

Wageningen UR in Global Agri-food Chains

Commitment to a better quality of life



WAGENINGEN UR
For quality of life

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Preface

Wageningen UR (University & Research centre) addresses societal challenges related to food safety, food security and livelihoods. Multidisciplinary research and collaboration between the social and the natural sciences create a unique research profile. One major area is global agri-food chains, covering the entire spectrum from field to fork. This brochure presents the capabilities and experiences of Wageningen UR (see annex for organigram) in this field, as well as some project examples.

As a result of such global issues as climate change, population growth and the fuel, water and food crises, Wageningen UR is experiencing a growing demand for research and support. The effects of climate change, incidences of drought, heat waves and erratic wet spells, and mitigation mechanisms will remain a central research area. An upcoming phenomena, perhaps the most important one in this decade, is the emergence of geographic agri-food clusters. Many benefits emerge from establishing agricultural and food processing activities close to cities. In the face of scarcity, food waste is another key theme. Even in technology-intensive chains, waste levels can be as high as 30-40%. Similarly, research on sustainable protein foods (e.g. the use of protein from insects in processed food) and the bio-based economy (the conversion of biomass into transport fuels, chemicals and energy) are central to modern agro food developments. Impact evaluation of policies and interventions on growth, innovation and well-being is also a major area of Wageningen UR's expertise.

Consumers have increasingly complex and varied demands for the food they buy. Burgeoning middle classes in emerging economies like China, India and Brazil want safe, good quality food at competitive prices. At the same time, there are increasing ethical demands on the way food and agro products are produced; these demands concern such issues as animal welfare, environmental impact, labour and human rights, biotechnology and fair trade. In combination with advances in communication and transportation technology, the global food system has transformed into a highly dynamic, complex and interrelated system. This is going to demand an unprecedented scale and pace of change. It poses challenges to food safety and risks, fresh logistics and the design of

coordinated information management systems that assure transparency and traceability in production and distribution. Moreover, incentive systems for chain actors to produce safe, resilient and responsible foods are key to the chain performance. The economics of animal and plant health require independent research, such as the use of antibiotics in animal production. New supply chain governance models are emerging, with greater influence on agro-food processing and retail.

Global sourcing is a common practice for agri-food businesses. The phenomenon has created increasingly fine-meshed sourcing, production and distribution networks around the globe. Despite more recent signs of protectionism, trade barriers have become less prominent: overall tariffs have decreased, levels of support and subsidies have dropped, and concentration and consolidation have increased across many chains. The geopolitical position of commodity producing countries is changing. A strong policy discussion is evolving around acceptable levels of food security, both locally and globally. New innovative business models and entrepreneurship are needed. Producers must gain better control over production, trade and distribution in order to guarantee the quality and value added of their products and to operate in a cost-effective way. Market and competition analysis is hence conditional for success.

Wageningen UR provides technological, economic, organizational and educational support in all these areas. In this booklet we present Wageningen UR as a potential partner in the development and upgrading of agri-food chains – a partner that is doing its utmost to contribute to a better quality of life.



Dr Aalt Dijkhuizen
Chairman of the Executive Board

A handwritten signature in black ink, appearing to read 'Aalt Dijkhuizen', with a long horizontal flourish extending to the right.



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The Wageningen approach

Wageningen UR is an internationally leading research and education institute in Life Sciences. Our research focuses on the domain of healthy food and living environment, translated in our mission statement 'to explore the potential of nature to improve the quality of life'.

Issues within the Wageningen UR domain are rarely exclusively natural, technical or social in nature. There are always multiple approaches and possible solutions – often synergetic ones. Wageningen UR therefore fosters the unique interaction between the natural and social sciences. Both sets of disciplines are part of our coherent package of research, education and services. This integrated approach offers additional possibilities for the effective application of expertise in policy or in practice.

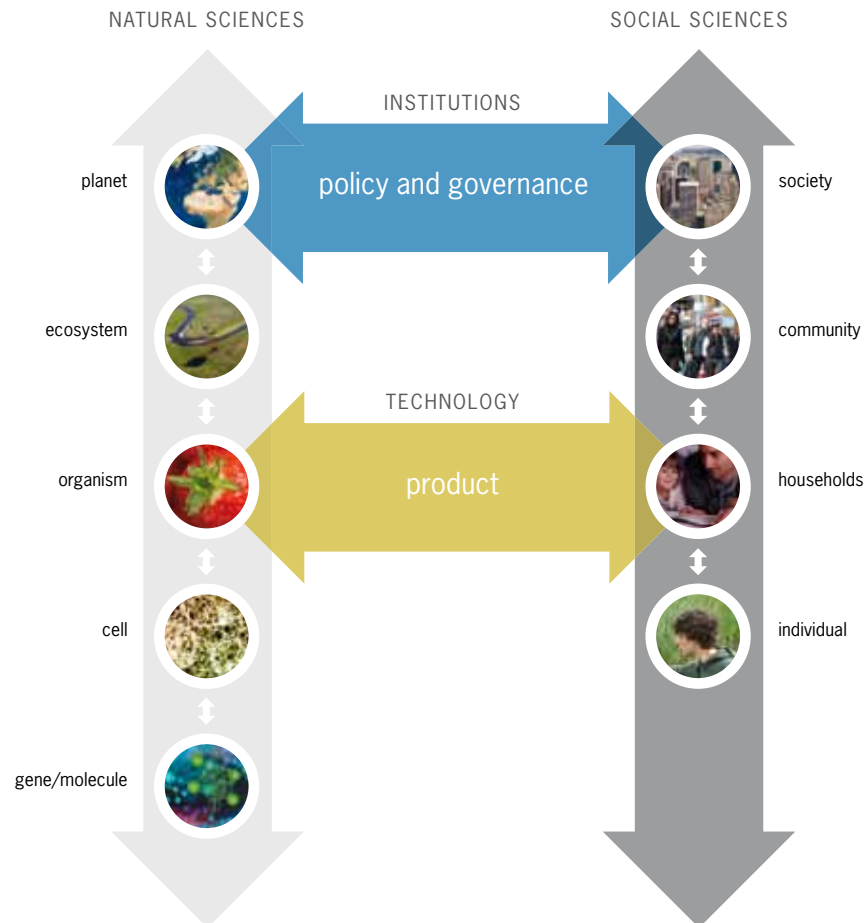
At Wageningen UR we have expertise groups who operate at all the levels of biological and social systems. What's more, our scientists scale-up and -down between these levels. This means that they try to understand system behavior at the ecosystem level, based on knowledge of underlying levels such as individual organisms (e.g. crop models) and so on.

Science for Impact

The work of Wageningen UR comprises research, training, facilitating processes of change and obtaining value from our knowledge. A key responsibility for Wageningen UR is to educate and guide young people in their academic and professional development and to provide lifelong learning opportunities. The Wageningen approach is embedded in a full range of education and training programmes. This means that our students and professionals are trained and capacitated to place an issue under study within a broader context of science and society. It helps our clients to evaluate various solution strategies for societal issues in interaction with stakeholders and colleagues from other professional and scientific domains and other cultures. It enables them to combine in-depth professional and scientific training with a broad vision and communication skills. The Wageningen approach will continue to be a challenging and inspiring concept for generations to come.

THE WAGENINGEN APPROACH

LINKING NATURAL AND SOCIAL SCIENCES



In recent years the debate on the 'knowledge society' and the need for innovation, have led to the view that scientific research is a prerequisite for economic development. Research results must be used more effectively, for societies to benefit from them. This utilization of research results needs to be promoted actively, and this can be done through an interactive model of research and application.

Results from Wageningen UR research on global agri food chains is disseminated through several channels. Next to input for education, the results of our activities are published in scientific and professional journals and are presented at conferences for scientists, practitioners or policy makers. Wageningen UR also has its own specialized conference on chain studies, the Wageningen International Conference on Chain and Network Management (WICaNeM). This conference has been organized every two years since the early 1990s. Another Wageningen UR based outlet for research on global agro chains is the Journal on Chain and Network Science.

Modern science and scientists are often inspired by the challenges and problems confronting societies across the globe, such as pandemics, the destruction of the natural environment, conflict and poverty. As a response, research in tropical and developing countries is increasingly linked to research in Western countries and vice versa. International comparisons are important tools for understanding complex phenomena and linking knowledge elsewhere to local issues. The validity of these comparisons depends on the extent to which they are based on context-sensitive research.

Experience has also taught us that a focus on scientific advancement and excellence alone is not enough to obtain results in terms of development impact. Therefore, special attention needs to be given to ways of increasing the societal use and impact of research and notably to the framework of supported research projects, including:

