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Samen met Nederlandse partners uit het bedrijfsleven zijn mogelijkheden verkend om tot een Iraans-Nederlandse samenwerking te komen om de Iraanse zuivelsector te versterken. Iran is een land met een zuiveltraditie en binnen de centraal geleide economie is de ambitie om de productie verder te laten groeien en zuivel te exporteren. Een groot deel van de productie vindt op professionele melkveebedrijven plaats. Vier centrale thema's zijn geïdentificeerd voor een potentiële samenwerking: melkkwaliteit, beschikbaarheid en kwaliteit van voer, waterefficiëntie en voerproductie, en educatie. Aan Nederlandse en aan Iraanse kant zijn potentiële partners voor deze samenwerking benoemd.

In cooperation with Dutch industrial partners, possibilities for a Dutch-Iranian cooperation have been explored aiming at a strengthening of the Iranian dairy sector. Iran is a country with a dairy tradition. The ambition of Iran, within its centrally planned economy, is to further develop dairy production and look for possibilities to export. A large share of the volume is produced on professional dairy farms. Four key topics have been defined for a possible cooperation: milk quality, feed availability and quality, water efficiency and feed production and education. Both on the Dutch and the Iranian side possible partners for this cooperation have been identified.

Key words: Iran, dairy

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Preface

This report explores the possibilities for cooperation between Dutch and Iranian partners to strengthen the Iranian dairy chain. The project was commissioned by the Dutch ministry of Economic Affairs within the framework of the top sector Agri & Food. The project is a so-called seed money project. The basic approach of this type of project is to explore possibilities to build consortia to work together on specific topics and to create business opportunities.

The project was executed in close cooperation with FrieslandCampina, Trouw Nutrition and CRV. I would like to thank Jan Bles, Sybren Attema (both FrieslandCampina), Otto Seijler (Trouw Nutrition) and Bart Dronkers and Jan Lok (both CRV) for their valuable input. Marinus Overheul from the top sector Agri & Food and from the Dutch Ministry of Economic Affairs was a strongly involved and motivating client. The project received great support from the Dutch embassy in Teheran in organising the trip and providing information on Iran. A special thanks, in particular, goes to Taco Westerhuis and Hassan Javaran from the embassy.

I also thank all the Iranian contacts who were visited during the field trip and were prepared to share their insights. A special word of thanks also goes to Mr. Shahab Jansepar, who put a lot of effort in organising the field trip to Iran. His hospitality and network strongly enhanced our understanding of the Iranian dairy sector and the mutual willingness to cooperate.

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General Director Social Sciences Group (SSG)
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Summary

S.1 Key findings

Iran is a country with a long dairy tradition. Dairy production has increased to a level of about 9bn kg of milk per year. The ambition in the sector is to further increase production and to improve the quality of the milk to be able to export. Based on the analysis of available data and on a field trip to Iran, 4 key areas have been identified by the participating partners in the project where a Dutch Iranian cooperation could strengthen the Iranian dairy chain.

1. Milk quality assurance, quality standards and milk-payment systems
   There is a lack of trust within the Iranian dairy chain. A further improvement of the milk quality is needed if Iran wants to export. Dutch experience and technology about how to organise (governance) and implement (e.g in milk-payment systems) with all relevant stakeholders to achieve a higher quality of consumer products can help solve this issue.
2. Feed availability and quality
   The lack of trust also applies to the feed part of the dairy chain. Chain efficiency can be improved considerably if trust is improved. Dutch experience and technology about how to organise and implement independent assessment of feed quality and building trust in the chain can help to make the Iranian chain more transparent and efficient.
3. Water efficiency and feed production
   Iran has to be more efficient in its feed production, especially in relation to water use. Dutch international experience in crop production and water efficiency on farm level and knowledge on policy development on regional and national level can be used to contribute to this issue.
4. Education: both on operational level and on economics
   All Iranian farmers mentioned the need for operational trainings of their employees. Several had done training in the Netherlands in the past. The changing circumstances in Iran require more skills and insights related to strategic and economic decisions.

The main recommendation is to develop a joint programme with Iranian and Dutch partners to work on these four areas. Possible partners for such a programme have been identified on both sides.

S.2 Complementary findings

- Iran has a centrally planned economy. For dairy this means the government decides on the price of the major dairy products in the retail market and also decides on the milk price that farmers receive. This policy is gradually changing.
- Iran is almost self-sufficient in dairy. The Iranians want to export dairy products to countries in the region (among others Iraq, Afghanistan) and to Russia. Iran imports butter.
- The overall dairy production in Iran is about 8.8bn kg of milk. A large share of this milk is produced on professional dairy farms with over 150 dairy cows. Some of the farms are part of government-owned holdings; other farms are privately owned. There seems to be no policy to support small-scale farms.
- There is a lack of reliable and consistent statistics.
- Additional areas were raised for possible cooperation but not identified as priorities for a joint programme at this moment: sharing experiences with dairy export, import of feed and feed additives, medicines, machinery, biogas technology and exchange of knowledge (seminars, exchange of students).

S.3 Method

In a desk research, available data and reports were collected and analysed. A field trip was organised to collect additional information and data in direct contact with Iranian stakeholders.

Samenvatting

S.1 Belangrijkste uitkomsten

Iran is een land met een lange zuiveltraditie. De zuivelproductie is gestegen tot bijna 9 miljard kg per jaar. De zuivelsector wil verder groeien in productie én in kwaliteit om te kunnen exporteren. Op basis van literatuuronderzoek en een bezoek aan Iran zijn samen met de projectpartners vier onderwerpen gedefinieerd waar een Nederlands-Iraanse samenwerking kan resulteren in een versterking van de Iraanse zuivelketen:

1. Melkkwaliteitsborging, -standaarden en melkuitbetalingssystemen
   Er is een gebrek aan onderling vertrouwen in de Iraanse zuivelketen. Daarnaast is het nodig dat de melkkwaliteit verder verbetert om te kunnen exporteren. Nederlandse technologie en kennis op het vlak van hoe je dit binnen de keten samen met andere partijen organiseert en implementeert (onder andere via uitbetalingssystemen) kan hieraan een belangrijke bijdrage leveren.
2. Beschikbaarheid en kwaliteit van voer
   Het gebrek aan vertrouwen speelt ook aan de voerkant. De ketenefficiency moet sterk verbeteren om beter samen te werken. Ook hiervoor geldt dat Nederlandse ervaring en technologie een belangrijke bijdrage leveren om de keten meer transparant en efficiënt te maken.
3. Efficiënt watergebruik en voerproductie
   Iran moet efficiënter voer produceren, vooral met minder water. Nederland heeft veel internationale ervaring met waterefficiënte productie van gewassen zowel op boerderijniveau als op beleidsniveau (regionaal en landelijk)
4. Educatie: gericht op praktische vaardigheden en op economie
   Alle bezochte Iraanse melkveehouders benoemden de noodzaak voor goede trainingen voor hun medewerkers. Velen van hen hadden goede ervaringen met trainingen in Nederland. Daarnaast zorgen de veranderingen in Iran ervoor dat er voor de melkveehouders zelf meer vaardigheden en kennis nodig zijn rond strategische en economische beslissingen.

De belangrijkste aanbeveling van de betrokken projectpartners is om een gezamenlijk Iraans-Nederlands programma te ontwikkelen voor deze vier thema's.

S.2 Overige uitkomsten

- Iran heeft een centraal geleide economie. Voor de zuivelsector betekent dit dat de overheid beslist over de prijs van de belangrijkste zuivelproducten voor de consument en ook over de prijs die de melkveehouders ontvangen. Dit beleid verandert langzaam.
- Iran is bijna zelfvoorzienend voor zuivel. Het land wil zuivel exporteren naar landen in de regio (onder andere Irak, Afghanistan) en naar Rusland. Iran importeert boter.
- De totale melkproductie in Iran is ongeveer 8,8 miljard kg melk per jaar. Een groot deel van deze productie is afkomstig van professionele melkveebedrijven met meer dan 150 koeien. Een deel van de bedrijven maakt deel uit van holdings die eigendom zijn van de staat. Er lijkt geen beleid te zijn dat gericht is op het ondersteunen van de kleine bedrijven.
- Er is een groot gebrek aan betrouwbare en consistente data over de sector.
- Naast de geïdentificeerde vier thema's zijn nog diverse mogelijkheden voor samenwerking genoemd, maar niet als prioriteit gekozen. Genoemd zijn: kennis delen over zuivelexpert, importeren van voer (additieven), medicijnen, machines en werktuigen (bijvoorbeeld biogastechnologie) en kennisuitwisseling (onder andere via seminars of uitwisseling van studenten).

S.3 Methode

Er is literatuuronderzoek uitgevoerd om een totaalbeeld van de sector te krijgen. Daarnaast is met de projectpartners een bezoek aan Iran georganiseerd waarin aanvullende data zijn verzameld en vooral veel direct contact is geweest met Iraanse stakeholders.

1 Introduction

Iran has a long dairy tradition. The Netherlands has added to this in many ways: in practical trainings as well as in business relationships. In 2006 the UN Security Council imposed sanctions after Iran refused to suspend its uranium enrichment programme. These UN sanctions were lifted on 16 January 2016. The lifting of the sanctions has offered opportunities to cooperate with Iran again in a more intensive way.

This change was the main reason to start with a so-called seed money project (SMP). Seed Money projects serve as a start-up (or as 'seed') for international collaboration ventures for SMEs in the Dutch Agri & Food and Horticulture top sectors. The aim is to form a consortium that can contribute to the sustainable development of a local agriculture or horticulture system. A group of three Dutch companies (FrieslandCampina, TrouwNutrion and CRV) and Wageningen University & Research started the seed money project in the first half of 2016. The project was supported by the Dutch Ministry of Economic Affairs and the Dutch embassy in Teheran.

The overall aim of the project is to come up with a co-operation model that could help to improve the Iranian dairy chain towards sustainable production with high quality standards with the input of expertise and technology from the Dutch Agri & Food sector.

The key activities from the project were:
1. Desk research: collecting available information on Iran and the Iranian dairy sector
2. Field trip to Iran: meeting with several stakeholders in Iran, assessing strong and weak points and identifying opportunities
3. Reporting

The aim of this report is to publicly share the collected information from the desk research and the field trip.

The report starts with a general description of Iran and agriculture in Iran, based on an earlier visit from a Dutch delegation to Iran (in 2015).[1] The next part focuses on the Iranian dairy sector, followed by the main findings of the field trip that was executed in September 2016. The final part consists of general conclusions from the partners in the project.

[1] Based on a memorandum commissioned by the Ministry of Economic Affairs, DG Agro, Directorate of European Agricultural and Fisheries Policy and Food Safety, by Siemen van Berkum – LEI Wageningen UR, 30 October 2015.

2 Agricultural sector

2.1 A first impression

Iran is a country with 78m inhabitants and an average income of over USD 5,700 per capita.[2] The country generates substantial revenues from exporting oil. After economic sanctions were imposed by the UN and EU in 2012, Iran experienced a two-year period of economic recession. According to the latest prognosis from the IMF (2015), the signs of recovery that emerged in 2014 will be followed by a modest growth in the next few years. See Figure 2.1.

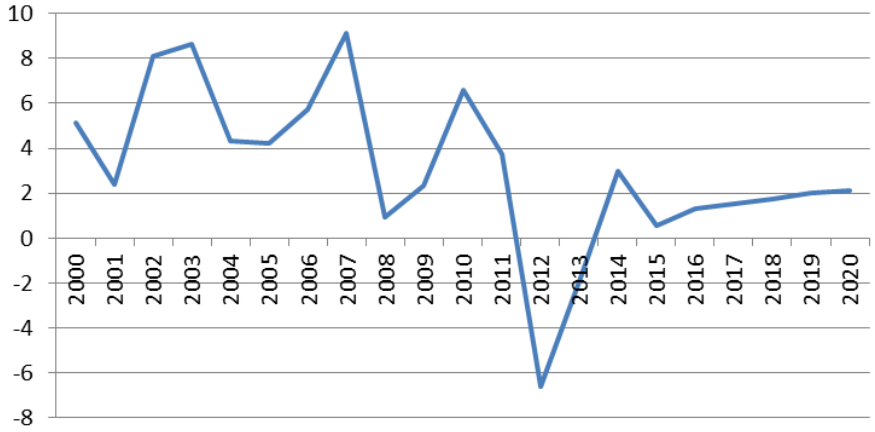

Figure 2.1 *GDP growth (%) in Iran a)*
a) The percentages from 2014 onwards are estimations.
Source: IMF World Economic Outlook, April 2015.

The growth was negative in 2012 and 2013.

Farms are in average small in Iran. According to the FAO (2015), 47.5% of the businesses are smaller than one hectare, 30% are between 1-5 ha, and 22.5% are larger than 5 ha. The agricultural sector provides employment for 21% of the population. The contribution of the agricultural sector to Iran's gross national product fluctuates around 10%, which means that incomes in agriculture are relatively low. The sector is characterised by small-scale operations and low revenues per hectare and per animal. This is mainly due to the country's difficult natural conditions. Nevertheless, there is a steady increase in agricultural production, with higher growth rates for horticulture and arable farming than for the livestock farming sectors. Iran is a net importer of agricultural products; particularly meat (beef and poultry meat), cereals (corn, wheat, and rice), oil seeds (soya beans), vegetable oils (soya and palm oil), and soya oil cake. For more details, see Table 2.1.

[2] Gross national income per capita in 2013. The average level of income can be compared to that of the EU member states Bulgaria and Romania. By comparison, this figure was over USD 47,000 per capita for the Netherlands in 2013 (World Bank, 2015a).

Table 2.1 *Net export position of agricultural sectors in Iran in 2011 (values shown in m USD, selection of two-digit HS codes) a)*

HS codes	Export	Import	Net export
01 Live animals; animal products	39.8	43.4	-3.6
02 Meat and edible meat offal	30.9	988.2	-957.3
03 Fish etc.	168.4	75.8	92.5
04 Dairy produce etc.	377.8	410.7	-32.8
05 Products of animal origin	76.7	13.1	63.6
06 Live trees and other plants	36.7	5.5	31.2
07 Edible vegetables and certain roots and tubers	581.8	125.8	456.0
08 Edible fruit and nuts; peel of citrus fruit or melons	2,008.6	624.8	1,383.8
09 Coffee, tea, mate, and spices	346.9	235.0	111.9
10 Cereals	12.7	2,547.7	-2,535.0
11 Products of the milling industry	18.6	9.8	8.8
12 Oil seeds and oleaginous fruits, etc.	17.8	660.4	-642.6
13 Lac; gums, resins and other vegetable saps and extracts	55.1	42.2	12.9
14 Vegetable plaiting materials; vegetable products	14.1	5.1	9.0
15 Animal or vegetable fats and oils	103.1	1,716.8	-1,613.8
16 Preparations of meat	13.5	6.9	6.6
17 Sugars and sugar confectionery	164.0	628.6	-464.7
18 Cocoa and cocoa preparations	33.2	99.6	-66.4
19 Preparations of cereals, flour, starch, or milk	355.1	14.8	340.3
20 Preparations of vegetables, fruit, nuts	335.2	91.2	244.0
21 Miscellaneous edible preparations	157.7	249.1	-91.4
22 Beverages, spirits, and vinegar	27.2	50.1	-22.9
23 Residues and waste from food industries; prep. animal fodder	10.6	952.1	-941.6
24 Tobacco and manufactured tobacco substitutes	6.0	219.1	-213.1
Total agricultural products1)	5,030.4	10,523.5	-5,493.1

a) Definition of agricultural products includes the HS-codes HS 1-24, 29, 33, 35, 40-41, 44-45, 50-53.

