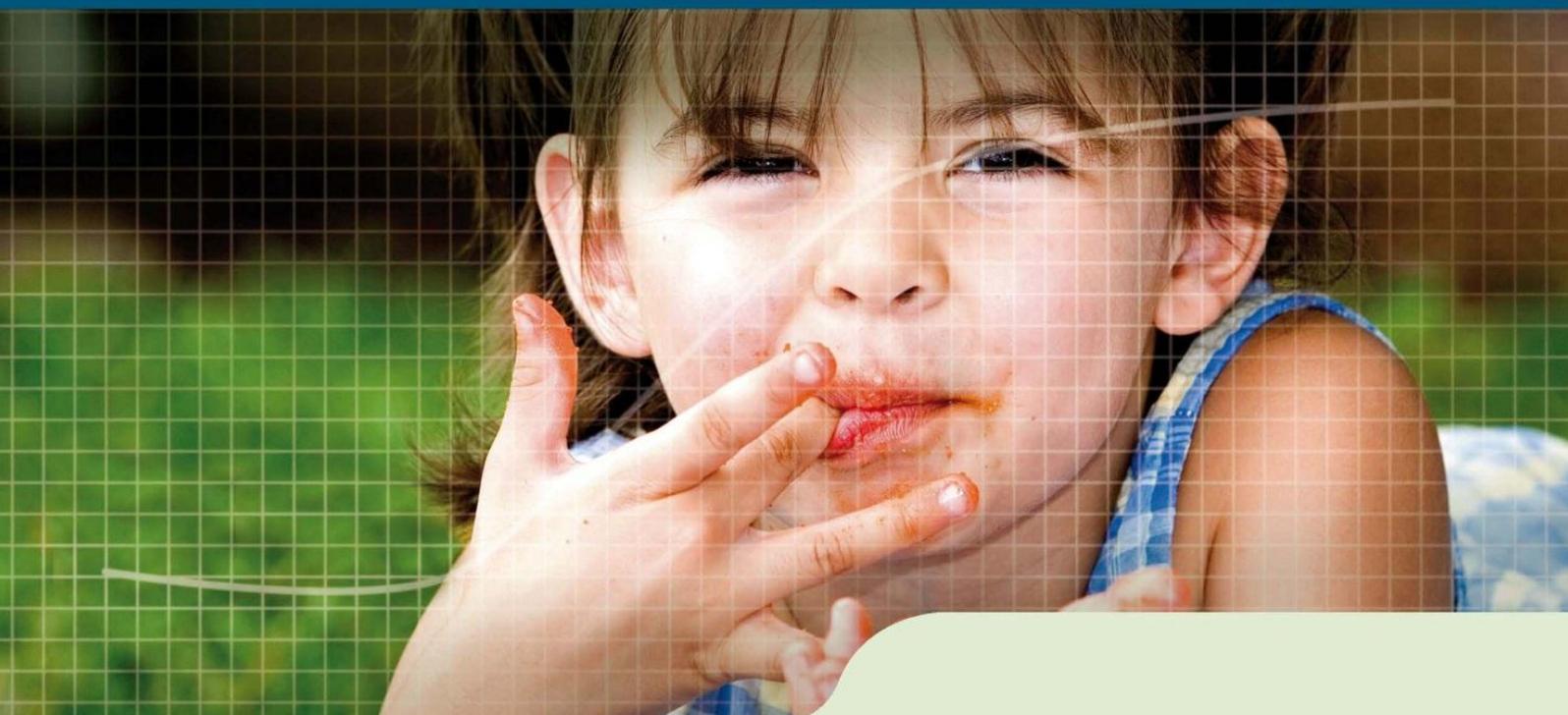


Wageningen UR Livestock Research

Partner in livestock innovations



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Livestock, the World, and the Dutch

Part II: Background Country Studies

April 2013



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Wageningen UR Livestock Research
P.O. Box 65, 8200 AB Lelystad
Telephone +31 320 - 238238
Fax +31 320 - 238050
E-mail info.livestockresearch@wur.nl
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Abstract

This report presents the background country
studies for the report Livestock, the World, and
the Dutch. A quick scan of opportunities in
livestock production in nine countries.

Keywords

Animal production, livestock development,
livestock products, growth opportunities, dairy,
poultry, pigs, quick scan, Russia, China, South
Korea, Vietnam, Indonesia, Turkey, Ethiopia,
Kenya, Mexico, The Netherlands.

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Livestock, the World, and the Dutch

Part II: Background Country Studies

Final draft for discussion

Katrien van 't Hooft

April 2013

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1 Russia

1.1 General information

The transition to a player of global proportions

Since the fall of the Soviet Union in 1991, Russia underwent the transition from socialism to capitalism. In the first decade of the transformation the economy collapsed. It recovered thereafter and what followed was a period of stable growth. In 2008-2009 a recession took place, which recovered soon after. In 2011, GDP returned back to its pre-crisis level [1]. Part of these accomplishments in the reinvigorating economy might have to be attributed to higher oil prices [2].

According to the World Bank inflation and unemployment rates were historically low in 2012 [3]. Moreover, the share of poor people in the population was reduced to 12.5% in the first half of 2012 (7.7 million people), the lowest rates in two decades. Furthermore, purchasing power has improved. Russia is one of the fastest growing economies in Europe with approximately 143 million consumers, who are increasingly interested in quality, Western food products [1].

The country's agricultural sector followed a similar course as the nation's economy as it moved from state-owned farms in a command economy to individually owned farms in a market economy. The first decade of the transition was marked by a sharp decline in output, particularly in the livestock sector, as heavy government subsidies ceased to exist. At the turn of the century, the sector gradually picked up as output rose and performance of farming systems improved, although some farming systems show a systematic underperformance. Russia gradually grew into the global player in world agricultural markets we know today, both in terms of supply (mainly grains) and demand [3].

Agricultural Development Program: great challenges for feeding the nation

Russia has 10% of the world's agricultural lands though 40% of the land is un-used. Meanwhile, Russia is one the major importers of food, importing about 50% of its food. Gradually Russia is moving towards self-sufficiency, though this process is difficult [3]. The country has set major self-sufficiency targets in its in 2010 enacted Food Security Doctrine: by 2020, the country should be 80% self-sufficient in basic foodstuffs. This includes 85% of meat and meat products, 90% of milk and 95% of grain. This would represent an overall increase of 20% in what is currently produced [4]. Approximately one-third of the nation's budget for the program is allocated for supporting the livestock industry [5]. A recent World Bank report concluded that the following issues need to be tackled: "nonviable large farms, a glut of unskilled workers, a shortage of skilled labor, and deficient commercial services and public institutions to support the sector" [3].

An important role for small farms

Russian agriculture today is characterized by three types of farms. Two of these – corporate farms and household plots (or: dachas) – existed already in the Soviet period as collective and state farms. The third type – peasant farms – emerged during the post-Soviet transition. It is estimated that about *half* of the Russian families living in large cities have dachas, ranging in size from 0.9 - 2.7 Ha. Since the fall of the Soviet Union, the share of peasant farms rose. In terms of numbers of farms, small plots represent the vast majority; in 2002 98% of farms in Russia had less than 2 hectares of land [6]. In 2005, these two types of farming were responsible for more than half of the country's agricultural production, while they used 20% of the land for agriculture. This reflects a higher productivity at these type of farms compared to corporate farms, that produced 41% of agricultural output using 80% of the land [7].

Becoming the world's organic food basket?

There are currently no standardized procedures for organic farming in Russia, but legislation is in preparation [8]. The organic market in Russia is in its development stage. Organic food sales increased almost 20 times from 2002 to 2008 [9]. It is projected that it will continue to grow in the coming years; more farmers will follow organic standards and more consumers will demand food that is produced organically [10]. Enthusiastic farmers believe that, with its vast agricultural potential, Russia could become the world's organic food basket [11].

1.2 Livestock systems

Following the collapse of the Soviet Union, demand for livestock-derived products in the CIS countries (Former Soviet Republics) declined, while at the same time institutional and structural changes led to

growing environmental problems. Transition in the livestock sectors also resulted in the disruption of markets, unfavorable input and output prices, and fragmentation and erosion of livestock capital [12].

Another result of the break-up of the Soviet Union and the subsequent political independence and economic collapse of the Central Asian republics has been the resurgence of pastoral nomadism. Pastoral livestock still is the major source of living and employment in rural areas, and livestock (reindeer, yaks, sheep, goats) provides the most important source of income generation [17].

Livestock production accounts for an important part of Russians agricultural production value: cow milk, cattle meat, chicken meat and pigmeat form the top 5 of agricultural production value in 2011 together with wheat. Cattle meat, pork meat and cheese of cow milk form the top 5 of major import commodities next to sugar and tobacco (based on import value in 2010) [18].

Dairy

- Russia is nearly self-sustainable when it comes to dairy [19].
- Since the fall of the Soviet Union the cow herd has reduced from around 21 million cows in 1990 to almost 9 million cows in 2011. Related to this, the annual milk production was over 55 million tonnes in 1990, while in the past 15 years, total annual dairy production seems to be stabilized between 30 to 35 million tons [20][21].
- Milk yield per cow rose 2.1% in the period 2006-2011 to a yield of 3.36 tonnes per cow per year in 2011 [21].
- Consumer prices for milk have risen 4-fold between 2000 and 2011 [21]. As a result, consumption of dairy products in Russia has generally remained flat, and this is expected to continue into 2013 [21][22].
- The high prices for dairy products make it difficult for low income families to regularly purchase high-end dairy products [22].
- In the past, the situation of escalating prices had been softened by an agreement in 2010 among producers and processors that established mutually acceptable minimum and maximum price levels for raw milk. Nevertheless, there is a wide variation in prices by region, as a result of varying degrees of regional support, regional differences in the cost of production, and differences in the quality of raw milk [22].
- About half of the dairy produced in Russia reaches the market through formal chains [21]. These chains are well organized and have modern (Western-like) facilities and management.
- However, in the (mostly informal) chains in rural areas things are less well organized. Milk is sourced from smallholder producers or from former state farms. Modern milking installations and reliable cooling facilities are scarce [23].
- Russia wants to increase national dairy production by 20% to 38 million tons by the year 2020. In 2012 over 129 million Euros was used to support dairy farmers [24]. Policies aim at strengthening national production, regulating competition from other countries and strengthening export. An example is the Family Dairy Farming Project which aims to promote family dairy farms by co-financing 30% of construction costs. Also, several regulations to increase competitiveness of Russian dairy products are envisaged in the Draft Programme "Development of Agriculture in 2012-2020", such as the instalment of import duties, the introduction of a traceability system and the support of certification schemes [22].

Pigs

- Similar to dairy, the pork production in Russia dropped drastically between 1992 and 2005. Commercial pig production was effected most by this trend. Due to this decrease of commercial production, the contribution of private backyard production to total pig production increased. Between 2007 and 2011 backyard pork production decreased due to the spread of African Swine Fever and its control measures. This process is projected to continue [25].
- Pork consumption grew at the beginning of the 21st century due to increasing incomes. However, from 2003 onward consumption stagnated as domestic supply decreased due to decreasing imports. Still, nearly 1 million tons of pork was imported in 2011, making Russia the largest pork importer [26].
- The pig sector fears major losses due to entering the WTO and competition from western Europe, which will result in the drop of prices of live pigs on the domestic market [27].

- Over 8 billion of dollars was invested in the pig production industry between 2006-2011 in the context of the National Priority Project on Agricultural Sector Development (2006-2008) and state program of Agricultural Development (2008-2011). 750 swine breeding facilities were put in place with a gain in pork production of 58% [25].

Poultry

- Poultry production in Russia is dominated by large agricultural enterprises. There were about 600 poultry producing farms in 2009, accounting for 88% of total production [28].
- Poultry marketer and producer Servolux has taken over Smolevichi and in this way has become a monopoly in White-Russia – with 50.000 tonnes of poultry meat. This is twice as much as the second largest producer Poultry Farm Druzba **Fout! Verwijzingsbron niet gevonden..**
- Higher productivity and reduced slaughter age increased broiler turnover from 4.0 (in 1990) to 6.5 (in 2009) and increased broiler output per egg layer from 78 kg (slaughter weight) in 1990 to 230 kg in 2009. The Russian ministry of agriculture projected that poultry (chicken and turkey) production will increase with 7.3% between 2012 and 2013 [28].
- With its “Development of Poultry to 2012 and to 2018-2020” program Russia aims to further increase domestic production. The main objectives are providing the Russian population with sufficient volumes of domestic poultry products, ensuring efficiency and competitiveness, and developing the Russian poultry industry’s export potential. The targeted level of self-sufficiency is 85% [28].

1.3 Expected critical points for improvement

Shortage of skilled labour

- There are not enough motivated and well-trained agricultural workers in the Russian livestock sector. Both technical and management skills are underdeveloped [3][30].

Marketing barriers

- Russia is an important importer of poultry brooding products. Since August 20, 2012 it has closed borders for Dutch day-old chicks and eggs for brooding as well as non-heat treated poultry products because of the prevalence of low-pathogen avian flu in the Netherlands [31].
- Export of live heifers is stopped due to the prevalence of Schmallenberg virus in Russia [32].
- There is a ban on live animals (except breeding animals) from the EU since March 2012 [31].

Environmental problems

- Russia harbors globally important natural ecosystems, populations and species, unique habitats, and bio-resources. A sustainable management of these resources is important [33]. However, the country is facing loss and degradation of agricultural areas, due to erosion, neglect and destruction by mining, road building, etc. [34]. Also, livestock diversity is seriously threatened in Russia, with six local cattle breeds and one pig breed endangered; 13 local cattle and 10 pig species have already become extinct [35]. With regards to livestock production, issues such as grazing and land degradation, pollution from industrial animal production and global environmental effects (loss of biodiversity and deforestation) need to be tackled [12].

Infectious animal diseases

- In 2007 there was a major outbreak of African Swine Fever which still is not under control. This is a threat also to other countries, including the EU. The disease occurs in backyard production as well as in wild animals and in commercial large-scale production [36].
- Bird flu has been reported on a large-scale farm in June 2012 of a low-pathogenic strain type A, subtype H9 [37]. In November 2012 it was also found amongst wild birds in province of Krasnodar– though the Russian Veterinary Service did not find proof that it was on basis of the H5N1 virus [29].

Health issues and zoonosis

- According to the World Bank the health indicators in Russia are low when compared to other countries with similar levels of development. Moreover, the differences in health outcomes across regions are

profound [3]. According to WHO, Russia has exceptionally high heart disease death rates amongst men over 30 years of age, rate due to cardio-vascular diseases (61% of all deaths), also compared to other western societies, which can be prevented through a healthy diet, regular exercise and reducing tobacco use [38].

- Dangerous zoonotic diseases such as Rabies are still prevalent in Russia. The WHO indicates that while several countries in Central and Eastern Europe are almost rabies-free, rabies is still a problem in the Baltic countries, Ukraine, Russia and the CIS countries. Tuberculosis also continues to be a problem, especially amongst HIV positive people, though the rate has been reduced since 2002 [39].

Antibiotic resistance

- Antibiotic resistance is an issue of major concern in Russia, including the spread of multidrug resistant ESBL-producing organisms and MRSA. One of the causes of resistance problems identified is the lack of regulation of antibiotic use in agriculture. These problems lead to challenges in treating infectious diseases that are prevalent in the country, such as acute respiratory infections [40].

1.4 Government and knowledge institutes

After the fall of the Soviet Union, research and development institutions in the livestock sector were unable to effectively address the problems the sector faced because they too were a product of the planned economy. Such institutions were used to serving large farms in a centrally planned economy, after the break-up the links among the institutions weakened leading to insufficient access to information [12].

The agricultural sector tends to look at the federal/regional government for financial support (loans, subsidies), which hampers entrepreneurship in agricultural development [13]. Those government bodies that have the task to support the agricultural sector, often lack information or the capacity to perform adequately. For example, the Russian Food Safety authority (*Rosselkhozadzor*) has not been able to control the African Swine Fever after the outbreak in 2007 as information is missing and prevention measures are not followed up sufficiently [14][14].

The World Bank is supporting the creation of a Eurasian Centre for Food Security (ECFS), which was launched in March 2012 to help enhance agricultural performance in the Eurasia Region and to ensure the sustainability of rural development and natural resource management [16].

1.5 Current Dutch involvement

The Netherlands is a major investor in Russia, with 11.6 billion dollars invested in 2009. Approx. 80 million was invested in primary food production [41]. Dutch companies see opportunities for investment because of Russia's aim to come to food-sufficiency by 2020.

Current Dutch involvement seems to be following two strategies: expansion of large-scale animal production units and the elaboration of its products and; setting up educational programs, including demonstration farms. There is currently no Dutch involvement in small-scale agriculture – nor with the development of organic agriculture.

Several institutions created or coordinated by Dutch government or companies are active in Russia:

- The Dutch ministry of Economic Affairs installed the LEC (Livestock Expertise Center [42]) for transferring Dutch knowledge and technologies on dairy and pig to Russia. LEC has three main activities: (1) Program MBA Agro-business, (2) practical training of cattle specialists; (3) laboratory analysis on feed stuff and animal health.
- The Dutch Trade Board - a public private partnership focusing of Brasil, India, Russia and Turkey - supports Dutch companies that want to enter the Russian market [43].
- A number of leading Dutch companies that are active in the cattle/dairy and pig sector on the Russian market have joined in 2009 in the Foundation Dutch-Russian Livestock (FDRL) [44]. This foundation works closely together with the LEC and the Dairy Support Centre (DSC) [45] initiated by the Friesian.
- There is a working group on agriculture (Landbouwwerkgroep Nederland Rusland) that organizes a 6-monthly meetings at government level to discuss market issues and cooperation between the Netherlands and Russia in the field of agriculture.
- A number of leading Dutch companies in poultry came together in the Dutch Poultry Centre (DPC). The aim is to a joint profiling towards the international market. The DPC focuses on countries like Russia, China, India, Argentina and several parts of Africa [46].

The following livestock-related Dutch activities could be identified:

Direct investments in Animal Production

- Dairy: BarenbrugHolland, Blez Dairies, Cowhouse BV, CRV Delta,
- Animal feed: De Heus, Denkavit Netherlands BV, Provimi
- Breeding: Hendrix Genetics, Topigs
- Automation: Fancom, Hotraco Agri BV, JOZ (mestafvoer techniek) , NEDAP, Nooyen pig flooring, Trioliet Mullos (feed mixing equipment), Hotraco
- Meat/food processing: MPS (Meat processing System), Ecolab
- Expertise: BLGG AgroXperts, ECOLab (Water&Energy technologies)
- Food: Unilever (The company has launched a new investment project in the Tula region: a multi-purpose ice cream production complex) [47].

Research, Education, Advice

- GD Deventer
- Education/consultancy: PTC+, the Friesian, Wageningen UR
- WUR: setting up MBA programs in agriculture on Russian universities. . Till date 3 universities have been accredited: Kazan, Belgorod and (in part) Stavropol. There is much interest for these programs – also in other universities. Problem lies in financing.
- Livestock Expertise Center and Trio Farms: model dairy farm and training center (total 3000 cows). A contract has been signed between TrioFarm and LEC to start education of dairy managers. First class examined march 2013 [48].
- Melken over de Grens – Rusland: website for Dutch farmers working abroad [49].

1.6 Opportunities for future Dutch involvement in Russia

- a. *Training and skill development* focused on entrepreneurship and competencies at farm level; including theoretical and practical skills, management skills and market intelligence.
- b. *Support large-scale systems in finding ways to produce more efficiently*, at lower cost in order for them to be competitive with the rest of the world after WTO accession.
- c. *Further vertical integration along the livestock value chains*, with processing industry acquiring interests not only in their suppliers (livestock farms), but also in supplier of their suppliers (i.e. integrating concentrate feed production) and in distributors (integrating retail).
- d. *Support the production of feed-ingredients* so as to limit the need for the import of soy and other feed-ingredient from other countries.

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2 China

2.1 General information

Rapid social and economic development

China has a population of about 1.3 billion people – of which 55% lives in rural areas. Since initiating market reforms in 1978, China has shifted from a centrally planned to a market based economy and experienced rapid economic and social development. All Millennium Development Goals have been reached or are within reach. China has experienced an extra-ordinary economic growth with an increase of per-capita income around 8.3% between 1981 and 2005. Poverty fell from 65 to 10% of the population in that same period. Poverty is especially frequent in ethnic minority areas [1]. Meanwhile there are limits to growth – even in China. Economic growth is slowing down, from 10.4% in 2010 to an expected 8.5% in 2013 [2].