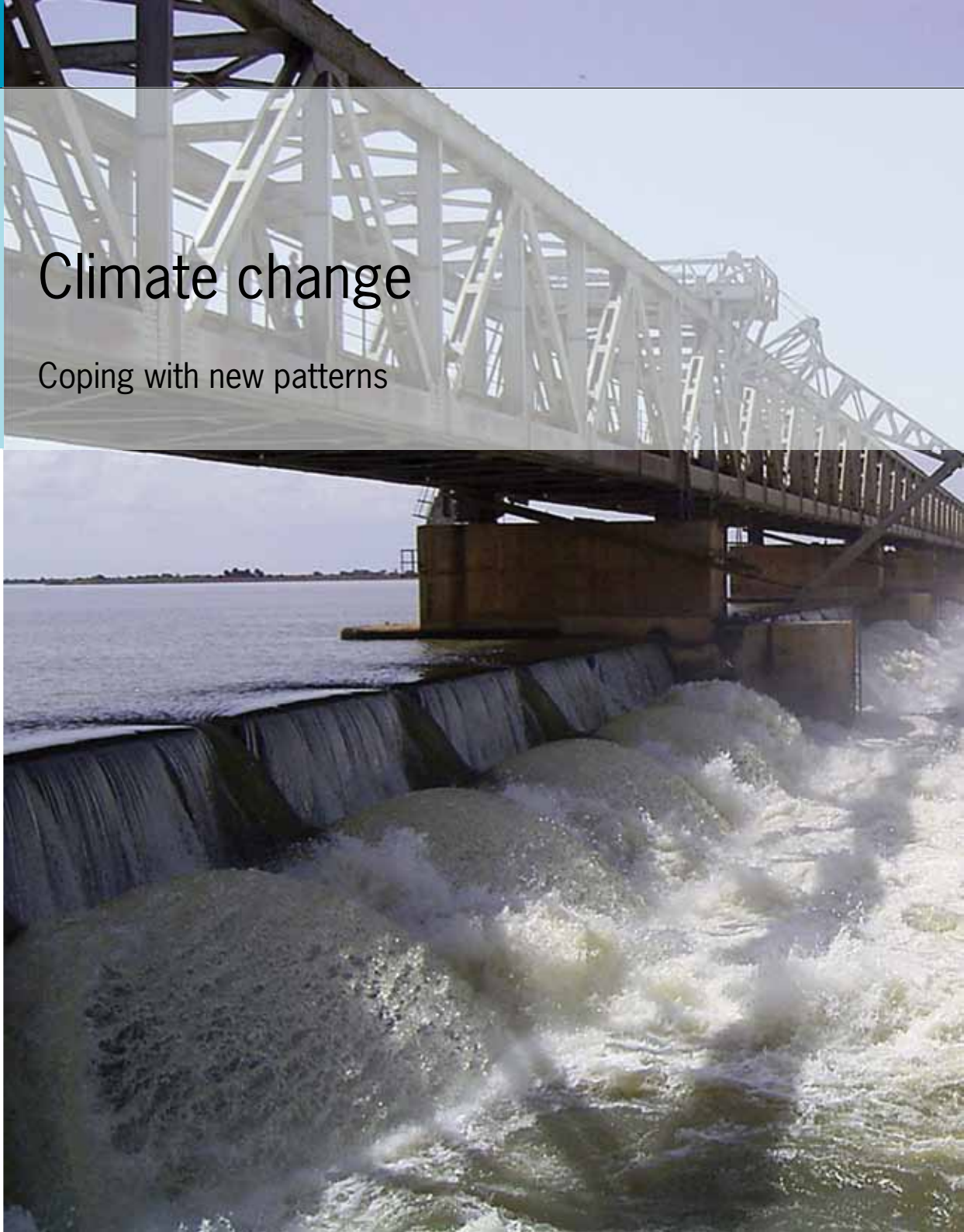
- the linkage of research questions to international research agendas inspired by or derived from policy agendas;
- the nature of international partnerships: projects and subjects should be of interest to both parties while working together and sharing knowledge;
- the need for an integrated approach to knowledge development, with attention to the different steps involved, including basic, translational and applied research;
- the design and implementation of innovative tools for learning and facilitating change processes such as round tables for enhancing sustainability;
- the involvement of non-academic stakeholders in all phases of and after the projects;
- the importance of integrating research and local capacity building;
- counteracting brain-drain;
- the sustainability of funding and the need for private sector research funding.

Finally, the scope and scale of research projects appear to be important factors for their actual impact. In addition to funding ‘upstream knowledge development’, close attention is to be paid to the subsequent steps towards innovation and application.

1

Climate change

Coping with new patterns



Global food production will be strongly affected by climate change, namely by increasing incidences of drought, heat waves and erratic wet spells. This will lead to a higher number of harvest failures and a greater loss of arable land and water, and thus to an increase in the volatility of prices.

Moreover, climate change-related human displacement and migration will add to the number of urban dwellers in developing countries. This will increase the number of net food consumers, while reducing the number of net food producers, which may again increase food prices. Economic outcomes will be significant, especially for developing economies, which often rely strongly on rain-fed agriculture. These developments call for trans-disciplinary and multidisciplinary approaches that analyse the trade-off relations between economic, social and environmental aspects – relations that are sometimes conflicting or hidden.

Policy choices aimed at mitigating the effects of climate change can conflict with other aspects of sustainability. Wageningen UR develops and implements tools that assess these impacts of policy choices, such as crop growth models that include various agro-ecological conditions. This has been a strong aspect of Wageningen UR since 1960 with Professor C.T. de Wit. These models allow the construction of scenarios of crop performance (including pest and disease population dynamics) of crops in a changing environment regarding temperature and humidity, as well as reactions to increased erratic occurrence of such events as heat waves and excessive rainfall.



◀ Evaluating Climate Change in Mali and Brazil

In 2008, Wageningen UR analysed climate change policy options in two case studies: the Office du Niger region in Mali – which faces recurrent droughts and therefore an imminent reduction in rice production – and the Mato Grosso state in Brazil, which is undergoing strong deforestation for soy bean production. With finance from The Dutch Ministry of Economic Affairs, Agriculture and Innovation (EL&I), Wageningen UR developed a method to evaluate land use policies and adaptation and mitigation strategies towards climate change. The method includes an ex ante impact assessment of sustainable development combined with an evaluation tool.

Climate change effects on food safety

Climate change will affect the safety of our feed and food products, both directly – due to the effects of contaminants – and indirectly, due to shifts in production. Within Wageningen UR, several projects focus on estimating the impact of climate change on food safety. For example, the EMTOX project focuses on estimating the occurrence of mycotoxins in cereals and phytotoxins in algae in Europe in 2050.

Climate change effects on potatoes

Potato grows best in temperate climates, where there are no frosts or excessive temperatures. The LINTUL Potato crop growth model (which was developed by Wageningen UR) shows that in most areas where potato grows during summer, yields will increase as the length of the growing season increases. The model outcome allows the evaluation of mitigation strategies, such as altered planting time and area. As the model takes account of risks of extremes and issues of water depletion, it also informs post-harvest decisions, for example those related to investments in processing. Higher temperatures also increase pests cycles and risks, and influence land accessibility. These issues are included in the LINTUL Potato model.



Risk management tools

The vulnerability of poor people to price fluctuations highlights the need for risk management tools. Wageningen UR analysed the wide range of possible instruments that reduce risk linked to price variability and discussed to what extent these can be successfully implemented in sub-Saharan Africa. These instruments include both government policies and market-based instruments, such as warehouse receipt systems, future and option contracts that can be traded in commodity exchange systems, as well as farmers' cooperatives and contract farming mechanisms, insurances and credit provisions. The study argues that before an instrument is implemented, the necessary infrastructure and institutions must be in place. Furthermore, application of any of these instruments will affect supply chain configurations and performances.



A framework for mitigation

In 2008, Wageningen UR collaborated in a joint project on the development of a methodological framework for Ethiopia. In this project, both mitigation and adaptation strategies towards climate change were developed; Wageningen UR further developed the evaluation tool. Case study analyses in two hotspot regions in Ethiopia are being conducted in close cooperation with local research institutes in that country.

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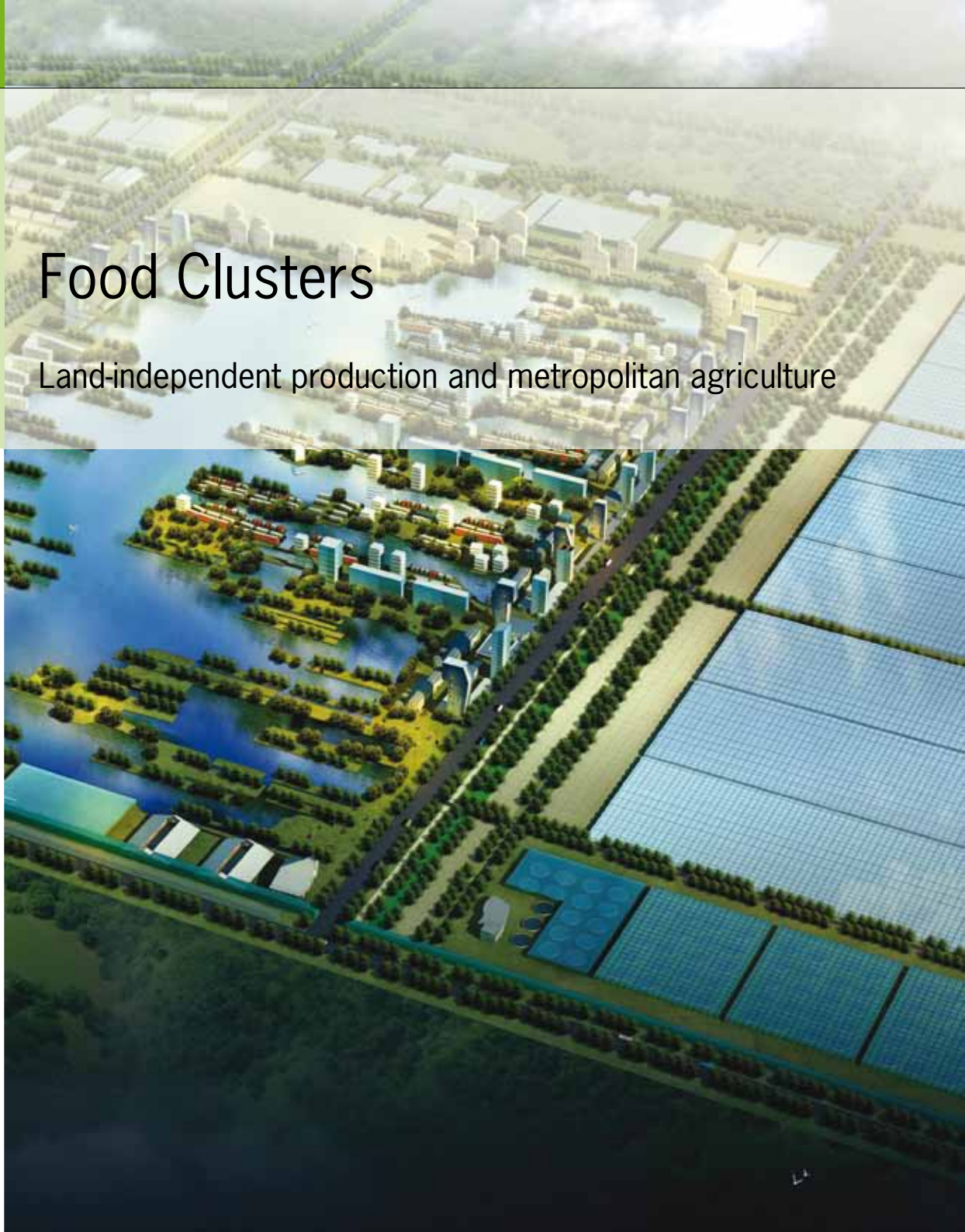


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2

Food Clusters

Land-independent production and metropolitan agriculture



The world is undergoing the largest wave of urban growth in history. In 2008, for the first time in history, more than half of the world's population lived in towns and cities. By 2030 this number will swell to almost 5 billion, with urban growth concentrated in Africa and Asia.