Source: UNCOMTRADE.

The country exports a wide range of vegetables, fruit, and nuts and is one of the world's biggest producers of pistachio nuts, dates, and apples. Iran also exports a significant amount of wheat flour, especially to its neighbouring countries.

2.2 Important biophysical characteristics

Iran has a hot, dry climate, especially in the south and in the desert zone in the central region. Iran's northern region lies in a moderate climate zone. The average rainfall does not exceed 250 mm per year (Badripour, 2006). Two-thirds of Iran's surface area is so dry that it is barely possible for vegetation to grow and another 20% of the land is characterised by a semi-arid climate. Only the Caspian plain in the north, adjacent to the Caspian Sea (where Tehran can be found), receives more than 1,000 mm rainfall per year. It is in this area that arable farming and horticulture are concentrated.

Livestock farming (mainly sheep and goats) is distributed across the 'rangelands' – grazing lands with natural vegetation – and is an activity which is often practised very extensively. Badripour (2006) observes that the number of animals grazing on the rangelands is double the maximum number these lands can support and that better management of these lands is needed to prevent them from becoming further exhausted. Since 2003, a national plan has been in force with the aim of promoting a more sustainable use of these areas by reducing the number of animals that graze on these lands. To achieve this aim, the government supports farmers in the purchase and efficient use of additional feeds and concentrates in an attempt to strengthen the capacity of the natural environment as well as to improve the economic development of the sector (Rajab-baigy and Kamalzadeh, 2011). The most recent figures from 2011 show that there has been a slight decrease in the size of the livestock numbers on the rangelands since 2005 (National Statistics Agency).

Water is scarce and is becoming an ever greater problem in Iran (Khajehpour, 2015). Almost all the surface water is being used and the level of the ground water reservoirs is falling. The agricultural sector is a major consumer of water; it is estimated that 90% of all available water is used by this sector. The sector could therefore make a significant contribution to water savings but it does, however, have a strong political lobby behind it. For example, in its aim to improve food safety for its own inhabitants, the Iranian government wants to become self-sufficient in wheat, rice, sugar, oil seeds, and cotton (Khajehpour, 2015). These are crops that need a lot of water. By focusing on other, more water-efficient crops, the agricultural sector could save a considerable amount of water.

2.3 Production and markets

Arable crops

Wheat and barley are the country's main crops, with wheat making up around 70% of its total grain production. Irrigation is used in roughly one-third of the wheat-producing areas. This means that the majority of the harvest is dependent upon weather conditions, resulting in significant variations in total yield (also per hectare) from year to year (FAOStat). In 2015, the wheat harvest was expected to amount to 13m tonnes, which is the same as in 2014 and slightly lower than the average for the last five years (FAO GIEWS, 2015). Besides wheat, other important arable farming products are barley, rice, corn, and sugar beet. Yields have fluctuated in recent years around 2,000 kg/ha on average for wheat and barley, 5,000 kg/ha for rice, and from 5,000 to 7,000 kg/ha for corn.

Fruit and vegetable sectors

Iran produces a wide variety of fruit, nuts, and vegetables. The country produces around 21m tonnes of vegetables; mainly potatoes, onions, tomatoes, cucumbers, and melons in terms of tonnage. Vegetable production is rising steadily, thanks to a growing acreage and higher yields per hectare (FAOstat). The country's fruit production, on the other hand, has shown a declining trend since 2005-2008: production in 2013 was around 20% lower than in the peak years mentioned due to a decreasing acreage. Fruit cultivation mainly focuses on citrus fruits (oranges, tangerines, pomegranates, lemons) and apples, as well as an extensive assortment of summer fruits (apricots, cherries, etc.). Iran is also a major producer of pistachios and walnuts, and also dates. The country is also the largest producer of the herb saffron.

Livestock sectors

In terms of numbers, livestock in Iran is dominated by sheep (50m) and goats (22m). However, stocks of both sheep and goats have decreased by around 10-15% since 2005/6. A major problem is the supply of feed, particularly in the drier areas of the country (see above), where the animals are generally dependent on what grows; due to costs, supplementary feeding with concentrates is virtually non-existent. In other areas, where there is more vegetation, there are greater opportunities for roughage extraction and supplementary feeds and compounds.

In recent years, there has been a slight rise in the number of cows to over 8.5m in 2013 (FAOStat). The livestock comprises a variety of breeds. Most of the cows devoted to milk production are generally kept in stalls with little opportunity for pasture grazing, and are fed imported feeds and concentrates, such as corn and soya. This type of dairy farming is usually found near urban areas. In the most productive companies, milk production per cow amounted to an average of 2,600 kg (Rajab-baigy and Kamalzadeh, 2011) (compare this to almost 8,000 kg per cow in the Netherlands).3 The production of milk, from cows and other animals, has increased considerably over 15 years, from 4m tonnes in 1998 to 6.8m tonnes in 2013 (FAOstat). The market for cheese, yoghurt, desserts, and other dairy products is dominated by two big national dairy companies (Euromonitor, 2015).

The production of red meat and lamb is on the decline in Iran. By contrast, the production of meat within the poultry sector has doubled over the last decade, to almost 2m tonnes in 2013 (FAOStat). This production – mainly of chicken meat – is strongly dependent on imported fodder. Production is

[3] Consider the comparison between the Netherlands where 709 kg is produced per capita and Iran where 96 kg is produced per capita. The global average is 105 kg per capita (Dutch Dairy Board (PZ), Zuivel in Cijfers 2013, 2014).

largely carried out in the more densely populated areas in the north and north-west of the country. As in other countries, the poultry meat sector in Iran increasingly consists, to a lesser or larger extent, of vertically integrated companies, which is a development of the past 40 years (Kamalzadeh et al., 2011). After a number of leaner years between 2008 and 2011, the production of eggs has once again risen. Again, this production is predominantly in the hands of a few large companies (Kamalzadeh et al., 2014).

Markets

Not much is known about food consumption patterns in Iran. The most recent FAO data (from Food Balance Sheets) are from 2011. Considerable amounts of cereals, sugar, vegetable oil, and vegetables are eaten, but not many animal products: only a few kilograms of dairy and meat products are consumed, with the exception of poultry meat, which amounted to over 26 kg per capita in 2011. There also appears to be a growing trend towards the 'westernisation' of consumption patterns, particularly in urban areas.

Since 1979, there has been a rapid growth in Iran's population, with half of the population now younger than 35 years. In addition, roughly two-thirds of the population now live in urban areas. These developments – towards a young, urban population – often signify a change in a country's food consumption pattern to more animal products (meat and dairy) and to packaged, processed, and easy to prepare foods. This calls for greater coordination along the entire production chain and also entails significant logistical efforts from the distribution and food industries to be able to supply the urban population with the products they demand.

For the time being, the domestic market is still dominated by bazaars and small grocery stores (Euromonitor, 2015a). Although supermarket formulas are appearing in urban areas, there are no multinational chains due to the restrictions in relation to foreign investments. A great deal of growth potential is attributed to packaged and processed products. For example, Euromonitor (2015) has noticed an increase in cheese consumption over the past few years and demand is expected to continue rising, as it is for yoghurt and other desserts. It must be noted in relation to this expected growth, however, that the base for this predicted growth is still narrow and also subject to influence from government policy. Take, for example, the liquid milk consumption, which decreased in 2015 due to the abolition of subsidies on milk by the government in 2014.

2.4 Institutional framework

The main policy frameworks for agriculture in Iran are based on the long-term development plan Vision 2025 (of a general economic nature) and the Broad Policies for Agriculture that was adopted in 2005 (GOI et al., 2012). The long-term strategy for economic development is implemented in national development plans, each with a five-year term. Recently, the sixth 5-year development plan was adopted for 2016-2021 (World Bank, 2015b) and includes three main points: a strengthening of the economy, progress in the field of science and technology, and the promotion of culture. To help facilitate economic growth, the government is prioritising the implementation of certain reforms, the most important of which are to increase efficiency in state-owned companies, introduce privatisations in the financial sector (which is dominated by state-owned banks), and make better use of oil revenues. The latter is mainly concerned with the reduction or abolition of subsidies on bread, energy, and water (World Bank, 2015b).[4]

Considerable focus was given to the development of Iran's agricultural sector in its fourth and fifth 5-year plans (covering 2005-2009 with an extension to 2011, and 2011-2016 respectively). In these plans, Iran emphasised its desire to become self-sufficient in essential agricultural products. This was implemented by the policy via measures that include providing input subsidies (soft loans issued by a state-owned bank), and encouraging the use of seeds, mechanisation, and knowledge. Guarantee prices also form part of the policy package; at present, guaranteed prices apply to more than twenty

[4] To compensate for the abolition of consumer subsidies, the government has set up a cash-based safety net system (World Bank, 2014).

crops (including wheat and rice) (World Bank, 2015b). According to the FAO (2014), the price guarantees for wheat have significantly contributed to the rapid growth of wheat production in recent years. The government also supports the sector through its Agricultural Products Insurance Fund (APIF). This fund provides farmers with financial support when harvests are poor due to drought or other weather conditions as well as for other, non-climate related, crises such as diseases in animals. At the moment, this insurance fund can be used for more than 150 different agricultural products (FAO 2014; GOI et al., 2012).

In 1998, Iran drafted a document entitled 'Broad Policies on Water' that provides a policy framework for measures that facilitate more efficient use of water. The fifth 5-year plan (2011-2016) included certain measures to encourage the sustainable use and management of water, such as setting up water users' associations, providing information and training in the use and management of water, and repairing irrigation systems. The purpose was to reduce groundwater extraction by 25% by the end of the plan's term (2016) (GOI, MOJA and FAO, 2012:60). Because the alarm was raised in the spring of 2015 regarding a shortage of water in the short and long terms (Khajehpour, 2015), the estimation by 2015 was that t this goal would not be achieved any time soon.

2.5 Potential

The agricultural potential in Iran is largely determined by its natural conditions – a hot and arid climate and few fertile soils. Arable farming covers an area of 18m ha. According to different sources, this acreage could be supplemented by around 10m (Khajehpour, 2013) to 15m (Badripour, 2006) ha; however, these are lands that are less fertile than the acreage currently used, a proportion of which is already left fallow to prevent further exhaustion (Kamalzadeh et al., 2008). The availability of water is a considerable problem due to the scarcity and irregularity of the rainfall during the course of the year. Experts also point out the inefficient use of water sources, with only 40% of water being used efficiently. In addition, 30% of agricultural products are lost during the production, storage, and transportation process. With the correct application of knowledge and technology, it would be possible to reduce these inefficiencies and make a significant contribution to better realise the potential.

Despite the government's intentions to support agriculture (as set out in the Broad Policies on Agriculture programme described above), Khajehpour (2013) observes that the government policy of 2005-2011 also had numerous adverse effects on production developments in the sector. An overvalued exchange rate that was kept low artificially made it cheaper to import food than produce it locally. In addition, artificial fertilisers and fuel became much more expensive due to the cut in subsidies in 2010 and 2011 (the government was forced to enact budget cuts after economic sanctions against the country were announced). This resulted, according to Khajehpour (2013), in higher costs for these important inputs as well as a deterioration during these years in the economic position of the agricultural sector, which was also due to excessively low minimum guarantee prices. Since 2012, there has been a significant devaluation of the exchange rate, making imports more expensive and reducing competition for the agricultural sector from abroad. Agricultural development benefits from a stable macro-economic climate.

The agricultural sector would benefit greatly from public investments in knowledge and infrastructure and from investments made by public-private partnerships in the production, storage, and distribution of agricultural products. Khajehpour (2013) suggests that the sector has not received sufficient attention from policymakers and implementers in recent years, despite the priorities given to agricultural development in the 5-year plans; in any case, experts conclude that, for a long time now, the government has made far fewer investments in agriculture than are needed to modernise the sector.

2.6 Water (based on Madani, 2014)[5]

Lakes and rivers that are drying up and a falling groundwater table are signs of the unsustainability of Iran's level of water consumption and water policy. Lake Urmia (a large salt lake in the west), Lake Hamun (a disappearing lake in the east), and the Zayandeh-Rud river (which dries up during seasons in the centre of Iran) are all examples of water bodies that are drying out. Dams are being constructed in the rivers on a large scale. As economic development is prioritised above environmental matters, these wetlands receive less water and thereby lose their natural value and ecosystem services, even though wetlands are protected under the 1971 Ramsar Convention. Although Ramsar is situated in Iran, the country does not fulfil the agreements under the convention.

It is not only the surface water but also the groundwater that is becoming depleted. Since energy and water are subsidised for farmers, there is little incentive for them to use these resources more efficiently. Hellegers et al. (2013) show us the major difference between the need for and availability of water in the dry areas of Iran. These differences could be reduced with better irrigation systems and by recycling water. One consequence of the drop in groundwater level is the subsidence of the Tehran plain (the fastest rate of subsidence in the world). The supply of drinking water and the connections to the sewage system are better in Iran than in any other country in the region. During periods of water scarcity, the water supply in urban areas is interrupted for several hours.

According to Madani (2014), the water crisis has three main causes:

- *Population growth*
  More than half the population is younger than 35 years. This is due in part to the baby boom that occurred after the Islamic revolution. Population growth has since fallen to 1.3% per year. Iranians living in urban areas use a relatively large amount of water. Water is transported to areas where many people live, but where there is little water available.
- *Inefficient agriculture*
  Ninety-two per cent of the water is consumed by the agricultural sector. This is partly due to the support given to agriculture by the government in its aim to increase non-oil revenues. Furthermore, the cultivation plan is not compatible with the amount of water available. It is based more on Iran's traditional crops and agricultural practices and the guaranteed prices received for those crops. Madani (2014) suggests increasing the price of water and energy to be more in line with actual costs and encouraging investments in water-saving measures. The government's most recent plans focus on these areas (GOI, MOJA, and FAO, 2012; World Bank, 2015b).
- *Mismanagement and a hunger for development*
  After the Islamic revolution, Iran developed a stronger desire to become independent from other countries and to rely on its own expertise. The problem was made worse by a policy that was not integrated. As a result of the structural reforms of President Ahmedinejad (2005-2013), water management was not organised at river basin level but rather at provincial level. Little attention was given to protecting nature and the environment, with far greater priority given to economic and other development activities.