Growing difference between rural and urban populations

The differences between rural and urban centres has increased; salaries in urban centres are 3-4-fold of those in rural areas. Over the past 10 years employment in industry has increased dramatically, especially for younger generations. But contrary to countries like South Africa and South America, the rural-urban migration is not a one-way issue but rather cyclical movement to and from town. Young people go to town and many of them return after marriage. The married women live in the villages and men try to get employed in the rural area. In the meanwhile men return during times of high demand in agriculture. The families live in the villages and the children move to town when they grow older [3]. The Chinese government wants to develop its rural economy and stimulates rural activities. As a share of total farm receipts, subsidies in China have risen from 6% in 1995 to 17% in 2010 [4].

Shortages of arable land

Agriculture is vital in China, employing over 300 million farmers. China has around 7% of the world's agricultural land while having to feed more than 20% of the world's population. About 75% of China's cultivated area is used for food crops. China ranks first in worldwide farm output, primarily producing rice, wheat, potatoes, sorghum, peanuts, tea, millet, barley, cotton, oilseed, pork and fish. Due to the severe shortage of arable land, farming in China has always been very labour intensive and most farmers own small plots of around 0.3 Ha. of land each. The last decade, agricultural mechanisation has increased over 50%. Meanwhile, China is buying and leasing lands in other countries for food production, especially in Africa, while importing huge amounts of food products and inputs for animal feed. China holds over half of the world's food reserves.

Significant policy adjustments are required in order for China's growth to be sustainable. China's 12th Five-Year Plan (2011-2015) forcefully addresses the development of services and measures to address environmental and social imbalances, setting targets to reduce pollution (also specifically related to livestock production), to increase energy efficiency, to improve access to education and healthcare, and to expand social protection. Its annual growth target of 7% signals the intention to focus on quality of life, rather than pace of growth [4].

Agro-ecological and organic agriculture

Chinese farmers have long history of agro-ecological farming, including integrated technologies, for instance rice-duck farming, rice-fish farming, intercropping systems and light traps to control insects. These farming techniques are based on closing nutrient cycles by using different natural resources, including fish [6][7].

The organic food business is experiencing rapid growth in China as a consequence of increasing concern over food safety. Although organic food is over three times more expensive, many people who can afford it, switch to organic food products. Companies have rushed into the organic food sector looking for business opportunities in the market and more profits. Media reports suggest that 345 companies obtained certification from the China Organic Food Certification Center (COFCC) in 2010. This means an increase of 18% on 2009. However, people have expressed doubts and fears over how genuine the goods are since it is hard to identify whether food is truly organic [8][8].

The Ministry of Agriculture set up 50 counties as model counties for the development of ecological agriculture. Training is offered to the leaders and technicians of these counties each year. Institutions for ecological agriculture research were set up under the Committee of Environmental Protection, the Ministry of Agriculture and in collaboration with universities [7]. Moreover, a Green Food program has been developed

where produce is certified for low pesticide input, aligned with IFOAM international standards for organic farming. This has formed the basis of the rapid expansion of organic agriculture in China [10]. Meanwhile, there is a lack of technologies and advice regarding pest and disease control as well soil fertility maintenance [11].

2.2 Livestock systems

China has a large livestock population, with pigs and fowl being the most common species. In rural western China, sheep, goats and camels are raised by nomadic shepherds. In Tibet, yaks are raised as a source of food, fuel and shelter. Dairy has recently been encouraged by the government, though 92.3% of the adult population is affected by some level of lactose intolerance [12].

Increased incomes have resulted in increased consumption of the Chinese middle class. Meat consumption has grown four-fold since 1980 and pork consumption has doubled in the last 20 years. According to the US Grains Council the consumption of poultry meat has grown 300% in 10 years, pork 85% and beef 155%. Total meat consumption is now double that of the United States [13].

To produce the required amount of animal feed, maize production has outnumbered rice production for the first time. China is largest importer of soy in the world and the government is investing 4.7 billion to produce own ingredients for animal feed [14].

Traditional Chinese Veterinary Medicine (TCVM) has been practiced in China for over 2,000 years. TCVM includes acupuncture and herbal medicine. Today, more than half of China's veterinary clinics offer acupuncture and Chinese herbal medicines on a routine basis. TCVM is gaining more and more recognition by traditional veterinary professionals, in China as well as in the US [15].

Dairy

- Dairy consumption is very low compared to western countries: 0.1kg of butter, 0.2kg of cheese and 9kg of fresh milk per capita [31].
- The self-sufficiency in milk is 92% and export 1% of production [32].
- Demand is expected to increase. Dairy imports are mostly (baby-)milk powder [33]. Chinese imports of EU cheese have grown with 36% in 2012 and are expected to double in the next 2 [34].
- Lactose intolerance Although there are no official figures, studies have indicated that lactose intolerance affects around 30% of Chinese children, and a study of Chinese adults showed that 92.3% suffered from some level of lactose mal-absorption. Despite this there is a huge push to encourage Chinese people to drink more milk [35].
- The melanine scandal in 2008 has seriously affected (and is still affecting) the consumer confidence in dairy products. Six children died and around 300.000 were sick due to consuming melanine-contaminated milk [36]. A recent (January 2013) scandal in milk is related to DCD (Dicyandiamide) found in milk powder imported from New Zealand through Fonterra [37].
- The average farm in China has 2.8 milking cows and there are 2.3 million holdings with less than 20 cows. However, the number of farmers is reducing by 3.5% a year. 'Milking stations' and 'cattle villages' are farms where cattle owned by a number of farmers are kept together. At the other end of the scale, there has been massive investments in recent years in large-scale units; there are already 700 herds with more than 1,000 cows. International investors are involved in some of these massive units, including US financial house Kohlberg Kravis Roberts; Pfizer, DeLaval and New Zealand's Fonterra co-op [33][38].
- Most dairy production (84%) takes place in northern China, while most dairy consumption (67%) is located in the south [33]. China's dairy value chain continues to be long and complicated due to the unevenly distributed sources of raw milk supply nation-wide [39].
- Resource use tends to be more efficient at smaller and mixed than at large and specialised farms, but product quality tends to be more critical at the smaller farms. There are to achieve both commercial and environmental and social gains by achieving a new balance between development of the large sector and the small- and/or mixed farms [40].
- The latest 5-year plan aims to increase milk production by 5% per year. The government prefers large-scale farms over smaller ones and has established regulations which affects especially small dairy producers and enterprises. Small-scale dairy farmers are obliged to scale-up their production or leave. This is striking, as especially large-scale farms were involved in the melanine scandals [41].
- A giant re-structuring is taking place as smallholder farmers are moving to urban centres while mega-stables are being built of 5000 cows and more. Fonterra from New Zealand is a major player. But the

loss of backyard production capacity is higher than the growth of large-scale farming. The new stables are built in semi-arid areas with low-quality grassland and where it is not possible to grow soy. Much feed imports are needed. Moreover, management of these large stables is a major problem: some of them are already empty; the cows last only 1.5 lactation [42]. With so many competing land uses, quality forage for high yielding dairy cows is a scarce commodity; that some large scale Chinese dairy farms even import alfalfa hay from the United States [38].

- Organic dairy is in its infancy stages, but there are indications of a high potential [43].

Pigs

- China is currently 99% self-sufficient in pig meat but demand is projected to increase. Consumption of pig meat in China is high: 37KG a year, of which 20% is currently sold through supermarkets. China is presently producing 50 million tons of pork, which is half of the world's total pork production [16].
- In 1997 China was exporting pork, now it is importing meat. Export possibilities of Dutch pork products (like pig legs) to China has improved, though the market is dominated by the US [17].
- There are 80 million pig farmers in China, and 97% of them are back-yard pig producers or small-scale family pig farms. The products are sold through local markets or out-of-home. More than any other animal, pigs are a central feature in Chinese food culture. Pigs is even the central part of the symbol for 'home' (see figure): this is a combination of the symbols for 'roof' and for 'pig'.
- Niche products on basis of special breeds of pigs are a central feature in Chinese food systems. An example is the black hill pig, that is sold at a higher price in super-markets due to it's the superior taste of its meat and it includes a traceability system. Supporting such systems could be an opportunity for Dutch companies [16].
- There are 48 native pig breeds remaining in China all with different features and qualities. Chinese government has pioneered excellent conservation efforts for many of these breeds, which are still greatly favoured by many [18].
- Due to economic reforms industrial agriculture became favoured over small farms, making it much easier for China to produce cheap pork. In 2010 22% of the pork production was taking place in such factory farms [19]. The Chinese government is also supporting large-scale pork production with 2 billion Euros [20].
- Government intervention is focusing on preventing food-scandals. Therefore the government aims for more control in slaughterhouses; the present 21.000 slaughterhouses for pigs will be reduced to 2000 large ones.
- Large-scale pig farms has increased from 1% in 1983 to 14% in 2009 and this percentage will continue to increase.
- Prices of production are relatively high while prices for meat in supermarkets are relatively low. Chinese prefer pork over other meat, but when the price for pork increases a substitute for meat proteins is poultry meat. Prices for pork fluctuate and are also influenced by infectious diseases, such as FMD, Classical Swine Fever, and PRRS.
- Environmental problems in pork production are widespread and relatively new – manure is being spread directly into the water systems rather than on the land. This is contributing to the already high levels of water pollution [21]. The ministry of agriculture has now included reduction of manure-related environmental problems in the new 5-year plan [22].
- Recent scandals with pork have influenced the consumers: for example the pork with steroid clenbuterol in March 2011 [23]. Such incidents are leading to increased market for organic pork, though a recent scandal of Walmart in Chongqing selling fake organic pork may reduce confidence in organic products [24].

Poultry

- Poultry meat consumption is gradually growing. The current yearly consumption of poultry is 13 kg.
- China's poultry industry is beginning to develop its own growth path out of the shadows of the pork industry. Poultry production in China is expected to continue to grow faster than pork thanks to the efficiencies it offers to both producers and consumers. The poultry industry is already the most industrialised protein segment in China [25].

- Poultry meat production in 2012 was about 13 million tons and over 16 million tons in 2013. [25][26]
- Self-sufficiency in poultry meat is 95% and the rate for eggs is over 100% [27].
- China is the largest importer of Brazilian poultry meat **Fout! Verwijzingsbron niet gevonden..**
- China has a wealth of chicken genetic resources with more than 80 different indigenous chicken breeds. Some of these breeds have unique meat and/or egg qualities, a low susceptibility to stress and other useful characteristics. These resources could provide valuable breeding material for the poultry industry in China and even for the rest of the world [29].
- Soy for poultry production has to be imported from elsewhere, especially South America. Prices are low, which requires lower end-weight of the animals [26].
- Large-scale poultry production in China is relatively low. Poultry production in China is still much less industrialised than in other leading producers such as the US, Thailand or Brazil. Vertical integration is quickly gaining popularity, but contract farming is likely to remain the dominant business model as a result of prohibitive capital requirements, a lack of experience and rising land costs [30].
- China lags behind other poultry producing countries in terms of farm management, productivity, food safety and disease prevention. Disease outbreaks have brought serious consequences to producers and processors in the past few years. In 2012 alone, avian influenza and other diseases have affected the industry several times [30].
- The feed model has come under fire with consumers raising concerns over the use of growth promoter and medicines in poultry production. It will take a considerable amount of time for poultry companies to rebuild trust among China's consumers [30].

2.3 Expected critical points for improvement

Marketing barriers

- Long procedures with difficulties to get permits for import of animal products;
- As of May 2013 new legislation is in place on import of dairy: imported dairy products are subject to the same quality & food safety standards as the 2011 standards for domestic products;
- Excessive pesticide residues, low food hygiene, unsafe additives, contamination with heavy metals and other contaminants, and misuse of veterinary drugs have all led to trade restrictions between China and nations such as Japan, the United States, and the European Union.

Environmental problems

- China is highly dependent on imports of animal feed, such as maize, soy and lucerne hay. According to the USDA the soybean imports for animal feed are expected to grow by over 50% by 2020, which will have major impact on the earth's bio-diverse hotspots [19].
- In the past 30 years fertilisers and pesticides were introduced in Chinese agriculture together with irrigation, machinery and new varieties. While both yields and commercial output from agriculture increased dramatically, soil erosion, desertification, overgrazing, over-fertilization, deforestation, over-fishing, and soil fertility decrease occurs in many places [7].
- Excessive insecticide use in intensive agriculture leads to decline of bee population. In south-west China wild bees have been eradicated completely, forcing apple farmers to pollinate their trees by hand [44].
- Livestock diversity is threatened in China, with 9 local poultry and 1 pig breeds at risk or endangered; 9 local cattle and 5 poultry breeds and 10 pig breeds have become extinct [45].
- Water quality problems due to deficient manure handling in large-scale animal units are increasing. Currently over 50% of animal manure is dumped directly in surface waters, contributing to severe water quality problems [22].

Infectious animal diseases

- Foot&Mouth Disease (FMD): According to the OIE, FMD was established through ELISA test in 2011 in a pig farm in Yun-Lin. The animals were not culled. In Ningxia FMD was reported on a cattle and sheep farm; the animals were vaccinated [46].
- PRRS – also known as Blue Ear Pig disease – has led to a severe crisis in 2008-2009. The outbreak required Chinese pig farmers to slaughter millions of pigs and the ensuing downturn in the nation's supply caused pork prices to skyrocket. As a result China has set up a strategic pork reserve [19].

- Avian Influenza (HPAI): Avian influenza is not under control in China. In September 2011 H5N1 was identified in southern province of Guandong and in April in northwest region of Ningxia – where 95.000 chicken were killed to prevent spread of the disease [47]. Together with Vietnam, China is working on a vaccine to prevent birdflu.

Health issues and zoonosis

- According to the WHO health statistics deaths due to tuberculosis are high [48]. Moreover, the Multi-Drug Resistant forms of tuberculosis are becoming a serious epidemic in China [49].
- According to the China Animal Disease Control Center (CADC) the incidence of Bovine Tuberculosis and Human Brucellosis are increasing rapidly [50].
- According to FAO, China has reported the second highest rates of illness and death from human rabies worldwide. Between 1950 to 2004 more than 103,000 persons died of rabies throughout the country in four reported epidemic waves [51].
- Obesity in China is still low (2.9% in adults [52]) though it is a growing problem [53].

Antibiotic resistance

- Indiscriminate use of antibiotics and other chemicals (such as growth-hormones) in animal production systems has lead to multi-resistant strains, such as MRSA. In China risks with ESBL are increasing. Though antibiotic resistance is a threat worldwide China is a special case [54][55]. Chinese livestock gets nearly half of all antibiotics produced for animals worldwide [56].

2.4 Government and knowledge institutes

- The Chinese government aims to become independent in terms of food supply and food-quality. It has therefore included animal production programs in the next 5-year plan that includes the establishment of 100 mega-farms as well as 500 demonstration enterprises. The aim is to modernise the animal production systems with support investments of international private enterprise and other organisations [57].
- China has witnessed an extra-ordinary development of the government veterinary sector since 2008 due to the melanine problem as well as the Olympic Games in Beijing [58].
- The Chinese government has established extensive laboratories throughout the country. The National Avian Influenza (AI) Reference Laboratory was certified by OIE in 2008. Five other veterinary laboratories were designated as OIE Reference Laboratories, including National Foot and Mouth Disease (FMD) Reference Laboratory of Lanzhou Veterinary Research Institute of the Chinese Academy of Agricultural Sciences (CAAS), the Laboratory for Equine Infectious Anemia (EIA) of Harbin Veterinary Research Institute of CAAS [59].

2.5 Current Dutch involvement

China is of economic importance for the Netherlands: outside the EU China is the Dutch third export partner, after the US and Russia. Focus is on education and inputs for developing (large-scale) dairy and pig production. The business climate in China has several aspects [16][33]:

- There are opportunities for Dutch involvement, basically due to increased demand for animal products and positive attitude of the Chinese government. Focus on metropolitan food supply and education. But:
 - Netherlands is not yet well-known in the agro-food sector
 - Chinese have more ritual mentality and are focused on relationships rather than on business; Dutch people need to have 'patience'
 - There is priority for Chinese businesses over foreign ones
 - Copying behaviour and other interpretation and implementation of regulations
- The Netherlands is part of the China-Council for international cooperation (CCICCD), which gives policy advice to the Chinese government. The theme for 2013 is Environment and Society for Green Development [60].

Investments in Chinese animal production

- Friesland Campina: offices in Beijing and Shanghai
- Agrifirm. International animal feed production with highest growth in China is the most important source of income for Agrifirm **Fout! Verwijzingsbron niet gevonden..**
- Oranje Pig is an initiative of 10 firms that are investing in developing the pig production chain in China, including Topigs, De Heus, Botraco, VION, Provimi, NEDAP, Nooyen, MPS, VDL Fancoom. NL has presented itself with a Dutch Pavilion during the VIV China 2012, a major event on animal industries Feed to Meat [62].
- Dutch Poultry Centre also presented itself during this VIV China event. Dutch poultry farmers, such as ECO group presented itself and the first book of the Chinese version of a training called “Chicken signals” International was presented.
- NEDAP China Ltd. – subsidiary of NEDAP NV, automation of animal husbandry, especially pigs and dairy [63]. NEDAP works in coordination with WUR-LRI.
- Agriprom – dairy stables

Sustainable chain development

- Solidaridad works with 1) Chinese soy producing companies towards sustainable soy production according to RTRS standards; 2) Bionext on developing organic layer feed chain that complies to ecological and social criteria; 3) China Soybean Industry Association on multiyear partnership **Fout! Verwijzingsbron niet gevonden..**

Research, education and advisory services

- SIDAC (Sino-Dutch Animal Husbandry Training & Demonstration Centre) in Beijing has functioned between 1997 and 2002, offering courses about pig and poultry husbandry. This was an initiative supported by the Dutch government, PTC+ and Dutch pig & poultry companies, in coordination with Beijing University. The project stopped in 2002 [65].
- WUR:
 - WUR: establishment of two centers in China. One in Beijing, working with Municipal Bureau of Agriculture (gov) and one in Shanghai, working with Shanghai Bright Food Group (private)
 - LEI (Robert Hoste): marketing study pig and dairy production [16]
 - ASG (Kees Lokhorst en Bennie van der Fels): precision farming pigs and poultry [66]
 - Alterra: development of agro-production park in Shanghai - Greenport Shanghai [67]
- E-kwadraat about lowering energy costs in dairy farming
- Roodbont provides books and digital information
- Van Hall Larenstein has cooperation with Yunnan Agricultural university (10 years) [68]
- Education: numerous Chinese students come to the NL for courses (Wageningen University, HAS, CDI, Oenkerk, van Hall, Dairy Campus).

2.6 Opportunities for future involvement in China

- Learn from past experiences*, including difficulties, e.g. SIDAC
- Improve efficiency and sustainability in dairy, poultry and pig sector*
 - Support moderately-sized large-scale systems for metropolitan food supply with emphasis on food safety, closing nutrient cycles, animal welfare, soil-fertility and climate provisions.
 - Improvements for all animal production systems in the field of food safety, disease control, breeding, feeding, mechanisation, water and energy management and supply chain development.
 - Support the upcoming organic production systems, building on new trends for direct marketing and shortening food chains.
 - Support small-scale systems with ‘niche products’ such as meat from black Hill Pig with reliable traceability systems.
 - Support to promote and establish local food production for local population, so-called “local for local”.
- Support manure handling systems*
 - Appropriate waste management of animal manure in large-scale animal systems, including appropriate utilization of animal manure for crop production based on crop demand, in order to prevent further environmental damage.

d. Food safety

- The need for implementing food safety control and traceability in supply chains is an opportunity for the Dutch to provide expertise and technical systems.
- Besides control the Dutch have expertise on improving animal health, reduction of medicine use (including antibiotics) and use of other chemicals e.g. in feed production. WUR has already established a food-safety lab in Beijing.
- Using by-products of the food industry in animal feed preventing food safety risks.

e. Training and education

- Training is an obvious component with an emphasis on practical training. E.g. at demo-farms with appropriate technology and educational opportunities. This training has to be adapted to local circumstances and include the various animal production systems. The lessons learnt in terms of environment and social effects of animal industries in the Netherlands can be shared.

f. Other opportunities

- The Dutch involvement is to be focused on developing in-land food security strategies rather than promoting exports from the Netherlands to China. Although for some products, like veal, the Chinese production can't keep up with the demand - which may be an opportunity for Dutch companies.

