Lack of knowledge and understanding of consumer market drivers	X	X			X
Policy changes inconsistent with technology improvements.	X		X	X	X
Risk of consumer demand shifts		X	X	X	X
Risk of lack of vaccines developed and approved for small countries with lack of harmonisation	X		X	X	X
Risk of public, issues and priorities		X	X	X	X
Tracing and tracking	X		X	X	X
Creating new value propositions		X	X		X
Environmental policy	X		X	X	
Government policy and regulation risk	X		X	X	
Institutional mistrust	X	X			
Policy - defining consistent and appropriate regulatory thresholds in food	X		X	X	
Policy - need level playing field in Europe	X		X	X	

Risk	Disease	Consumer	Policy	Liability	Production
Policy to match liability and responsibility with appropriate party in chain	X		X	X	
Risk of determining which activities should be facilitated by government	X		X	X	
Trust in consumer organisations	X	X			
Trust in scientific labs	X	X			
Chain has weak links	X			X	X
Communication/internet		X	X		
Consolidation and concentration at retail level		X		X	X
Individual farm or firm production risks	X			X	X
Individual farm or firm purchase risks	X			X	X
Loyalty in chains		X		X	X
Obesity - consumer and public		X	X		
Perspective risk - perspective matters		X	X		
Lack of strong links in chain		X			X
Quality schemes		X			X
Risk of specialisation	X				X
Translation of demand to producers - is it worthwhile, if so how much		X			X
Climate change			X		X
Creating climate for entrepreneurship			X		X
Demographics		X			
Determining how activities should be facilitated by government			X	X	
Lack of research on emerging by-products and their nutritional versus caloric value.			X		X
Maintaining regional competitiveness in Europe			X		X
Media, its role in prioritising issues		X			
Policy - WTO			X		X
Policy - CAP			X		X
Research institutes are too privatised, not enough public facilitation to accomplish mission			X		X
Risk of competing industries such food and fuel production.			X		X
Riskiness of choice			X	X	
Food security, geopolitical risk of food supply (example oil)			X		
NGO's - people's conscience			X		
Risk of misuse of market power				X	X
Risk to keep important institutions for future leadership, Need to keep LNV and research university structure			X		
Trade policy			X		
Consolidation at farm level					X
Degrees of freedom versus strength of links in chain					X
Economy of scale and consolidation trade-off					X