2.7 General opportunities for the Netherlands

In its *Vision 2025*, the Iranian government expresses its desire to diversify the economy with a view to reducing the country's dependence on the oil industry and oil incomes. Food safety is a top priority (GOI et al., 2012:6) that must be improved by increasing the productivity of the country's agricultural sector. The government's *Broad Policies on Agriculture* document sets out how this should be achieved: by modernising the agricultural sector and by making greater use of new and existing knowledge and technology adapted to local conditions (GOI et al., 2012:49-50). The government wants to invest more in research and information provision, and in more efficient irrigation systems. In addition, it also wishes to alter the distribution of land, water, and other production resources so that they can be used more productively. To achieve this, the government is promoting a process of

[5] Contribution by Stijn Reinhard, Wageningen Economic Research.

privatisation and scale increases and sees an important role for farmers' cooperatives and other forms of professional associations that could stimulate agricultural development.

In this context, there appear to be many opportunities for the Dutch agricultural business community and agricultural knowledge cluster to contribute products and services to assist Iran in its objective to increase production in its agricultural sector, taking into account the difficult natural conditions in which agricultural activity takes place. Opportunities may present themselves in the provision of supplies and services such as breeding material, seeds and seedlings, stable construction, agricultural machinery, knowledge of water consumption and management (water-saving technology), and knowledge transfer (including information provision) in the area of cultivation techniques and business operations. Whilst Iran's import figures clearly indicate potential sales opportunities for products such as meat and animal feed, given its wide assortment of fruit and vegetables, Iran could also act as a sourcing country for products sold elsewhere in the region or in Europe with the help of agrologistical and marketing knowledge from the Netherlands. After all, Iran produces various types of fruit and vegetables that are not available from many other countries. These include pomegranates, raisins, dates, pistachios, and almonds. It would be beneficial for European importers to set up sourcing networks in Iran for these products (Van Rijswick, 2015). However, these exports from Iran would have to meet the EU standards for food safety.

Current trade relations between the Netherlands and Iran are limited when it comes to agriculture and food. In 2014, the total export of agricultural products amounted to €69.2m. For more details, see Figure 2.2.

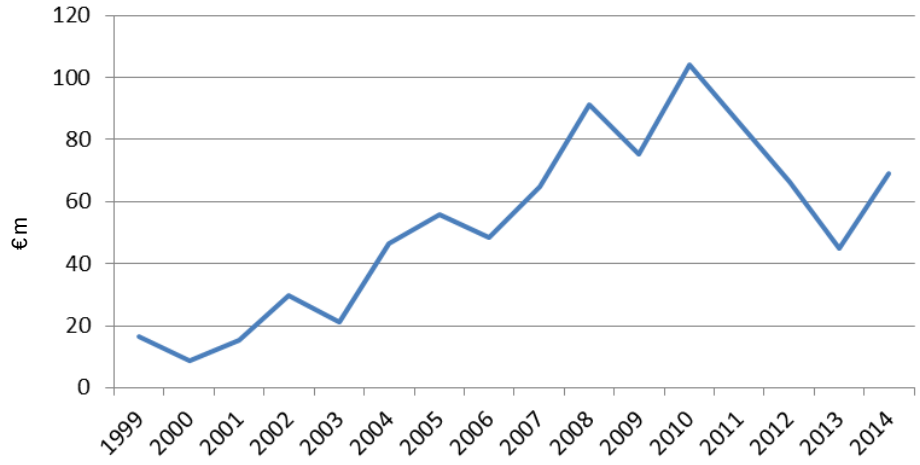

Figure 2.2 *Export of agricultural products from the Netherlands to Iran, in €m/Year*
Source: Eurostat, COMEXT.

The main export products are vegetable seeds (18m) and food additives (12m), with pistachio nuts and (in the fruit category) raisins/currants the main import items. See Table 2.2 for a breakdown of product categories at two-digit level.

Table 2.2 *Dutch exports and imports of agricultural products to and from Iran (2014, € 1,000)*

HS code (two-digit)	Export	Import
01 - Live animals	2,245	
03 - Fish etc.	51	
04 - Dairy produce, birds' eggs, etc.	1,291	
05 - Products of animal origin	84	
06 - Live trees and other plants	5,042	
07 - Edible vegetables and certain roots and tubers	1,308	213
08 - Edible fruit and nuts; peel of citrus fruits or melons	20	14,107
09 - Coffee, tea, mate, and spices	1,027	
10 – Cereals	1	
11 - Products of the milling industry	792	8
12 - Oil seeds and oleaginous fruits	22,498	64
13 – Lacs	1	563
15 - Animal or vegetable fats and oils etc.	167	1
17 - Sugars and sugar confectionery	3,332	29
18 - Cocoa and cocoa preparations	306	
19 - Preparations of cereals, flour, starch, or milk	2,900	82
20 - Preparations of vegetables, fruit, etc.	4,171	752
21 - Miscellaneous edible preparations	12,675	52
22 - Beverages, spirits, and vinegar	1,017	15
23 - Residues and waste from the food industries; prepared animal fodder	5,447	68
24 - Tobacco and manufactured tobacco substitutes		
29 - Organic chemicals		
33 - Essential oils and resinoids; perfumery, cosmetic, or toilet preparations	2,716	32
35 - Albuminous substances, modified starches, glues, enzymes	3,055	
38 - Miscellaneous chemical products	6	
40 - Rubber and articles thereof	21	
41 - Hides and skins (other than fur skins) and leather		
44 - Wood and articles of wood; wood charcoal	2	
51 - Wool, fine and coarse animal hair; yarn and fabrics of horsehair	16	
52 - Cotton		
Total	69,163	17,014

Source: Eurostat, COMEXT, Brussels/Luxembourg.

Over the past fifteen years, there was a continuous increase in agricultural exports to Iran up until 2010. Since then, there has been a decline, with a possible recovery in 2014 (see Figure 2.2). There has, however, been a shift in the composition of the exports. Previously, the main products exported from the Netherlands to Iran were butter (export values of €10-30m per year from 2008 to 2010) and livestock feed (additives) (€20-25m during the same period). Iran is still a net importer of both dairy products and animal feed, as shown in Table 2.1. However, a renewed focus on this market by Dutch exporters and greater awareness by Iranian importers of Dutch and European products may increase the export flows of these product groups once again in the near future.

The brief suggestions mentioned above are based on an analysis of a limited number of background documents written in English. In the short amount of time available for this quick scan, it was difficult to find much recent data and information in English.[6] Nor was there much information to be found in international sources from the FAO and World Bank concerning the agricultural sector in post-2011 Iran. Further study into the opportunities available for the Dutch agricultural sector in Iran (in the form of trade and/or investments) would benefit greatly at present from visits to the location to see

[6] This is also the reason why no attention has been given to the fisheries/aquaculture sector, which, incidentally, is a very small sector in Iran. A report by the FAO (2011) gives some insight into the sector developments, although the most recent information dates from 2009.

first-hand the strengths and weaknesses of the sector in the country and thus to explore what market opportunities there are for the Dutch business community and knowledge cluster.[7]

It should be noted that a good awareness of Iranian and Islamic culture and customs is required, as well as a thorough understanding of the regulations concerning trade and investments. In its annual *Doing Business* report, the World Bank concludes that Iran, ranked 130 among the 189 countries, has a poor business climate (World Bank, 2015c). Import-related procedures take an average of 37 days and require 11 documents to be completed. In addition, the opportunities to export products and services to Iran depend strongly on the development of the oil price. With the sale of oil (and other raw materials), Iran earns hard currency which it can use to purchase the technology and knowledge from elsewhere that it desperately needs to modernise the sector. Therefore, the export and investment opportunities for the Dutch agricultural sector also depend on Iran's economic prosperity.

[7] One concrete example is Wageningen UR's plan to conduct an exploratory study into the possibility of collaborating with Iranian partners (ministries, teaching and research institutions, and businesses) in the area of agricultural development and water management.

3 The Iranian dairy sector

3.1 Dairy market

Cheese

Cheese is expected to continue recording healthy growth as a result of the better availability of different product ranges in both traditional and modern retail outlets. The consumption of packaged cheese is becoming widespread and unpackaged products are becoming less popular, even in rural areas of Iran. More sophisticated products were offered to consumers in 2015, which boosted growth in the category substantially. Previously, only one type of cheese was available in Iran, which was known as UF Iranian cheese, classified as soft cheese as per Euromonitor International's definitions, although innovations by some key manufacturers altered this situation and gave consumers the chance to purchase many other types of cheese such as cream cheese, processed cheese and cheese with added flavours such as walnut. This helped the entire category to record rapid growth towards the end of the review period. Overall, cheese is expected to record current value growth of 24% in 2015, which is set to be better than the 23% current value CAGR (Compound Annual Growth Rate) recorded in the category over the entire review period, demonstrating the steady positive performance of cheese sales.

Kalleh Dairy Co, Pegah Dairy Co and Sahar Dairy Industrials Co remained the strong leaders in cheese in 2015, accounting for 28%, 26% and 10% of value sales respectively. Outright leader Kalleh Dairy Co focuses mainly on more complex products with higher added value. It currently offers five types of cheese including Amol cheese, cream cheese, fresh cheese, pizza cheese and natural cheese. Amol cheese is mainly produced in the Kalleh factory in Amol and consists of attractive products flavoured with walnut and caraway and Lighvan cheese, which proves very popular, especially among younger consumers. Its range of fresh cheese includes cottage cheese, village cheese (mahall) and rio cheese, while its natural cheeses include blue cheese, Butterkäse, Gouda, Parmesan, Prato, camembert, Esrom and halloumi.

The outlook for cheese seems to be promising as per capita consumption of packaged cheese remains very low. The process of converting from unpackaged products to packaged cheese is expected to continue at a rapid rate over the forecast period and many consumers are expected to discover the new types of cheese which are set to be offered by key manufacturers such as Kalleh during the forecast period. Demand for unspreadable processed cheese, especially pizza cheese, is expected to grow at a very fast rate in response to the rapid surge in consumption of fast food through both retail and foodservice channels. Finally, the tiny consumer base for natural cheese such as Gouda and Parmesan is set to result in significant volume growth due to the expected increase in the consumer awareness of these cheeses.

3.1.1 Drinking milk products

Consumption of drinking milk products, especially fresh milk, continued to decline during 2015, a trend which can be considered as a direct consequence of high unit prices and continuous unit price increases. This trend was most obvious in fresh milk as many low-income consumers could not afford to pay for fresh milk anymore. In contrast, shelf stable milk continued to record positive growth because of the lower base from which it is rising and the smaller price gap between fresh milk and shelf stable milk.

The competitive environment for drinking milk in Iran remained consolidated in 2015 as several key manufacturers are able to effectively cover most of the country. However, State-owned Pegah Dairy Co, which has subsidiaries in most of the provinces of Iran was able to remain the category leader, accounting for 25% of value sales. The company is active mainly in fresh milk and benefits from a wide distribution network. A total of 17 companies are responsible for the processing of raw milk and

other dairy products in Iran, while another 27 other companies are responsible for sales and exports. These companies form the largest distribution chain for dairy products in the country.

The future prospects for drinking milk products in Iran seem promising, with the exception of fresh milk. While fresh milk is set to continue declining in volume over the forecast period due to the recent removal of price subsidies, a more stable situation in terms of unit price is likely to result in strong growth in consumption for this category. Non-subsidised milk products such as shelf-stable milk and flavoured milk, each of which is rising from a very low base, are likely to continue growing in volume at a rapid pace over the forecast period. Overall, drinking milk products are expected to increase in value at a CAGR of 2% at constant 2015 prices over the forecast period, which is set to be much a higher rate of growth than the marginally negative value CAGR recorded over the review period in constant 2015 terms. It is important to note that the switch prevailed during special situation of 2012 and 2013 due to the sudden increase in the unit prices of milk, had a very negative impact on growth in the category over the review period, while major improvements in the Iranian economy in terms of declining inflation and positive GDP growth are likely to remain in effect during the forecast period.

3.1.2 Yoghurt and Sour Milk Drinks

The trends which prevailed in yoghurt and sour milk products during 2014 continued into 2015. This category experienced significant volume declines during 2013 and 2014 due to unpredictable unit price increases and although volume sales fell further in 2015, the rate of volume decline was much lower in 2015, which gives an indication that after the category has emerged from the problems caused by the crisis over the previous three years, it is now headed towards some level of stabilisation due to the more stable business environment in Iran. Sour milk products are set to record a 2% decline in retail volume in 2015, while plain yoghurt is expected to record a marginal volume increase. Overall, the 2% decline expected in retail volume sales of yoghurt and sour milk products in 2015 is set to be much worse than the review period CAGR of 1%.

Local manufacturers are the strongest performers in the yoghurt and sour milk products category. This means that each city of Iran has its own local yoghurt producers, which support demand in a limited geographical area, usually in close proximity to their respective factories. However, there are several key suppliers which have nationwide coverage. Kalleh Dairy Co, Pegah Dairy Co, and Choupan Agro Ind PJS, for instance, are the key suppliers of yoghurt in the country with value shares of 30%, 22% and 16% respectively in 2015. The rest of the category is for local manufacturers such as Padratoos Dairy Co, which covers only the northeast of the country. Sales of doogh are also dominated by local manufacturers, with Kalleh Dairy Co accounting for 29% of total sour milk products value sales in 2015, Cheshme Nooshane Khorasan Co accounting for 20%, Pegah Dairy Co accounting for 16% and Choupan Agro Ind PJS accounting for 15%.

Yoghurt and sour milk products are expected to record more dynamic growth during the forecast period. The category's key suppliers are set to do their best to increase the speed of conversion from artisanal products to packaged alternatives. Yoghurt, in particular, is set to benefit from numerous new launches of different additives which is expected to lead to higher consumption among encourage consumers. Doogh is also set to remain a very dynamic category due to its health benefits in comparison with cola carbonates. As a more stable situation is expected in terms of price, both yoghurt and sour milk products are expected to gradually return to stability, with positive volume growth rates expected during the forecast period. Overall, yoghurt and sour milk products are set to increase in value at a CAGR of 4% in constant 2015 terms over the forecast period, which is set to be a higher rate of growth than the -2% value CAGR recorded in constant 2015 terms over the review period.

3.1.3 Other Dairy

Cream, chilled and shelf-stable desserts and coffee whiteners were the only other dairy categories present in Iran during 2015. Currently, cream has a very low sales base in the country, which is the result of the range of limited products and weak distribution. However, in 2014 and 2015, major changes happened in this category. Several key manufacturers including Mihan, Kalleh and Ramak

started to engage in broader distribution of this product. They also introduced mixtures such as cream and honey, which have proved very successful in Iran and this also boosted per capita consumption. One factor which is hampering growth in cream, however, has been the popularity of the unpackaged products which are offered in the dairy specialist retailers outlets known as labaniati in Farsi.

Kalleh Dairy Co maintained its leadership of other dairy in 2015 with a 33% retail value share. Overall, the company is one of the leaders in dairy in Iran overall as it has a strong distribution chain for dairy products across the country, which means that its products are available to consumers throughout the country. Its strong position in other dairy was won through the company's leading cream product, which is a simple 30% shelf stable cream available in the majority of grocery retailers outlets throughout the country.