The explosive growth of the urban middle class is revolutionizing consumption patterns in terms of both quantity and quality. Metropolitan agriculture – namely highly productive, land-independent agriculture – is a response to that revolution. This agro-production system can satisfy changing and competing demands of the urbanized population on a sustainable basis, through new and intelligent connections inherent to network societies that are part and parcel of urban areas.

Wageningen UR actively searches for innovations in food clusters. We design intelligent agro logistic networks that contain:

- Consolidation centers, which supply the metropolises in a consumer-responsive way;
- Agroparks, which cluster different plant and protein production chains, focusing on their waste flows according to principles of industrial ecology;
- Transformation centres, which source raw materials from existing farmers while training them to comply with stricter quality standards.

Food cluster design covers both hardware as well as organizational aspects, like business planning, training and education. The Wageningen UR approach is integral and trans-disciplinary. Knowledge institutes, entrepreneurs, and non-governmental and governmental organizations are participating in these innovation processes.



IFFCO Greenport Nellore project, India

The agropark IFFCO Greenport Kisan Special Economic Zone Nellore is under construction near the city of Nellore in Andhra Pradesh, India. When it is finished it will accommodate large-scale dairy production (10,000 cows), 400 ha of greenhouse, intensive poultry, goat and sheep production, and 300 ha of processing, storage and trade facilities. It will employ 10,000 people inside and 15,000 people outside the park in rural transformation centers. Joint ventures between Indian investors and international knowledge providers are setting up their first businesses. Wageningen UR was the main designer of the park's hardware and its industrial ecology, and also facilitated the working process in which IFFCO (an Indian cooperative with 55 million members),

together with the state and local government, is setting up the rural transformation centers that will source the fodder for the agropark's livestock and the products for its processing plants. Together with Yes Bank (the park's Indian strategic partner), Wageningen UR is also elaborating the business plans of the future park manager and of the individual entrepreneurs who want to set up their business in the park.

Rakesh Kapur, CFO of IFFCO: We will not let you go away Wageningen UR after you've finished the master plan of this project. We need you to be around during the implementation and operation of the park.

More information: www.slideshare.net/Agroparks/agroparks

New mixed farm in south-east Netherlands project

In the new mixed farm, a pig breeder, a poultry producer and an installation company will set up a joint location and bio-energy plant that will be fed with their waste flows. They are elaborating technical innovations as well as new forms of cooperation to find the correct equilibrium between the independence of the entrepreneurs and the dependencies associated with industrial ecology and a joint location. This project shows how spatial clustering and the exchange of waste flows contribute to sustainable development. The active involvement of government and knowledge institutes has led to better results. The public discussion about the environmental impact is ongoing in the region. Because existing policy and permits are not applicable to the new value proposition, the innovation path in policy is elaborate. Former Dutch Agriculture Minister Cees Veerman (2005): This project has a special status, because of its innovative power. If our rules are blocking its progress, we must look for ways to get around them.



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Food Waste

Reduce, reuse, recycle, rethink



One of the significant inefficiencies in the conversion of biomass resources and fossil energy into digestible energy, is the enormous amount of spoilage in the total supply chain: 35-40% of food resources intended for human consumption do not reach the consumer, but end up in a lower value by-product stream (e.g. bio-energy or compost) or in rubbish bins (incineration or landfill).

Each year in the Netherlands, consumers waste 1.6 billion euros' worth of food. Producers, supermarkets and other chain actors waste an additional 2 billion euros' worth of food and food ingredients. Companies, governments and other stakeholders are becoming increasingly committed to reducing the amount of waste. Key issues are interventions to prevent waste and to improve valorization by the reuse of by-product streams.

The Dutch Ministry of Economic affairs, Agriculture and Innovation (EL&I) has set the target to achieve a 20% reduction in food wastage in the Netherlands by 2015. Wageningen UR believes that a 40-50% reduction is ultimately possible. To help achieve these goals, Wageningen UR is applying a programmatic approach. The basis is a well-aligned science and innovation funnel, with a balanced portfolio of research activities that will lead to long-term breakthroughs in combination with short-term benefits and the dissemination of results. Wageningen UR builds on a diversity of high-quality core competences in relevant fields of science and innovation, for example sustainable food chains, consumer science, business administration & economics, agro production & logistics, post-harvest technology, and food safety. We create synergy with our partners in a global network in order to deliver integral solutions.

Supply chain monitoring with smart RFID

PASTEUR is the acronym for Perishables Monitoring through Smart Tracking of Lifetime and Quality by RFID. A wireless sensor platform is being developed to monitor the environmental conditions of perishable goods. The sensor platform will be based on an intelligent RFID (radio frequency ID) package with multiple sensor technologies. The role of Wageningen UR is to predict the real shelf-life of fresh produce by means of quality predictive modelling techniques. In cooperation with international partners in the fresh supply chain, several distribution pilots will be run to implement and validate business rules. The project is a collaboration of 17 European partners, coordinated by NXP and supported by CATRENA.

More information: www.catrene-pasteur.com

Sustainable food chain model

The goal of the North-west European Interreg 'GreenCook' project is to reduce food wastage and develop a model for a consumer-driven sustainable food chain. The aim is to develop, implement, validate and disseminate methodologies and interventions by changing consumer behaviour and design concepts in the supply chain to improve efficiency. Wageningen UR has set up innovation projects and pilots with partners in the retail and out-of-home channel. Activities focus on supply and demand matching, direct sourcing of global fresh chains, improved valorization and interaction with consumers. GreenCook works with 12 partners and a large group of actors in the supply chain, as well as ambassadors and relevant stakeholders.





Effects of laws and regulations on food waste

It is believed that laws and regulations cause food waste, both directly and indirectly, throughout the food chain. Wageningen UR investigates which laws and regulations have an effect on food wastage by interviewing companies in the chain and analysing law texts. Wageningen UR also analyses why waste streams are often inefficiently disposed of, even though they could still be used for human consumption. Dissemination of this knowledge to the relevant stakeholders may result in reducing both food waste and inefficiently used food by-product streams.

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Sustainable Protein Foods

Tomorrow's menu



Growing populations and increased welfare are leading to an increased demand for proteins from animal sources. The global demand for meat, for instance, grew from 100 to 235 billion kilograms in the period 1970–2000, and is expected to grow to 376 billion kilograms in 2030.

A transition to the more sustainable production and consumption of proteins is required in order to reduce the pressure on natural ecosystems. Key issues are to make the current system for the production of animal proteins more sustainable, to substitute animal proteins with plant protein products, and to identify and exploit new sources of proteins for human consumption.

The transition to the sustainable production and consumption of proteins has many aspects (e.g. societal, behavioural and technological) that need to be addressed in order to reach the desired solution. Wageningen UR has all the required disciplines for this transition in-house. Through a combination of academic research and applied technology, Wageningen UR is actively working on the entire protein supply chain, from the sustainable primary production of proteins to consumer sciences and health. In collaboration with clients, technologies are developed to create innovative meat substitutes and protein alternatives that satisfy consumers' expectations.

Protein transition in today's consumer society

Explorative research, financed by EL&I, on marketing strategies that could enhance the sustainable consumption of proteins has identified a large number of Dutch consumers who are already reducing their meat consumption. These part-time vegetarians (or 'flexi-vegetarians') should be the focus in strategies and policies to promote sustainable protein consumption. The general conclusion is that an integrated approach that combines environmental, cultural and marketing knowledge is crucial for a successful transition to the more sustainable production and consumption of proteins. Wageningen UR will elaborate this integrated approach by carrying out further research on food consumption and lifestyles (cultural and marketing dimension), and will develop an LCA model (environmental dimension) covering complete diets.



Sustainable production of insects for human consumption

In this project Wageningen UR is investigating the potential of insects as a future source of proteins for human consumption. Together with Venik (the Dutch organization for insect growers), a sustainable production method for insects is being investigated by, for example, using waste streams of the agro food industry as feed material. An optimal isolation process for the protein fraction is also being developed. Finally, the functional properties of insect proteins are being investigated, as is their potential for application in food products.



Fibrous meat substitutes

Wageningen UR, financed by EL&I, is developing novel plant-based meat substitutes that have a high-quality fibrous structure. Available process technologies are adapted and optimized to improve the fibrous structure of texturized plant-originating protein-enriched products. The quality of the structure and the consumer acceptance are evaluated by means of sensory and consumer research, using the state-of-art facilities of the 'Restaurant of the Future'.

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Bio-based Economy

New markets for biomass



The bio-based economy is one in which national and international companies transform biomass into transport fuels, chemicals, materials and energy. Interests in this field are spurred by climate change, competing claims on green raw materials, the depletion of fossil resources, rising oil prices and structural changes in global energy needs, which are partly a consequence of the rapid growth of the Chinese and Indian economies.

Wageningen UR analyses the effects of biofuels and bio-based economies on the 3P (planet, people and profit) components of sustainability. With our industrial partners, new sustainable technologies are developed for the application of biomass in a variety of products. We develop new crops for the production of high value added products. We study the environmental impact of potentially competing applications of biomass, thus providing insights into the sustainability aspects of different choices. We research optimal chain configurations for producing and marketing high value products. The issues we focus on are business strategy, chain coordination, logistics and monitoring of sustainability indicators. Wageningen UR realizes that the transition to a bio-based economy requires innovations at various interacting levels. A bio-based economy can succeed only when companies (micro), sectors and chains (meso), and governments and societies (macro) fully adapt themselves on the basis of a coordinated vision.