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3 Republic of Korea

3.1 General information

Export-driven economy

South Korea has recently become one of the major economies worldwide. The country is highly urbanized with nearly a quarter of the people living in Seoul [1]. Population density is one of the highest in the world. The population is rapidly aging, which could become a problem in the future [2]. South Korea's economy is export-driven, with production focusing on electronics, automobiles, ships, machinery, petrochemicals and robotics. It counts as a high income country [3] with one of the highest education-participation rates in the world [1]. There is, however, a gap in income between farm and urban households: in 2005 average farm household income was only 78% of urban household income [4].

Compared to other manufacturing industries, food processing companies are smaller in size and investments are much lower. The retail sector, particularly hypermarkets and convenience stores, has been developing very rapidly [4].

Land shortage and transformation to industrialised society

South Korea's agriculture is characterized by small farms and the shortage of agricultural land. The country has many mountainous areas, leaving only one-fifth of the total area suitable for agriculture [3]. Between 1970 and 2005 there was a rapid transformation from an agrarian to an industrialised society. South Korea's agricultural part of the GDP shrunk from 25% to 3%, with rice as the main product. In 2005, there were about 1.3 million farm households left. Most farms were mixed general farms, with little variation between regions and farm types. About 62% of Korean farms were less than 1 ha in size; average farm size was 1.4 hectares and only 7% had more than 3 hectares. Farm size and the number of specialised farms, notably in the production of livestock and greenhouse vegetables, is increasing [4].

Rising production and continued need for food imports

Although Korea has been able to double its agricultural production between 1970-2005 and attain self-sufficiency for some major products such as rice, it still needs to import most of its food [1][5]. Currently, over 60 Korean firms are operating in 16 countries on around 24.000 ha of agricultural land for food production, most of them are based in Russia [6].

Need to increase competitiveness of agriculture

A growing number of bilateral free trade agreements increasingly exposed Korea's agriculture to international competition, making it urgent for policy makers to increase the competitiveness of this sector [4]. Policies introduced since 2004 include the 10-year medium-long term Policy Framework for Agricultural and Rural Communities [6], the 'Comprehensive Plan for Promotion of the Agro-Food Industry' in 2005 and the 'Agro Food Promotion Act' in 2007.

Changing food consumption patterns

Korea's food consumption patterns are changing. While rice continues to be the staple food, the consumption of livestock products, fruits and vegetables has greatly increased. Obesity is a major problem. Food-safety, health food, and environmental impact of food production have become more important considerations than food availability. Trends include organic baby food, food with natural ingredients, and reduction of sugar-full drinks [6].

3.2 Livestock systems

While small-scale farms continue to dominate the cattle sector, pigs and poultry are predominantly intensively produced, primarily using imported feedstuffs [4]. In 2005, pork contributed 11% of the value of South Korea's agricultural production, beef and veal 9%, milk 4%, eggs and other livestock products 6%, and chicken meat 3% [4].

Livestock numbers in South Korea in 2011 [10]

	Animal numbers	Animals/km2	Establishments
Poultry	162,246,496	1,346	4,384
Cattle	3,353,353	28	168,997
Sheep and goats ¹	250,438	2	15,261
Swine	8,170,979	68	6,347

The South Korean market for meats is undergoing considerable change, shifting from the sale of undifferentiated meat thawed or frozen (pork and beef) or fresh or chilled (poultry) to the sale of specific cuts and qualities. This has benefitted the imports of certain cuts, especially pork ribs and bellies, which are sometimes in short supply and priced above world market levels [11]. Overall, the evolution of the composition of agricultural exports has shifted towards higher value products, such as processed goods [4].

Dairy and beef

- The Korean dairy sector is relatively young – it started in the 1980's with rice farmers adapting to dairy [19]. Dairy consumption has been actively stimulated by the government – which gave rise to an increase of the per capita daily consumption of dairy products of approximately 2450% between 1969 and 1987 [20].
- In 2011, South Korea had about 404,000 dairy cows; milk yield was about 4.59 ton/cow [21].
- Most dairy farmers are family farmers with up to 50 dairy cattle and only 1 ha of land – no pastures. All feed, including grass, is imported from the US. Due to lack of land, manure is also a problem and is being traded with crop farmers [19].
- There is a milk quota to limit production. Overproduction has led to a powder-milk reserve used for food-aid to North Korea [19].
- All milk is processed in the 11 major processors [21].
- In 2010, beef consumption was 434,000 tons. More than half of this was imported [22]. Growth in beef consumption is dampened by high prices [23].
- Export to Japan of agricultural products including dairy has risen, after Japanese consumers were concerned about cattle fed with radio-active straw [24].
- The Korean Dairy Committee (KDC) was created in 1999 to handle the marketing of milk between producers and processors [4].

Pigs

- In 2011 South Korea consumed around 100.000 tons of pork per month, 75% of which comes from local farmers and 25% is imported [13].
- Although beef is their favorite meat, South Koreans consume more pork than any other meat, in part because beef (especially Hanwoo) was in short supply and often more expensive than pork [11].
- Pork used to be a major export product, accounting for 13.5% of total exports in 1992-1994, but its share shrank to 1.8% in 2004-2006 due to competition from China and the outbreak of swine fever [4].
- The pig sector in South Korea grew up to 2002 (growth stopped due to the outbreak of swine flu) in term of numbers of animals and the weight of hogs slaughtered. Pig farming turned into a full-time activity. Pig production concentrated on fewer farms with more animals (mostly more than 1,000 hogs but some even have more than 10,000 hogs) which could produce with lower costs. Production is concentrated in the province surrounding Seoul, and, secondarily, in the southeast and central parts of the country [4][11][11].
- Since June 2012 place-of-origin labelling is compulsory for pork. It already applied to rice and beef. Meat processors and sellers are required to issue receipts identifying the place of origin [14].

¹ Sheep make up less than 3% of this category

Poultry

- Between 2005 and 2009, broiler meat production in South Korea has grown from 451,000 metric tons (MT) to 605,000MT, and consumption rose from 508,000 to 671,000 MT. In 2009, about 10% of consumption was imported [15], mainly from Brazil, US and Thailand [15]. According to unofficial forecasts, broiler meat production is expected to reach 740,000 tonnes in 2013, up 2% from 2012. Consumption is expected to increase by 3% [17].
- Most chicken production is on farms with 40,000 or more birds. About 3,000 chicken farms (broiler and layer) dominate production. Despite government restrictions on the maximum farm size because of environmental concerns, the trend toward larger, more efficient farms continues [11].
- Improved local poultry breed was successfully promoted for export of safe chicken meat as Premium Korean Chicken Brand 'Handak' by the Chicken Export Research Institute, to countries like Vietnam, Japan, China and Taiwan [17].
- Since June 2012 place-of-origin labelling is compulsory for chicken. It already applied to rice and beef. Meat processors and sellers are required to issue receipts identifying the place of origin [14].

3.3 Expected critical points for improvement

Marketing barriers

- Animal disease outbreaks early in 2000 have seriously disrupted trade, production, and consumption of meat in South Korea, one of the world's major meat importing countries [11].
- South Korea had closed its borders for Dutch poultry meat since 2003 due to the HPAI epidemic. Since Jan 2013 the Netherlands can export again to South Korea after an agreement between both countries [15].
- The country recently reduced its pork imports from the EU because its own pork production rose after the MFD outbreak in 2011 – after which prices for pork reduced drastically. Thanks to EU Korea FTA, the difference between the tariffs from US and EU is only 0.4% now. There is no big negative effect on pork imports from the EU due to US Korea FTA. In 2012 pig producers protested against tariff-free quota for imports of pork from the US [25].
- Bovine semen is not yet open due to the outbreak of Schmallenberg virus in Europe [26].

Environmental problems

- High use of fertilizers, pesticides and water in agriculture [4].
- In 2009 the country has signed an agreement with the US and accepted the import of genetically modified soy [27].
- Insufficient manure processing facilities result in low use of manure [28].

Infectious animal diseases

- South Korea was officially declared FMD free in 2011 after a major outbreak in 2010. The country decided to cull 3.5 million cattle and pigs and introduced an obligatory vaccination program to eradicate the disease [29]. This was met with serious international claims of animal wellbeing organisations [30]. The Netherlands has supported this by sending FMD vaccine [31]. The disease is still common in North Korea, where funds are insufficient for effective control [32].
- Classical Swine Fever was reported by the OIE in 2003 [32].
- HPAI is not completely under control. During the 2006–2007 winter season in South Korea, several outbreaks of highly pathogenic avian influenza virus (H5N1) were confirmed among domestic poultry and in migratory bird habitats [33], including in a 300,000 bird unit with supposedly high biosecurity standards [35]. HPAI virus H5N1 was also reported in 2010-2011 [36].

Health issues and zoonosis

- Obesity is a major problem. One out of every five children in South Korea is overweight. The government has prohibited TV commercials for hamburgers, sweets etc. during children's programs between 5-7 PM [37].
- The frequency of food poisoning and outbreaks in restaurants and school meals due to various micro-organisms and chemicals is increasing [38].

Antibiotic resistance

- South Korean government banned animal feed containing antibiotics, to control antibiotic resistance and increase acceptance of meat production amongst population [39].

3.4 Government and knowledge institutes

In 2010 the government announced its Green Growth strategy. Focus of the strategy is towards promoting urban agriculture, renewable energy from livestock manure and biomass, a carbon labelling system, investments in green R&D, environmentally friendly agriculture infrastructure, ecosystem conservation and strengthening international cooperation and global partnerships [7]. Under a current policy review the Green Growth strategy might be abandoned due to the notion of the strategy being too oriented toward economic growth instead of sustainable development [8].

The government is active in animal disease control. In 2011, it announced measures to improve the nation's livestock disease controls, including farm registration, minimum space requirements per animal, increased training, stronger FMD Standard Operating Procedures (SOPs), and cost sharing for vaccination expenses. The most significant change for the local livestock industry is the farm licensing system, which will be gradually instituted from 2012 through 2015. The government will help offset the costs by drawing on the 1.6 trillion won (\$1.5 billion) set aside as part of the Korea-EU FTA countermeasures [9].

3.5 Current Dutch involvement

After the US and Japan, the Netherlands is third largest investor in South Korea. Some activities related to agriculture are:

- Between 25 and 31 of May 2013 a trade mission will be organised by the Chamber of Commerce of the province of Limburg together with LLTB (Limburgse Land & Tuinbouw Bond [40]), Greenport Venlo and the Dutch embassy in Seoul [41].
- Between 14-17 May 2013 there will be a Holland Pavillion in the Seoul Food Show (organisator is Dutch embassy):

The Dutch Business Council Korea (DBCK) is a platform for Dutch citizens working in South Korea [42]

The Korea Trade Center in Amsterdam is part of KOTRA, a South-Korean government organization designed to promote Korea's economic interests abroad [43].

Currently the main focus of Dutch involvement with South Korea is related to training and to development of agro-parks or food valleys.

The following livestock related Dutch activities could be identified:

Export of NL products

- Poultry products. Eight Dutch firms are eligible to export poultry meat and poultry products after approval of Korean authorities in December 2012. Total poultry imports are estimated 247million US\$ in 2012 [44]
- South Korean government and organizations are particularly interested in the experiences and knowledge in terms of agricultural policy innovation in changing conditions [45].
- Praktijkschool PTC+ receives groups of students from South Korea for special training courses [46][46].

Direct investments in animal production:

- Some Dutch companies including Nedap are introducing state of the art feeding and detecting systems for better production efficiency are being introduced into Korea [26][48].
- Jansen's Poultry Equipment

Public Private Partnerships on various agriculture related themes

- Landreclamation project Saemangeum: Korea invests 18 billion US\$ until 2020 in the project. The Netherlands Ministry of Economic Affairs and the Korean Prime Minister's Office signed an MoU in April 2010 to facilitate cooperation in several aspects of the sustainable development of Saemangeum (e.g. energy, water, ecology and agriculture) [26][48].
- The Netherlands food and consumer product safety authority and the Korean Animal, plant and fisheries quarantine and inspection agency (QIA) signed an MoU in 2012 on electronic certification of information exchange in the trade of agriculture products [26].

- Smart City project is related to the national policies Green Growth to which the government will invest 2% of its BBP. These initiatives in the cities of New Songdo, Saemangeum and Sejong City give opportunities for training and consultancy in agri-food (agro-parks) [50].
- NIZO Food Research and Oost NV have signed MoU with Foodpolis – to develop a Food Valley Region with agro-food clusters in the Jeonbuk province May 2012 [51]. NIZO food research is partner in the Top Institute Food & Nutrition (TIFN), an international alliance of industry and research organisations to strengthen the innovative position of the Dutch food industry. TIFN partners include several internationally active parties covering food, feed, breeding, agriculture and research (CBL, CRV, Danone, Nestle, DSM, FNLI, Royal Friesland Campina, Productschap Zuivel, Unilever, VION, NIZO Food Research, TNO and WUR

3.6 Opportunities for future Dutch involvement in South Korea

- Training and knowledge sharing.*
 - Korea is particularly interested in the Dutch experiences related to agriculture in general, including livestock. It wants to build it's food security on latest technologies and insights. Capacity building with emphasis on practical training adapted to local circumstances and including the various animal productions systems, taking into account all lessons learnt.
- Manure management systems.*
 - Sales of installations e.g for biogas production.
- Food safety and quality systems*
- Modernization of livestock housing, feeding system and breeding*
 - The Korean government is putting efforts in modernizing the facilities in the livestock sector, including housing and feeding systems
 - Import of good quality bovine breeding materials and technical support of breeding companies in poultry and pig
 - In case of pig and poultry breeding there will be opportunities in technical cooperation between breeding companies.
- Organic food chain, especially for baby-food*

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4 Vietnam

4.1 General information

From agriculture to industry and services

Vietnam has a population of 92 million people and an annual economic growth of around 7%. Two decades of rapid economic growth and market integration have transformed Vietnam from a subsistence economy to an emerging economy with lower-middle income country status, integrated into global markets. The structure of the economy has shifted from agriculture towards industry and services, and GDP growth has accelerated [1]. Agriculture contributes about 20% to the country's GDP. GDP contribution and the number of people working in agriculture are expected to decrease gradually as Vietnam aims to become an industrialized country by 2020 [2]. The private sector in Vietnam is limited – with many links to the government [3].

In 2011 the country experienced double digit inflation (18.6% [4]) and macro-economic instability, leading the government to issue measures such as tightening monetary and fiscal policy, reduction in public investment, control of trade deficit, and export promotion. As a result inflation has been steadily put under control and export continues to grow [1].

North and South distinct regions

The Northern and Southern part of the country are quite distinct; the government is situated in Hanoi in the North, the South is economically more vibrant.

Agriculture: important source for labour and income, using more external inputs

The government vision for development is laid out in the Socio-Economic Development Strategy 2011-2020 [1]. The government aims to invest in agriculture to become less affected by price fluctuations on the world market and to reduce inflation – which regularly is cause of social unrest [5].

Despite the rapidly changing environment, 70% of the population continues to live in the rural areas and derives its livelihood from agriculture, which remains an important source of income and job creation for the large rural labour force. With improved ability to market farm surplus, farmers turned to chemical fertilizers and other agro-chemicals to increase crop yields and thus their livelihoods [6].

Overall decline of poverty, mainly a rural phenomenon

In the period 1993 – 2010, national poverty incidence declined from 58% to less than 10% – lifting some 30 million Vietnamese people out of poverty. However, poverty remains predominantly a rural phenomenon, Rural people comprised 91% of total poor in 2010 – a figure that has shown little decline since 1993 when it stood at 95%. Moreover, the nexus between climate risk and poverty is of growing concern. The most vulnerable social groups (women, ethnic minorities and disabled) are exposed to greater risks [1].

Traditional integrated farming (VAC system) still in place

Integrated farming – or the VAC system - is the traditional approach to family food production, integrating the home plot/garden ('*Vuon*'), pond ('*Ao*'), and livestock pen ('*Chuong*'). An estimated 85-90% of rural families maintain a garden and livestock pen, with 30-35% of them having fishponds. In many villages, 50-80% of families have the full VAC system. Over the last decade farmers and researchers have developed more intensive approaches, as economic changes have taken place [7]. Smallholder VAC is also being promoted as 'Integrated Food Energy system' [8].

VAC produce is not organically certified. Despite the growing awareness amongst key stakeholders, there is only one certified organic farm currently operating in Vietnam. Problems for development of this sector are related to the lack of land that is chemical-free, as well as the complex and costly certification process [6].

4.2 Livestock systems

Vietnam imports around 5% of the total meat consumption, mainly beef and chicken [2].

In the 60s and 70s of last century, livestock were kept in cooperative farms, be it small or state-managed, and mainly based on native breeds. The cooperative system was replaced by private household production, resulting in increasing herd sizes over the last decades. The market driven economy has led to mass

importation and development of high productive exotic breeds. Some native breeds have become extinct, others are at risk [9].

Priority to pigs and dairy

The government is prioritising swine and dairy sectors with the objective of boosting pig meat exports and reducing reliance on imported milk products. The swine/pork sector receives most attention in MARD's plans. The poultry sector has not developed many large commercial operations or processing plants [10]. The traditional water buffalo is gradually being replaced by small tractors.

Regular animal health issues

The animal health situation in Vietnam is quite complicated, with outbreaks of Avian Influenza in poultry and Blue Ear (PRRS) in pigs. Foot and Mouth Disease (FMD) and other infectious diseases are also occurring from time to time. Monitoring and control of animal disease in Vietnam is difficult because of the small scale of farms, the tropical climate, and long borders with China, Laos, and Cambodia [2].

Livestock population and production in Vietnam 2005-2010 (Source: Vietnam's General Statistic office)

Year	Buffaloes & Cattle		Pig		Chicken	
	Population (mil.heads)	Production (mil.tonnes)	Population (mil.heads)	Production (mil.tonnes)	Population (mil.heads)	Production (mil.tonnes)
2005	8.4	202.0	27.4	2 288	219.9	322
2006	9.4	223.8	26.9	2 505	214.6	344
2007	9.7	273.6	26.6	2 663	226.0	359
2008	8.2	298.2	26.7	2 783	248.3	448
2009	9.0	342.4	27.6	3 036	280.2	528
2010	8.8	363.1	27.4	3 036	300.5	621

Dairy and beef

- Vietnam has a relatively short tradition in production and consumption of dairy products. Dairy consumption per capita is growing with 5.7% per year (with increasing incomes and education) [5]. Growth is mainly attributed to a strong increase in the domestic demand of dairy products, coupled with very supportive policies for the domestic dairy sector [21].
- Substantial potential exists on both the demand and supply side. On the demand side, Vietnamese consumers pay as high prices (0.63 US\$/lt.) for fluid milk as European consumers pay for similar products. On the supply side, only some 30% of dairy products is produced locally. Farm gate prices of milk have nearly tripled between 2006 and 2012.
- Lactose intolerance is three times more common in South Asians than in other populations; no specific data are available for Vietnam [22].
- About 98% of the dairy farms hold 5 cows or less. Vietnamese dairy farms belong to both a) the lowest cost milk producers (<18 US\$/100kg ECM) and b) the world's most profitable dairy farms (2 to 9 US\$/100kg ECM entrepreneurial profits) [21].
- The strong profitability of Vietnamese dairy farms relies heavily on national public support. This support reaches the farms through two main channels: (a) farm output prices (e.g. milk and beef) are kept above world market prices and (b) prices of farm inputs (e.g. capital and labour) are purposely kept low [21].
- Between 90 and 95% of the milk marketed in the region of Hanoi is captured by the formal sector, which basically consists of two large processors, Vinamilk and Hanoi Milk. Despite the dominance of the formal sector, an informal sector exists, mainly consisting of small milk shops, marketing 5 to 10% of the region's fresh milk volume [21].
- Friesland Campina and Nestle have central positions in the dairy market [23]. In 2010 the government has set maximum prices for baby milk [24]. Price fluctuations in dairy do affect the population – in 2011 a 15% rise of milk prices lead to a run on baby milk powder products [25].