The low sales base from which cream in Iran is rising is set to be the main driver of impressive growth in the category over the forecast period. Iranian consumers are expected to discover cream as a good choice for breakfast and also when preparing meals. The process of conversion from unpackaged cream to packaged products is also set to accelerate over the forecast period, thus boosting sales in the category.

3.2 Structure of the dairy sector

Two organisations in Iran provide information on the agricultural sector: Statistical Center of Iran (SCI) and Ministry of Agriculture. SCI publishes reports based on census data at normal intervals of every four years. Moreover, one specific report is published for modern cattle farms for researchers and stakeholders by SCI almost every year. The following information has been provided by SCI in 2012-2013.[8]

Definitions

Modern cattle farm
An agricultural production unit where cattle are raised according to modern procedures and methods with respect to the characteristics of the place, rearing, feeding, and health. The capacity of these farms is more than 20 heads. These can be farms with dairy cows or fattening cattle.

Modern dairy cow farm
A modern cattle production unit that produces milk. Calves are also fattened in these farms.

Dairy farm capacity
The potential number of cattle and calves in a unit which can be less or more than the actual capacity.

Most of the farms are privately owned. The farms are often organised into voluntary regional co-operatives. Some farms belong to holding groups such as Bonyad, Tamin, Astan Qods or Emdad. Holding groups are state-controlled companies.

[8] The report for 2011-2012 is available at https://www.amar.org.ir/english/Statistics-by-Topic/Agriculture#113281-releases (in English).

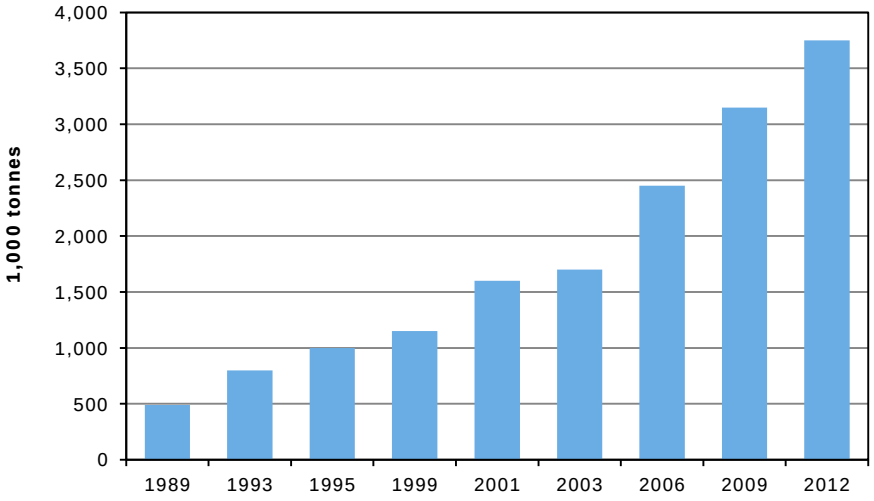

Figure 3.1 *Overall milk production in Iran, 1989-2012 (1,000 tonnes)*

3.2.1 Dairy farm structure in main dairy regions

It is quite difficult to find recent and reliable data on the Iranian dairy sector. Several sources are available from 2006 or earlier, some of which are listed in the appendices. The data in this chapter were partly collected during the field trip in September 2016.

The key dairy regions of Iran are the following regions (Figure 3.2):

1. Provinces of East and West Azerbaijan and Ardebil (Northwest)
2. Guilan and Mazandaran (Southern coast of the Caspian sea)
3. Tehran, Qazvin, Alborz
4. Northern part of Khorasan province (Northeast)
5. Isfahan, Fars and Kerman (Centre of Iran)

Figure 3.2 *Major dairy regions in Iran*

The following tables contain information from these dairy regions. For a full overview of all the Iranian regions can be found in the appendices (ref: Report for 2011-2012 is available at https://www.amar.org.ir/english/Statistics-by-Topic/Agriculture#113281-releases (In English).

Table 3.1 *No. of cattle farms based on capacity in 2012-2013*

Province	Sum (heads)	≤ 20	21-50	51-100	101-150	151-200	201-300	≥301
Total	**25,353**	**1750**	**8754**	**8,007**	**2,480**	**1,938**	**1,128**	**1,296**
East Azarbaijan	**696**	13	175	261	88	86	46	27
West Azarbaijan	**583**	15	136	265	72	61	19	15
Ardabil	**307**	1	34	129	41	77	19	6
Isfahan	**2,594**	232	973	739	189	172	120	169
Alburz	**613**	73	212	123	47	47	38	73
Teheran	**3,606**	54	764	1,170	476	430	285	427
North Khorasan	**224**	8	102	73	23	7	6	5
Fars	**1,927**	47	524	733	250	197	105	71
Qazvin	**556**	3	79	189	69	79	64	73
Kerman	**870**	37	373	268	70	51	35	36
Gilan	**180**	12	80	62	8	9	4	5
Nmazandaran	**373**	14	164	124	24	21	12	14

Within the Iranian dairy regions Teheran, Isfahan and Fars are the leading regions, with a clear concentration of larger scale farms in Teheran.

Table 3.2 *No. of dairy farms based on capacity in 2012-2013*

Province	Sum (heads)	≤ 20	21-50	51-100	101-150	151-200	201-300	≥301
Total	**16,295**	**1,426**	**5,943**	**4,845**	**1,434**	**1,071**	**648**	**928**
East Azarbaijan	**489**	11	133	179	55	58	32	21
West Azarbaijan	**397**	14	102	185	43	34	9	10
Ardabil	**97**	1	22	38	14	15	4	3
Isfahan	**2,299**	204	828	660	175	158	114	160
Alburz	**559**	69	195	112	35	42	35	71
Teheran	**1,288**	14	262	385	156	146	93	232
North Khorasan	**164**	7	70	57	15	6	5	4
Fars	**1,385**	34	389	516	176	136	76	58
Qazvin	**354**	1	43	100	49	50	48	63
Kerman	**683**	29	294	206	58	34	32	30
Gilan	**129**	10	59	39	7	7	3	4
Nmazandaran	**314**	14	145	101	22	14	7	11

Table 3.3 *Active dairy farms and number of cows by capacity, 2012-2013*

Province	Sum (heads)		≤ 20		21-50		51-100		101-150		151-200		201-300		≥301	
	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of cows	No. of cattle	No. of cow	No. of cattle
Total	**12334**	**1,022,223**	**922**	**42,899**	**4,235**	**134,744**	**3,732**	**168,284**	**1217**	**103,561**	**865**	**62,295**	**546**	**78,608**	**817**	**431,832**
East Azarbaijan	**366**	**28,487**	7	1,038	95	4,395	128	5,784	43	4,632	51	2,109	24	1,916	18	8,613
West Azarbaijan	**287**	**13,946**	8	978	69	3,528	134	4,951	34	1,500	26	943	6	488	10	1,558
Ardabil	**66**	**16,990**	0	136	15	1,079	26	1,007	13	368	7	162	3	210	2	1,4028
Isfahan	**1,923**	**185,843**	152	6,590	654	20,107	567	26,472	157	14,978	144	13,416	103	12,816	146	91,464
Alburz	**305**	**57,241**	13	426	71	2,505	70	4,448	26	3,775	30	3,220	29	4,757	66	38,110
Teheran	**926**	**168,774**	9	1,972	156	8,345	261	12,900	117	12,916	109	8,934	74	13,224	200	110,483
North Khorasan	**97**	**5,501**	2	376	32	1,412	40	1,418	12	500	5	368	3	286	3	1,141
Fars	**1,004**	**78,311**	21	2,199	237	11,201	377	22,172	148	13,135	106	6,872	65	9,472	50	13,260
Qazvin	**317**	**58,263**	0	370	36	2,752	91	5,369	44	4,624	43	2,484	43	5,916	60	36,748
Kerman	**510**	**34,272**	14	2,178	199	5,971	167	6,325	49	3,400	26	1,976	27	3,474	28	10,948
Gilan	**76**	**3,299**	1	355	33	905	28	821	7	130	3	200	1	480	3	408
Nmazandaran	**256**	**19,892**	8	730	113	3,921	85	4,080	21	1,698	12	916	6	564	11	7,983

Table 3.3 shows that about 40% of the cows in all of Iran are kept at larger scale farms with an average of over 800 cows per farm.

Table 3.4 *Milk, beef and calf yield and value in 2012-2013*

Province	Milk yield (100 tonnes)	Calf and beef (head)
Total	**3,7930**	**507,466**
East Azarbaijan	980	9,884
West Azarbaijan	346	5,208
Ardabil	536	5,388
Isfahan	6,911	47,684
Alburz	2,415	9,663
Teheran	6,894	148,040
North Khorasan	178	2,893
Fars	3,479	31,109
Qazvin	2,324	13,155
Kerman	995	10,888
Gilan	109	1,170
Nmazandaran	600	4,715

Table 3.4 shows again that especially Isfahan and Teheran are the key dairy regions, each producing about 18% of the total national production

3.2.2 Livestock population, breeding and milk recording[9]

The total dairy cattle population consists of about 8.4m animals. A small part is buffalo's (3%), 12% are pure breeds, 51% cross breeds and the remaining one-third (34%) are indigenous cows with on average a low milk yield per animal.

The total animal production in milk has increased from 7bn kg of milk in 2008 to 8.8 in 2014 (Figure 3.3)

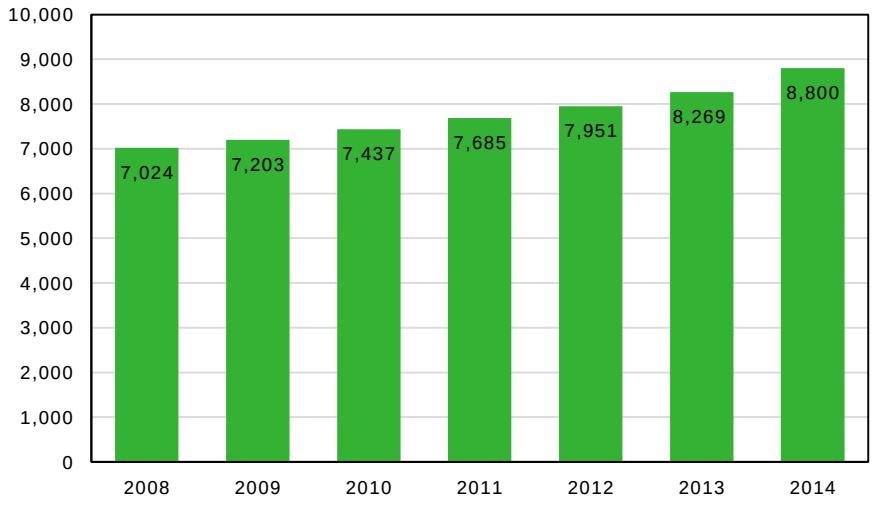

Figure 3.3 *Development of total milk production in Iran (x 1,000 tonnes)*

Data from the Ministry of Agricultural shows that about 3% of total dairy herd consists of buffalo's, 12% pure breeds, 51% cross breeds and 34% indigenous cows. Milk performance recording is mostly implemented at pure breed and cross breed farms (>90%).

[9] Based on presentation during field trip by Mr. Mohamadreza Mansourian, Ministry of Agriculture, Animal Breeding Center.

In total 1,284 herds participate in milk recording; the average herd size of the participating farms is 226 cows. The average milk yield per cow per lactation is 10,100 kg of milk with 3.23% fat and 3.11% of protein. The average length of lactation is 327 days, which results in an average milk yield of 34 kg/day. The average cell count 321,000. The average culling age is 5.7 years.

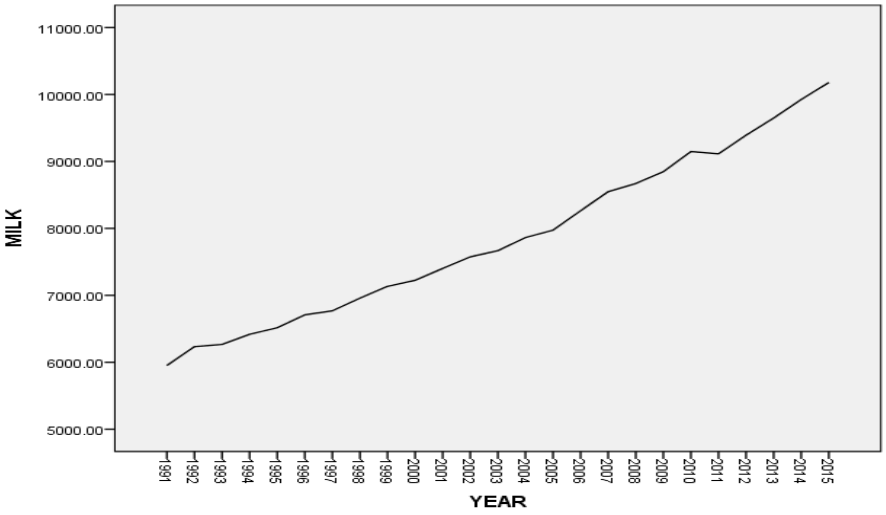

Figure 3.4 *Development of average milk production in kg of milk per cow per lactation of herds in milk recording, 1991-2015*

4 Field trip findings 2016

4.1 Introduction

From 24 to 29 September 2016, a field trip was made by the participants (Appendix 8) of the SMP project to Iran. The goal of the field trip was to meet the key stakeholders of the Iranian dairy sector to assess the weak and strong points and to identify opportunities for co-operation with Dutch and Iranian partners for the long term.

Box 4.1 Field trip programme

Day	Organisation / theme
1.	Iran Central Dairy Farmers Union (umbrella organisation of cooperatives)
2.	Livestock Production Division of Ministry of Agriculture
3.	Embassy of the Netherlands
4.	Three visits to large farms in Teheran province
5.	Three visits to dairy processors in Teheran province
6.	Iran Federation of Farmers Association
7.	Iran Feed Industry Association

In this report the reports of the individual visits and meetings have been translated to more generic findings and conclusions.

4.2 Sector challenge: export of dairy products

Iran has a self-sufficiency in milk of about 100% and this is why the government and the dairy sector are aiming at exporting milk to other countries. In the near future they hope to export 1m tonnes. Finding markets for export is a big challenge for the government. A good condition for export over large distances would be dairy products with internationally recognised brand names. These brand names will have to be developed. Some countries in the region prefer to import products from Iran: Iraq, Afghanistan, the Gulf region and Shi'ite areas in the Middle East. Most of the Arab countries have difficulties producing milk because of lack of water and a climate that is too hot for the cows. There is more potential to export to regions such as Syria, Pakistan and Russia. Russia is showing great interest in importing dairy products from Iran. The dairy sector in the country is in the process of receiving approval for the export of dairy products, carried out by Russian regulatory authorities. The ban on dairy products from Europe and the US and the positive development in the relationship between Iran and Russia offer real opportunities. Processors and farmers are preparing for it by implementing internationally recognised quality standards.