SCENAR 2020: food versus fuel

The production of biofuels creates a major uncertainty for the future of European agriculture, especially land use. This project analyses policy incentives for a bio-based economy and its consequences for the world's food supply and markets. Wageningen UR has investigated the effects of the EU Biofuel Directive on world agricultural markets, European agriculture and rural areas (related to the EURURALIS project). The results indicate that biofuels can have a significant impact on world agricultural prices, agriculture production, incomes and land use. A number of policy alternatives that will promote the achievement of a sustainable bio-based economy have been presented.

Bio-based performance materials

In collaboration with four other universities and forty companies, Wageningen UR develops new bioplastics to replace present-day fossil plastics in a variety of applications. The project connects partners that are active in the whole production chain of bioplastics – namely agri-food companies, biorefineries, plastics producers, plastics processors and end-users – thus significantly increasing the chance that market parties will adopt the new technologies and products. In addition to the technological development, sustainability studies are also performed.





Sustainability assessment of bio-based initiatives

Wageningen UR develops models and tools to assess the performance of new bio-based supply chains at the company and the supply chain level. Wageningen UR has developed a tool that enables researchers and companies to integrally assess each aspect of sustainability. Indicators of sustainability (people, planet and profit) are operationalized in line with national and international standards. This tool helps decision makers to balance costs and benefits, including compliance with rules for sustainable production methods and imports. Risks and uncertainties intrinsic to the bio-based economy are a fundamental part of the assessment.

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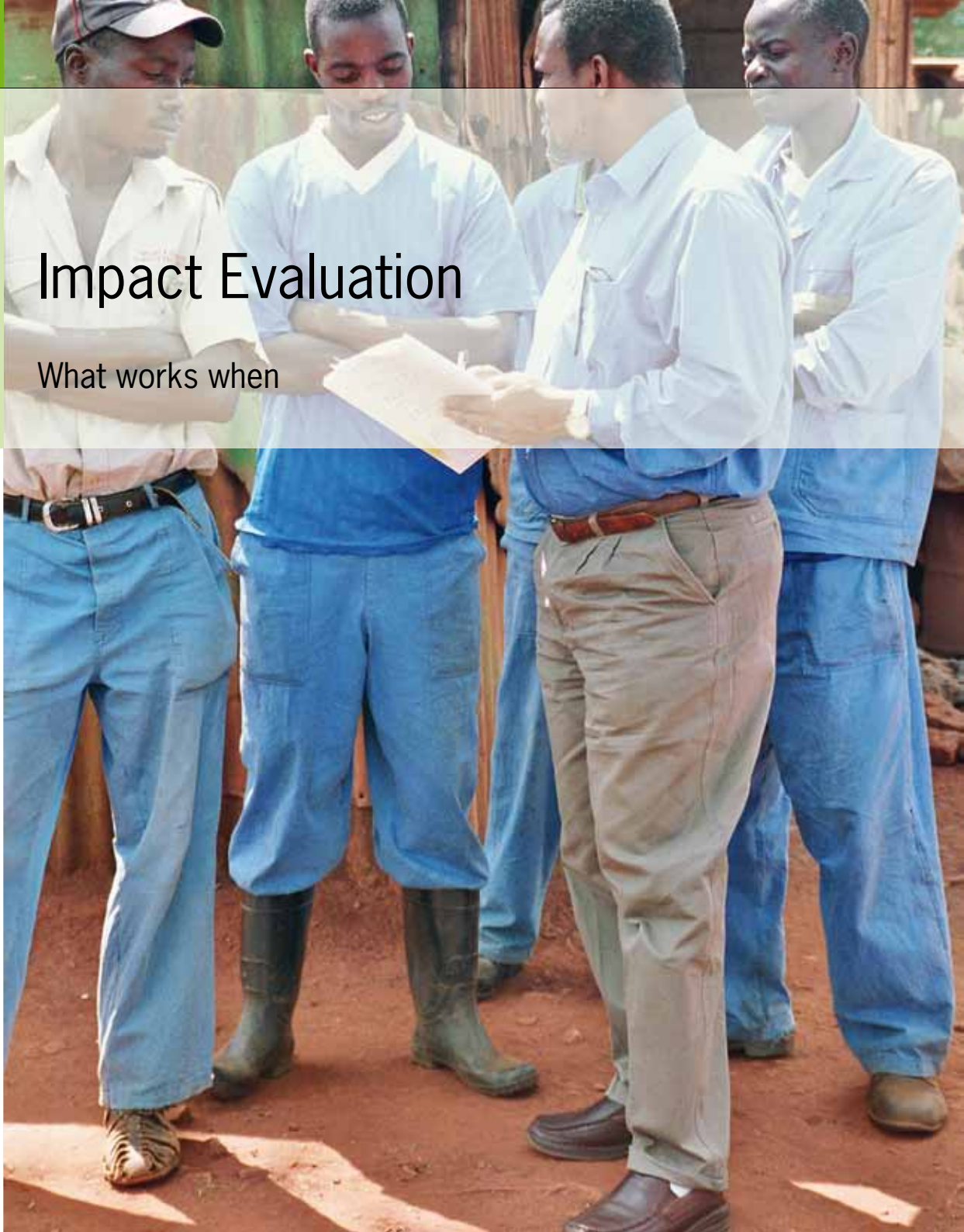


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6

Impact Evaluation

What works when



Public and private bodies are increasingly calling for credible evidence on the impact of their interventions to improve value chain performance. Even when impacts are measured to show that 'it works', the role of specific interventions in producing these changes is often not clear: for whom does it work and why?

Value chains are complex, influenced by a myriad of intervening actors, and continuously shaped and reshaped to adapt to changing conditions. Attributing impacts of interventions in this dynamic 'cloud' is difficult but necessary to answer legitimate questions about relevance, effectiveness and replicability of support.

Impact evaluation must inform intervention logics, testing underlying assumptions and relations to direct and less direct outcomes. Creative thinking is required to mix methods, combining quantitative and qualitative tools, and generate credible evidence within a client's budget and timeline.

In collaboration with clients, Wageningen UR develops and applies instruments that generate credible information and trigger learning at company and policy level. In a process of theory-based evaluation, we test and review critical assumptions in the logic and rationale behind interventions that are expected to improve chain performance. We develop methods to collect and store data on key indicators to help clients to evaluate and refine their strategies.



Understanding how training and certification changes farmers' livelihoods

Certification is an increasingly popular tool, offering consumers the option to consume more responsibly. It basically labels farmers' produce on issues such as environmental sustainability, the implementation of Good Agricultural Practices (GAPs), labour conditions and income generation. However, surprisingly little evidence exists whether certification programmes deliver the desired impacts: does certification really improve the lives of poor producers? Wageningen UR works towards that evidence, together with companies like Lipton, non-profit organisations such as Solidaridad and standard-setting bodies like Rainforest Alliance and UTZ CERTIFIED Good Inside. Using large-scale samples, the impact of certification and training is measured on farmers' income, productivity and for example the implementation of GAPs. Comparisons are made before and after and with and without certification/training. Results are used to improve the design of certification programmes. More so, methodological knowledge, how and what to measure, is built and shared with knowledge centres in producing countries.

Micro-irrigation induced horticulture

Wageningen UR developed a novel methodology for assessing changes in household income attributable to technology adoption by smallholder farmers in Nepal, Zambia and Ethiopia. Supported by the Bill and Melinda Gates Foundation, the methodology was applied by International Development Enterprises, which develops and promotes market-based supply chains of low-cost

micro-irrigation equipment for households at the bottom of the pyramid. Household income is calculated each year by estimating the gross margins of farm and off-farm activities, before and after technology adoption. The pre-adoption household incomes of successive cohorts are used to construct a proxy control for such exogenous factors as price fluctuations and weather conditions.



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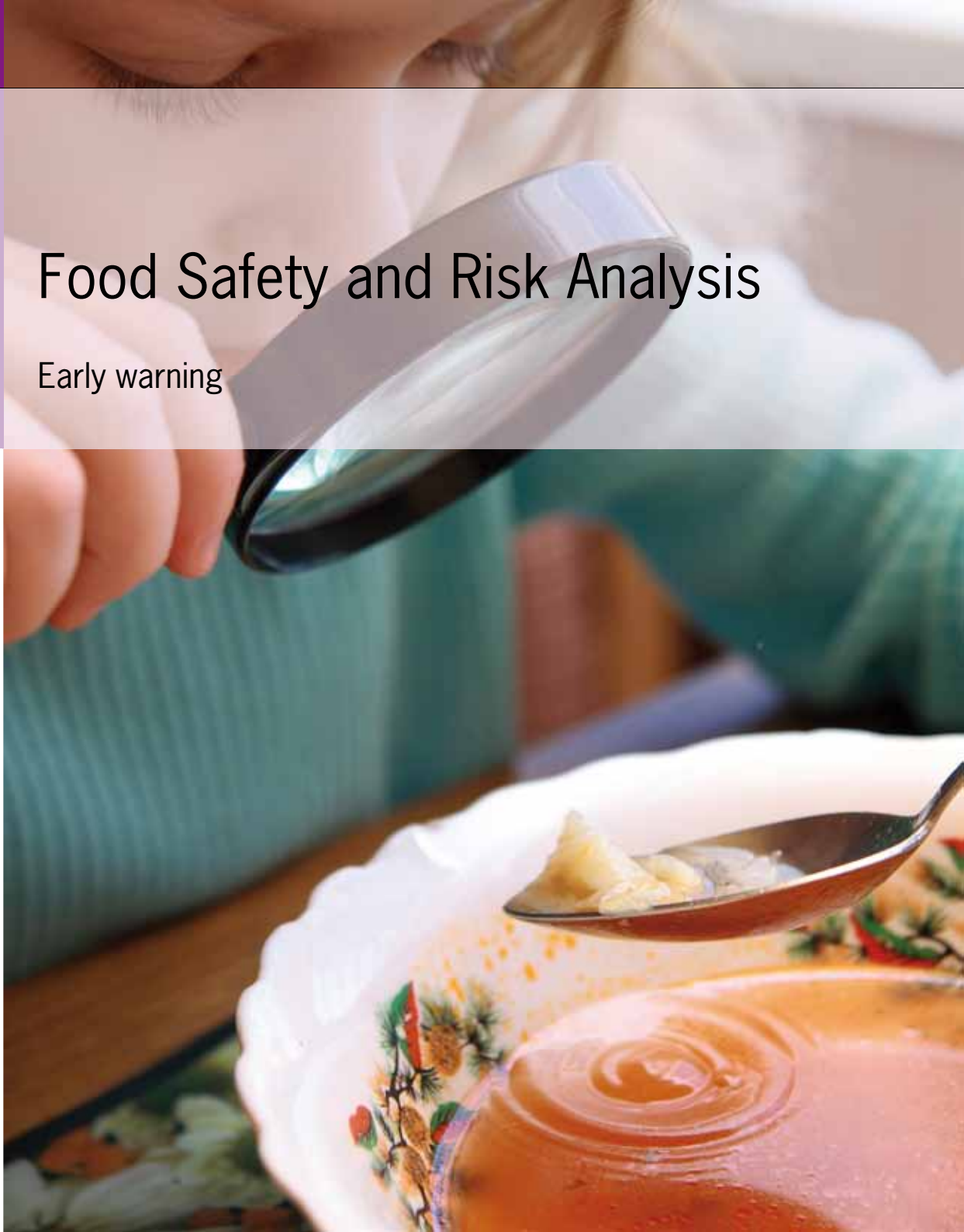