- About 93% of dairy farms supplying milk to FrieslandCampina Vietnam have adopted the Good Dairy Farming Practices (GDFP) following a project undertaken by the company to help farmers improve milk quality and volume [25].
- Afimilk – an Israeli led, international dairy management corporation, is building one of the world’s largest dairy farm projects [26]. It is importing 30.000 dairy cows from New Zealand for 12 farms, and training 1000 Vietnamese as employees [26].
- Domestic beef demand is met by local supply; beef production has been growing over the last two decades – both in aggregate and per-capita terms [10].

Pigs

- Vietnamese consume a surprising 35 kg of pork per capita annually, comparable to China and the USA. In the total meat consumption, pork accounts for 80%, chicken for 12-15%, and cattle and buffalo for 5-8% [2].
- Pig production is unequally distributed geographically. The Mekong and Red River deltas account for about 40% of the country’s pig population and about half of the pork output [11]. The vast majority of pork is sold through the wet markets [12].
- The size of pig farms is slowly increasing. The vast majority (98%) of farms are small-scale (1 or 2 pigs, VAC system) [13], many of the country’s units are getting bigger as mechanization gradually takes over from traditional manual labour. In 1994, pig farms with over 6 pigs only accounted 2.2% of farms; in 2002, this proportion increased to 7.9% with 548 commercial pig farms with at least 100 pigs per farm.
- Many of the large pig farms, which still tend to be fully or partially state-owned, have imported purebred lines from Europe and North America to set up nucleus and multiplier sections to breed their own F1 parent gilts. In addition, several international companies are establishing their own nucleus and multiplication pig units on Vietnamese soil [14].
- In the past, the local market was protected by custom tariffs. The rising demand and new WTO international trade agreements could force Vietnam to accept pork imports, jeopardizing continued growth in local pig production [14].
- A survey of manure management in northern Vietnam revealed that pig manure is traditionally used for fish-ponds or for biogas used for cooking, and only very limited for crop production. Around 19% is directly disposed of in public sewage, lakes, or rivers, indicating the problems with manure management when farm size increases [15].

Poultry

- Poultry meat consumption is expected to rise with 37% between 2012 and 2021. Production is expected to rise with 27% over the same period, import volumes with 49% [16].
- Poultry is raised in all regions of the country, though four regions account for 72% of the country’s poultry population [17].
- Three main systems of poultry production prevail in the country [18]:
 - *Backyard system*: Practiced by 92% of the households, with 5–7 chickens & ducks per farm of local breeds. Contributing approximately 30% to farmers’ total income, it is an important resource. The backyard system contributes over 65% of the poultry products in the country.
 - *Semi-intensive (or small-scale commercial) system*: since 1990’s peri-urban families are rearing flocks of up to a few hundred “white feather” birds from day-old chicks supplied by large breeding companies, that also provide feed and advice. Some 10-12% of households practice this system, producing 10-15% of poultry products.
 - *Intensive system*: produces 20–25% of poultry products, of which 3% is produced by private farmers; was introduced in Vietnam in 1973.
- The poultry industry was severely damaged by Avian Flu in 2003. At the time, the national poultry population amounted to 255 million, with around 38% ducks [18]. In December 2003, 38.3 million heads were destroyed/died, accounting for 15% of the poultry population, of which 50% were chickens, 30% ducks, and 20% other fowl [18]. Especially small commercial farmers were badly hit by the outbreaks and subsequent adjustments to the sector in 2005–2006. Some have recovered and are flourishing, while others have permanently lost their market share [19].

- Ducks were identified as carriers and conveyers of the HPAI H5N1 virus. The virus originated in wild ducks, increased in virulence, and developed into a highly pathogenic strain in domestic ducks. Ducklings hatched, bred and distributed without control and vaccination, are a potentially serious risk. In spite of the current risks and problems of raising ducks, around 80% of duck producers have chosen to restock; others have gone over to rearing other animal species instead [20].

4.3 Expected critical points for improvement

Environmental problems

- Livestock agro-biodiversity is a challenge in Vietnam, especially in the pig sector: Six native breeds are recorded as endangered, three native breeds are already extinct [28].
- With its mega-deltas and high population concentrations in the Mekong and Red River Deltas, Vietnam is characterized by the IPCC as a 'hotspot of key future climate change and vulnerability in Asia'. Expected impacts on agriculture and rural development will primarily derive from changes in temperature, rainfall and sea level [1].
- Medium-sized farms (with 300 to 2,000 pigs) are the fastest growing segment of Vietnam's livestock sector. The waste that these farms produce pollutes waterways and produces millions of tonnes of greenhouse gas (GHG) emissions in the form of methane [29].
- Unsustainable natural resource use, particularly of water and forests, is common and leads to water scarcity and land degradation, including saline intrusion and loss of biodiversity and flooding. This is amplifying vulnerability to climate change and natural climate hazards, which are increasing in frequency and severity. These constraints are compounded by the limited capacity of supporting institutions, particularly at provincial and lower levels [1].

Marketing barriers

- Imports of veterinary products are hampered by increased attention to sanitary issues and requirements [13].

Infectious animal diseases

- Avian Influenza (AI) is a major problem. Vietnam is the country most affected by HPAI after Indonesia. Since 2004, 119 people have been infected of which 59 died. Since then, dozens of outbreaks have been reported by OIE. In 2011 and 2012 the H5N1 virus was reported in 22 and 20 provinces respectively. In 2011 over 510.000 animals were culled preventively. The government ordered special controls at the borders, as imports of poultry are seen as one of the reasons why control measures fail to be effective [30]. A mutated virus H5N11-2.3.2.1 – resistant against existing vaccines – was isolated in the North of the country [31]. Vietnam is cooperating with China in developing a new vaccine [32].
- Classical swine fever (CSF) has been endemic in Vietnam for decades, and is still a disease of major economic importance. Vaccination efforts of smallholder pig production have encountered serious difficulties [33].
- PRRS (Abortus Blue) in pigs affects mostly Northern provinces of the country. Reported as controlled in 2007 [34] – in 2010 a man was suspected to have died of PRRS [35].
- Food & Mouth Disease is endemic [36].

Health issues and zoonosis

- Consumers are increasingly concerned about food safety; main issues of concern are pig diseases, chemical residues, and unhygienic conditions at the point of sale [12].
- In 2012 growth hormones were found in 4% of pig meat in slaughterhouses; these were also found in 2% of feed samples [37]. In 2006 the Southern Agricultural Techniques institute signalled an alarming use of 10 different kinds of growth hormones in animal husbandry, most commonly Clenbuterol and Salbutamol [38].
- Unrest arose in 2009 around milk from Friesland Campina with supplement of Vivinal GOS – a prebiotic. In total eight children ended up in hospital after consuming this milk. It is possible that these children had lactose intolerance – though it remains unclear why it happened only after consuming dairy products from Campina [39].

- Widespread and unregulated use of chemicals has resulted in negative health effects for farmers, due to their exposure to agro-chemicals [6].
- Interest in short-term gains and a lack of information about antibiotics are the driving factors behind widespread antibiotic resistance [39].

Land issues

- Although 9 million hectares of agricultural land have been issued to 12 million households, the land reform process is still incomplete and requires further investment in land-use planning and consolidation [9].

4.4 Government and knowledge institutes

Government response capacity to animal diseases is considered weak. Disease detection and control in Vietnam is facing many difficulties; in some places, farmers don't report the disease when their animals have disease symptoms; slaughter control and inspection is undisciplined; disease quarantine is limited; the proportion of vaccinated animals is low; and the quality of vaccines needs to be improved. The veterinary network at local levels is weak. The lack of control of animal and animal product at the borders leads to the spread of contagious diseases.

The agricultural extension system has a low investment and effectiveness. The agricultural extension services mainly provide technical information, rather than information on markets, regulations, policies, and credit conditions [9]. Universities generally are not engaged with the private sector in outreach activities.

4.5 Current Dutch involvement

The following livestock-related Dutch activities were identified:

Direct investments in animal production

- Hypor/Hendrix Genetics daughter Japfa Comfeed Vietnam Ltd is the second largest poultry producer in Vietnam [41].
- Friesland Campina is the second large milk enterprise after Vinamilk – with office in Ho Chi Minh City. Product brands Friso, Yomost, and Dutch Lady – the latter with 14% of the market. 20% of the milk comes from 2.500 local farmers – the rest from regional parties, such as Fonterra (New Zealand) [5]. Friesland Campina has a dairy development programme (DDP) as part of its corporate social responsibility [42].
- De Heus Vietnam LCC runs four feed mills in the country.

Public-private partnerships and development projects

- In 2006 and 2012 agreements were signed for the Dutch Ministry of Agriculture/Economic Affairs to assist in HPAI control [43] resulting in G2G co-operation on Avian influenza [13].
- WUR has signed agreements in Vietnam for Dutch support in disease control and identification of animals for slaughter [45].
- NVWA, Gezondheidsdienst voor Dieren and Holland Pig Consortium, an initiative of 10 firms that are investing in developing pork production chains (Topigs, de Heus, Botraco, VION, Provimi, NEDAP, Nooyen, MPS, VDL Fancoom) - New project expected to start April 2013 in 3 locations.
- Friesland Campina and Fresh Studio [13] run a VRF project on dairy development zones in Hainam province, and are in the process of a follow up project with De Heus, Wageningen UR, and The Friesian.
- Agriterra supports programs with dairy cooperative farmers [46].
- SNV has worked on the domestic biogas program: by 2011 about 115,000 biogas plants were constructed and over 800 technicians and 1,400 biogas masonry team leaders were trained. The program is extended till 2014 [47].

4.6 Opportunities for future Dutch involvement

a. Dairy supply chains

- Expansion of local milk production for foreign milk processors.
- Support to moderately-sized large-scale systems for urban supply - with emphasis on closing nutrient cycles, soil fertility, fodder supply etc.
- Inclusion of smallholder producers in modern value chains and increasing the productivity of small scale production systems; attention for manure management, dairy chain development, niche products etc.
- Establishment of Education, Research and Information facilities for dairy farmers.

b. Pork supply chains, including manure handling

- Large pork integrations offer opportunities for suppliers of genetics, inputs for chain control systems, equipment, manure handling, and processing equipment .
- Support to small-scale VAC systems, for example with marketing support for 'niche products' originating from local pig breeds with reliable traceability systems; follow-up on biogas systems.

c. Poultry supply chains

- More commercial production will provide market for suppliers of genetics, equipment and inputs.
- Changes to the poultry sector will change the social fabric and the livelihoods portfolio of many vulnerable people, and so they need to be carefully considered and backed up by supporting measures where existing coping strategies will not be enough.

d. Feed industry

- Expansion of market for feeds and feed supplements.

e. Environment

- Knowledge and technology on environmentally friendly waste management (nutrient cycling, technology).

f. Food safety promotion

- Knowledge and technology on quality assurance systems, including tracking and tracing systems (I&R), quality analysis equipment, control of use of antibiotics, chemicals, and other residues, and inspection and enforcement systems.
- Support to preventive control, including laboratories for animal feeds and other inputs.

g. Disease control

- Disease control (HPAI, FMD, pig diseases) becoming more important, offering opportunities for further assistance of the Netherlands with expertise and control programs. With enough interest from the private sector the on-going cooperation on Avian Influenza could be expanded. FAO has expressed interest in cooperating on AI vaccine production in Vietnam.

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5 Indonesia

5.1 General information

Vibrant democracy, economic growth and continuing poverty

With almost 250 million inhabitants, Indonesia is one of the largest and the world's 4th most populous country. It is an archipelagic country, with more than 13,600 islands. More than half of the population lives on the island of Java.

Indonesia is a middle-income country with a high economic growth: around 6% in 2012. However, approximately half of the households live below or around the national poverty line. The majority of the poor lives in rural areas [1].

Indonesia is one of Asia Pacific's most politically stable and vibrant democracies. The government has formulated a long-term development plan, which spans from 2005 to 2025. The current medium-term development plan, covering 2009-2014, focuses on promoting quality of human resources, development of science and technology and strengthening economic competitiveness [2].

Agriculture is key, but food-insecurity prevails

Agriculture is key to the economy of Indonesia. Some 31 million ha are under cultivation, with 35% to 40% of the cultivated land devoted to the production of export crops. Some 60% of the country's cultivated land is on Java [3]. The country is scarce in agricultural land but relatively abundant in water resources [4]. Despite its importance and role in the national economy, national food production is still insufficient to meet the food security needs of Indonesia's citizens.

There are three main types of farming: smallholder farming, smallholder cash cropping, and large-scale plantations owned by the state or private actors (from Indonesia or outside). There are approximately 1800 privately-owned and 15 state-owned plantations, mostly producing export crops. Rice, vegetables, and fruit constitute the bulk of the small farmer's crops; about 20% of output is in cash crops for export, the largest contributors of which are rubber, cocoa and palm oil [3].

The main priorities of agricultural policy concern food self-sufficiency, food diversification, value-added and competitiveness, and farmers' welfare. There is a wide range of input subsidies on fertiliser, seeds, credit, etc., to support agricultural producers. The number and costs of these measures have grown rapidly since the mid-2000s [4].

Organic farming is growing

Certified organic farming is a gradually growing phenomenon in Indonesia, while small-scale farmers may be producing organically 'by default'. In 2001 the department of agriculture established an ambitious program, entitled 'Go Organic 2010. The target is to become one of the biggest exporters of organic commodities in the world [5]. Although trade of organic products is rapidly rising in the big cities, very few shops have specialized in organic products [6]. The Indonesian Organic Alliance (constituting of 41 members) has set up a national certification centre called BIOCert [7].

Livestock population in 2011 [8]

Species	Number of animals (million)
Broilers	1050
Indigenous chickens	278
Layers	110
Ducks	50
Goats	17,5
Beef-cattle	14,8
Sheep	11,4
Pigs	7,8
Buffaloes	1,5
Horses	0,416
Dairy-cattle	0,597

5.2 Livestock systems

Indonesia has a large livestock population, with fowl being the most common species. Since the majority of the Indonesian population is Muslim, pig production and consumption are relatively low.

Dairy and beef

- Many smallholder farmers keep beef-cattle as a source of draught power, manure, and backup cash when needed. Besides cattle, goats and sheep play an important role for the livelihoods of families in resource-poor environments [9]. Small-scale cattle production is subject to a low degree of risk and creates employment for various family members, particularly women and children [10].
- There are also now some small- to medium-scale fattening operations (10-20 cattle) and a small number of commercial feedlots (up to 3,000 cattle) [10].
- Cattle production is well integrated with intensive crop production, as the animal are used as draught power to work the land, the animal dung is used as organic fertilizer and the crop by-products are used to feed the animals. Since East-Java has intensive cropping systems, cattle production is prominent there. Especially in the lowlands, cattle management is intensive, with cattle permanently housed in backyard barns utilising a cut-and-carry feeding system [10].
- The Indonesian dairy industry is growing. Although several major dairy farms are expanding their dairy herds, it is expected that the overall growth in domestic fresh milk production will remain limited. Locally produced whole fresh milk is typically mixed with imported milk powder [11].
- Local milk production from cattle in Indonesia is mainly concentrated in the higher altitude areas of the island of Java [12].
- Milk and other dairy products are cost prohibitive for many Indonesian consumers. Priority is given to children who need the nutrients in dairy for their growth. Adult Indonesians generally do not include dairy products in their daily diets [13]. Up to 90% of South Asians may be lactose intolerant; lactose intolerance is three times more common in South Asians than in other populations [14], though no specific data is available for Indonesia.
- Government policy directed at primary producers aims at improvement of production levels per cow, improvement of raw milk quality and a higher farm gate milk price. Government training centers offer courses for extension staff and farmers. Improving small-scale dairy farming leads to rural development as it improves incomes and employment opportunities in rural areas. General government policy is directed to increase self-sufficiency in milk products from 30% (in 2009) to 50% by 2015 [12].
- New Zealand is allocating almost \$5 million in assistance to share the country's farming expertise with Indonesia's dairy industry, so that the Southeast Asian nation can strengthen its food security [15]. Fonterra is projecting a new dairy packing plant in Indonesia [16].
- The 8th IndoLivestock Expo & Forum – Livestock, feed, dairy , fisheries industry Expo – will be celebrated in June 2013 in Bali [17].

Pigs

- Although it is not an Islamic state, Indonesia is the world's most populous Muslim-majority nation. Pork is consumed by the minority populations of the Christian, Hindu and Chinese. Pig production is relatively low and pork imports are discouraged [24].
- In some cases large amounts of animals (up to 22000 animals) are slaughtered as part of a ritual ceremony such as the Hindu Galungan festival. All pigs come from local production [25].
- Approximately 250.000 live pigs are exported to Singapore yearly. The production of these pigs is located in North-Sumatra and Pulau Bulan, an island close to Singapore [26].
- In November 2009 the veterinary authority Office for Environmental information (OEI) announced that the influenza A H1N1 virus has been found in pigs on an island off Sumatra. The Ministry of Agriculture officially declared on 23 November 2009 that an outbreak of pandemic influenza A/H1N1 occurs in pigs [27]. This resulted in decreasing prices for pork due to public scares [28]. Similar bird flu infections were found in 2006 [29].
- Nipah virus was found in West Kalimantan Province in 2012, transmitted through bats and mosquitos from Malaysia where it was first found [30].

- Possible ban on pig farming in uphill regions of West Java; when the stream of water flowing from the highlands to the lowlands is contaminated by pig waste, then the water is 'haram' (unclean). And the majority of the population in West Java is Muslim. This would affect hundreds of (family) pigs farms producing for the Jakarta market [31].

Poultry

- In 2004 around 64% of total poultry population in Indonesia was in the backyard sector. Backyard poultry is still common, though in 2007 the government banned it in the capital Jakarta to contain the HPAI outbreak [17].
- Poultry is a main source of income for many farmers. The country has one of the largest poultry populations in the world [19].
- The Indonesian poultry industry is characterized by a tight competition and rising prices for feed and feed ingredients [20][21].
- Indonesia has no integrated poultry industry. CP, Japfa and Sierad are the main producers of DOCs and feed. About 50% of the broiler production is in smaller, low biosecurity farms which are under contract with these companies. 50% is considered independent [21].
- Only 3-5% of poultry is slaughtered and processed under industrial conditions. The remaining 95% is transported as live birds into larger residential areas and slaughtered under poor hygienic conditions. An estimated 800.000 birds are consumed in Jakarta every day [21].
- A poultry teaching farm is opened as part of a three-year Strategies Against Flu Emergence (SAFE) program developed and funded by the U.S. Agency for International Development (USAID) and implemented by DAI (Development Alternatives, Inc. based in the US) [23].
- Poultry meat and eggs represent an important source of protein in Indonesia. As the population grows and the population increasingly prefers chicken over other animal meats, the consumption of poultry meat and eggs is expected to rise [20].

5.3 Expected critical points for improvement

Land issues

- Land tenure problems in Indonesia have increased dynamically and explosively over recent years. A range of stakeholders – logging companies, farmers, mining companies, settlement programs and local populations - have competing claims on (agricultural) land or natural resources. [32].

Environmental problems

- Indonesia is – after US and China – the world's largest contributor to greenhouse gas emissions – especially due to deforestation and slash and burn agriculture [33][34].

Infectious animal diseases

- Swine Flu has threatened Indonesia [35]. In 2009 the Indonesian authorities placed body temperature scanners at airports and banned imports of live pigs and pork products [36].
- Avian Influenza (bird flu) has caused numerous human victims since the turn of the century, with peaks between 2004 and 2007. Since 2003 159 people died of the virus in Indonesia. Vaccination programs for poultry have been put in place in order to control the situation [37][38]. Recently, some AI outbreaks were reported in South East Asian countries, including Indonesia [39]. In the end of 2012 a new variety of H5N1 was reported in Java that has killed a large number of ducks. The government has limited the traffic of live animals [40] and started the production of vaccines for ducks [40].
- Avian influenza impacts small and medium scale poultry producers, as their flocks died or were killed during control and eradication procedures. After an outbreak in 2004, the sector showed a dip in production: demand for day old chicks, feed, layers and broilers decreased and employment in the poultry industry dropped drastically [42].
- Government abilities to control HPAI have been limited. The generally poor sanitary conditions under which the animals are slaughtered in the Poultry Collector Facilities (PCFs), should be considered a public health risk [19].