One of the challenges for export is infant nutrition. It is already produced in Iran under licence of Danone and Nestlé. The desire is to also produce it under an Iranian brand name.

Iran is still a young player in dairy exports but has already reached an annual export level of 600,000 tonnes of dairy products. The country aims to be a regional key player in dairy exports. This requires top quality milk and techniques. The Netherlands have the experience to produce high quality products and already export those all over the world. This makes collaboration with the Dutch dairy sector very attractive. Iranian dairy sector representatives have mentioned the next challenges to collaborate with the dairy sector in the Netherlands:

- Sharing experiences with international trade and export regulation
- Importing of feed additives, veterinary medicines and vaccines

- Collaboration with production under licence (now already with Trouw Nutrition)
- Possibilities to import feed (10m tonnes of feed are imported annually)
- Exchange of students both on vocational as well as academic level (with Wageningen e.g.)
- Collaboration with Faculty of Veterinary Medicine, especially in the field of practical training for veterinarians
- Seminars of Dutch experts (among others train-the-trainer trainings)
- Supply of machinery
- Technology on biogas.

Currently knowledge and inputs for the dairy sector come mainly from the US. It is time to broaden the international collaboration.

4.3 Stakeholders

4.3.1 Central Union of Iranian Dairy Farmers

The Central Union has 630 cooperatives as members. These cooperatives together have 2m members. All the cooperatives have their own boards. They are represented in the board of the Union by the boards on (regional) State level. All board members are active farmers.

The Central Union has these services to its members:

1. Services to dairy farmers
    a. Financial services
       This includes communication about subsidised loans of the government, support in negotiations with banks about financial problems on farms aiming at changing the conditions of financing and negotiations with banks about financing in general.
       The union also negotiates with government about tax rates: almost zero % in dairy and agriculture in general. The union organises insurances for farmers (risks of vaccination, diseases and weather).
    b. Veterinary services. Farmers do not pay for the labour part of services, but do pay for vaccines, drugs, etc.
    c. AI-services. Semen has to be paid, but inseminations are for free.
2. Collection and distribution of products for export

All the services under 1 are for free. They are financed with the margins earned with the trade activities mentioned under 2.

The Union has good relations with the Ministry of Agriculture and with the Ministry of Industry. The chairman has a very good relationship with the minister and deputy minster. The Union is also negotiation partner with the Ministry of Agriculture about milk prices. The Union is a member of the agricultural committee in the parliament. The Ministry of Agriculture does not participate in the board of the Union.

4.3.2 Iran Federation of Farmers Associations

The purpose of the federation is not commercial business, but to be the voice of the member farmers to the minister, negotiating and setting prices for milk and meat. Twenty-two per cent of all animals and 55% of all milk of industrial (large) farms are produced by its members. Milk of this group is of top quality, 10% of it is exported. After the sanctions were lifted, many activities took place. Iran sees additional opportunities for business, education and practical training. This could help them in the long run for better quality and quantity. The main goal to improve quality is to be ready for export. In this field the Dutch partners could help. Nestlé and Danone take all their milk from members of this group. Better quality leads to a better price, e.g. Nestlé already exports an infant formula milk product to the value of €26m. The group is willing to act as a group who is interested in exploring new markets, develop education and to create win-win with new business partners.

There is a legal body for business purposes: the members have also formed a company for potential commercial activities such as feed mill, milk processing and Artificial Insemination stations. The charter is there, but still very young; there are no real activities yet. One of these potential companies could be a partner for a Dutch group or one of the companies within the group.

The members are in general farmers with large-scale farms producing between 7 and 120 tonnes of milk per day, with up to 3,000 cows on one location. Each farmer supplies different processors. Some farmers have their own processing or have done first investments in it or are considering it. Some farmers have up to 3 farms. One was considering to start with goats and one member was representing a cooperative with 51 members, some with own processing and with a permission to import semen.

The association covers different provinces; four provinces deliver board members of the federation. Within the association it is one man one vote, farm size does not matter. Each member pays a fee per kg of milk. The legal body that operates next to the association for commercial activities is organised differently. Members have to buy shares; the number of shares determines the voting rights.

What are the benefits of the association for the members? In the past the unions were very strong and they passed on the subsidies. Since the subsidies are gone, unions are not important anymore. So there was a need for a new organisation with a strong voice. This association has the ambition to play this role. The chairman goes to parliament, is spokesman on television etc. Some of the key issues of the association are: negotiating on import quota or tariffs (e.g. on meat) and developing the dairy policy of the government (very influential).

According to the federation, now is the time to set up cooperation. Though the current president of Iran Rohani and the minister of Agriculture Dr. Rokni have created a good business climate, it is uncertain what will happen after the next elections.

4.3.3 Iran Feed Industry Association

The association represents the feed industry. In total there are 644 factories in Iran, with a capacity of 21m tonnes, 8m tonnes for poultry, 10.5m tonnes for large animals, 0.3m tonnes for fish and 0.250m tonnes for pets and horses. The goal of the association is to increase the role of the feed industry in Iran. Since Mr. Ghadire is head of the association the production of its members has increased from 5 to 8m tonnes. 0.3m tonnes is exported to Iraq and Afghanistan. The goal is to increase this to 1m tonnes. There are 21 state-of-the-art factories that are capable to export. Important is to look for a good supplier. A lot of actions have been taken in the last couple of years, lots of foreign visitors and lots of foreign trips made by the members.

The association has made a deliberate choice to be part of the chamber of commerce. With the help of a committee from the members rules have been set for the feed industry. Within the association it is one man one vote. Production varies from 230,000 tonnes up to 1m tonnes per company. The association tries to get rid of the bad guys. Rules have been set in place 2 years ago but were not enforced. But this will start. The Iran Feed, Drug & Additive joint-stock company, is a private company of the association.

This organisation was established for the business side. There are 143 companies part of this group. The organisation imports 950,000 tonnes of grains and 30.000 tonnes of feed additives. Supplies others with raw materials and feed. Members have to buy shares to take part in the activities.

The big challenge is to increase to export. The traditional way of thinking of dairy farmers and of government has to change. The market is not only 80m people in Iran but also 400m people in the region. The association organises seminars, visitors who come to Iran (32) and trips abroad (27). The industry has grown in quantity, but should now grow in quality as well. Key issue now is to grow in know-how.

According to the association one of the key factors is practical training: most students lack practical experience. Training is considered to be very important. Well educated specialists/advisors can influence farmers. There is a need to educate farmers and take them abroad. The organisation would like to continue trainings, such as the ones organised by PTC[10]+ in the past.

Another key factor is related to the dairy farmers and quality of feed. Many farms are high in feed losses on the farm; this increases cost price. The raw materials are good so most feed producers make good feed. Dairy farmers are not well informed about the real quality. Many of them distrust the quality, also due to lack of transparency from the side of the feed producers. In the past there were subsidies for import of soy and farmers wanted their share of the subsidies so they make feed themselves. Sixty per cent of the feed is produced on the farm. The association is convinced that feed companies can do this better and cheaper.

Feed quality is strictly controlled by Iranian Veterinarian Organisation (IVO). A feed nutritionist has to be present at the factory. Random checks are done by IVO. Heavy fines if producers do not comply. Recently an MoU was signed between association and IVO. One of the problems is that there are no special feed trucks (feed trucks may be used also for steel or manure!). This needs to change, but will take some time.

The government is responsible for subsidies. This gives special side effects: there is a subsidy for gas and energy for agriculture, so poultry farm is build next to another industry so they can also use cheap energy. There is also a lot of hidden subsidy e.g. tariffs for imported poultry meat or milk replacer. This is not good and this will change. The dairy farmers association only asks for subsidies, the Feed Association wants no subsidies, but discount on taxes and lower insurance rates (50% discount). The association is persuading government to invest more money in cheaper loans for agriculture.

The cost price of milk is directly related to feed costs. Seventy per cent of costs are from feed, there is a lot of waste. Imported feed is better, but the farmers don't see this. The level of labour on farms is of low quality. There will be a shake out of the smaller farms.

The association expects there will be far less feed companies in the near future. There is no need for 644 factories. Many will be out of business within the next 5 years. General problem is that there are no correct statistics available. The chair of the association is convinced the sector can export without subsidies. 'Economy should be in charge of politics and not the other way around'. The policy is Iran should make more money from above the ground instead of under the ground (oil).

The Netherlands has the right knowledge and technology available and would be a good partner to cooperate with. It is important to pick the right Iranian partner; the Feed Association can help with that.

4.3.4 Large dairy farms

There are two types of large dairy farms in Iran:

- Private owned farms
  During the trip to Iran the participants of the mission have only visited three large private farms differing in size between 2,000 and 11,000 head of cattle (including young stock). All farms were strongly specialised in dairy production. The basic principles of management, housing, feeding and breeding are based on large scale farms in the USA.
- State owned farms or holdings
  The state owned farms operate in the legal form of a foundation. The foundation can be a large company with many branches among which dairy production.

[10] PTC+ is a Dutch Expertise Centre for the development of businesses and individual professionals in animal production (http://www.ptcplus.com/en.aspx). Since 2013 the trainings on dairy production and milk processing are now hosted by the DTC (Dairy Training Centre, http://www.dairytrainingcentre.com/en/dairy-training-centre).

Quality of forage and staff are considered to be the most important challenges of these type of farms. See also paragraph about fodder production and water supply for more technical aspects of dairy farms in Iran.

4.3.5 Consultants

Large farms use different types of consultants:

- Breeding advice is given by breeding consultant. The breeding consultants work in the morning for the Breeding Center of the Government and in the afternoon they have their own private consultant role as breeding advisor to farmers.
- Nutritionist makes rations.
- Economic consultant discusses the financial results with management team of the farms based on latest reports with data about farm performances.

4.4 Milk quality

In the last 10 years the Iranian milk quality has improved. Many of the large farms now produce high quality milk comparable with EU quality levels. The quality systems are established by the Unions and the Ministry of Agriculture. Controlling bodies are the Ministry of Agriculture and the Ministry of Health. Milk quality checks by processors include total bacteria count, somatic cell count, toxines, heavy metals, Johne's disease, Quality Assurance (QA) and Quality Control (QC) for feed and aflatoxin test in feed and milk. There are standards for consumers which are controlled by the Ministry of Health with mandatory rules. Private companies can comply with Eurep GAP and have to take their own responsibility when opting for higher quality standards. In general milk quality is considered as low. There is a general need to improve it. Some processors start paying for fat, protein and lactose content of the milk. The payment system is evolving to compound pricing.

Aspects of the milk quality issue

- Standard practice for many processors is monthly checking of the bulk tank for: fat and protein content, Somatic Cell Count (SCC), Total Bacteria Count (TBC), Preliminray Incubation Count (PIC) and Aflatoxins. Antibiotics and water in milk are daily measured.
- In the present quality based payment system in Iran, a few things are missing:
  a. No reference lab
  b. No external assessment
- Some large farms are below 100 for SCC.
- The desire is to implement EU-standards in Iran.
- Russia is now performing audits prior to approval for importing milk from Iran. They have also inspections on farms (a.o. animal health and animal welfare audits) and in processing plants. At the end there may be a risk that Iranian milk is too expensive for Russia because of (1) its high cost price and (2) the high price on the domestic market.
- Quality checks on consumer level
  These quality checks are performed by the Ministry of Health. This ministry has agents in the processing companies. Consumer behaviour in the field of dairy should be understood from the historical development. In the past (80-100 years ago) dairy consumption was very low. 50 years ago the milk production was increased by starting large farms with (Holstein-)Friesian cows. Now the average consumption of dairy products equals about 100 kg of milk equivalents per capita. Sometimes there are doubts about the quality, because e.g. promotion against milk fat, 'no cream on top like we had in the past' or doubts about adding palm oil to replace butter fat in milk.
- Two different procedures on testing of milk quality from Iranian Veterinary Organisations (IVO, operating on farm level) and Ministry of Health (at consumer level).
- There is a lack of trust in the quality of milk throughout the chain. The same is true for the quality of feed for cows. The trust seems to be improved since the establishment of the Iran Federation of Farmers Associations.
- There is room on the market for more high quality dairy products
- What Iran can learn from the Netherlands:
  a. Payment system based on quality

b. Independent quality testing laboratory
c. Efficient feed production

The Ministry of Health organises more and more serious checks to better secure the quality of the milk processed by all processors. This helps to improve milk quality and removes bad performers from the market.

4.5 Collaboration farmers and processors

Total national milk production is 9m tonnes, of which 6m tonnes is processed by 400 processing plants. 10 processors control 80 to 90% of the market. Amongst these 10 are: Pegah (2,500 tonnes/day), Kalleh (2,000 tonnes/day), Mihan (1,000 tonnes/day), Sabath cheese (1,000 tonnes/day) and Damdaran (700 tonnes/day). Most of the farmers visited are not satisfied about their relationship with processors. The main complaints about processors are about:

- Milk price: processors adjust their criteria for payment throughout the year. Although there is a general agreement between government, farmers and processors about the raw milk price, the processors can go around this by using many own standards. The price also fluctuates with the fluctuations in production (seasonality).The present milk market is a buyer market: processors are stronger than farmers.
- Lack of trust in the results of milk testing by the processor: this is why some large farmers make their own laboratory analyses once a weak. To create more trust the quality checks should be outsourced to an independent laboratory.
- Milk contracts: most companies have one year contracts, but also often negotiations by phone.
- Payment terms: some companies pay only after 80-100 days, others use a waiting period of 65 days
- Lack of incentives to improve quality: the incentives to pay extra for higher quality milk are considered as to weak. The (large) farmers would love to have clearer standards for milk quality including a quality based payment system. This is also seen as a pre-condition to increase export (goal of government and farmers).

Relations between farmers and processors can be improved by better agreements between the parties. The poor relationship has also created the opportunity to set criteria for a payment system and a certification system for high quality milk e.g. for export. One of the solutions mentioned in the discussion to avoid the complaints above is to start farmer owned cooperatives with trustworthy quality and payment systems. But during discussions with farmers they argue that Iranian farmers are no good team players, they do not know how to organise their own processing, margins of production of fresh products are low and the competition with international multinationals will become tough in the future.

Some farmers have emphasised they would like to make fair collective contracts with milk processors and also with feed suppliers.

Factors that determine the choice for a processor by farmers:

- Distance to processing plant
- The amount of milk needed by the processor
- Payment terms
- Trust in the processor concerning continuous purchase (also in holidays or poor dairy product sales periods) and the quality of the lab testing.

The transportation of milk is largely done by farmers. This creates problems with not completely sanitised bulk tanks, differing temperatures at delivery and connections with pipelines that don't fit very well. The focus on supervision of transport is low. There is no standard policy with regard to transport. Milk is selected from farms and brought to a collection centre and from there to the factory. There is no standard policy (enforced) for the sampling of the milk. The solution could be the use of more automated quality check system. For many processors it is too complicated to organise this for all their suppliers.