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7

Food Safety and Risk Analysis

Early warning



The number of food safety incidents in European feed and food chains is constantly increasing. Such incidents concern, for example, BSE, dioxins, GMOs, acrylamide and emerging pathogens (e.g. E.coli O157).

Public trust in both primary production and the regulatory institutions that are responsible for the governance of food safety is declining. The European Commission has recognized these problems and responded by issuing the General Food Law (EU, 2002), which describes and lays down the EU food safety framework and the relevant roles and responsibilities. Improved transparency, certificates and consumer involvement in risk analysis processes are some of the measures to improve health risks throughout chains and to restore public trust.

Food safety questions are complex, and adequate responses require collaboration between a wide variety of disciplines. Wageningen UR has all the various aspects of food safety risk analysis in-house – from management to assessment and communication. Wageningen UR has many years of experience in developing early-warning systems that prevent food safety hazards becoming risks. Prominent examples are the Emerging Risk Detection Support System (ERDSS), which is a knowledge-based system that can predict the emergence of food safety risks and the occurrence of mycotoxins in arable crops.

Safe foods

The aim of the EU SAFE FOODS project (2004-2008) was to help restore consumer trust in the food chain through the development of a new integrated risk analysis approach for foods. By combining the skills of over 100 natural and social scientists from 37 institutions in 21 countries, SAFE FOODS integrated a broad range of disciplines to refine risk analysis practice for food safety. The major objective was to develop an improved governance framework for foods produced by various agricultural and food processing methods and practices. The aim of this framework is to change the focus of decision-making on food safety from single risks to considering foods as baskets of risks, benefits and costs that are associated with the production and consumption of foods, and to take into account the social context in which decisions are made. The major outcome of the project is a new risk analysis approach for food safety management that integrates the risk assessment of human health, consumer preferences and values, and an impact analysis of socio-economic aspects. The strength of the model is the transparent and novel way of identifying and assessing risk using newly developed methods, and the inclusive way of risk management with the active involvement of all stakeholders, thus taking into account a broad range of ethical, social and economic factors.

More information: www.safefoods.nl

Predicting mycotoxins

Under favourable environmental conditions, fungi on cereals can produce mycotoxins. These toxins – for example, deoxynivalenol (DON) in wheat – affect the safety of animal and human health. Models have been developed to predict mycotoxin levels at harvest. These models can be used during the cultivation cycle. Predictions are useful for various groups of stakeholders, including growers, collectors, processors and food safety authorities. They can be used to support decision-making related to buying batches, routing within the chain, processing and testing frequency. Using predictions improves efficiencies and safety levels of food production.





Information impact before, during and after recalls

Food crises have an impact on consumer trust in government, chain partners and specific products. Product recalls have an impact on consumer trust in a brand or company. The consequences of recalls and crises depend on the perception of the potential risks and of the impact on products. Earlier projects showed that food crises have a greater impact on some segments of the market than on others. This project is developing a modelling framework that actors can use to monitor fluctuations in key metrics before, during and after a recall. The project makes it possible to connect consumer perceptions to chain decisions on risk analysis and choices.

Master's in Food Quality Management

The Master's in Food Quality Management offers an integrated, techno-managerial approach to the study and assessment of quality processes in the agri-food chain. This unique programme was developed by Wageningen University. Students study the entire supply chain from the primary sector to the final consumer. Food, flowers and cattle are also discussed. This two-year MSc is built on the integration of technological and managerial knowledge. This approach enables the integrated analyses of food quality problems and the design of integrated measures. This allows for a more encompassing approach on the topics of food quality, quality management, quality design, quality control, quality improvement, quality assurance, quality policy and business strategy.

More information: www.mfq.wur.nl/UK

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Fresh Logistics Management

From field to plate



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Fresh logistics management is about getting the right fresh food or flower product, in the right volume and with the right specifications, to the right place at the right time.

This is especially difficult due to the unique characteristics of the sector, such as demand volatility and supply uncertainty (due to seasonality and weather influences), product quality changes, limited shelf lives, high value by-products and long production times. The main challenge is to design robust, demand-driven international logistics networks that make optimal use of new technologies and deliver high consumer values related to food quality, transparency and sustainability, and do so at the lowest possible cost.

Wageningen UR goes beyond traditional logistics management practices and integrates knowledge about fresh product quality changes and technological developments in its research approach. Wageningen UR analyses and develops innovative and sustainable food logistics management concepts to improve the current food supply chain performance. Decision support models and tools are built and used to evaluate the effectiveness of new supply chain concepts on key performance indicators.



Sustainable fruit trade from South Africa

The ability of emerging South African farmers to penetrate market-driven local and global supply chains depends on their ability to compete on product quality, product and supply chain costs, and on various elements related to reliability, flexibility and collaboration. To improve the current situation, Wageningen UR and Ikhaya SA are developing a new trade concept to enable emerging fruit farmers to trade directly with retailers. The project involves developing and piloting an integrated supply chain reference model that supports the more direct models that are in line with the current thinking of the markets for food security that can be implemented at farm or cooperative level. Within the project, an Internet-based solution will be developed to give farmers, trainers, mentors and service providers direct access to relevant, up-to-date information, knowledge, training and support services, thus enabling central quality management and delivery, and local implementation and customization. This approach will guarantee the development of a number of local support models for small and emerging farmers that will ensure sustainability.

More information: www.ikhaya.nl/trade

Value chain cooperation within the fisheries sector

The Dutch fisheries sector holds a dominant position in North Sea flatfish fisheries. Most of the processed flatfish is exported to Southern Europe. The increased availability of cheaper farmed fish from South East Asia puts pressure on the market position of North Sea flatfish. Together with auction Hollands Noorden, fish processor Marine Harvest and Albert Heijn, Wageningen UR has initiated a project to provide Dutch consumers with fresh flatfish from the North Sea which is caught using sustainable fishing techniques. The project focuses on the cooperation between the different players within the value chain and the optimization of logistic processes in order to ensure and maintain a high quality product throughout the value chain. This is in the line with current consumer trends towards higher quality products.

Quality controlled logistics in the pork supply chain

As part of the EU-FP6 Q-porkchain project, Wageningen UR researchers are collaborating with 51 partners in 20 countries in developing innovative, integrated and sustainable food production chains of high-quality pork products. The programme was designed and is being implemented for the European pork supply chain network, which is characterized by a variety of farm production systems and processing systems. Furthermore, market segments have their own specific demands for product specifications and logistics services. In recent years, market consolidation and internationalization have taken place, while the means to gather and communicate quality information for logistics decision-making have improved as a result of developments in sensory technology and ICT. Logistics processes, however, are still subject to a number of inefficiencies – such as poor material usage, operational inefficiencies or low perceived product quality at final customers – which results in suboptimal market performance. In order to address these inefficiencies effectively and to ensure product quality throughout the chain, innovative logistics management concepts and decision support models are needed. These concepts should make effective use of product quality information to optimize the match between supplied and demanded products and ensure that all customer demand is met. Meat that has specific quality features should be assigned to designated processes and specific market segments, which will result in improved processing performance (less waste, higher efficiencies, etc.) and more added value by an improved product–market combination.

More information: www.q-porkchains.org



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Information Management and Transparency

From bricks to clicks

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Correct and complete information delivery is now an important competitive factor in the agri-food industry. Consumers increasingly make choices based on such food attributes as safety, quality and sustainability.

The modus operandi of Wageningen UR in this field is characterized by a design-oriented research approach that is organized in close cooperation with business partners and governmental bodies. Knowledge-intensive decision support is the key factor in this multidisciplinary process, in which fundamental and applied knowledge are combined in innovative concepts and systems.

Key research themes are:

- Analysis and design of information and knowledge management systems for practical business cases
- Design of multidisciplinary decision support models and tools that are embedded in a coherent architecture or framework
- Design of efficient algorithms based on mathematical modelling or automated reasoning.

E-Trust: ICT as enabling technology for building confidence and transparency

Ten European partners are collaborating in E-Trust – an EU-FP6 project to provide consumers with high-quality food that they can both trust and afford. The project is highly relevant to the food quality and safety priority, as it contributes to the well-being of European citizens by ensuring the provision of food that is of high quality, safe to eat and affordable. The take-up of B2B e-commerce is one of the key issues and core challenges for the competitiveness of European food chains. E-Trust creates consumer confidence through transparent, trustworthy food chains that are able to deliver guarantees to consumers and ensure the affordability of high-quality food by exploiting the efficiency power of e-commerce for food chains. It bridges the gap between the innovative ICT potentials for cost-efficient processes in the European food chain and the trust between companies in that chain. Within the consortium, Wageningen UR contributes its expertise on information management and building trust across cultures in international agri-food chains.