Health issues and zoonosis

- Indonesia has a Zoonosis commission in place (this replaced the National Commission for Bird Flu Control and Pandemic Influenza Preparedness) which focusses on bird flu, pig flu and Dengue [43].
- Tuberculosis and Rabies occur in Indonesia [44][45].

Marketing barriers

- There is an export barrier for cattle from Australia to Indonesia due to animal welfare issues, after reports on Indonesian slaughterhouses [46][47].
- Foot & Mouth Disease (FMD) is not a problem in Indonesia and the country considers FMD-zone free import requirements for beef [48].

Antibiotic resistance

- Antibiotic resistance of micro-organisms is a problem, especially in diarrheal patients [49].

5.4 Government and knowledge institutes

- The government emphasizes support to small-scale farmers for food-security over establishing large scale industries.
- There seems to be a trend towards 'green investments' for sustainable agriculture [50].

5.5 Current Dutch involvement

The Netherlands is an important investor in Indonesia [51]. It is attractive because of its growing economy and large consumer market (the largest in South East Asia) with over 20 million well-off consumers. According to the Multi-Annual plan of the Dutch Embassy, the focus on Dutch government support in the agro-sector will emphasize sustainable chain development and increase Dutch knowledge inputs. Activities will be aiming for food-security and agro-commodities.

NL-Indonesia organisations include:

- Indonesia Netherlands Association (INA) established in 1978, is the official Benelux Chamber of Commerce in Indonesia. The association aims to facilitate, encourage and support business cooperation between Indonesia, the Netherlands, Belgium and Luxembourg, and services more than 250 members. INA operates from its head office in Jakarta, supported by its liaison office in The Hague (INA Nederland) [52].
- Indonesia – Nederland Society was founded in March 2012 with the aim to organize symposia and contacts for private enterprise, education, knowledge institutes etc [53].

Business climate in Indonesia has several aspects:

- Indonesia is focusing on small-scale farmers for food-security.
- Business in Indonesia takes time and laws are not transparent [51].
- Low interest in pig production due to Muslim majority

The following livestock related Dutch activities could be identified:

Direct investment in animal production

- Friesland Campina is active in Indonesia since the colonial period – to supply the Dutch inhabitants with milk products. Milk comes from several cooperatives based only on the island of Java. Yearly, 600 million litres of milk is processed into long shelf life milk and milk powder [54].
- The Friesian: Milk quality improvement project, including dairy demo farms [55].
- ISA (Hendrix Genetics), Hybro and Intervet have offices in Indonesia. The first two import and breed layer and broiler Grand Parent Stock. Intervet provides animal health products and services [57].

Public private partnerships

- WUR has been engaged in the Indonesia-Dutch partnership program on HPAI (2005-2011) aimed to help contain the HPAI threat to humans and animals in Indonesia through: i) enhancing the capacity of

the animal health system at national and provincial/district level; ii) improving diagnostic capacity and quality of HPAI vaccines; and iii) increasing biosecurity at production and market level [19].

- Partners for Water includes a consortium of Dutch organizations active in the water sector in Indonesia [58].

Development Cooperation sector

- Of the fifteen 'partner countries' Indonesia is most dependent on Dutch development cooperation. Major focus is on renewable energies and reducing environmental impacts in lowlands [59]. The priority themes are water and food security [59].
- Agriterra, together with Friesland Campina, supports two dairy cooperatives in Java [61]. Two dairy farmers and members of NAJK (Nederlands Agrarisch Jongeren Kontakt) have travelled to Java to provide training at the dairy cooperatives [62].
- SNV is leading a working group on domestic biogas in the framework of the 'Energy for All Partnership'. Through this initiative, an additional one million biogas plants are planned across the Asian region by 2015. The Indonesia Domestic Biogas Programme is managed by Hivos. The aim is to set up 8000 biogas units in total. They construct the biogas units and provide training. Access to financial assistance is facilitated by Nestle [63][64].

5.6 Opportunities for Dutch involvement in Indonesia

- Disease control and food safety* - provision of knowledge of methodologies
 - Especially on Avian Influenza and new caste Disease (NCD)
- Value chain development*
 - Improving local dairy value chains (milk production, collection)
 - Quality assurance and traceability systems for niche products of local poultry breeds
- Provision of feed inputs, equipment and genetic material* (poultry, dairy)
- Manure management* making energy from waste (bio gas, nutrient cycling)
- Capacity building* - vocational training of actors in the value chains.

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6 Turkey

6.1 General information

Rapidly growing economy

Turkey is the world's 37th largest countries and has one of the largest livestock populations [1]. Although some 97% of the country lies in Asia, it geopolitically counts as Europe. Turkey has a population of about 80 million, growing 1.2% per year. Population density was 104 people / km² with more than 70% of Turkey's inhabitants living in cities [2]. Turkey is part of the Customs Union and is negotiating entrance to the EU since 2005, following request for membership in 1987 and acceptance of candidacy in 1999.

Due to substantial economic reforms in 2000, Turkey has been able to reduce the large budget deficit and debt levels it was experiencing the 1990s [2]. The Turkish economy is now 15th in the world and is growing fast with 8-12% over the past years. Due to the rapid economic growth after the 2001 crisis, Turkey's social outcomes have improved. Poverty decreased from 28% in 2003 to 18% in 2009, while extreme poverty virtually disappeared [3].

Totally self-sufficient in food production

Its area covers about 770,000 km. About half the land area is agricultural land. Of this, 21 million ha (ca. 57% of the agricultural land) are arable. In 2010, more than 12 million ha were planted with cereals [2]. While Turkey's agricultural GDP has more than tripled over the past decade, its share in country's total GDP has shrunk. In 2011, it was 9.1% [1].

Turkey is almost completely self-sufficient in food production. The Turkish government is prioritising and structurally investing in further strengthening the agro-food chain into an internationally competitive sector based on the sustainable use of natural resources [4].

Turkey's agricultural sector is dominated by small-scale production. There are some 4 million agricultural enterprises of which almost all are mixed crop-livestock operations and about two-thirds are smaller than 5 hectares in size [1]. But the structure of agricultural production differs from one region to another. While in the eastern part of Turkey traditional methods prevail, the western part -close to the big metropolitan centres - makes use of the newest technological developments for agricultural production [5].

Organic agriculture – a promising market?

In 2010, organic agricultural production covered an area of 501,033 ha and there were 42,097 producers, highest contributions from the eastern province Anatolia [6]. Organic livestock production is still very limited, but substantial increases were experienced in bovines and poultry between 2004 and 2010, indicating that it is a promising market. For example dairy processing facilities have been opened in Eastern Turkey for organic milk for export to EU. Only women are allowed to work there for better hygienic management [6].

6.2 Livestock systems

Livestock products generate about 20% of the value of agricultural GDP. Milk is of special importance as it contributes 40-45 % to the value of total livestock production [13]. While Turkey's livestock numbers [5] have been going down since the middle of the 20th century with the exception of poultry, the outputs of meat, milk and eggs have increased over the same period. Especially white meat and egg production have substantially grown since the introduction of hybrid birds and the industrialization of the subsector. The changes in milk and red meat were mainly due to changes in the herd structure [1].

In 2011, about 39% of 4.8 million cattle were introduced breeds, 20% local breeds and 41% cross-breeds [8]. The international breeds, referred to as "culture breeds" in Turkey's statistics, included Holstein-Friesian, Simmental, Brown Swiss and Jersey. The four main local breeds were Anatolian Black, Turkish Grey, East Anatolian Red, and South Anatolian Red [9].

Dairy and beef

- Turkey's staple food is wheat; meat and especially milk and dairy products are important parts of the diet. In the early 2000s the average daily energy intake was 3357 Kcal per person, of which 9.5% were derived from animal products [10]. Nowadays, the daily consumption is 3666 kcal of which 11.6% animal products.

- Turkey has an almost 100% self-sufficiency in dairy. Around 4% of production is exported; imports 2% of local consumption. Consumer prices have risen nearly 100-fold between 1996 and 2011 [11].
- In the period of 2006-2011 Turkey's milk production has been growing by 3% per year, while dairy consumption went up 1.1% per year [12].
- Large and small ruminant meat accounted for 67% of all meat eaten in 1960, but this had fallen to about 25% by the early years of the 2000s due to a combination of increased human population, high rates of inflation, increased consumer prices and continuing low incomes. Consumption of milk also decreased. Yogurt is the most frequently used milk product [10].
- Very little of Turkey's livestock products is imported (table 1). In 2011 milk export was about 4% of production and import about 2% of local consumption [12]. Cheese the biggest share [13].

Table 1. Turkey's important livestock commodities in 2009 (based on Food balance sheet of FAO Stat)

item	Production (1000 tonnes)	Import Quantity (1000 tonnes)	Import (% of production)	Export Quantity (1000 tonnes)	Export (% of production)	Domestic supply (1000 tonnes)
Meat (red and white)	1,937	2	0.1	125	6.5	1,814
Poultry meat only	1,309	1	0.1	116	8.9	1,193
Eggs	865	1	0.1	90	10.4	776
Milk - excluding butter	12,542	231	1.8	120	1.0	12,653

- Dairy farming in Turkey is important from a social and food security point of view. There are over 2 million agricultural holdings producing cow milk. Most of them have with less than 5 cows and produce mainly for subsistence and semi-subsistence. About 10% of the farms - mostly in the western part of the country - are larger and better equipped [13].
- Problems of the Turkish dairy sector include low quality of milk, low yields per cow and high seasonality of production, as most farmers lack the means to buy compound feed to supplement own cultivated winter silage. Other problems include insufficient grassland and pastures, lack of capital, and technology with high investment cost [13].
- Nearly 92% of milk Turkey comes from cattle, the rest from buffaloes, sheep and goat. More than half of the cattle milk was from international breeds, about 40% from crossbreeds and less than 10% from local cattle breeds [8]. The Turkish government is interested in furthering the improvement of local cattle breeds through breeding, animal health and feeding [1].
- Only an estimated 50% of cow milk production is being processed by the industry, while 20% is utilised on-farm, and the other 30% sold on street markets, or to so-called mandiras, which are seasonally, small-scale operating processors. Most of the medium and large scale dairy farmers have contracts with the dairy processing industry (contract farming).
- Like the dairy farm sector, milk processing is divided into a modern processing industry and traditional processing (informal sector). In 2006, there were more than 2,000 dairy processing units, most of them operating at (very) small scale and seasonal basis [13].
- An important development in the dairy sector is the introduction of government credits for animal husbandry and irrigation projects. Before the introduction of these subsidized credits the number of farms with 50 or more animals was around 4,300 (shortly after 2000). After introduction the number of farms in this category increased to 19,000 [14]. Current numbers stand at 27,000.
- The modern processing companies have an extensive network for milk collection from farms directly and through dairy cooperatives while some of them operate their own collection centres at village level. Competition is strong and their processing capacity is much higher than the milk they handle. As sourcing is important, processors often offer coops and farmers training programs at own training farms and provide on-farm staff advice. Improvement of milk quality is an important issue in the training [13].
- To avoid that large numbers of small producers quit production and move to big cities, dairy development should find ways to help these producers for example by supporting cooperatives and producers organisations. Other activities include increasing extension services, improving technologies, modern processing units and improving the current ones [13].

Pigs

- As 99.8% of Turkey's population are Muslim (mostly Sunni), pigs play a very small role. In 2002, there were about 12,000 pigs in Turkey, down from about 52,000 pigs in 1980. In 2008 BBC reported that new strict hygiene laws were forcing most of Turkey's pig farms to close [17]. In 2010 and 2011 pigs and their meat had dropped out from the official statistics [8].
- Pork is mainly for foreign tourist and the local Christian community. This is affected by new regulations and international standards [17].

Poultry

- Turkey is over 100% self-sufficient in egg and poultry meat production [15].
- Egg consumption increased more than 4-fold during between 1960 and 2005 [10].
- The industrialisation of Turkey's poultry sector started in the 1970s, introducing hybrid layers and broilers and new production technologies [1]. By 2006, the poultry sector was one of the most developed agricultural sectors in Turkey [16]. In 2011, there were an estimated 80 million laying hens, 160 million broilers, 2.5 million turkeys, 0.7 million geese and 0.4 million ducks [8].
- Backyard production with minimal inputs continues to be important in the rural sector [1]. Before the avian influenza outbreak in 2005, an estimated 60 million poultry were kept in backyard systems in flocks varying in size from 2 to 50 birds [16].
- Poultry meat comes mostly from chicken. In the last decade, it has been the fastest growing sub-sector of livestock production with an average of 12% per year.
- Industrial production is concentrated in the Middle North, Aegean, Marmara and the Mediterranean regions of Turkey. Over 500 thousand people (including producers and traders) are employed in the sector. Annual turnover is around 3 billion USD [13]. The broiler sector seems to be entirely privately owned, while some flocks of laying hens are in the hands of cooperatives [16]. About 93% of the poultry meat is produced in vertically integrated production enterprises using contract farmers [13].
- There has been a major transformation of the genetic resource of poultry from traditional scavenging types to highly productive hybrid strains. Specialist layer birds represent about 30% of the modern poultry subsector, 70% are broilers [1]. Turkey has also developed and registered three of its own layer hybrids for the industrial sector: 'atak', 'atak-s' and 'atabey' and two native fowl breeds – 'denizli' and 'gerze' [1].
- The White Meat Processors and Breeders Association (BESD-BIR) has 41 members and represents 80% of Turkish poultry meat. About 21 members have their own slaughterhouses. The sector's international competitiveness is reduced because of high production costs (especially feed due to import tariffs up to 130%) and low export subsidies [13]. About 70% of the production costs are feed costs, and large shares of the raw materials for this need to be imported [13]. This makes it difficult to compete with cheap meat imports from Brazil.
- In 2011, nearly 13 billion eggs were produced, an increase of 9.4% compared to 2010 [8].

6.3 Expected critical points for improvement

Marketing barriers

- Trade limitations to export live animals to Turkey due to Schmallenberg virus [18][19].
- In November 2010, after 14 years of trade limitations due to BSE – Turkey has opened its border for EU beef. Within two years' time it was the main country for EU export of beef and veal [20]. The export of Dutch veal to Turkey is limited due to the 100% import duties [14].
- Since 2009, some Turkish companies had approval to export processed poultry products to the EU. Import regulations for fresh poultry are hampering export of fresh poultry from Turkey to EU [21].

Environmental problems

- Waste disposal is a problem in regions with intensive poultry production. Systems for manure management are needed [13].
- There is no system for incineration of biomass in Turkey, so unused by-products tend to end up in the land-fillings. Given this background, a ban on using animal by-products as feed to control BSE would have serious implications for Turkey's environment [13].

Infectious animal diseases

- Cases of FMD and vaccination campaign in Turkey close to Bulgarian border [22].
- Measures to control avian influenza H5N1 in Turkey in 2005-2006. Turkey has indicated that neighbouring countries do not report the disease [23][24]. The disease was again reported in 2008. Until then 12 people had been infected, of whom 4 died [25].

Health issues and zoonosis

- The street market for milk is largely unregistered and unregulated. The milk there is sold raw and without cooling, and hygiene is often a problem [13].
- As a response to the 2005 avian influenza outbreak, live bird markets and the selling of live birds were banned and backyard poultry keepers were no longer allowed to sell their products in local markets. This affected especially women [16].
- The biosecurity measures of the top 10 poultry companies that dominate the sector are conform European standards. The biosecurity level of a small number of small-scale poultry companies is insufficient [13].

Animal welfare

- Animal wellbeing problems reported by Eyes on Animals at the Turkish border due to long waiting times. Between Nov. 2010 and Oct 2011 over one million sheep and cattle were transported by EU transporters from the EU to/through Turkey [26].
- Animal welfare is not a priority in Turkey.

6.4 Government and knowledge institutes

- The authority responsible for animal disease control is the Ministry of Food, Agriculture and Livestock (MoFAL). The General Directorate of Food and Control (GDFC) within MoFAL is responsible for the inspection and supervision of live poultry, hatching eggs and the production of poultry meat and meat products. It is also responsible for the hygiene and environment policy with respect to the establishment and licensing of slaughterhouses. The GDFC performs its operations through the Provincial and District Directorates, Institutes of Veterinary Control and Research, and Border Inspection Posts (BIPs) [16].
- There are 8 Veterinary Control and Research Institutes in Turkey. These Institutes provide diagnostic services at regional level. The Veterinary Control and Research Institute located in Bornova/Izmir is the Reference Institute for avian influenza. The latter is also diagnosed in the other institutes. The Reference Institute for Newcastle disease is located in Konya. Cooperation was established with the Veterinary Laboratory Agency in Weybridge immediately after the first outbreak occurred [16].
- The following research institutions are mentioned by Yilmaz and Wilson as involved in livestock research and conservation [16]:
 - Ankara Poultry Research Institute
 - Genetic Engineering and Biotechnical Institute (GEBI/MRC)
 - Lalahan Livestock Central Research Institute (LLCRI)
 - the Scientific and Technological Research Council of Turkey (STRCT)

6.5 Current Dutch involvement

Turkey is enjoying strong economic growth and, due to its strategic location, is a potential springboard to regional markets. The volume of trade between Turkey and the Netherlands has tripled in the past ten years. The Netherlands is one of the largest foreign investors in Turkey, which offers economic opportunities for, in particular, small and medium-sized companies, including those owned by successful Turkish-Dutch businesspeople. Apart from economic relations, there are a growing number of cultural and social ties. The

Netherlands is home to 380,000 people of Turkish origin, and more and more Dutch tourists are taking holidays in Turkey. In February 2012 the 400 years of Turkish-Dutch diplomatic relations were celebrated [27][28].

Agri-food is one of the themes of the Turkish-Dutch cooperation and several high level trade missions were organized over the past years. During the Trade Mission 20-25 March 2011 agricultural minister Bleker – opened the Dairy Seminar on modern dairy farming, entitled: The benefits of Dutch breeding material, Innovation and Knowledge [29]. The 5-9 November 2012 economic mission led by PM Rutte included agro& food businesses - Participants included 10 CEO's of Dutch multinationals and 80 representatives of MKB in various sectors [30]. This mission also met with critical comments, including that this is more to the benefit of NL than of Turkey [31].

There is no development cooperation between NL and Turkey – and Turkey has its own development cooperation agency (TIKA) with activities focused mainly on central Asia [32].

The business climate in Turkey has several aspects [33]:

- The EU is investing into the preparation of Turkey for entry into the EU, which creates opportunities for Dutch firms in terms of building activities, goods and services including in the environmental sector. Food safety is part of the negotiations [34].
- Turkey is increasingly orientated on Asia. Between 2005 and 2012 the trade with EU was reduced from 60 to 45%. Turkish international trade grows faster than Dutch trade with Turkey and NL may miss opportunities especially in the agri-food sector [35].
- As an Islam country Turkey's corporate social responsibility (MVO) and giving to the less favoured in society is deeply anchored in Turkey.
- Because of the proximity of EU consumers, there is much interest in improving the quality of local products through certification and auditing. E.g. the label for organic products introduced by the ministry of agriculture in 1994.
- Due to the government's efforts, Turkey ranked 54 on the Corruption Perceptions Index in 2012, while it ranked 69 in 2005. Over the past years good progress has been made in fighting corruption. In comparison: Greece ranked 48 in 2005 and dropped to 94 in 2012 [40].
- Labour circumstances are not all according to the ILO standards, and child labour is common especially in the agro-sector. The Netherlands support a project to prevent child labour in the Turkish hazel nut sector in line with the Turkish governmental objectives [14].
- Water quality of one of the environmental problems in Turkey and this is a business opportunity.
- Poor public image and insufficient knowledge among Dutch companies doing business in Turkey, gave rise to a project between 2007-2010 to improve the cooperation. For the same reason the Turkish-Dutch Bilateral (Wittenburg) Conference was held in March 2012 [36].