4.6 Cost price of milk

Farmers and experts met in Iran mentioned a wide range of values for cost price. The lowest value was €0.28, this number was mentioned by the largest farmer visited. The highest value was reported by the Central Union of Iranian Dairy Farmers at the level of €0.37. The present (September 2016) milk price was €0.30.

The breakdown of the cost prices shows these shares of costs:

- 70% feed
- 10% labour (costs about €0.50 per hour)
- 5% water, energy and telecom
- 4% medicines, disinfectants, detergents
- 2% genetics
- Rest: depreciation and interest
  Interest rates are high: 18% for agricultural loans

Attempts to lower the cost price are mainly focussed on the feed costs, since these are the major costs. An important best practice in this field is the improvement of the quality of the own forage grown on the home farm. On average the kg of concentrates per cow in Iran is higher than in the EU, mainly because of the poorer quality of the roughage fed. The official farm gate milk price is determined by the government in collaboration with the dairy farmers' organisations. This official price is based on the production cost and a margin.

At the time of visit (September 2016) the milk prices on the world market were lower than those in Iran. This means that Iran should lower its cost price to be an international competitive trading partner. To bridge the gap between the domestic and the world market the government has approved a subsidy on export of milk of 6.5 $ cents per kg of milk.

4.7 Forage production and water

Well managed fields in the area of Teheran can be very productive. We visited two farms where 3 crops per year were harvested: twice about 20 tonnes of dry matter corn (used as corn silage) and once 6 tonnes of dry matter barley (used as whole plant silage). Alfalfa is harvested in 8 cuts per year to make alfalfa hay. One innovative farmer is exploring to make silage out of alfalfa. He managed to enhance the protein content of the end product: 20% crude protein instead of 15% for hay. This farmer is also going to start a trial to plant corn in greenhouses first and then after germinating replanting it in the field. This will create the opportunity to let the barley crop mature further and will increase dry matter yield per ha of barley with about 2 tonnes. The farmer did also many experiments with reducing the use of water per ha by installing alternative dripping irrigation systems and sowing corn zig zag with distance between rows of 1.30m, to catch more sunlight.

Water is a critical factor in the Iranian feed production. Iran is aiming to be more efficient with water and produce better quality of feed. Water is scarce now already and climate change will lead to less rainfall. In the past the farmers used water from canals to irrigate with flood irrigation. The water was not used very efficiently. Now they use wells to pump water to the surface to be used for irrigation. It leads to ground subsidence in the region of Teheran. Some of the wells used are illegal. Experts and farmers mentioned that new irrigation techniques will strongly improve the kg growth (in dry matter) per kg of water. It used to be 1.3 with classical irrigation, now it is 5.5 with new generation dripping irrigation systems.

According to experts there is no need to import feed; Iran can produce enough for the domestic need. Iran is supposed to have a production capacity for feed of 18m tonnes. Only 30% of this capacity is used right now. The important factor is to improve crop management and water use. Later harvest of corn should result in higher dry matter yields and adjusted practices in growing and harvesting alfalfa

should raise the protein content of this crop. Part of the roughage is imported from countries such as Georgia and Spain.

4.8 Training/HRM

The farmers consider quality of workers as key and would like to invest more money on improving skills. They would like to improve the training facilities in Iran and see the Dutch training organisations (PTC+ and DTC) as a shining example. Only with this better skilled staff, the farms will be able to achieve higher targets for e.g. feed efficiency, quality of feed and young stock. It needs a lot more attention for farm management details that are all fine-tuned towards optimal results.

4.9 Identified key topics and next steps in collaboration

Based on the analyse of available data and on the field trip to Iran 4 topics have been identified by the participating partners in the project where a Dutch Iranian cooperation could strengthen the Iranian dairy chain.

1. Quality assurance, quality standards and milk payment systems
   There is a lack of trust within the Iranian dairy chain. Also a further improvement of the milk quality is needed related to the ambition of Iran to export. Dutch experience and technology about how to organise (governance) and implement (e.g in milk payment systems) with all relevant stakeholders to achieve a higher quality of consumer products can contribute to solve this issue.
2. Feed availability and quality
   The lack of trust also applies to the feed part of the dairy chain. Chain efficiency can be improved considerable if this were to be improved. Dutch experience and technology about how to organise and implement independent assessment of feed quality and building trust in the chain can help to make the Iranian chain more transparent and efficient.
3. Water efficiency and feed production
   Iran has to be more efficient in its feed production especially related to the use of water. Dutch international experience in crop production and water efficiency on farm level and knowledge on policy development on regional and national level can be used to contribute to this issue.
4. Education: both on operational level and on economics
   All Iranian farmers mentioned the need for operational trainings of their employees. Several had done training in the Netherlands in the past. The changing circumstances in Iran require more skills and insights related to strategic and economic decisions.

These key topics have been shared with a number of possible Iranian partners and with a broader group of Dutch companies that would fit within this cooperation. The next intended step is to invite the Iranian partners to the Netherlands to further explore the possibilities of a Dutch Iranian cooperation.

References and websites

Badripour, H. (2006). Country Pasture/Forage Resource Profiles, Iran. FAO, Rome

Euromonitor (2015). Dairy in Iran. Executive summary. http://www.euromonitor.com/dairy-in-iran/report

FAO (2014). Country fact sheet on food and agricultural policy trends, September 2014. FAO FAPDA

FAO (2015). State of Food of Agriculture 2015. FAO, Rome.

GOI, MOJA and FAO (Government of Islamic Republic of Iran (GOI), Ministry of Jihad-e-Agriculture (MOJA), and Food and Agriculture Organization (FAO) of the United Nations) (2012). Country Programming Framework (CPF) 2012-2016) for Iran's agricultural sector.

Good Food Markets: http://www.fao.org/3/a-I4581E.pdf

Hellegers, P., W. Immerzeel, and P. Droogers. (2013). 'Economic concepts to address future water supply–demand imbalances in Iran, Morocco and Saudi Arabia.' Journal of Hydrology 502: 62-67.

IMF (2015): IMF World Economic Outlook, April 2015

Iran GPD: http://www.tradingeconomics.com/iran/gdp

Iran GPD from agriculture: http://www.tradingeconomics.com/iran/gdp-from-agriculture

Kamalzadeh, A., A.M. Rajabbaigy en A. Kiasat (2008). Livestock production systems and trends in livestock industry in Iran. *Journal.of Agriculture & Social Sciences*, 04: 183–88.

Kamalzadeh, A., M. Rajabbaigy, H. Moslehi en R. Torkashvand (2014). Poultry in Iran. http://www.itpnews.com/en/statistics/poultry-production-in-iran. 7

Khajehpour, B. (2013). Iran's Need for Agricultural Reform, 9 juli, 2013, www.al-monitor.com

Khajehpour, B. (2015). Iran;s water crisis reaches critical levels. 1 mei, 2015. www.almonitor.com

Madani, K. Water management in Iran: what is causing the looming crisis. Journal Environmental Studies and Science 4:315-328

Rajabbaigy, M. en A. Kamalzadeh (2011). The scope of the livestock production in developing countries: a case study of Iran. International Business: Research, teaching and practice. 2011, 5(1).

Van Rijswick, C. (2015). Impacts of lifting Iran's trade sanctions on UK frut and vegetables markets. Rabobank. Presentatiesheets 14 juli.

Wereldbank (2015a). World Development Indicators. http://data.worldbank.org/

Wereldbank (2015b). Iran, overview. Wereldbank. http://www.worldbank.org/en/country/iran/overview

Wereldbank (2015c). Ease of Doing Business 2015. Wereldbank, Washington.

Appendix 1 Population of Iran

Population of Iran (2016 and historical)

Year	Population	Yearly % Change	Yearly Change	Migrants (net)	Median Age	Fertility Rate	Density (P/Km²)	Urban Pop %	Urban Population	Country's Share of World Pop	World Population	Iran Global Rank
2016	**80,043,146**	1.18 %	933,874	-28,787	30.1	1.72	49	74.3 %	59,443,534	1.08 %	7,432,663,275	17
2015	**79,109,272**	1.27 %	971,180	-60,000	30	1.75	49	73.7 %	58,315,802	1.14 %	7,349,472,099	17
2010	**74,253,373**	1.15 %	826,252	-109,900	27	1.79	46	70.8 %	52,589,842	1.14 %	6,929,725,043	17
2005	**70,122,115**	1.27 %	854,411	-14,100	24	1.97	43	67.6 %	47,393,356	1.14 %	6,519,635,850	17
2000	**65,850,062**	1.77 %	1,106,286	123,100	21	2.63	40	64.1 %	42,210,684	1.15 %	6,126,622,121	17
1995	**60,318,632**	1.44 %	829,887	-455,200	19	3.95	37	60.4 %	36,423,980	1.14 %	5,735,123,084	16
1990	**56,169,196**	3.5 %	1,775,681	268,900	17	5.62	35	56.5 %	31,748,896	1.16 %	5,309,667,699	20
1985	**47,290,793**	4.11 %	1,724,514	393,900	17	6.53	29	53.7 %	25,379,649	1.07 %	4,852,540,569	22
1980	**38,668,222**	3.39 %	1,187,533	84,000	18	6.28	24	50 %	19,325,507	0.95 %	4,439,632,465	22
1975	**32,730,555**	2.8 %	843,309	15,500	18	6.24	20	46 %	15,040,458	0.89 %	4,061,399,228	25
1970	**28,514,011**	2.7 %	711,779	10,400	18	6.68	18	41.3 %	11,789,487	0.86 %	3,682,487,691	25
1965	**24,955,116**	2.64 %	609,642	-200	21	6.91	12	23.7 %	5,903,540	0.83 %	3,322,495,121	26
1960	**21,906,905**	2.57 %	522,581	-400	20	6.91	14	33.8 %	7,407,650	0.79 %	3,018,343,828	26
1955	**19,293,998**	2.42 %	434,947	-200	21	6.91	12	30.6 %	5,903,540	0.76 %	2,758,314,525	26

Source: **Worldometers** (www.Worldometers.info)

Elaboration of data by United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects: The 2015 Revision. (Medium-fertility variant).

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Appendix 2 Global Food Markets

Source: http://www.fao.org/3/a-I4581E.pdf Food Outlook May 2015, page 110 and page 114.

Statistical appendix

APPENDIX TABLE 15: BOVINE MEAT STATISTICS
(thousand tonnes, carcass weight equivalent)

	Production		Imports		Exports		Utilization	
	2014 *estim.*	2015 *f'cast*	2014 *estim.*	2015 *f'cast*	2014 *estim.*	2015 *f'cast*	2014 *estim.*	2015 *f'cast*
ASIA	**17 611**	**17 683**	**4 609**	**4 852**	**2 183**	**2 269**	**20 045**	**20 305**
China	6 546	6 459	1 189	1 340	43	42	7 713	7 767
India	2 621	2 678	-	1	1 933	2 010	688	668
Indonesia	591	601	93	86	-	1	683	686
Iran, Islamic Republic of	253	254	127	140	4	3	377	391
Japan	495	482	737	731	2	2	1 221	1 221
Korea, Republic of	330	325	346	365	5	5	671	701
Malaysia	31	31	194	202	13	12	211	221
Pakistan	1 680	1 735	5	4	29	33	1 656	1 707
Philippines	290	286	142	145	4	3	427	428
AFRICA	**6 161**	**6 229**	**764**	**763**	**76**	**100**	**6 850**	**6 892**
Algeria	135	132	94	95	-	-	229	228
Angola	107	108	143	150	-	-	250	258
Egypt	870	860	300	300	2	1	1 168	1 159
South Africa	860	862	30	29	45	70	846	820
CENTRAL AMERICA	**2 468**	**2 509**	**381**	**378**	**310**	**338**	**2 538**	**2 549**
Mexico	1 770	1 782	223	220	133	138	1 860	1 864
SOUTH AMERICA	**15 776**	**16 017**	**462**	**422**	**2 740**	**2 927**	**13 488**	**13 517**
Argentina	2 809	2 848	-	1	215	230	2 594	2 618
Brazil	9 820	9 973	71	80	1 839	1 950	8 052	8 103
Chile	209	211	224	220	5	5	428	426
Colombia	840	835	4	4	11	9	833	831
Uruguay	525	550	3	2	308	330	220	221

Statistical appendix

APPENDIX TABLE 19: MILK AND MILK PRODUCTS STATISTICS
(thousand tonnes, milk equivalent)

	Production			Imports			Exports		
	2011-2013 average	2014 *estim.*	2015 *f'cast*	2011-2013 average	2014 *estim.*	2015 *f'cast*	2011-2013 average	2014 *estim.*	2015 *f'cast*
ASIA	**285 917**	**302 700**	**313 370**	**35 236**	**40 985**	**42 877**	**6 419**	**6 645**	**6 570**
China	41 707	42 513	44 216	9 991	13 183	13 933	241	249	233
India[1]	131 978	141 702	147 795	227	93	88	585	670	528
Indonesia	1 377	1 400	1 450	2 499	2 530	2 577	106	105	98
Iran, Islamic Republic of	7 624	7 700	7 800	499	470	501	373	551	571
Japan	7 537	7 315	7 350	1 712	1 815	1 811	6	6	6
Korea, Republic of	2 035	2 073	2 065	911	886	878	14	24	25
Malaysia	84	86	86	1 662	2 086	2 250	413	640	641
Pakistan	37 830	40 000	41 000	434	422	438	78	89	89
Philippines	18	22	23	1 716	1 580	1 707	210	76	77
Saudi Arabia	2 298	2 380	2 400	2 455	3 143	3 316	1 551	1 199	1 169
Singapore	-	-	-	1 722	1 865	1 878	615	609	606
Thailand	1 033	1 125	1 300	1 379	1 477	1 586	238	186	186
Turkey	16 895	19 500	20 500	160	229	256	409	649	726
AFRICA	**45 089**	**46 198**	**46 612**	**9 235**	**9 842**	**10 176**	**1 132**	**1 283**	**1 289**
Algeria	2 923	3 200	3 300	2 506	3 115	3 298	3	3	3
Egypt	5 842	5 950	6 000	1 650	1 378	1 424	656	566	581
Kenya	4 943	4 950	4 940	38	48	52	24	16	18
South Africa	3 341	3 450	3 500	223	209	198	153	403	394
Sudan	7 514	7 580	7 600	276	262	266	-	-	-
Tunisia	1 139	1 190	1 200	101	100	103	45	38	38
CENTRAL AMERICA	**16 485**	**17 099**	**17 367**	**4 880**	**4 821**	**4 917**	**634**	**704**	**704**
Costa Rica	1 016	1 100	1 125	49	58	59	165	174	175
Mexico	11 014	11 296	11 454	2 946	2 861	2 927	155	182	178
SOUTH AMERICA	**67 231**	**70 586**	**71 549**	**3 579**	**3 280**	**3 302**	**4 565**	**4 405**	**4 239**
Argentina	11 414	11 680	11 119	97	43	46	2 598	2 144	2 021
Brazil	33 036	35 450	36 680	1 037	698	654	90	407	366
Colombia	6 408	6 500	6 550	152	202	182	21	18	28

Appendix 3 Agriculture and livestock farming in Iran

Source: Mohammadali Maysami, Energy Efficiency in Dairy Cattle Farming and related Feed Production in Iran, 2013, Humboldt University Berlin.