More information: www.etrustproject.eu



Information managed by and for smallholders

In partnership with EDE Consultancy, Plant Research International developed a tool that makes information about farmers' activities available in easy formats. Financed by the Douwe Egberts Foundation, the 'Farmer Field Book'(FFB) was developed in 2003 in the Vietnamese coffee sector. The FFB is now being used in 15 projects around the world as an integral part of smallholder support (six projects in Vietnam, three in Uganda, and one each in Tanzania, Peru, Guatemala, Colombia, El Salvador and Honduras). The FFB promotes benchmarking and record keeping, improves farm management through farmer-to-farmer learning, and enables farmers to access certified markets, for which record keeping is a prerequisite. It can analyse labour efficiency, nutrient flows and household economics. The FFB provides project staff, extension workers, researchers and farmers easy access to field data on which to base technical or economic interventions in farming systems. It is perfectly suitable for monitoring impacts. Although the first FFBs were Excel-based, a free web-based open-source software package (Simpatica) will be launched in 2010. Simpatica can deal with large numbers of farmers, is more user friendly and robust, and allows decentralized data digitization, monitoring and analysis, allowing farmers to log in directly. Simpatica is unique in that it captures the complete farming system, including the economic, social and environmental aspects.

More information: www.defoundation.org/vietnam-2

Early warning food safety systems

Wageningen UR has developed a new concept for the detection of emerging risks, that is, hazards that are not yet a risk, but that might pose a threat to human health in the future. The holistic approach of the ERDS system supports the detection of emerging risks by taking into account various fields of expertise and disciplines. Facts and rules are extracted from, for example, economics, international trade, climatic changes or human factors, as well as knowledge about certain supply chains, areas of distribution and production chains, and knowledge about breeding and plants. The system is able to reason with this information to alert the user to possible risks at an early stage, thus allowing action to be taken to prevent the further development of possible risks. The ERDS concept allows transparency in food safety management by applying WEB 3.0 technology.

Arable crop ontology: delimitation of domain and modelling concepts

The ever-increasing quantity of data resulting from more growers gathering data in more years offers possibilities to add value. Wageningen UR is developing a common and controlled vocabulary of the arable crop domain that describes concepts, attributes and the relations between them in a formal way using a standardized knowledge representation language, for example the potato ontology. All possible stakeholders will be able to understand data expressed in this ontology, and software applications will be able to process it automatically. It will also allow the application of advanced numerical techniques that may help to uncover previously unknown correlations that make the chain more transparent and will add value. Data come from field and produce registrations, automated decision support systems, and generic weather and soil data. Authorizing access to the data, or part thereof, is part of the process.



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Chain Performance

Continuous improvement



This field focuses on the relation between chain (and networks) management and the performance of actors in the agro chain. Even production chains with high levels of competition have many possibilities to improve efficiencies and qualities; for example, the pig chain in the Netherlands could reduce its annual costs by around 70 million euros.

Common performance indicators are added value, distribution of profits throughout the chain, product quality, and the sustainability of practices, processes and costs. Measures like bonus and penalty points create more value at the primary production part of the supply chain, improve chain efficiencies and contribute to sustainability.

Wageningen UR develops models to monitor economic, environmental and social performance. Our diagnosis is focused on various levels: complete supply chains, companies, aspects of societies, certain animals or the environment as such. Measures are identified, ranked, weighted and aggregated, using literature reviews, decision support systems, generic soil and weather data, crop and produce registration data, models, theory, and expert and stakeholder opinions. Main tools and methods in this field are stochastic chain optimization models, time series analyses and life-cycle assessments.

Castration of boar piglets

Developing sustainable alternatives to surgical castration (which is common practice for boar taint prevention) has become a key topic for European pork chains. As part of the national 'Stopping the castration of boar piglets' project funded by The Dutch Ministry of Economic affairs, Agriculture and Innovation (EL&I) and the Product Boards for Livestock, Meat and Eggs, this research deals with the economic analysis of feasible alternatives to surgical castration. These are genetic selection (breeding stage); altering management strategies, such as measures related to pig housing and hygiene, social environment, feeding (growing stage); and early slaughtering. Preliminary analysis shows that single-sex raising of boars is more cost-effective than the mixed-sex option. The breeding programmes that focus on selection for both economic and boar taint based objectives are more cost-effective than programmes that focus on boar taint only, and are much more cost-effective than early slaughtering. A stochastic chain optimization model is being developed. The results will help parties in and around the pork chain to define the least-cost alternative, for a more sustainable solution to boar taint .

More information: w3.rennes.inra.fr/pigcas/

Carbon footprint methodology for horticultural chains

The horticultural sector aims to reduce its emissions of greenhouse gases. With the support of the Dutch Product Board for Horticulture and EL&I, a calculation methodology was developed that enables growers and traders to calculate the carbon footprint of their supply chain. This methodology is a state-of-the-art specification of the life-cycle assessment approach for greenhouse gas emissions scores, and the first product-specific carbon footprint guideline. The method takes into account all greenhouse gases emitted in the chain, from the production of the inputs (e.g. artificial fertilizers) through transport to cultivation practices, packaging and waste management. The tool offers users the opportunity to develop optimization strategies to reduce the impact of the cultivation and distribution of their products on climate change. It thus helps to improve the sector's performance and competitive position and its capacity to respond to the demands of chain parties and civil society stakeholders.

More information: www.tuinbouw.nl/files/page/carbon%20footprint.pdf



Long-distance transport of live animals

The long-distance transport of live animals is a highly debated issue in the EU and also in some Member States. To assess the impact for the Dutch stakeholder, EL&I requested Wageningen UR to develop a mathematical optimizing model at the EU level to simulate the transport of live animals and meat. The model includes environmental impacts. First calculations show that especially for pigs and poultry, policy options have a huge impact on the international trade of live animals and meat. This will have a direct impact on such stakeholders as slaughterhouses, transport companies and control posts within the EU, as well as on environmental and animal welfare aspects.



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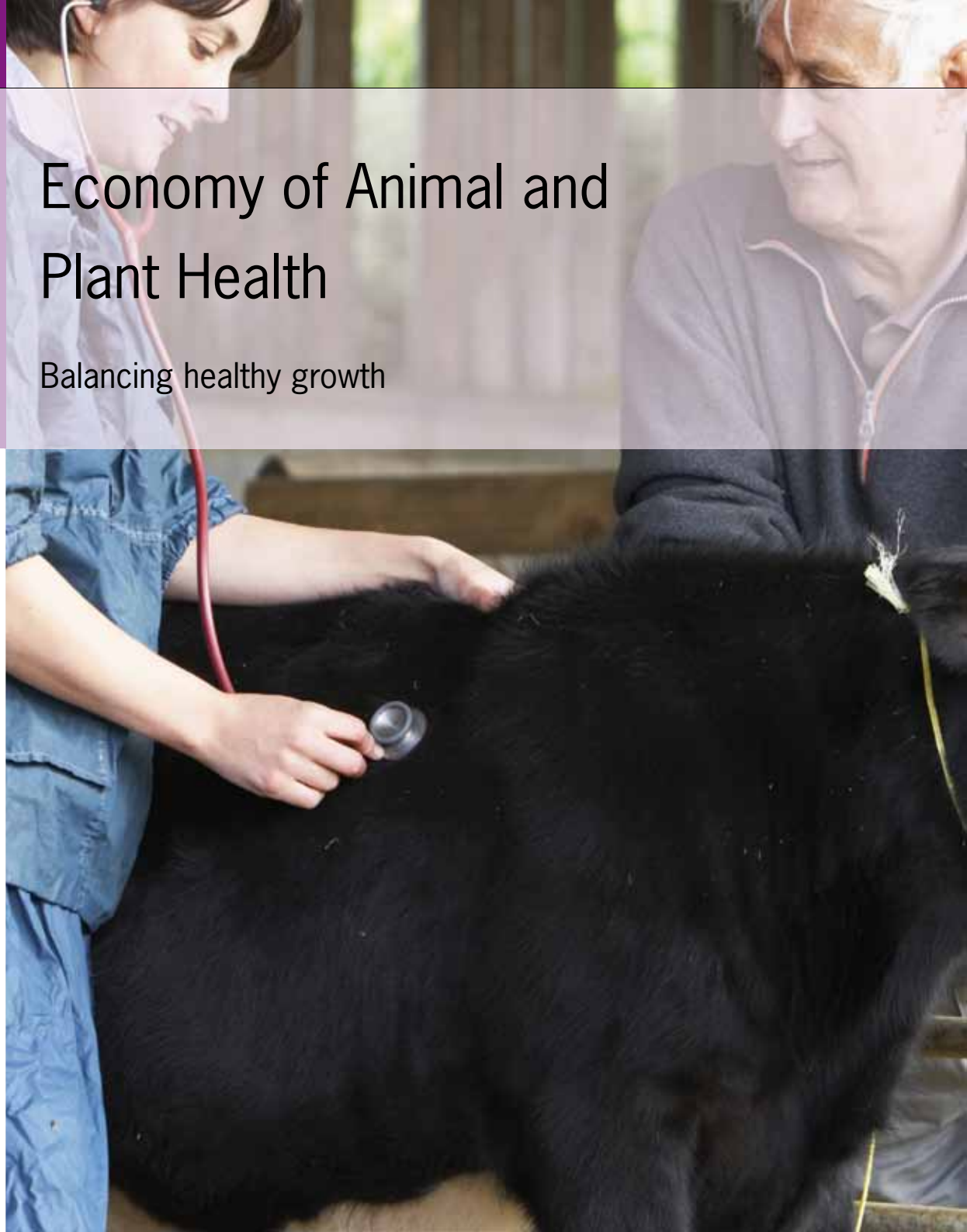


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Economy of Animal and Plant Health

Balancing healthy growth



Pests and diseases, whether endemic or invasive, are a major source of risk to the animal and plant production chain. They threaten human health, the competitive position of the agricultural sector, and nature and biodiversity.