Some interesting links of organizations working in Turkey:

- In order to improve trade a digital office was created by the Dutch embassy in Ankara: www.hollandturkeytrade.com
- "MVO-toolkit Turkije" made by Agentschap NL: www.agentschapnl.nl/onderwerp/mvo-turkije
- Corporate Social Responsibility Association of Turkey is an independent NGO that establishes linkages for business, NGO's and governments: www.csrturkey.org
- Business Council for Sustainable Development in Turkey is focusing on sustainability and environmentally friendly business in Turkey – and solving the water shortage: www.tbcsd.org
- Corporate Governance Association of Turkey is an NGO that provides info on the Corporate Social responsibility efforts of Turkish businesses: www.tkyd.org/en/
- Turkish-Dutch Agricultural Working Group – between min EZ (NL) and MoFAL (Turkey) with regular meetings held alternately in the Netherlands and in Turkey within the framework of the MoU signed in 2000 [37].

The following livestock related Dutch activities could be identified:

Direct investments in animal production:

- The Friesian/Dairy Training Centre – in cooperation with Anadolu and at request of Ministry EL&I organised mission of Turkish dairy actors to NL in June 2012 [38]

- Stable devices and livestock production equipment: e.g. Agriprom, DSD Stalinrichting BV, VDK Products BV, Cow House, Lely Industries
- Feed and feed supplies: Barenbrug Holland, Trioliet
- Training and support: Vetvice BV, Koepon Holding & Alpha genetics provide dairy training through interactive training tours in coordination with major Turkish dairy firm Anadolu Hayvancilik [39]
- Slaughtering: VION
- Genetic material: CRV Delta

Public Private Partnerships on various themes

- Green Knowledge Exchange, a cooperation between NL and Turkey in the field of Biodiversity protection and conservation [40]
- Ministry EZ/ Zanders Poultry BV – Consortium with cooperation with Aytav for alternative poultry layer barn and equipment – to prepare Turkey for EU entry in banning cage egg production and animal welfare according to EU standards [41]
- BGP Engineers has developed the first Biogas Plant (operational in 2011) on basis of cow manure in Turkey in the framework of the program PSO-M by Agency NL EVD International [42].
- CVI, LEI, Veteffect - Support for the general strategy for brucellosis and tuberculosis control in Turkey – financed by EVD International [43]
- Future cooperation on veterinary issues – agreement on vector research to Schmallenberg virus [44]
- AERES Group/CSAH Dronten Assessment of training needs, based upon the new rural development policy, institutions, and functions – in support of the Turkey's Ministry of Agriculture and Rural Development to align with European Union regulations on rural development. Funded by EL&I [13].
- AOC Friesland – engaged in a study which aims to support Turkish investor living in Amsterdam to develop a Dutch-style dairy farm [45]

6.6 Opportunities for future Dutch involvement in Turkey

- Improvements in feeding, breeding and housing (good farming practices) in various dairy/milk-producing and poultry production systems.*
- Animal disease control programs - Adaptation to EU regulations*
- Manure management to reduce water pollution - Especially poultry industry.*
- Training and education - Demand driven capacity development with emphasis on practical training adapted to local circumstances and including the various animal productions systems.*
- Support to the organic sector – including for export to the EU*

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7 Ethiopia

7.1 General information

Rich agro-biodiversity – one of the poorest countries

Ethiopia has a population of 91 million people. The country harbours an extraordinarily rich agro-biodiversity resulting from its geography, climatic differences, ethnic diversity and strong food culture.

Ethiopia is one of the poorest countries in the world; the United Nations Human Development Report for 2013 ranked Ethiopia 174th out of 187 countries on the Human Development Index [1].

Marked differences exist between rural and urban areas, though rural poverty is relatively evenly distributed. While the constitution guarantees gender equality and supports affirmative action, women have fewer years of schooling, heavier workloads, and also suffer disproportionately from environmental degradation. The two main challenges that could seriously derail the drive towards attaining the MDGs are the current high inflation rate, estimated by the Central Statistical Authority (CSA) at 18.4% in 2007/08, and increasingly frequent droughts [2].

Agricultural potential - Dominance of smallholder rain-fed farming systems

With a total area of around 1 million square km, of which one third is arable land, Ethiopia has tremendous potential for agricultural development. Ethiopian agriculture is dominated by a subsistence rain-fed farming system. The agricultural sector greatly influences the rate of economic growth in Ethiopia, as it accounts for roughly 47% of GDP, 90% of exports, and 85% of employment. About 11.7 million smallholder farmers account for approximately 95% of agricultural GDP and 85% of the population [2]. Smallholder farmers are modernising quickly and adapting their agricultural system to new developments such as climate change, market opportunities, and new plant varieties [3].

Land use: Rangelands 63% support 12% of population, one third highland mixed crop-livestock areas

Pastoral areas in Ethiopia are generally known as rangelands and cover about 0.7 million square km (two-thirds of total area). These areas support about 10 million people (12% of total population) of which 56% are pastoralists and 32% are agro-pastoralists [4]. By moving their animals to ensure a constant supply of good pasture, the pastoralists are able to produce comparatively more meat and milk than sedentary animals reared under the same conditions. However, the pastoralists' mobility and independence is being challenged by recurring drought and increased competition for land [5].

High self-sufficiency in animal products

Livestock production accounts for about 15% of the GDP and draught animal power is critical for all farming systems. Overall, the growth of agricultural GDP has hardly kept pace with the population growth rate of about 2.6% [2]. According to FAO-stat self-sufficiency in animal-based food is high: around 97% in beef, 92.4% in milk, 95.3% in poultry meat, 100% in eggs and 99% in pork [6]. However, overall consumption levels are low, with less than 100 kcal/capita/day consumption of animal products [6].

Government policies supporting agriculture and rural development

The Ethiopian government's mission is to improve Ethiopia's status to that of a middle income country by 2025. It does make headway in these objectives: fast economic growth was registered in recent years, infrastructure and social services expanded remarkably. Annually, some 10% of the Government's budget is spent on agriculture (in line with CAADP commitment). Meanwhile, internally, democratic practice and civic rights are not keeping pace with economic development [7].

Traditional cooperative associations play crucial role

Traditional cooperative associations have existed for a long time, and today the extensive cooperative network plays a crucial role in economic and social development. Farmer cooperatives represent one of the key mechanisms through which the government intends to promote the modernization of smallholder agriculture. They also represent a preferred mechanism for organizations in rural development and poverty reduction interventions [8]. More recently an increase in the number of consumers' cooperatives has been observed in Addis Ababa [9]. Producer companies appear to be a recent phenomenon that is on the rise.

7.2 Livestock systems

Large livestock population, export commodity

The livestock population of Ethiopia is believed to be one of the largest in the world and the largest in Africa, comprising of 49 million cattle, 25 million sheep, 22 million goats, 2 million camels and 38 million chickens, totalling up to 136 million animals. Cattle play the most important role in the farming economy, followed by sheep and goats. The livestock sector has been contributing a considerable portion to Ethiopia's economy, with exports contributing about 43.5% of the GDP and 61% of total export (primarily live animals, meat & hides). Export opportunities are the major driving force for increase of agribusiness in the livestock sector [10].

Mixed crop-livestock, pastoral, and peri-urban production systems

Livestock production systems in Ethiopia can be broadly categorized into (1) mixed crop–livestock systems, (2) pastoral and agro-pastoral system, and (3) urban and peri-urban production systems. Around 75% of the animals is owned by smallholder mixed farmers. Nearly a third of the total gross value of livestock output is represented by the value of animal draught power as an input into crop cultivation. Moreover, the credit benefits of livestock, derived from the ability to 'cash in' on the value of animals as needed, is estimated to be as high as the direct off-take value. On top of this the animals also have an important (asset-based) insurance value of around 10% of the capital value of the national herd. These value distributions are particularly acute for highland livestock production systems in which animal energy for transport and dung for fuel are as important as milk and meat production [11].

Pastoralism

Pastoralism in Ethiopia provides about 90% of legal livestock exports in live animals. Approximately half of these livestock sector exports are not recorded and not recognized by the National Bank of Ethiopia, because they are produced by the cross border trade in live animals. The government deems these to be illegal [11]. According to IUCN the direct value of pastoralism in Ethiopia is estimated at 12% of GDP. In spite of the benefits to the Ethiopian economy, this sector has been largely marginalized by development policies and strategies [4].

Camel production and marketing is of increasing importance – in 2010 the trade was valued at 61 million US\$, nearly half of all cattle, sheep and goat live animal and meat exports together. This trade has developed without tangible government investment [12].

Dairy and beef

- Only 1-2% of the average Ethiopian diet is based on animal protein. Domestic demand for livestock products is increasing [10].
- Middle Eastern countries are Ethiopia's traditional destinations for meat and livestock exports, which have been increasing over the years [10].
- Livestock prices are highest during Muslim fasting periods relative to other occasions. A problem that is affecting the functioning of the livestock marketing is transaction of livestock in credit contracts, where the terms are not usually respected in due time [11].
- In Ethiopia, the national per capita consumption of milk and milk products is about 17 kg, one of the lowest in sub-Saharan Africa [10].
- The cattle population is primarily of indigenous types, mostly zebu. Main cattle breeds include: Boran, Fogera, Horro, Sheko, and Afar. Friesian and Jersey dairy cattle have been crossed with indigenous cattle breeds [10].
- The total milk production from about 10 million milking cows is estimated at about 3.2 billion litres, an average of 1.54 litres per cow per day over a lactation period of about 6 months. The performance of Ethiopian cattle sector has been lagging behind that of the neighbouring countries with comparable agro-ecological conditions [10]. Feed scarcity, water shortages, security problems, and limited access to veterinary services were identified as major causes of low productivity. Mortality due to diseases was identified as a major cause of loss [13].
- The Federal Government of Ethiopia has launched the Agricultural Growth Program as part of the growth & Transformation Plan 2010-2015, which focuses on development of 83 districts with high agricultural

potential [14]. This program channels much of the GoE and donor investments into agriculture and livestock.

- Smallholder dairy development in Ethiopia can be an effective pathway out of rural poverty. National policy priority has changed in favour of pro-poor, gender sensitive and ecologically sustainable commercialization of smallholder production systems. Policy envisions an increasing role for the emerging private sector [15].
- Specialization of urban dairy farmers includes more frequent use of crossbred dairy cows. Constraints include access to farmland and to training, veterinary- and credit services [16].
- The biggest dairy plant in the country, the private company Sebeta Agro Industry, processes around 30 000 litres per day. Around 6 000 - 10 000 litres of this milk comes from the owner's own dairy farm; the remaining milk is collected from farmers in the region [17].
- Milk sales are highly affected by low milk quantity, by distance to the market, and by fluctuations due to the fasting seasons of the Orthodox Church.

Pigs

- Traditionally, Ethiopians do not use any pork or seafood (aside from fish), as most Ethiopians have historically adhered to Islam, the Ethiopian Orthodox Church, or Judaism, all of which prohibit consumption of pork [21].
- Due to these religious restrictions pig numbers are extremely low; according to FAO 19.000 and 25.000 animals in 1980 and 2000 respectively [22]. This number is rising quickly, however, due to the demand from Chinese who are entering the country in large numbers [23].

Poultry

- Rising demand for meat products has led to poultry prices increasing fivefold over the past decade. Nonetheless, broiler meat production remains fairly low, with most consumers favouring traditional forms of poultry over processed products [18].
- An estimated 10.5 million estimated agricultural households are engaged in small scale poultry production. The flock size per household is estimated between 4 and 8 birds; mean survival rate to age 3 months of baby chicks is about 40%, due to predators and infectious diseases, especially New Castle Disease [18].
- The total poultry population (2010) is estimated to be about 38 million animals, 96.4% indigenous breeds, and 3% and 0.5% hybrid and exotic breeds respectively [10]. The country's poultry population has declined by 64% over the past 50 years - the Ethiopian poultry population was estimated at 85 and 31 million in 1954 and in 2005 respectively [18].
- Poultry is an important source of self-reliance for women; also used for strengthening marriage partnerships and social relationships; women face significant market constraints [18].
- Formal marketing operations exist in urban and peri-urban areas, where large scale commercial poultry production takes place. The 20 private large scale poultry farms are all located in Oromiya region, specifically in and in the vicinity of Debre Zeit [18].
- Around major cities and towns, such as Addis Ababa, there is also an emerging small-scale intensive system with 50-1000 exotic breed chickens under relatively modern management [18].
- Government-owned poultry breeding and rearing centres aim at providing improved dual purpose chickens of crosses with exotic breeds [18].
- A potential biosecurity risk in Ethiopia is the presence of toll millers who informally sell mixed feed to producers [19].
- An Ethio-Poultry Expo is being organized for investors in the poultry industry sector [20].

7.3 Expected critical points for improvement

Land issues

- In Ethiopia, all land is public property and belongs to the State. It cannot be bought but it can be leased for a certain number of years. Over the past decades, land pressure has increased and the average holding has declined from 0.5 ha per person in the 1960s to 0.08 ha at present. There is a general

perception of insecurity amongst farmers regarding tenure of their land, which tends to discourage investments in land improvements and soil conservation. However, recent reforms have introduced land title certificates and longer-term land leases, and there are plans to develop a cadastre [2].

- According to Human Rights Watch, Ethiopia is forcing tens of thousands of people off their land to lease it to foreign investors, leaving former landowners destitute and in some cases starving. The United Nations has voiced concern that countries such as China and Gulf Arab states are buying swathes of land in Africa and Asia to secure their own food supplies. Eventually some 1.5 million Ethiopians may be forced from their land [24].
- The government has decided to offer 3 million hectares – about the size of the Netherlands – for international investments for agricultural development. For example, the Saudi Arabian Sheik Mohammed Al-Amoudi is investing 1.7 billion Euros and lease 290.000 hectares for the production of maize, sunflower and rice for export [25].

Environmental problems

- Ethiopia has one of the highest rates of soil nutrient depletion in the world. Annual soil erosion ranges from 16 to 300 tons per hectare each year. Estimates suggest that the annual phosphorus and nitrogen loss from the use of dung for fuel is equivalent to the total amount of commercial fertilizer applied annually. Land degradation is further exacerbated by overgrazing, deforestation, population pressure, and perceived land tenure insecurity [2].
- The vast majority of the Ethiopian arid lands is considered drought-prone [26].
- Biodiversity: Existing animal genetic resources have been under-utilized and are at risk of being lost; crossbreeding programs have not been based on an understanding of indigenous animal genetic resources; this is particularly so for cattle and chicken [27].

Productivity and value-chain development

- Feed scarcity, water shortages, security problems and limited access to veterinary services are identified as the major causes for low animal productivity. Mortality due to diseases was identified as a major cause of loss in cattle and camels [13].
- Milk sales are affected by low milk quantity and by distance to the market.

Infectious animal diseases

- Ethiopia has a large incidence of infectious animal diseases, including Rinderpest and FMD [28]
- RVF (Rift Valley Fever) has resulted in a ban by the Gulf States in the year 2000, which has critically affected the export of red meat.
- African Swine Fever (ASF) is low due to low numbers of pigs in the country.
- Avian Influenza (HPAI): In March 2006 FAO-Ethiopia initiated a project entitled “Urgent intervention for the early detection, prevention and control of avian influenza in Ethiopia”. There was a HPAI ‘false alarm’ in 2006 [19].

Health issues and zoonosis

- Would Ethiopia adopt factory style intensive animal production operations, it would be forced to import the water intensive grains required for such operations – potentially putting people and animals in direct competition for food [26].
- Ethiopia is identified as one of the hot-spots of zoonosis, including [29]:
 - ‘endemic zoonosis’, such as Rabies, Brucellosis and cyst-causing tapeworms
 - ‘epidemic zoonosis’, which typically occur as outbreaks, such as Anthrax and Rift Valley Fever
 - Relatively rare ‘emerging zoonoses, such as bird flu (HPAI).

7.4 Government and knowledge institutes

According to IPMS Ethiopia the way extension system is oriented in Ethiopia may not be in the best interest of livestock keepers. Most livestock development issues are left to development projects and NGOs that have limited scope, coverage and duration. Credit facilities to support livestock development have been provided at very limited scale by microfinance institutions, food security projects, small-scale micro enterprises, and NGOs. The contribution of the private sector in livestock input has been limited to supplies

of veterinary drugs and services, roughage and concentrate feeds, and processing equipment and utensils [30].

Currently there are nearly 3,000 international civil society groups, NGOs and charities operating in the nation – including those engaged in supporting small scale farmers and pastoralist groups [31]. Meanwhile, in 2009 the government issued a highly disputed Charities and Societies Proclamation. This law criminalizes human rights-related work undertaken by Ethiopian organizations that receive more than 10% of their funding from overseas.

7.5 Current Dutch involvement

The Netherlands is the second most important importer of Ethiopian agricultural products, especially flowers (roses) and increasingly vegetables. There are some 90 Dutch firms active in Ethiopia. The development cooperation sector is gradually evolving into an investment- and business cooperation [32]. There is a long-standing university cooperation.

The business climate in Ethiopia has several aspects [10]:

- The government is giving priority to the horticultural sector and export products like: meat, leather, oilseeds and coffee.
- The Ease of Doing Business Ranking is reported yearly by The World Bank, and Ethiopia ranks 116 out of 181.
- Political unrest is reason for concern [33].
- There are patent problems related to Teff genetic resources by the Dutch company HPFI [34].
- African Study Centre organises Country Meetings, including on Ethiopia [35].

The following livestock related Dutch activities could be identified:

Direct investments in animal production:

- Holland Dairy – dairy plant run by Dutch family in Debre Zeit, including a farm with Holstein dairy cattle imported from the NL [36].
- Poultry production Maranatha farms – Poultry, dairy and vegetable production with Dutch owner (faith based)[37] see also Double Harvest [38].
- Alpha farm – Dairy farm with strong emphasis on fodder production; acts as nucleus farm; Arnold Krul raises pigs at the same location [39].
- Cowgrow, a Dutch-Ethiopian farm also engaged in potato farming (Solagrow), breeding dairy cattle, crossing between Holstein, Jersey and Borana, for heifers to be sold to Ethiopian farmers [40].
- Velocity Dairy Plc. – planning to develop a 70,000 litre/day processing plant, part of Velocity African Holding [41].
- Alama Koudijs Feeds AKF - Animal feed factory of De Heus/Koudijs [42].

Public Private Partnerships and development projects:

- Holland-Africa Poultry Partners: A consortium of Dutch poultry companies will, on behalf of Dutch government, execute a 3-year program in the Ethiopian poultry sector. De Heus Animal Nutrition BV, MSD Animal Health, Vencomatic, PAS Reform, VDL Agro, Aeres Groep and Agriterra in cooperation with Wageningen UR and the Netherlands African Business Council, to utilize business opportunities in the sector [43].
- EDGET-EADD: Dairy sector development project (2012-2017) implemented by SNV-Ethiopia, Heifer International and Wageningen UR with Ethiopian dairy value chain actors (succeeding the MIDD program - Market-Linked Innovation for Dairy Development) [44].
- SNV-Ethiopia (other activities besides dairy) - engaged in biogas and export of Ethiopian honey.
- BoP Innovation Centre (together with SNV and WUR) is developing small-scale cooling units for small scale dairy farmers [45].
- AgroEco LouisBolk Institute supports organic trade chains with Africa (Development through trade projects) [46] and has developed a new Nutrient Recycling project, which aims to re-use phosphate and potassium from Dutch city waste as fertilizer in Africa [47].
- Prolinnova program of ETC Foundation is engaged in promoting the local innovation capacities in smallholder farmers and pastoralists – including livestock activities in Ethiopian societies [48].
- PUM (Netherlands senior experts program)

- Nuffic-Niche Agribizz project strengthens agri-business education in 8 universities, with focus on dairy in some universities [49].

The Dutch Embassy (EKN) is supporting a number of programs related to food security [7]:

1. Productive Safety Net Program - PSNP – To reduce household vulnerability in food insecure areas, including soil & water conservation and reforestation activities.
2. Programs to increase agricultural productivity and market access in surplus producing areas, including scaling-up of best-practices and micro-irrigation (supporting the GoE's Agricultural Growth Program)
3. Public-Private Partnerships (PPP) with emphasis on horticulture, input seed, oilseeds and dairy.