Agriculture is one of the most important sectors of Iran's economy. Currently, agriculture constitutes 13.9% of the total gross domestic product (GDP) and 30% of non-oil exports from the country (Rabii, 2011). According to FAO, Iran ranks among the top 7 countries in the production of 22 important agricultural products. In comparison to the previous year, the value of agricultural production increased by 20% in the Iranian calendar 1389 (ending March 2011), and agricultural exports rose by 30% (Rabii, 2011).

The total land area of Iran is approximately 165m ha, consisting of 54.6% range-land, 7.5% forests, and 20.6% deserts, and the remaining 6% are other settlements, infra-structures, and water. Approximately, 33m ha have good capacity, on average, for agriculture, but just 18.5m ha (12% of total land area) are cultivated. Of the cultivated land, 8.5m ha are irrigated, and 10m ha are rain fed (Badripour, 2006). There-fore, agriculture is correlated with rainfall, and the amount of rain that falls on the region is the most significant challenge of the Iranian agricultural sector. The annual rainfall is 264 mm, which is less than one-third of the world's average precipitation.

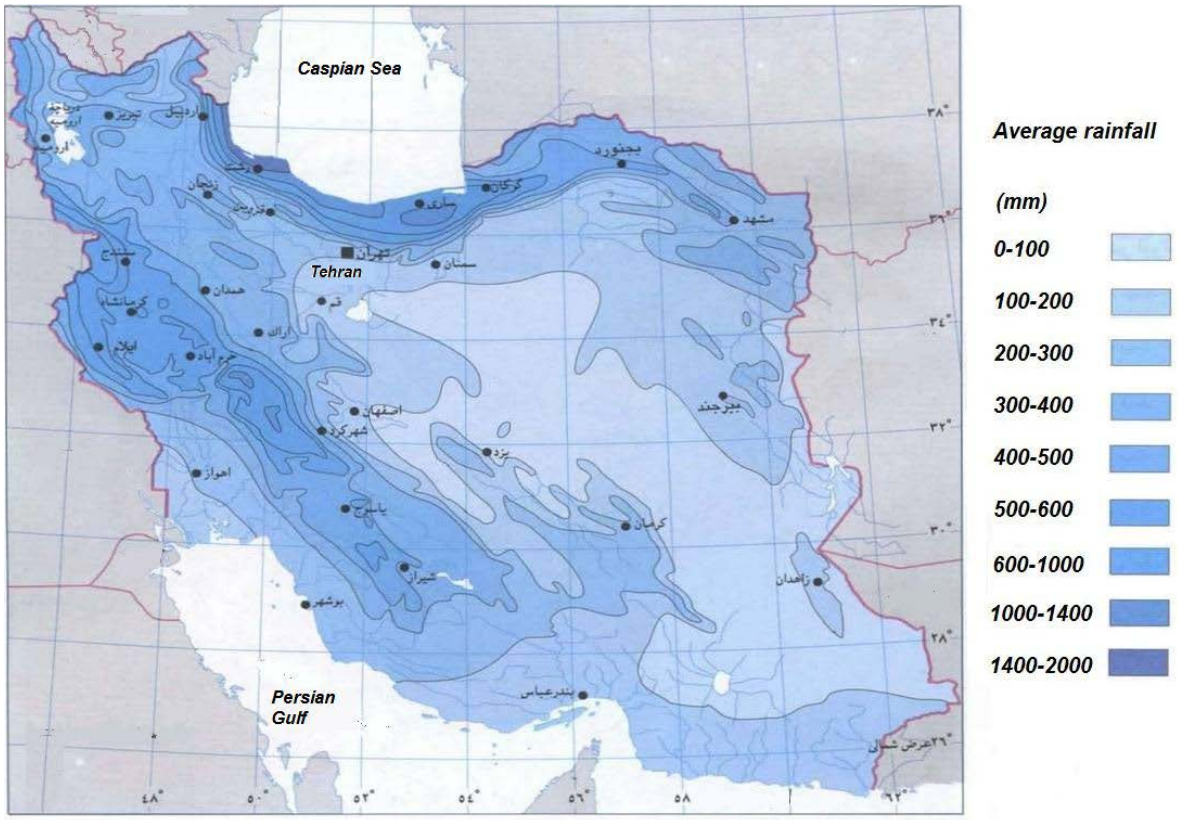

Figure A3.1 *Average annual rainfall map of Iran*

The mean altitude is 1,200 m above sea level. The lowest point is the coast of the Caspian Sea, at 27 m below sea level, while the highest point is Damavand Mountain, at 5,670 m above sea level. The southern half of the county is in the subtropical zone, the northern half is in the temperate zone, and

there is a desert zone in the middle of the country. These con-trasting zones cause high diversity in the climate across the entire country (Badripour, 2006).

Livestock farming constitutes 6% of the total GDP of Iran. There are nearly 83m animal units[11] in the country. Only 37m animal units can be fed by range for 7 months per year, leaving an excess of 46 million animal units (Badripour, 2006). Therefore, some of the arable land is under cultivation for feedstuff for livestock in competition with foodstuff production. However, a significant share of feedstuff is imported yearly, depending on the yearly rainfall rate.

Table A3.1 *Range condition in Iran (Badripour, 2006)*

Condition	Area (m ha)	Mean DM yield (kg/ha)	Useable DM (m tonnes)
Fair – Good	14	290	4.0
Poor – Fair	60	92	5.5
Very poor – Poor	16	26	0.5
Total	*90*		*10.0*

According to FAOSTAT, in 2006, the livestock numbers comprised 54m sheep, 26 mil-lion goats, and 7.9m cattle. In 2011, these numbers were 49, 23.5, and 8.6m, respectively (FAOSTAT, 2012). In 2011, the average whole fresh milk yield per cow was 2.2 tonnes per year with a total of 6.4m tonnes of milk across the country (FAOSTAT, 2012). The statistical portal of the agricultural ministry of Iran claims that the total milk production was 7.8m tonnes in 2006 and 10.8m tonnes in 2011 (MAJ, 2011). The difference between these two statistics may refer to the estimation of produced milk on small dairy farms, where the producer consumes the products or they sell their products directly to private individuals. These farms are not included regularly in the statistical surveys. Additionally, the statistics of the agricultural ministry include milk produced by sheep and goats, as well as from buffaloes and camels.

Based on the diversity in climate and the demographic culture, in addition to the population density, there are different systems of agriculture and animal husbandry all over the country. These systems have been adapted to each region and climate over a long period of time. The difference between livestock systems appears in the breed purity of the livestock, the feedstuff fed to the livestock, keeping systems, herd size, and managerial patterns. Sheep and goats are kept mostly extensively, while cattle, buffalo, and camel are kept intensively and in barns in the vicinity of villages and cities. The breed composition of cattle population in Iran in 2006 consisted of 8.6% Holstein with a milk yield of 6,634 kg per year and cow, 45.4% crossing of Holstein and local breeds with a yield of 2,827 kg per year and cow, and 46.0% local breeds with yield of 864 kg per year and cow (Amar, 2006). Breed purity improving programmes in the country has been planned to change from local breed to Holstein breed.

[11] Animal unit means a unit of measurement for any animal feeding operation (University of Illinois: agricultural and horticultural extension). An animal unit (AU) in Iran was defined as a sheep of 45 kg mass, which requires 276.5 kg TDN per year (Badripour, 2006). Accordingly, in Iran, a pure breed Holstein cow is 9.5 AU, cross breed cattle is 6.5 AU, local cattle is 4 AU, buffalo is 6.5 AU, goat is 0.75 AU, camel is 5.5 AU, and horse and ass is 4.5 AU (MAJ, 2007).

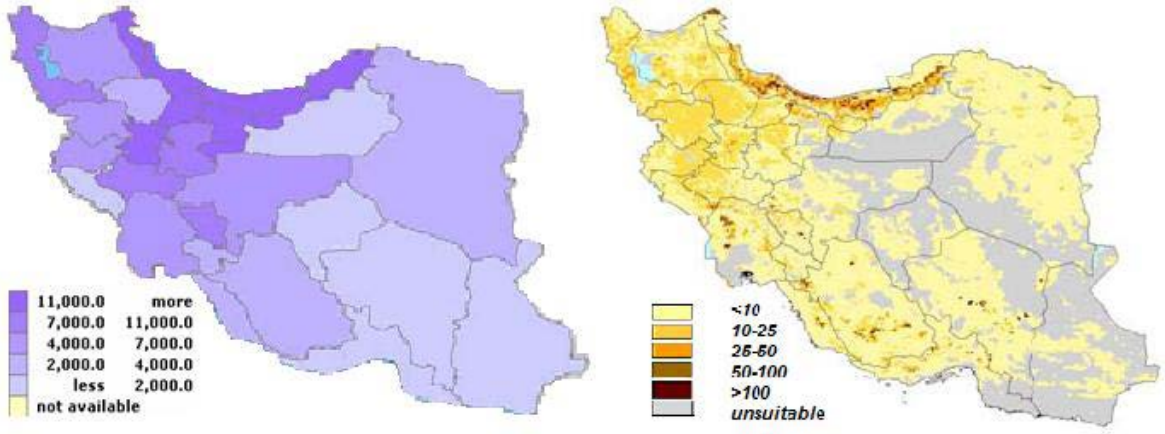

Figure A3.2 *Density of milk production in kg per km^2 (left) and the cattle population in heads per km^2 (right) in Iran (FAO, 2005)*

The two main systems in cattle farming are traditional and industrial. As reported by the statistic centre of Iran in 2006, traditional livestock farming was generally practiced in rural locations and comprised approximately 85% of the total cattle population, while industrial farms had a share of only 15% of the total cattle population (Amar, 2006). However, there have been an increasing number of cattle raised on industrial farms in recent years (see Figure A3.3).

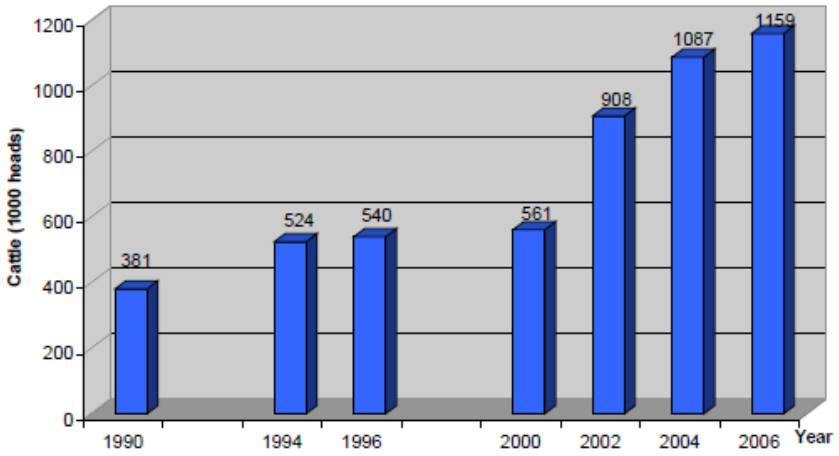

Figure A3.3 *Number of industrial raised cattle in Iran from 1990 to 2006 (Amar, 2006)*

The term 'industrial dairy farm' refers to farms that adjust their barns, facilities, management, feeding programme, and cattle breed to the new methods and scientific techniques introduced by the agricultural ministry and experts (Amar, 2006). This definition is independent of the herd size, but most industrial farms have larger herds than the traditional farms. On some industrial farms, the number of cattle is over 20,000. The feedstuff of these farms is generally not produced on site, but is instead bought from external providers. Only 5% of industrial farms have the availability to include a grazing programme to supplement half of the feeding of cattle (Amar, 2010), while in rural farms, this availability is higher. However, there are also no regular grazing programmes on rural farms. Grazing is often limited to a short session and is performed on the after-harvest residues. As shown in Table 2, most of the cattle population in Iran in 2006 were kept on farms consisting of 10 or fewer head (88% of total cattle holders). Thirty-one per cent of the cattle were kept in 11-50 head herds, and only 15% were kept in herds bigger than 50 head.

Table A3.2 *Classification of holders and dairy cow population by herd size (Amar, 2006)*

Herd size	Holders population (%)	Cattle population (%)
1-10	88	54
11-50	11	31
51-100	0.5	5
101-200	0.2	4
201-500	0.06	3
More than 500	0.01	3
Total number	*1,321,531*	*7,609,358*

Appendix 4 Information about Dairy Farms

Table A4.1 *No. of cattle farms based on capacity, 2012-2013*

Province	Sum (heads)	≤ 20	21-50	51-100	101-150	151-200	201-300	≥301
Total	**25,353**	**1,750**	**8,754**	**8,007**	**2,480**	**1,938**	**1,128**	**1,296**
East Azarbaijan	**696**	13	175	261	88	86	46	27
West Azarbaijan	**583**	15	136	265	72	61	19	15
Ardabil	**307**	1	34	129	41	77	19	6
Isfahan	**2,594**	232	973	739	189	172	120	169
Alburz	**613**	73	212	123	47	47	38	73
Ilam	**85**	2	14	37	19	5	4	4
Bushehr	**314**	5	54	146	74	17	15	3
Tehran	**3,606**	54	764	1170	476	430	285	427
Chahar-Mahal Bakhtiari	**481**	30	177	208	38	21	3	4
South Khorasan	**462**	120	216	96	9	8	7	6
Khorasan Razavi	**2,575**	340	1,164	636	191	115	60	69
North Khorasan	**224**	8	102	73	23	7	6	5
Khozestan	**531**	0	28	302	72	71	36	22
Zanjan	**211**	5	37	73	31	36	15	14
Semnan	**1,217**	128	556	342	88	40	39	24
Sistan and Baluchestan	**83**	1	8	38	2	9	6	19
Fars	**1,927**	47	524	733	250	197	105	71
Qazvin	**556**	3	79	189	69	79	64	73
Qom	**1,054**	8	261	404	194	87	53	47
Kordestan	**173**	2	99	56	9	1	3	3
Kerman	**870**	37	373	268	70	51	35	36
Kermanshah	**189**	0	36	68	23	32	13	17
Kohkiluyeh&Buyer Ahmad	**136**	7	54	57	8	5	4	1
Golestan	**415**	10	113	158	73	31	7	23
Gilan	**180**	12	80	62	8	9	4	5
Lorestan	**376**	41	128	122	29	27	11	18
Nmazandaran	**373**	14	164	124	24	21	12	14
Marazi	**2,348**	229	1,159	634	144	97	48	37
Hormozgan	**139**	12	94	18	9	1	2	3
Hamadan	**400**	12	134	143	37	35	20	19
Yazd	**1,635**	289	806	333	73	63	29	42