Pest and disease pressure is increasing as a result of climate change, changed production systems and increased trade at the global level. Effective and efficient strategies at each level (from field to farm to industry, and from farm to fork) are necessary to mitigate huge economic, social and environmental impacts. The handling perspective that agents have to protect themselves against damage depends on national and international legislation, the requirements of consumers and retailers, and the social acceptance of measures and strategies. Agents must balance on a tightrope to produce healthy products in a socially acceptable manner.

The aim of Wageningen UR research in this field is:

- To develop and apply high-quality models to describe and analyse the behaviour of agents in the agricultural production chain
- To develop and apply tools to analyse probabilities of infestation and its consequences
- To develop strategies to prevent disasters at the national, the international, the sector and the farm level.

Furthermore, Wageningen UR develops tools that help farmers' organizations and governments (national and international) to rearrange institutions in such a way that agents are intrinsically motivated to reduce risks.

The use of antibiotics in animal production

On behalf of EL&I, Wageningen UR is investigating the use of antibiotics by farmers to protect themselves against animal diseases caused by bacteria. Research has shown that those bacteria may become resistant to antibiotics. Resistant bacteria not only threaten animal health, but can also be transmitted to humans, thereby undermining their health. Detailed information about the application of antibiotics is necessary in order to develop an effective strategy to reduce the use of antibiotics.

www.wur.nl/uk/newsagenda/archive/news/2009/Usage_of_antibiotics_in_food_animals_is_still_increasing.htm



Towards Phytopia: the phytosanitary policy reinvented

Government institutions want to know whether they have a role to play in plant health risk reduction from an economic point of view, and to what degree the public role can be limited. Wageningen UR has developed a framework that helps EL&I to analyse why, and to what degree it should be involved in protecting plant production & trade systems and the environment from plant pests and diseases. This framework can also be applied in comparable policy areas.



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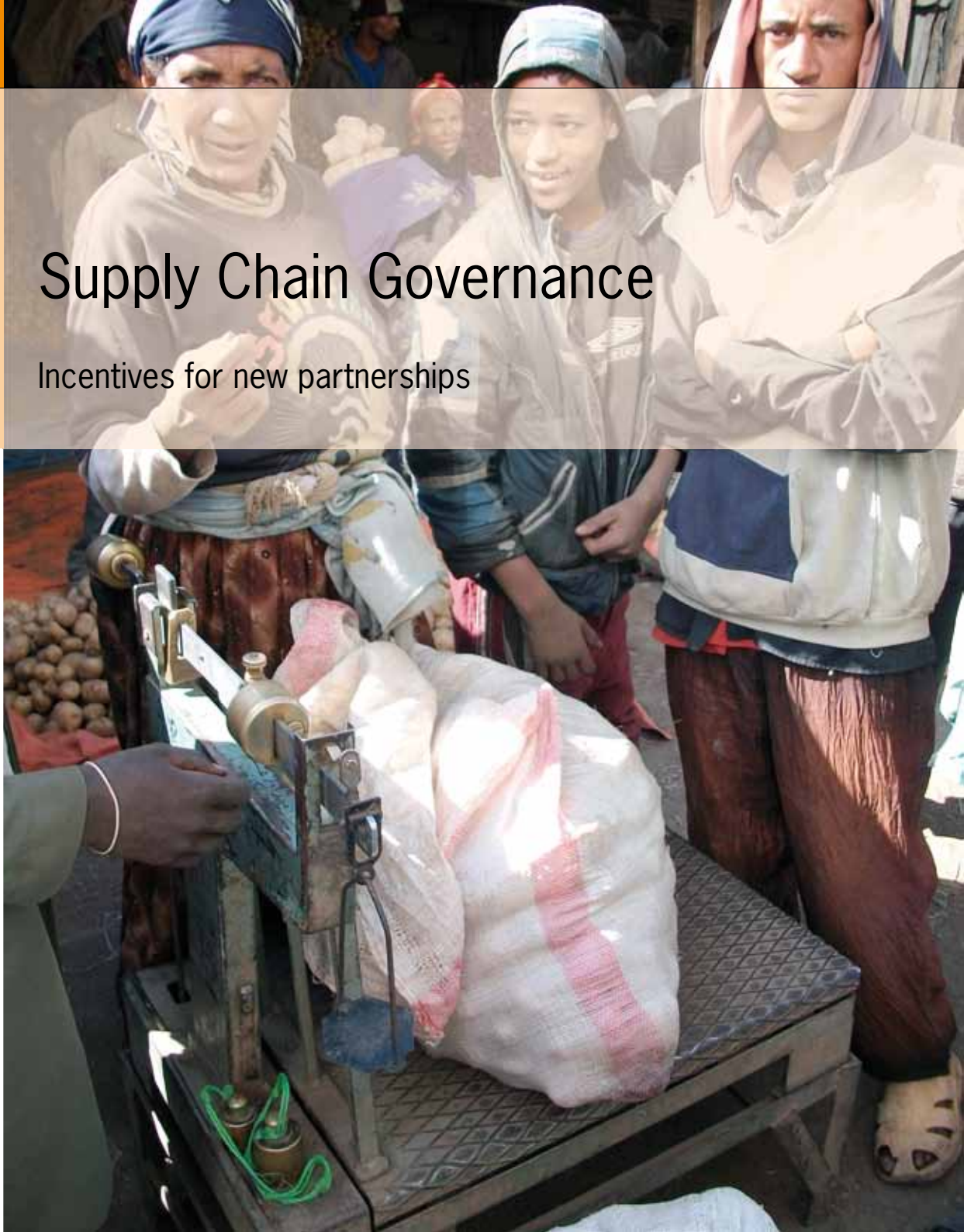


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Supply Chain Governance

Incentives for new partnerships



The design, functioning and governance of agri-based value chains are increasingly challenged. New modes of cooperation and coordination are needed. Value chains are being reconfigured with regards to innovativeness, responsiveness and efficacy.

Research investigates the mechanisms that drive those changes. Applied research and technical support help to shape these new institutional arrangements. At the international level, leading multinational corporations have started to interact with policy makers and civil society in order to enhance transparency and sustainability in their value chains (e.g. via round tables for palm oil, soy and sugar). Achieving transparency and sustainability goals in consumer products often requires cooperation and coordination between companies that are in consecutive stages of the supply chain. Companies are therefore looking for new institutional arrangements that embed transparency and sustainability goals in the supply chain. At national levels, governments in developing economies are trying to institutionalize redistributive mechanisms that serve both commercialization and regional food security (e.g. the rise of commodity exchanges and warehouse receipt systems in East Africa). To help companies to embed transparency and sustainability goals in their supply chain, Wageningen UR analyses and designs incentive mechanisms in supplier-buyer relationships. Research goes beyond standard economic analysis at company level and focuses on the interaction between companies. Incentive mechanisms, which reward desired performance and internalize external failure costs into supplier decision-making, align company interests and actions in the supply chain and improve supply chain performance. Time series analysis and surveys are used to assess the effectiveness of actual incentive mechanisms, while quantitative stochastic optimization models are utilized for the ex-ante analysis of incentive mechanisms.



DRIVE: Incentive mechanisms to improve the food safety performance of pork supply chains

Since 2005, EU food business operators (FBOs; e.g. farmers, processors, retailers) have had full responsibility for food safety control. To improve such control, the focus has to shift from the company to the supply chain level. With the support of the KB3 theme (which is funded by EL&I, VION and Transforum Agro en Groen), incentive mechanisms for food safety control that reward the favourable food safety performance of a supplier were analysed. An incentive mechanism with a financial penalty per pig with a lesioned liver implemented in the Netherlands in 2005, reduced liver lesion prevalence in finishing pigs from 10% prior to 2005 to 3% in 2009, thereby reducing failure costs by an estimated 10 million euros annually. Food chain information about antibiotics use in finishing pigs provided by their producers was insufficiently reliable to be used in an incentive mechanism to control antibiotics residues and to guarantee the absence of antibiotics residues in pork. The accuracy of the test technology that measures performance can be used to steer supplier behaviour. By analysing these and other aspects of incentive mechanisms, DRIVE helps to cost-effectively improve food safety and quality control in the supply chains.

Co-innovation for Quality in African Food Chain (CoQA)

CoQA is a Wageningen UR/INREF funded research programme. It has eight PhD students and one postdoc researcher, and runs from 2008 to 2013. It is being carried out in collaboration with three African universities: University of d'Abomey-Calavi (Benin), Hawassa University (Ethiopia) and University of Fort Hare (South Africa). It is an interdisciplinary programme, bringing together research from agronomic, food technology, economics, marketing and management perspectives. The programme deals with quality issues from a supply chain perspective, and focuses on three crops: potato, pineapple and citrus. CoQA studies quality improvement in agri-food chains from two integrated perspectives; one relates to the combination of different scientific disciplines, the other to seeking quality solutions that combine changes at various stages of the supply chain. The issue of governance is central to the CoQA programme, as the individual PhD projects seek to develop quality solutions by explicitly studying technical improvements within their economic and organizational supply chain context.

More information: www.coqa.nl

Uganda Oilseed Subsector Platform: a platform for vulnerable voices

Wageningen UR supported the Uganda Oilseed Subsector Platform (OSSUP) within the framework of the Value Chain for Pro-poor Development programme. OSSUP is a multi-stakeholder platform installed to find strategic solutions for tenacious and complex problems in a subsector that is confronted with volatility, unruliness and low competitiveness and that is challenged by a fragmented R&D system. OSSUP – which is a national platform – links to two regional platforms supported and facilitated by the Uganda Oilseed Producers and Processors Association. The specific nature of the oilseed and edible oil subsector – namely the possibility of substituting locally sourced oilseed with imported oilseed – importantly conditions the prospects for collective action and also makes the subsector dependent on fluctuations in international markets. OSSUP is in the process of inventing a novel form of collective and coordinated action. In a competitive setting, partly invoked by imports of palm oil, and a market facing unstable prices and fluctuations in supply, oilseed producers in Uganda find it difficult to survive by merely selling what they produce; they need to engage with intermediaries and food industries in planning and managing production and trade at a level beyond the individual farm. The action research was motivated by the need to find institutional changes and policies that will reduce risks and the cost of doing business, and establish a level playing field for the poor. This research indicates that strengthening strategic types of platforms, such as OSSUP, is an important complementary strategy to, for example, bilateral contractual agreements or group bulking by producer organizations.