Network and exchange activities:

- National Dairy Forum was set up in 2010 by SNV, ILRI, FAO, Land O'Lakes, Wageningen UR, MOARD, and EKN [50].
- Cordaid includes activities with Pastoralist groups (Afar Pastoralist Development Association) and has set up CELEP – the Coalition of European Lobbies for Eastern African Pastoralism [52].
- Agri-Hub Ethiopia - a platform for farmer entrepreneurship initiated by AgriProFocus. Currently counts 500+ members; key topics are contract farming, business development services, finance, and gender. Dairy is priority topic for cross-country learning. Organised Agri-Business Finance fair in Oct. 2012 [53].
- Teampro (private consultancy supporting Dutch entrepreneurs in Eastern Africa) has organised missions to Ethiopia to establish contact in the poultry sector [54][55].
- Soil&More did workshops on composting, carbon- and water footprinting in Ethiopia, together with Ethiopian Horticultural Producers & Exporters Association [56], and was sponsor of the GoGreen Africa Fair, in Addis Abeba June 2011 [57].

7.6 Opportunities for future Dutch involvement in Ethiopia

a. *Combine input of Dutch businesses with expertise developed by development cooperation.*

b. *Supply chains with smallholder inclusion (dairy farming, various poultry systems)*

- Increased donor support (US, Netherlands, Canada) to develop dairy and meat sector. This will give spin off for input (AI, semen, feed) and equipment suppliers (cooling equipment, slaughter house equipment),
- Smallholder dairy development in Ethiopia can be an effective pathway out of rural poverty. National policy priority has changed in favour of pro-poor, gender sensitive and ecologically sustainable commercialization of smallholder systems. Policy envisions an increasing role for private sector.
- Creation of special labels and trade-marks of niche-products based on local (poultry) breeds

c. *Training and education*

- Demand driven capacity development with emphasis on practical training adapted to local circumstances and addressing the various animal productions systems.
- Further expansion of the universities will continue to generate demands for higher education of university staff (PhD studies) and curriculum development around livestock production.

d. *Animal genetic resources and animal health*

- Support creation of special labels and trade-marks of niche-products based on local breeds;
- Animal disease control programs.

7.7 References Ethiopia

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8 Kenya

8.1 General information

Well-developed economy, with extreme inequalities

Kenya's population stands at around 43 million and has a strong population growth of around one million people annually. At over 4% per year, Kenya's urbanization rate is among the world's highest. The country's GDP is among the lowest in the world and it has a low ranking on the UNDP human development index. Women are particularly vulnerable because they do not have equal access to social and economic assets [1][2].

On the positive side Kenya's economy is doing well, it is the fifth largest in Sub Saharan Africa. It has relatively advanced agricultural and industrial sectors, substantial foreign exchange earnings from agricultural exports and tourism and there is a highly educated middle class in the country. Kenya is on track to achieve Millennium Development Goals 2 and 6: universal primary education and HIV/AIDS, malaria and other diseases [1].

Kenya suffers from chronic problems with governance, including systemic corruption and impunity. In Kenya's history, political power has been used to redistribute the country's resources along ethnic lines and to benefit allies. Kenya was shaken by inter-ethnic violence, which followed disputed elections in 2007 [1].

Both commercial scale and subsistence agriculture are of great importance

Agriculture is the backbone of Kenya's national economy; it contributes one quarter of the GDP and employs three quarters of the country's labour force [3]. The Kenyan agricultural sector is one of the technically most advanced in East Africa. Cash crops for export (coffee, tea, fruit, wheat) are produced on large farms in intensive monocultures. In rural areas subsistence farming is the main source of livelihood, especially for women [4].

Half of Kenyans is food insecure

Kenya has a high level of food insecurity; about 50% of Kenyans is food insecure. Food insecurity has its causes in political marginalization and bad governance, conflicts over natural resources, policies favouring urban consumers over rural consumers and increasing prices of commodities on the world market [5]. Livestock products are traded on the rural markets. Traders are mostly private business persons targeting maximum profits rather than quality products. They offer low prices to the producers in exchange of the livestock, which distorts functionality of the livestock market and discourages farmer participation [6].

Growing certified organic production for export and Nairobi market

Organic producers are united in the Kenya Organic Agricultural Network (KOAN), they produce according to the East African Organic Production Standard (EAOPS). Certified organic production in Kenya has been growing steadily. Earlier, most of the certified organic products were mainly targeting export markets. Recently, organic producers are gradually turning towards national markets [7][8].

8.2 Livestock systems

Livestock production accounts for an important part of Kenyans agricultural production value: cow milk and cattle meat are the most important agricultural sector in Kenya (status in 2011); they rank 1st and 2nd respectively. Trade in livestock is relatively low; in the top ten of import and of export commodities, livestock products are not present [9]. Livestock contribution to agricultural GDP is estimated at 43% [10]. The livestock sector employs close to 50% of Kenya's agricultural labour force and is a primary source of livelihoods for the 6 million (agro-)pastoralists that live in ASALs [11].

Livestock production systems in Kenya can be broadly categorized into mixed crop-livestock systems, (agro) pastoral systems, and (peri-)urban production systems. The livestock systems mainly rely on indigenous breeds whose overall productivity is generally low. However, the indigenous breeds have developed exceptional adaptive traits such as the ability to utilize poor roughage and resist endoparasites and other major diseases in the region [6].

The (agro-) pastoral systems of Eastern and Central Africa such as the ones in Kenya are confronted with extremes climatic events. Droughts are increasing in frequency and magnitude: there were at least eight severe drought episodes in the last four decades, the last one in 2010-2011 [6].

Manure is an important source of nutrients for many smallholder farmers in East Africa who cannot afford or are using limited amounts of chemical fertilizer. Smallholder farmers in Central Kenya highly value dairy cows for the production of manure, in addition to their production of milk. In mixed farming systems, manure and nutrient availability vary temporally and spatially, due to variations in crop/livestock ratio, animal feed quality and intake, and manure management [12].

More than 80% of Kenya's land is classified as arid or semi-arid lands (ASAL) that hosts about 70% of the national livestock population. Livestock is the backbone of local communities' economy, therefore any intervention geared towards increasing local well-being, redressing power imbalances and increasing markets inefficiencies should target the local small-scale livestock producers. The main constraints affecting the pastoral zones target groups can be listed as follows [15]:

- Lack of processing and marketing facilities for livestock and animal products;
- Weak veterinary control on animal disease movement and meat inspection, partly due to the lack of animal gathering points;
- Insufficient bargaining power due to the dominant role of middle men and large scale traders;
- Lack of alternative income- generating activities, currently restricted to firewood and charcoal production.

The above problems are framed within current situation of the livestock value chain characterized by informal networks and fragmentation (livestock trade is mainly concentrated in the capital city of Nairobi). This situation imposes unsustainable transaction costs on the local pastoralists who attempt to participate in value-addition and marketing of their products [15].

Dairy

- The Kenyan highlands with their moderate tropical climate are particularly suitable for dairying. Smallholder dairying dominates in the East African region and Kenya is the major regional producer, processor and exporter of dairy products [16].
- Many ethnic groups in Kenya have a tradition of keeping cows, which is generally associated with status and prestige in these communities. The dairy cow is a substantial asset to a small farmer, providing nutrition, cash income, manure to enrich the soil, and offspring for sale [17]. Dairying accounts for over 30% of farm household income nationwide with some 75% of households being engaged with it, especially lower-income groups [18].
- Zero-grazing (stall-feeding) is the common strategy of intensifying dairying. It is widespread in the Kenya highlands, though productive capacity is limited. Production suffers from feed shortages due to lack of rains. This requires farmers to purchase expensive feed supplements, but some are not able to. As a result milk supply is fluctuating [18].
- Conducive macroeconomic policies since 2003, resulted in a growth of the dairy industry by over 25% per year, from 144 million litres in 2002 to 360 million litres in 2006 [16].
- The majority of milk is traded in informal markets. There it is sold raw or it is processed with low-cost processing facilities [18].
- Kenya's annual per capita milk consumption is estimated at over 145 litres, which is considerably higher than that in other Sub-Saharan African countries [18]. Dairy products are responsible for an average expenditure of 18% of the household income. Growth in consumption is expected 2-3% per year. Currently Kenya is self-sufficient in dairy, but estimates by the Kenyan dairy board are that demand will outstrip supply by 2014 [20].
- Improved dairy type cows account for approx. 70% of milk production, another 16% is produced by Zebus, 10% by camels and 4% by goats (situation in 2007) [14].
- There is an unmet demand for camel milk, both within Kenya and internationally [21].
- Government regulation has driven many of the key policy changes while donors, NGOs and the private sector have supported smallholder production and marketing initiatives [18].
- Since 1996 Heifer International Kenya (HPI-K) has re-established the cooperative business model (Chilling-hub model), based upon farmers investing their own funds, and taking ownership of the business. HPI-K is now supporting the creation of the Kenya Dairy Farmers Federation (KDFF). This national organization will act as a voice for all smallholder dairy farmers to support enabling policies for the dairy industry in Kenya [17].
- HPI, in partnership with ILRI, TechnoServe, the World Agroforestry Centre and the African Breeders Service, run a regional industry development program which is funded by the Bill and Melinda Gates Foundation [18].

- A meat processing unit is the best way forward to boost a local livestock-based economy in pastoral remote areas, due to the following [15]:
 - The plant will be a marketing outlet for local livestock and a drought management facility;
 - It will stimulate the local economy and create employment, through meat processing and all related activities like rural tannery, cottage industry, handicrafts, biogas, etc.
 - Intensifying trade when drought is forecast will reduce the number of animals and decrease the impact on pasture and the environment;
 - It will contribute effectively to animal movements and disease control;
 - Transport of carcasses and processed meat, which – differently from live animals in Kenya - is allowed during both day and night time, is more cost-effective and less prone to raids than transport of live animals;
 - Marketing of processed meat speeds up the business cycle by avoiding the risk of keeping animals idle in a holding ground in Nairobi, while also reducing the stress on the environment around the capital city.
 - Finally, trade is a major toll for contrasting insecurity, as most conflicts are caused by raids for cattle and limited natural resources.

Beef

- Kenyans consume an average of 15-16 kg of red meat (cattle, sheep, goats and camels) per capita annually. Cattle are Kenya's most important source of red meat. The middle class is the highest consumer of beef [6].
- Over 80% of beef is produced by pastoralists, either domestically or in neighbouring countries (Ethiopia, Somalia, South Sudan and Tanzania), with the remainder coming from highland cattle [6][10].
- Although total volumes remain small (1% of meat production), Kenya has experienced an important increase in meat exports since 2005. Markets include Tanzania, the UAE, Qatar, Oman, Kuwait, Somalia and Egypt [11]. The Kenyan Private Sector Alliance (KEPSA) estimates that camel will surpass beef to become the most common type of meat eaten in the country by 2015 [13].

Pigs

- Pig production is a minor activity in Kenya and lags behind dairy, beef, sheep, goat and poultry. Domestic pork consumption is low: an average of 2 kg per head per year (2% of total consumption of animal products) [5]. Muslims form around 20% of Kenya's population [24].
- The pig market mainly depends on tourism; factors that affect the tourist industry also affect the market for pork and pork products [25]. The Kenyan government has continued to encourage pig production as it plays a major role in the tourism sector [25].
- Imports of pork have increased from 2005 onwards. Most of the imports were from Brazil and Canada. Exports, most of which were to COMESA countries (Eastern and Southern Africa) increased from 603 Mt to 1966 Mt between 2000 and 2007 [25].
- Pig production in Kenya dates back to the beginning of the twentieth century. The production of surplus cereals and skimmed milk from dairy operations provided the basis for pig-keeping as a secondary activity for British settlers [25].
- Up to 70% of all pig farmers are engaged in small-scale production. Pig farming has become a lucrative commercial enterprise for small scale farmers in the past few years, especially for those neighbouring Nairobi. There is a high demand for breeding stock and piglets. The pig population in that district has more than tripled since 2009, and the price of cold-dressed pork has doubled between 2009 and 2011 [26].
- Large commercial pig farms are found around Nairobi, Kiambu in Central Province, and North Rift Valley. These farms each have between 5 000 and 30 000 pigs. Farmer's Choice is an influential player in the value chain. Over 80% of the slaughter was carried out by Farmer's Choice and it is the main supplier of pork and pork products to the domestic and export market [25].

Poultry

- Consumption of poultry meat and eggs in the average diet is relatively low: 1 Kg of poultry meat and 2 kg. of eggs per head per year (1% and 2% of total consumption of animal products respectively). There is 100% self-sufficiency for both [5].
- Imports and exports of poultry products are limited and differ over the years [22].
- The Kenyan poultry industry is characterized by two main production systems namely (1) indigenous poultry production and (2) different types of commercial poultry production [23].
- Poultry production represents 30% of the agricultural contribution to GDP.
- Most rural families in Kenya (an estimated 75%) keep poultry, including chicken, turkeys and ducks. Indigenous chickens contribute 71% of the total egg and poultry meat produced and therefore impact significantly on the rural trade, welfare and food security of smallholder farmers. The people of Western Kenya have been keeping quails as a local tradition while pigeons are kept in small numbers throughout the country [22].
- The region is experiencing increasing demand of exotic breeds especially in the fast foods industry [6].
- Trade in poultry and poultry products is characterized by extensive movement of live birds and their products within Kenya and from neighbouring countries [23]. The limited biosecurity and nature of the poultry trade poses a significant challenge [24].
- Nairobi city is the final destination for much of the poultry from the rest of the country and hence has the oldest slaughter facilities, particularly for indigenous birds [5].
- The Ministry of Livestock and Fisheries Development ran an extensive poultry program in the last thirty years. Goals of this program are a.o. to improve the productivity of indigenous chickens and to secure the indigenous breeding stock [22].
- One commercial poultry company (Kenchic) has operations that are classified as a sector one farming system. It has six breeding farms with a total flock capacity of approximately 100,000 birds and contract operations with farmers around Nairobi. The hatcheries import their parent stock from France, Britain, Holland or United States of America [23].

8.3 Expected critical points for improvement

Land issues

- Changes in land tenure systems and farming systems have led to loss of common property resources like communal grazing land and water points. A change from customary (communal) to private ownership has led to fencing off big chunks of land therefore closing out livestock keepers. Land 'grab' is a serious issue, especially for communities whose land has been identified to contain high value natural resources such as oil, gas, timber, and high-value minerals such as gold, diamond, tin, platinum, and coal [6].

Environmental problems

- **Water shortages:** As a result of poor management, rapid and uncontrolled agricultural development, urbanisation and deforestation, water resources are rapidly depleting and threatened by pollution [1]. More ethnic clashes are to be expected over grazing land and water resources [27].
- **Soil nutrient depletion and overgrazing:** Kenya suffers from land degradation accelerated by human activities: overgrazing, over-cultivation, inappropriate farming practices, fuel wood demands etcetera [28].
- **Biodiversity:** The local breeds of East Africa which include East African short horn, Zebu, long horned Sanga Ankole, Turkana and Toposa are more adaptable to the arid environment and more resistant to diseases and drought. An opportunity lies in conserving these indigenous breeds while improving the ability to produce meat and milk. Meat from local breeds like the Ankole cattle is also said to contain low levels of cholesterol and fat [6].

Infectious animal diseases

- Kenya has a large incidence of infectious animal diseases, including Rinderpest, Contagious Bovine Pleuro-Pneumonia (CBPP), as well as various tick-borne diseases, African Swine Fever and FMD [6].

- The impacts of the Avian Influenza scare in 2007 were short-lived, but had sharp impacts on the commercial broiler sector in particular. The indigenous sector was largely unaffected, but one should not underestimate the potential impact of a real outbreak on this sector [23].
- Control of diseases is an investment opportunity for both governments and non-government institutions in the region. Investment in establishment of abattoirs that are equipped and operated on internationally accepted standards would also enhance competitiveness of meat especially for domestic niche and international markets [6].

Animal concentrated feed

- There is limited availability of animal feed and quality is relatively low (lack of vitamins and minerals) [29].

Health issues and zoonosis

- Kenya is one of the hot-spots of zoonosis, including [30]:
 - 'endemic zoonoses', such as Rabies, Brucellosis and cyst-causing tapeworms
 - 'epidemic zoonoses', which typically occur as outbreaks, such as Anthrax and Rift Valley fever
 - Relatively rare 'emerging zoonoses', such as bird flu (HPAI).
- Kenya has established a high quality animal field laboratory in the town of Busia which also handles human samples, and thus serves as a 'One Health' laboratory facility [31].

Policy problems

- In the current policy, enforcement of some livestock Acts are done by ministries other than the Ministry of Livestock Development. This leads, for example, to abuse and misuse of veterinary drugs, exposing related risks to consumers [6].
- The Agricultural Finance Corporation (AFC) provides loans for animal production at commercial rates; lack of micro finance leads to low inputs in livestock production [6].
- The country needs to enhance its political stability, reduce corruption and impunity, tackle inequality and improve legal certainty for business [1][32].

8.4 Government and knowledge institutes

Since 1980 the National Livestock Policy is in effect to support the sector. Although production of livestock and livestock products at national level increased on average, many households continue to be poor and food insecure. Also, the sector is still characterized by market inefficiencies, high cost of inputs and low standards as compared to the international requirements for livestock and its products. Because of market liberalization and economic reforms an update of the policy was effected in 2008. The focus of the policy is on livestock management systems; animal genetic resources; control of animal diseases and pests; food safety and quality control. The aim is to ensure food security and safety and to increase competitiveness of the livestock industry. The new policy stressed the need for more funding, improvement of infrastructure and restructuring and strengthening existing institutions for research, marketing and quality assurance, to name a few. In order to consolidate livestock research, the Kenya Livestock Research Institute (KELRI) is to be established to address animal research needs. The Animal Health Inspectorate Service (AHIS) Board is to ensure that livestock products meet international standards safe for human consumption [6].

The enforcement of policies regarding livestock is low since most livestock is traded on rural markets. Institutions and organizations responsible for ensuring safe marketing of livestock and products are limited to urban and peri-urban areas, with less or no presence in rural areas [6].

8.5 Current Dutch involvement

Kenya's economy is the fifth largest in Sub Saharan Africa, and is the gateway to and main economy of the East African Community, a market of more than 120 million people. More than 150 Dutch businesses are active in Kenya of which many have local representation. Many Dutch businesses have well-established investments in Kenya or have strong trade relations with potential to grow. Dutch interest in the private sector has a strong focus on agriculture, especially the export oriented horticulture [1].

According to the Strategic Plan 2012-2015 of the Dutch Embassy in Nairobi the focus in the agri-food sector is on private sector development and food security with the following 5 outputs [1]:

1. Higher production and incomes for agribusinesses in four agro-food value chains
2. Expanded financial inclusion of small market oriented farmers
3. Improved business climate in Kenya and better regional market integration

4. Expanded Dutch trade and investments in Kenya, in a broad range of sectors
5. Improved livelihoods in the ASALs (cross cutting with other spearheads).

The following livestock-related Dutch activities could be identified:

Public Private Partnerships and development projects:

- DSM Nutritional Products has carried out a market research for the feasibility and the modalities to fortify milk (-products) in Kenya (vitamins, micro nutrients) [33].
- Dairy production (incl cheese) by HappyCow. Soil analysis and animal feed laboratory by BLGG.
- RABO Development wishes to set up a Guarantee Fund in partnership with one or more Kenyan financial institutions, and develop financial products for operators in the dairy value chain [33].
- SNV Kenya is acknowledged as one of the most prominent Dutch actors in the dairy sector. As a partner in the DFID funded MAP programme, SNV is currently engaged with the Livestock Genetics Society. Supports dairy business hubs, milk quality, feed & fodder, Base-of-Pyramid marketing, vocational skills development, and biogas in the Kenya Market-led Dairy Program (KMDP) [34][35]. SNV Kenya is also focusing on extensive livestock (pastoralist) systems, including the promotion of camel milk production and dairy chain [21][36].
- WUR-CDI in a consortium with SNV, Aeres Group and MSM is revising the Dairy Curriculum of Egerton University and DTI (Dairy Training Institute) Naivasha, and leading them to a stronger collaboration with the private sector.
- A Dairy Training Institute is being set up in Bukara Agricultural College as part of a four year initiative funded by NUFFIC/NICHE program. Involvement of SNV, WUR, HAS den Bosch and Q-Point BV [37].
- With support of NABC the 2g@there consortium has been formed with Dutch dairy development partners [33][38]: SNV, WUR/CDI, The Friesian, Bles Dairies, Cowhouse, Koudijs/deHeus, InterCommerce BV, van den Heuvel dairy equipment, CRV, Agriterra, PTC+ and EK Cheese (goat farming and cheese making).
- An East African regional exchange on dairy is being set up by WUR, Heifer NL en SNV-Kenya as part of the East Africa Food Security Learning Partnership. This is a research Program on Climate Change, Agriculture and Food Security (CCAFS) an initiative of CGIAR and Future Earth [39].
- WUR Livestock Research is engaged in the Manure Management Improvement Project (2013-2015) which will explore region-specific acquisition of information on manure management in favour of resource use efficiency [40].
- Agriterra is active in various sectors including dairy. Together with Friesland Campina they won the first price in Business Development Award for a micro-franchise concept to improve the dairy distribution and reduce loss of milk and malnourishment [41].
- Solidaridad works with farmer organization, investors, knowledge institute, and NGO on beef chain.