Table A4.2 *No. of dairy farms based on capacity, 2012-2013*

Province	Sum (heads)	≤ 20	21-50	51-100	101-150	151-200	201-300	≥301
Total	**16,295**	**1,426**	**5,943**	**4,845**	**1,434**	**1,071**	**648**	**928**
East Azarbaijan	**489**	11	133	179	55	58	32	21
West Azarbaijan	**397**	14	102	185	43	34	9	10
Ardabil	**97**	1	22	38	14	15	4	3
Isfahan	**2,299**	204	828	660	175	158	114	160
Alburz	**559**	69	195	112	35	42	35	71
Ilam	**45**	0	12	17	12	2	0	2
Bushehr	**33**	5	13	9	3	1	2	0
Tehran	**1,288**	14	262	385	156	146	93	232
Chahar-Mahal Bakhtiari	**460**	30	166	199	37	21	3	4
South Khorasan	**370**	114	160	76	8	2	5	5
Khorasan Razavi	**2,373**	321	1060	590	171	106	58	67
North Khorasan	**164**	7	70	57	15	6	5	4
Khozestan	**98**	0	14	45	7	14	8	10
Zanjan	**132**	3	28	46	23	17	7	8
Semnan	**713**	86	323	193	47	23	23	18
Sistan and Baluchestan	**23**	0	3	7	0	2	3	8
Fars	**1,385**	34	389	516	176	136	76	58
Qazvin	**354**	1	43	100	49	50	48	63
Qom	**431**	5	101	182	78	30	14	21
Kordestan	**141**	1	86	42	9	0	1	2
Kerman	**683**	29	294	206	58	34	32	30
Kermanshah	**121**	0	31	46	15	12	6	11
Kohkiluyeh&Buyer Ahmad	**71**	4	28	32	4	1	1	1
Golestan	**399**	9	110	150	71	29	7	23
Gilan	**129**	10	59	39	7	7	3	4
Lorestan	**267**	40	110	81	15	12	1	8
Nmazandaran	**314**	14	145	101	22	14	7	11
Marazi	**625**	118	295	140	28	19	10	15
Hormozgan	**21**	0	19	0	1	0	0	1
Hamadan	**316**	10	102	110	33	28	15	18
Yazd	**1,498**	272	740	302	67	52	26	39

Table A4.3 *Active Dairy farms and number of cows by capacity, 2012-2013*

Province	Sum (heads)		≤ 20		21-50		51-100		101-150		151-200		201-300		≥301	
	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cow	No. of cow	No. of cattle	No. of cow	No. of cattle
Total	**12,334**	**1022,223**	**922**	**42,899**	**4,235**	**134,744**	**3,732**	**168,284**	**1217**	**103,561**	**865**	**62,295**	**546**	**78,608**	**817**	**431,832**
East Azarbaijan	**366**	**28,487**	7	1,038	95	4,395	128	5,784	43	4,632	51	2,109	24	1,916	18	8,613
West Azarbaijan	**287**	**13,946**	8	978	69	3,528	134	4,951	34	1,500	26	943	6	488	10	1,558
Ardabil	**66**	**16,990**	0	136	15	1,079	26	1,007	13	368	7	162	3	210	2	14,028
Isfahan	**1,923**	**185,843**	152	6,590	654	20,107	567	26,472	157	14,978	144	13,416	103	12,816	146	91,464
Alburz	**305**	**57,241**	13	426	71	2,505	70	4,448	26	3,775	30	3,220	29	4,757	66	38,110
Ilam	**35**	**2,251**	0	99	6	282	14	990	12	560	2	0	0	0	1	320
Bushehr	**20**	**814**	3	132	6	51	6	229	3	0	0	159	2	243	0	0
Tehran	**926**	**168,774**	9	1,972	156	8,345	261	12,900	117	12,916	109	8,934	74	13,224	200	110,483
Chahar-Mahal Bakhtiari	**377**	**22,589**	20	780	128	5,012	168	7,859	34	2,778	20	691	3	692	4	4,777
South Khorasan	**239**	**8,705**	65	1261	103	2,445	53	1,372	7	330	2	0	4	686	5	2,611
Khorasan Razavi	**1,898**	**109,188**	219	8,107	831	23,539	503	21,869	146	10,704	90	6,434	52	7,325	57	31,210
North Khorasan	**97**	**5,501**	2	376	32	1,412	40	1,418	12	500	5	368	3	286	3	1,141
Khozestan	**60**	**3,840**	0	184	5	932	25	549	6	877	9	153	6	744	9	401
Zanjan	**84**	**11,233**	1	223	19	985	26	1,494	16	884	10	711	6	536	6	6,400
Semnan	**561**	**26,205**	53	2,545	244	6,125	166	5,709	43	3,392	20	1,186	21	2,079	14	5,169
Sistan and Baluchestan	**15**	**1,435**	0	47	2	117	5	223	0	0	2	748	2	300	4	0
Fars	**1,004**	**78,311**	21	2,199	237	11,201	377	22,172	148	13,135	106	6,872	65	9,472	50	13,260
Qazvin	**317**	**58,263**	0	370	36	2,752	91	5,369	44	4,624	43	2,484	43	5,916	60	36,748
Qom	**306**	**24,993**	5	552	67	3,597	118	6,895	67	5,576	25	1,966	10	1,264	14	5,143
Kordestan	**82**	**3,384**	1	239	37	1,189	35	1,511	8	245	0	200	1	0	0	0
Kerman	**510**	**34,272**	14	2,178	199	5,971	167	6,325	49	3,400	26	1,976	27	3,474	28	10,948
Kermanshah	**84**	**13,270**	0	177	15	793	29	1,104	14	1,415	11	1,022	6	1,058	9	7,701
Kohkiluyeh&Buyer Ahmad	**30**	**3,434**	0	20	15	747	13	532	1	0	0	0	0	0	1	2,135
Golestan	**301**	**23,010**	7	951	70	2,910	108	4,614	62	3,512	27	1,564	6	1,832	21	7,627
Gilan	**76**	**3,299**	1	355	33	905	28	821	7	130	3	200	1	480	3	408
Lorestan	**180**	**8,541**	19	832	63	2,008	67	2,028	14	1,068	9	182	1	467	7	1,956

Province	Sum (heads)		≤ 20		21-50		51-100		101-150		151-200		201-300		≥301	
	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cows	No. of farms	No. of cow	No. of cow	No. of cattle	No. of cow	No. of cattle
Nmazandaran	**256**	**19,892**	8	730	113	3,921	85	4,080	21	1,698	12	916	6	564	11	7,983
Marazi	**505**	**22,040**	97	2705	242	3,492	105	2,883	25	2,107	13	1,144	9	1,976	14	7,733
Hormozgan	**11**	**327**	0	49	9	171	0	0	1	107	0	0	0	0	1	0
Hamadan	**170**	**14,903**	6	453	43	1,444	54	2,728	23	1,817	19	1,328	9	2,476	16	4,657
Yazd	**1,243**	**51,242**	191	6195	620	12,784	263	9,948	64	6,533	44	3,207	24	3,327	37	9,248

Appendix 5 Iran Feed Industry Association

https://www.linkedin.com/company/iran-feed-industry-association
Iran Feed Industry Association
International Trade and Development
10,001+ employees

In the direction of improving Protein Products (Dairy products, Meat, Poultry, egg, etc.) supply chain in Iran, 'Iran Feed Industry and Association' was established under auspicious and permission of 'Iran Chamber of Commerce, Industries, Mines and Agriculture'. This Association, with support of industry owners and leaders in the field has laid the foundations and implemented several strategies and plans to organise, unite and increase the capabilities and production capacities of national business units and create a more resilient correlation between international organisations in the same field Membership in International federation of Feed industry, establishing a solid tie between related international organisations, utilisation of available workforce in small and medium-sized institutions, build a networking platform in between production units as well as strengthening the alliance between industrial and educational sector are among the major objectives of this association. Taking into consideration the existing production standards, this association has extensively promoted further use of industrial animal feed as a substitute for low quality raw material. It is also believed application of new and innovative technologies and localizing them is a major step to maximise the production efficiency. Expansion of protein products supply and production chain is a goal that increases the possibility to monitor and control the products quality and decrease the production cost. In pursuance to this objective, this organisation has taken policies and procedures into consideration that increases quantity and quality of products in Agro industry. With more than 400 members, and purpose to increase profitability, benefit of production units and organisations under auspicious of this association, the request for local and international representation, after confirmation of 'Iran Chamber of Commerce, Industries, Mines and Agriculture' will be considered and reviewed.

Appendix 6 Agro & Food Knowledge infrastructure[12]

The Agriculture Research, Education and Extension Organisation (AREEO) is the major agri & food knowledge organisation in Iran under the Ministry of Agriculture. It comprises of 24 national institutes, 34 provincial research centers and 32 agricultural education centers. Current staff is approximately 12,000 of which 2,000 have an academic degree. The education is directed at farmers and extension officers. Besides it offers also BSc and MSc in connection to universities under the Ministry of Science, Technology & Research. Research is primary conducted at the national institutes, the provincial centres serve as test and demonstration facilities for farmers. There are few linkages with the agro-business industry. AREEO funding mechanism: basically every institute has its own research budget administered by a scientific committee. Sometimes there are specific calls from the government (Ministry of Agriculture and Mininstry of Science). Very few AREEO institutes have externally funded projects. Most institutes perform research only in their specific area, few linkages exists with other knowledge institutes (inside and outside of AREOO), or with other disciplines, and there seems to be no mechanism in place to evaluate the impact of the education and extension activities. Many of the tasks that AREEO is currently undertaken have been privatised in the Netherlands. In the present situation there is also competition between some of AREEO's institutes and the emerging commercial agribusiness sector in Iran. Therefore AREEO has initiated steps to reform itself into a more effective and costs efficient organisation. It could learn from similar developments that have taken place in the Netherlands in the past 40 years. The following AREOO institutes were visited:

Research Institute for Forests & Rangelands
Research areas include climate change effects on forests, climate change adaptation, agro-forestry, reforestation, drought resistance, desertification processes etc.

Soil Conservation & Watershed Management Research Institute
Research areas include coastal protection, river engineering, water resources development, GIS & RS applications, flood management. In general technical (hydraulic) oriented research. It has 160 staff. International cooperation with a/o ITC in NL.

Agriculture Engineering Research Institute
Major research areas a/o irrigation & drainage, farm machinery & mechanisation, food & post-harvest technology, greenhouse engineering. Post-Harvest losses are big issue in Iran, estimated at 50% (!). Research priorities are: food security and safety; food loss reduction strategies from production to consumption, especially at the time of handling and storage; cooling and cold chain management; primary and secondary processing, logistic, trade and traceability; irrigation management in protected and open field Agriculture; development of strategies to combat adverse effect of climate change on water availability patterns and water management.

National Institute of Ornamental Plants (NIOP)
a/o contract research for growers of ornamental plants. Had previous contacts with Wageningen UR.

Seed and Plant Improvement Institute (SPII)
Applied research (directed at farmers) on cereals, maize & forage, oilseeds, vegetables, plant genetics. It employs 430 staff, 100 at HQ, rest in provincial centres.

Agricultural Biotechnology Research Institute (ABRII)
ABRII is modern institute with high tech facilities for advanced plant molecular biology and biotechnology, nanotechnology and biofuel research. It employs approx. 100 staff.

[12] Report of Mission Arjo Rothuis (W.I.) and Stijn Reinhard (LEI), November 2015

Soil & Water Research Institute (SWRI)
SWRI works on soil classification, soil & water management, water requirements for crops, GIS etc. Major challenges is this area are water shortage and soil salinity as a result of water extraction.

Seed and Plant Certification Research Institute (SPCRI)
SPCRI works on monitoring controlling and certifying seeds and seedlings, permits, standards, certificates for export of seeds. The institute was conducting several training courses in the past in collaboration with FAO and Wageningen UR, with Nuffic fellowships. Wants to revive this activity.

Sugar Beet Research Institute (SBSI)
SBSI works on sugar beet agronomy, breeding, pathology, quality, seed production & distribution to farmers
All of the visited institutes work on areas that Wageningen UR is involved with. In a meeting with Minister Kamp, Prof. Zand (Director AREEO) and others, it was concluded that for cooperation with the Netherlands/Wageningen UR, most priority is in the area of 1). water & agriculture (including water policy, greenhouse horticulture, plant cropping patterns, water saving technologies etc.), to be funded by Iranian governmental sources, 2). modernisation/improvement of vegetable & cut-flowers production, including the post-harvest processes, to be funded by the private sector, 3). improvement of animal production (including dairy) and animal health, to be funded by the private sector. Besides, the Netherlands can also contribute towards the reform of the extension services (4).

The University of Tehran (UT)
UT is a broad university with education and research programmes ranging from arts, to economics, to engineering and agriculture, compromising of a large number of colleges and faculties, divided over 8 campuses. It is ranked 551-600 on the QS World University Ranking. Wageningen UR had 40 joint publications with UT in the period 2010-2015. At the college of Aburaihan several departments were visited (Agronomy and Plant Breeding Sciences, Horticulture, Irrigation & Drainage), and in Tehran the International office. Most departments offer BSc, MSc and PhD programmes with relatively few academic staff, 15-30 per department. Research is mostly conducted within a single department. Few linkages exist with private sector companies (99% of research funding is from governmental sources). The region around the of Aburaihan campus is an important area for cut-flowers and livestock production. The campus has a science & technology park with space for the establishment of start-ups and private sector companies, and a new (Dutch) greenhouse research facility is presently under construction. Within Europe, UT has many contacts with German scientists, partly due to favourable facilitation from the German government. With the Dean of the college *it was concluded that joint research in the areas of horticulture (including water use and drought resistance) and livestock (dairy & meat), involving PhD students (sandwich construction) are most relevant. Such a cooperation could be initiated through seminars involving different (e.g. horticulture) academic and professional societies.*

The Shahid Beheshti University (SBU)
SBU has 19 faculties ranging from Letters and Human Sciences, to Mathematical Sciences, Biological Sciences and Water and Environmental Engineering and 9 research institutes. SBU provides 69 programmes at Bachelor's, 208 at Master's and 136 at Ph.D. levels, and there are approx. 10,000 BA/BSc, 7000 MA/MSc and 1400 PhD students studying at the university. We had discussions with representatives of the Environmental Sciences Research Institute (ESRI) and the Water and Environmental Engineering Department. ESRI provides education as well as doing research. Areas are agri-ecology, environmental economics, biodiversity, environmental planning & law. The research work is project based and often multidisciplinary. The institute employs 20 academic staff. Within the SBU the institutes are financially independent and need to be self-supportive. The Water and Environmental Engineering Department provides education and research in civil engineering, water & waste water engineering, soil mechanics & hydraulics. *In a follow-up meeting with ESRI and Wetlands International, possible cooperation on wetland degradation in Iran was discussed, using for example the Global Environmental Facility of the World Bank.*

Appendix 7 Participants Dairy Mission to Iran

Dairy Mission to Iran
September 24 - 29, 2016

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The mission of Wageningen University and Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.