More information: www.dgis.wur.nl/UK/VC4PD



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Food Security and Entrepreneurship

Innovative business models at the base of the pyramid



In the coming decades, agri-food systems will need to cope with an extra 3 billion people. Changing patterns of food and energy consumption, accelerated land degradation and declining resources and inputs are going to demand an unprecedented scale and pace of change in the way we produce food.

Innovative chain models are increasingly tapping into a segment of the world population (3.7 billion) currently largely excluded from formal agri-food systems. This group, people who earn less than US \$ 4 a day, forms the 'base of the pyramid' (BoP.) The BoP represents a fast-growing market, an underutilized productive sector and a source of untapped entrepreneurial energy. It is a central agent for sustainable poverty alleviation strategies and especially for sustainable agricultural growth.

In this new arena of BoP research, Wageningen UR integrates approaches that were previously treated as separate. We merge knowledge of consumer issues, retailer dynamics, sourcing strategies, logistic efficiencies and producers' livelihoods. All aspects relate to the design and implementation of new, inclusive business models. Models that can only work if designed according to enabling principals like transparency, access to knowledge and co-ownership. Besides research and institutional designs, our researchers co-innovate appropriate technologies with users, for example small-scale cooling technologies or service-intense distribution centres for fresh produce. We work along innovative lines when dealing with entrepreneurship development: we focus on building business models that provide entrepreneurs with the right incentive structures that intrinsically motivate them to grow their business in an inclusive manner. In highly asymmetric markets, information can certainly trigger new ways of doing business at the bottom of the pyramid.

Africa Agribusiness Academy

The objective of the Africa Agribusiness Academy (Triple A) is to support local agri-food SMEs in commercial activities by strengthening individual entrepreneurial capacities. The principle behind the initiative is that SME entrepreneurship in the agri-food sector can be, or can be made a profit-making endeavour. But entrepreneurs must get the opportunity, the skills and space for inspiration to make a profit. The Triple A feels that an important reason for low food security in Africa is not the low productivity or unavailability of farm land, but the absence of enough players in local food markets. The primary target group of the initiative comprises of upstream African agri-food SME entrepreneurs and downstream partnering entrepreneurial farmers. The main activities of the Triple A are: entrepreneurs supporting entrepreneurs through networks and partnering, resource centre for knowledge sharing and the dissemination of local entrepreneurial agri-food experiences, and education and training.





BoP Innovation Center

Wageningen UR is one of the founding partners of the Dutch BoP Innovation Center, the aim of which is to help explore the potential of low income markets and to create new business propositions through partnerships with leading companies and engagement with societal stakeholders. The center provides an incubator space for pro-poor innovation development. These initiatives provide information for research and learning processes. And the combined efforts devoted to learning and development create a unique space in which to increase the size and accelerate the impact of the initiatives and to grow from pilots into sustainable business propositions.

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Market and Competition Analysis

Getting prices right



Public bodies are increasingly worried about the impact of both concentration and strategic buying and selling behaviour on value creation and distribution in the food supply chain.

If competition is limited, consumer prices may end up too high and markets may no longer react to changes in supply and demand conditions. At the same time, farmer incomes have to be secured in order to guarantee the future availability of food, feed and fibres. Furthermore, the ability to innovate may be at stake in the food supply chain. Policy solutions considered include a prohibition on selling below purchase prices, producer indications on private labels and codes of conduct for large enterprises. Achieving a good balance between promoting farmers' incomes and guaranteeing that consumers will have access to affordable food remains an important political theme. Furthermore, the NMA (Dutch competition authority) and EU Competition Policy have increased their monitoring of the food and agri-business sectors, because at certain levels in the value chains few companies are active and products have a homogenous character. These market characteristics lead to an increased risk of competition-distorting behaviour by market actors.

Industry concentration and supply chain coordination influence both supply chain efficiency and possible market power. In order to assess the trade-off between the effects of efficiency benefits and increased levels of market power, one needs a clear insight into horizontal and vertical competition along the supply chain. Wageningen UR researchers combine theoretical insights from industrial organization and related theories, with econometric analysis and knowledge of specific food supply chains.



Supermarkets and the meat supply chain

This project entailed an OECD secondment, financed by EL&I. The project started with a literature review of changes in retail buying behaviour in OECD countries, followed by an econometric study of retail pricing behaviour with respect to meat in four OECD countries. The econometric analysis was composed of two parts: one on price asymmetry and one on measuring market power. The findings confirmed the dominance of the retail sector and revealed that the sector has remained competitive.

The impact of private labels on the competitiveness of SMEs

The project involved a study on the possible negative impact of private labels on the competitiveness of small and medium-sized enterprises (SMEs) in the food supply chain. It comprised a literature review, a supply chain description and a legal impact analysis. The review of the state of the art is complemented by data analysis based on national statistics, scanner data and interviews. It was a joint research initiative between Wageningen UR and INRA Toulouse (France), Competition Analysis Limited (University of Loughborough, UK), University of Piacenza (Italy) and AKI (Budapest, Hungary).



Competitiveness of the European food industry

This project involved a competitiveness study of several food chains in Europe. The main questions were: how competitive is the industry, how will this develop under future globalization trends (as reflected in policy changes in CAP and DDA), and what role can innovation and changes in legislation contribute to the competitiveness of the industry? The report can be found at: www.ec.europa.eu/enterprise/sectors/food/files/competitiveness_study_en.pdf

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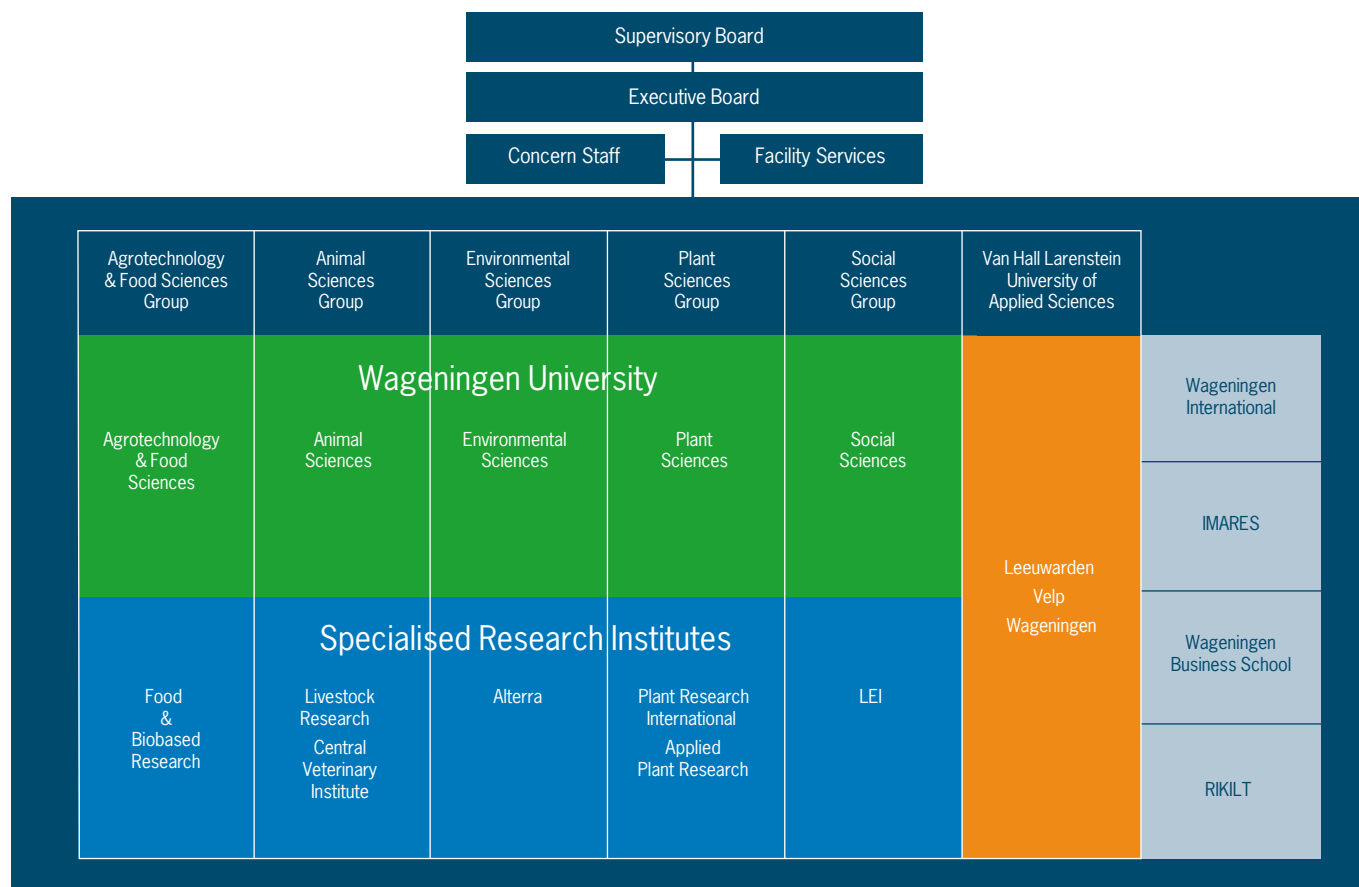
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Organisation Chart of Wageningen UR

Within Wageningen UR, the departments of Wageningen University and the organisational units, the Sciences Groups.



Colophon

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This brochure presented capabilities, experiences and examples of Wageningen UR (University & Research centre) in global agri value chains. A comprehensive list of current projects can be found at www.lei.wur.nl/UK > Market & Chains. The work involves various institutions of Wageningen UR. More information about Wageningen UR its structure and research areas can be found at www.wur.nl. Amongst many other things, it presents additional information on food & health, animal welfare, biobased economy, nature & landscape, climate and food security. Through a better understanding of the global agri food system, its challenges and opportunities, Wageningen UR is working for quality of life.