Network and exchange activities:

- Kenyan Agri-hub of Agriprofocus: activities are centred around 4 themes [42]:
 - Financial services: ICCO, SNV, SCOPEinsight, Agri-Finance, Oikocredit Kenya, Pawdep, IIRR, KIT, Rise Trust, CABI, K-rep
 - Policy engagement
 - Agri-business development
 - ICT-related business development: ICCO/Fair & Sustainable, SNV, MESPT and MediaEdge.
- Cordaid includes activities with Pastoralist groups (Afar Pastoralist Development Association) [43] and has set up CELEP – the Coalition of European Lobbies for Eastern African Pastoralism [44]
- ETC Foundation supports Prolinnova–Kenya (PK): a multi-stakeholder platform in Kenya that promotes farmer-led innovation processes in food- and agricultural systems [45].

8.6 Opportunities for future Dutch involvement in Kenya

- a. Support emergence of medium-sized family farms with investments in technology and management.
- b. Opportunities in input & service supply, including feed & fodder production & distribution, AI services, disease control systems, heifer supply, credit, equipment (for fodder, chilling & milking, processing, transportation, milk dispensing), manure management.

- c. Focus on demand driven capacity development and practical training adapted to local circumstances.
- d. Establish abattoirs that fit internationally accepted standards in order to enhance international competitiveness of the meat sector.
- e. Continue efforts in development of smallholder dairy farming, combining the expertise from development cooperation with private sector development. Support the development of formal value chains and linking smallholder farmers to these value chains.
- f. Support camel milk production, especially for of pastoralist societies
- g. Help conserving indigenous breeds' genetic resources and support an increase in production yields of indigenous breeds.

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9 Mexico

9.1 General information

Growing economy closely linked to US

Mexico is the 12th economy in the world with a total population of 115 million inhabitants. Rural population is 25 million (22%). Mexico is the second largest economy in Latin America. Economic growth was 3.9% in 2012 and the coming years this growth is expected to be continued. Growth is driven by private consumption and investments - boosted by relatively stable inflation and credit growth [1].

Mexico enjoyed sustained economic growth but was hit by a number of financial crises, the most severe one in 1994-1995. Having pursued policies of economic liberalization in both domestic and foreign trade, in the 1990s it joined the Organization for Economic Co-operation and Development (OECD) and signed the North American Free Trade Agreement (NAFTA), accompanied by major shifts in its production structure and foreign trade. As a result, the role of agriculture in the national economy slipped to account for 5% of GDP in 2003 (as compared with 8.1% in 1982) [2]. The crisis in 2008 in the US resulted in another crisis in Mexico, which it is now recovering from. Up to 40% of the countries' income is derived from oil exports [3].

Origin of thousands of maize varieties and controversies over GMO maize

Around 14% of the 1.9 million km² is under cultivation, 23% with irrigation. Water is a scarce commodity. Maize is central in Mexican culture and diet. Mexico is the origin of thousands of maize varieties, which explains why experiments with genetically modified maize are widely criticized by environmental groups and scientists alike [4]. In 2011 the country experienced an extreme drought which forced the country to import 25% more maize than in 2010 – around 10 million tons, mainly from the US, to meet demands [5]. A recent study indicated that Mexico could become independent from import by investing in water infrastructure and supporting medium- and small scale producers. Contrary to government policies it indicates that genetically modified maize is not necessary in this process and may affect local biodiversity [6][7].

Strong cooperative movement

A growing part of the population (40%) buys their products in the supermarkets. Meanwhile, approximately 10% of Mexicans live below the poverty line of USD 1 per day [2]. Around 28% of the rural population lives in extreme poverty – and 57% in moderate poverty, a total of 14 million people. Poverty is related to geographical location (highest levels in Southern part), ethnicity (in rural areas 61% of indigenous population is extremely poor) and gender (higher levels of poverty in female-headed households) [8]. In January 2013 the *National Crusade Against Hunger* was launched [9].

Credits are difficult to obtain for small and medium size enterprises, due to high interests and rigid requirements [10]. The cooperative movement is of growing importance. There are around 15,000, mostly producer and consumer cooperatives, with around 5 million members. Moreover there are 26,000 'ejidos' or communities with communal land ownership. These systems engage around 15% of total workforce. The cooperatives have a joint property of around 6 billion Euros and therefore do not represent the marginalised sector.

Growing demand for organic food

Demand for organic food products in Mexico has been growing over the last few years along with the overall trend of healthier eating. Mexico is a top 20 producer of organic foods worldwide with 1.3 million acres of land dedicated to organic agriculture: it is the main producer and largest exporter of organic coffee and the third largest producer of organic honey; other organic products include dairy [11].

Even though organic production represents less than 1% of all agricultural production on surface planted in Mexico, it generates around 10% of the gross domestic product in the agricultural sector with revenues of approximately 300 million USD a year [11]. Over the last decade, the Mexican government and private sector is further promoting organic farming. National certification has been accredited by the government, but faces difficulties due to lack of controls and missing expertise related to export requirements to US and EU [10][12].

9.2 Livestock systems

Livestock accounts for thirty percent of Mexico's agricultural output, producing milk, poultry, eggs and beef. Mexico is not self-sufficient in the production of meat and fish, importing its remaining needs from the United

States. The Mexican animal production sector is growing. Poultry industry has annual growth of 5%, pig industry 4% and dairy 2%. According to SIAP, the info centre on agriculture in Mexico, the poultry sector provides about half of the total meat production, followed by beef, pigs and goats/sheep [13].

Over the last 10 years, agricultural, livestock and fisheries production grew at an annual rate of 2.4% - twice as much as the growth of population of the same period. In addition, yearly average growth rate of agri-food exports was above that of imports, 9% vs. 7% [14].

The national animal feed industry has a capacity of 32.5 million tonnes; industrial units represent 35% of the capacity and farmers with infrastructure to produce feed represent the remaining capacity. Only 75% of the total processing capacity is used. 60% of all forage feed is imported (maize 62% with no import tariff; sorghum 31%) which explains the high % of feed costs: 55-65% of total production costs [15][16].

Dairy and beef

- Mexico is largely self-sufficient in beef production [17]. Mexico is the 8th beef producing country (1.731.000 tonnes in 2010); meanwhile 6th importer of beef (335.000 tonnes in 2010) [15].
- In 2010 Mexico started exporting beef to Russia; in 2011 the exports multiplied by seven to 25.000 tonnes. It is now the no. 6 beef exporting country to Russia, higher than Argentina and Germany [18]. Recently Mexico started to export beef to China [19].
- Mexico is largely self-sufficient in milk production; imports about one fifth of local consumption and exports 2% of production [20]. Mexico is the 15th milk producer worldwide and has 2.3 million dairy cows [15][16].
- 45% of the dairy import value is milk powder. USA supplies over 55% of all dairy products, the Netherlands 2%, mainly cheese.
- Between 2006 and 2011 the exports of cheese from the US to Mexico has doubled; around 20% of this is Gouda Cheese [21].
- Besides peasant cattle keeping, Mexico's dairy farms can be classified in three systems:
 - (1) semi-specialised or smallholders;
 - (2) dual purpose farms and
 - (3) large dairy operations.
- The average yield per animal (5,000 kg of milk) comparable to most benchmark countries. The milk yield per cow ranges between 700 to over 9,000 kg per cow.
- Many semi-specialised farms lack access to or do not use the cold chain. They supply their milk to about 2,000 artisan cheese makers; milk quality is not perceived as reliable.
- Mexico allows the use of BST (Bovine Somatropine) to increase milk production. Some milk processors refuse this 'BST milk'.
- The dairy processing industry (over 300 dairy processors) gives direct employment to 37,000 and indirect employment to 200,000 people. These companies use on average 80% of their production capacity and have their own milk quality control system.
- Consumer prices have more than tripled between 1996 and 2011; while farmers' milk price has doubled. Farmers' share of consumer prices has declined from 63% to 35%. The 10 major processors in the country process 95% of the milk [20].
- Milk based on imported milk powder is cheaper than domestic fresh milk.

Pigs

- Mexico is the 8th country in pork production and 3rd importer of pork [15].
- Consumption per capita is 15 kg [15]. Consumption of pork has grown rapidly and increase in domestic production has not satisfied demand. Mexico is 4th importer of pork mainly from the US (over 80%) and Canada (about 15%) [13].
- Exports of pork have increased rapidly (in 2007 70,000 tons). Main export markets are Japan (85%) and the US (15%). Export has grown especially since free trade agreement with Japan in 2005 [13].
- Backyard pig production is still common and will remain so, especially in rural communities, due to the importance for lower income class of fresh meat, low prices and short marketing chains. Besides, Aujezki control has led to buying of local pigs from backyard production in exchange of free pig meat for local festivities [13].

- Besides the peasant backyard pig keeping, commercial pig production in three types:
 - (1) traditional backyard production (10-50 sows), with 30% of total production;
 - (2) semi-technical production (150-500 sows) with 25% of total production) and
 - (3) large-scale production (500-1000 sows) with 45% of total production. A small number of farms has over 20,000 sows [13].
- Pig production has increased 25% over the last decade, due to modernization of production chain; the largest companies have high levels of vertical integration. Since the mid-20th century, small farms raising pigs have given way to massive, industrial pig production facilities [13].
- The government promotes the use of Tipo Inspección Federal (TIF) slaughterhouses, but this is expensive compared with local slaughter procedures [13].
- Environmental regulations indicate that pig producers with over 25,000 animals have to declare the effects on surface waters and are obliged to build manure tanks [13].
- Mexico is developing a large number of projects on Clean Development Mechanism (CDM). This implies biogas- and energy saving projects. Biogas from pig manure counts for 50% of all CDM projects [13].
- Imports of live animals and sperm from NL [13].

Poultry

- Mexico is the 4th country in poultry meat production and 5th in egg production. The country exported 3 million US\$ worth of poultry meat. Meanwhile Mexico is 3rd importer of poultry meat (499.000 tonnes) [15].
- Consumption of poultry is around 30 kg of meat (mainly internal production and some import from the US and Chile). Chicken meat consumption per capita has grown with over 50% in 10 years. Consumption of turkey is increasing (2 kg in 2006) and imports of turkey are becoming more important.
- Consumption of eggs is 18 kg eggs per capita per year.
- Mexico imports one-day chicks. EU used to have a good share in this (over 50%). After the avian influenza epidemic in 2006 97% of the genetics come from the US [13].
- Besides the peasant back-yard poultry production, the commercial poultry sector can be divided in three types:
 - (1) backyard (commercial) production (largest number of producers, varying number of animals per producer);
 - (2) semi-technical production (between 1-16 million broilers/0.5-2.5 million laying hens – around 40% of production) and;
 - (3) technically advanced very large-scale (60-70 million broilers/2.5-7 million laying hens – around 50% of production). The latter has total vertical integration and is comparable to production in the EU.
- It is expected that the concentration of poultry production will further increase, and that (commercial) backyard production will stabilize around 5% of total production due to their market share amongst poorer consumers, fresh meat and low prices.
- Poultry industry is the fastest growing of all animal production sectors. Two major poultry producing regions are Puebla and Jalisco.
- Mexicans prefer dark meat and whole chicken against chicken parts – though the latter is growing in supermarkets. Roasted whole chickens have 26% of market.

9.3 Expected critical points for improvement

Marketing barriers

- Export markets may be closed in case of outbreaks or presence of infectious animal diseases and zoonotic diseases.
- Meat exports to China and Russia were prohibited due to the H1N1 Hog Cholera threat in 2009 [22]. There is nowadays export of pork meat to Japan, Russia and Hong Kong.
- After bird flu crisis imports of breeding eggs and day old chickens have resumed [15].

Environmental problems

- Sustainability is of growing concern for both government and private sector [16]. Mexico has the lowest environmental standards with respect to industrialized farm animal production in the region. In 2006, Mexico's National Commission for Water (CONAGUA) estimated that only 20% of the waste water originating from pork production in Mexico is treated [23].
- There is a death-zone of nearly 7.500 Km² in the Gulf of Mexico, where pollution with nutrients from agriculture and other activities along the Mississippi River has stimulated the growth of algae, and has affected fishery. During the 2011-2012 drought this zone was reduced in size [24].
- Droughts, floods, earth quakes and tropical storms are relatively common in Mexico [25].

Biodiversity loss

- In spite of their importance for the poor and poorest groups, local animal breeds have been severely affected since the 1960's through imported breeds and indiscriminate cross-breeding [26]. Two native cattle breeds and two native pig breeds have been reported endangered [27].
- In 2012 Mexico was the fifth country – and the first of the so-called megadiverse countries to ratify the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization to the Convention on Biological Diversity [28].
- Protests against imports of GMO maize have been reported, since the government has approved 177 experiments with GMO maize in 2009, that are threatening the numerous local maize varieties in the country [29].

Infectious animal diseases

- Mexico confirmed its status as a country of controlled risk for bovine spongiform encephalopathy (BSE) and free from Foot and Mouth Disease (FMD), by the World Organisation for Animal Health (OIE). Chile has recognized Mexico's health condition as free from Classical Swine Fever (CSF) [19]. Japan and the US recognized the Aujeszki free status.
- HPAI continues to be a problem. Avian Influenza crisis in 2012 led to increased egg prices and culling of 22.3 million birds. 140 million birds were vaccinated [15]. Recent reports indicate a new outbreak of the H7N3 strain [30] - H7N3 is less dangerous to humans than H1N1.
- In spring 2009 75 human deaths due to the Hog Cholera virus H1N1 originating from Mexico led to worldwide panic. In Mexico it resulted in closing of schools and restaurants, and seriously affected the tourist industry and pork exports [31].

Health issues and zoonosis

- The livestock sector is struggling with dependency on growth hormones and antibiotics, such as Clenbuterol in pig production and BSE in dairy [15].
- Adult obesity as well as child obesity is a large problem in Mexico. The prevalence of obesity is 30%, after the US the highest prevalence in the world [32]. The Mexican government has made it a priority to reverse this through education campaigns and new food nutrition laws targeting school children. As a result, a growing number of Mexican consumers are pursuing healthier lifestyles which include better eating habits [11].
- Zoonosis and especially the neglected zoonosis are still frequently seen in the marginalised populations with lags in their development [33].

Animal welfare

- Though protests are still in infancy stages, animal welfare in industrial systems is critically viewed by some organisations. Most of the industrial poultry production in Mexico implies the use of (in EU-forbidden) battery cages. This is gradually being challenged by consumers: where special restaurants offer cage-free eggs [34].

9.4 Government and knowledge institutes

Since the late 1970s, Mexico's administrations have constantly formulated strategies and policies to address the dual challenge of economic growth and improved social conditions, especially for rural areas. The approach has typically followed one of two avenues - a social approach or a productive approach - with a view to fostering some degree of capitalization among farmers, including small scale producers [2]. The

government gives financial support to protect national agrarian producers through PROCAMPO. By providing cash, PROCAMPO helps credit-constrained farmers to invest in agricultural production and obtain higher returns on production [13][35].

Federal and regional policies are reviewed and changed every 6 years, whenever the political party in power changes. The current government that has started December 2012 will aim towards increased food self-sufficiency. The high imports of maize and sorghum for animal feed are no longer accepted, and there will be increased investment (e.g. irrigation) for productivity increases in small and medium farming enterprises [15].

Mexico has significant institutional capacity for formulating and implementing strategies, policies and programs in many spheres of economic and social development, although scope remains for enhancing program and project performance at the micro level [2].

9.5 Current Dutch involvement

Mexico is especially interesting because of its geographical position close to large markets from the US as well as the growing internal market. Maize, sugar, wheat, rice, cotton, vegetables and fruits are the major agricultural products. In the last few years horticulture is of growing importance; Mexico is now the world's largest tomato exporter. In the livestock sector, pig and poultry production is growing: Mexico has the highest per capita egg-consumption in the world [36].

The EU is the third trade partner with Mexico, after the US and China. Mexico has a free trade agreement with the US and Canada (NAFTA), which is responsible for 80% of all Mexican exports. EU sees opportunities in the export of meat, dairy and prepared foods to Mexico. Mexico is one of the fastest growing economies in the world with a population of 115 million [37]. Moreover, since 2012 Mexico is part of the Trans Pacific Partnership (TPP) of countries around the Pacific [38].

The most important opportunities in Mexico include water, sustainable energy, waste management and horticulture [38].

The *business climate* in Mexico has several aspects:

- Membership of NAFTA opened the Mexican economy. Farmers' subsidies and trade protection have been largely abolished.
- Dutch agricultural sector has good reputation in Mexico as high quality and innovative.
- Certain areas in the country are dangerous due to drugs-related violence.
- Mexico is the major supplier of greenhouse vegetables in the US. This provides opportunities for the Dutch horticulture sector [40].
- The Dutch embassy in Mexico City publishes Agri News Mexico, a (bi) monthly e-magazine with relevant info for businesses interested in agro-food sector in Mexico [41].

The following livestock related Dutch activities could be identified:

Networking and matchmaking activities

- Large exhibitions:
 - the VIV Mexico in 2010 (together with the office of the Agricultural Counsellor VNU Exhibitions organised a Holland Pavilion and field visits);
 - the International Poultry Exhibition (The Executive President of the Mexican Poultry Union (UNA) has shown interest in the Netherlands-Mexico joint efforts and probably members participate in the Netherlands poultry mission to Mexico in 2013) [42];
 - bi-yearly animal production exhibition FIGAP-VIV 2012 [19].
 - VIV Mexico (15-17 October 2014).
- Trade missions and so-called road shows:
 - road show in 2011 with 15 Dutch companies (cooperation between Agricultural Counselor and VNU Exhibitions);
 - trade mission in October 2012 with 16 representatives of Dutch companies;
 - mission in June 2013 in cooperation with the top sector Agro Food a match making event will be organised between the Mexican and Dutch companies;
 - trade mission/road show in September 2013.
- LinkedIn group named "Animal Production in Mexico - the Dutch link", started in October 2011

Direct investments in animal production [13][43]

- Animal health and feed (Nutreco, DSM, vaccins)
- Genetic materials (Topigs)
- Slaughter equipment (Stork, Meyn)
- Financial services (Rabobank)

Public Private Partnerships on various themes

- Metropolitan Food Cluster Aguascalientes, Mexico is an integrated agro-park to be developed in the state of Aguascalientes. WUR Alterra/LEI are involved in the design, development and preparation of implementation of an Integrated Agropark (AP), its intelligent Agrologistic network (IAN) and Rural Transformation Hubs. This implies Mexican companies like Gilsa (Milk processing) and Nutrypollo (Broiler chicken) as well as knowledge partners INIFAP and Universidad Autónoma de Aguascalientes [44][45].

9.6 Opportunities for future Dutch involvement in Mexico

- a. *Support for improving large scale farms* whereas the focus is twofold - improving the production and prevention of passing adverse effects on the environment.
 - Manure treatment systems to reduce water pollution, including biogas
 - b. *Support for small scale farms* by improving hygiene and health issues.
 - c. *Support animal genetic resources* through the creation of special labels and trade-marks of niche-products based on local breeds;
 - d. Enhance the infrastructure of Artificial Insemination
 - Increase awareness of the benefits, confidence to make AI and good genetics successful.
 - e. Grassland and roughage production to contribute to lower production costs and availability of roughage year round.
 - f. Feed management and production of concentrates.
 - Technologies for concentrates and feed management, vaccines
 - g. Management tools on production level of the individual animal (dairy, sows) to monitor and reflect on feeding and breeding.
- b. *Support to organic dairy chain*
 - c. *Slaughtering equipment*

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Wageningen UR Livestock Research

Edelhertweg 15, 8219 PH Lelystad T 0320 238238 F 0320 238050

E info@livestockresearch.wur.nl | www.livestockresearch.wur.nl