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Development of Dairy Industry in Israel

Bachelor Thesis

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Declaration

I declare that the Bachelor Thesis Development of Dairy Industry in Israel is my own work and all the sources I cited in it are listed in Bibliography. Prague, 20. 02. 2020 Signature

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Summary

Israel's agricultural industry has made a huge breakthrough over the past 60 years. In the 1950s, food there was issued on cards, and 80% of the milk was imported.

Today, the country provides itself with food at 95%, importing certain types of products (oilseeds, coffee, cocoa, sugar), and exporting agricultural products annually brings Israel almost $ 4 billion in profit. And this despite the fact that due to the arid climate in agriculture, only 20% of the land is used, but Israeli farmers have achieved particularly striking successes in dairy farming. Milk yield per cow has grown and tendency is not stoping, and by this indicator, Israel has been ahead of other countries for several years.

If you characterize Israeli livestock in one word, it will be "rationality." Farmers are not faced with the task of getting as much milk as possible - they strive to make the production process as efficient as possible and supply raw materials suitable for processors to dairies. The number of livestock in the country is controlled (about 125 thousand cows are kept on farms), and milk can be sent for processing only by quotas. Thus, the state regulates prices in the market, the stability of milk purchase prices. Israel is one of few places where cooperative farming is developing with good financial gain while in the most part of the world, cooperatives does not exist anymore or at the point where disadvantages overcome advantages.

Key words: milk quotas, cattle breeding, dairy production, agriculture

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1. Introduction

In the past decades the world population has been increasing significantly- by statistical measures, it is projected to reach 9.8 billion people in 2050. Currently people are suffering from unsufficient amount of food supplied in some part of the world such as Asia and Africa, but it is mainly cause of management practices, ignorance in agricultural education, policies, communication between farmers an government and other reasons. However, some countries as Israel has reached high outputs from the resources that are available in the region. As an example can be shown that, it supplies about 80% of the Israeli domestic demand for milk and dairy products, while the rest is supplied by imports (Hojman et al., 2012). The map below shows dairy industry distribution.

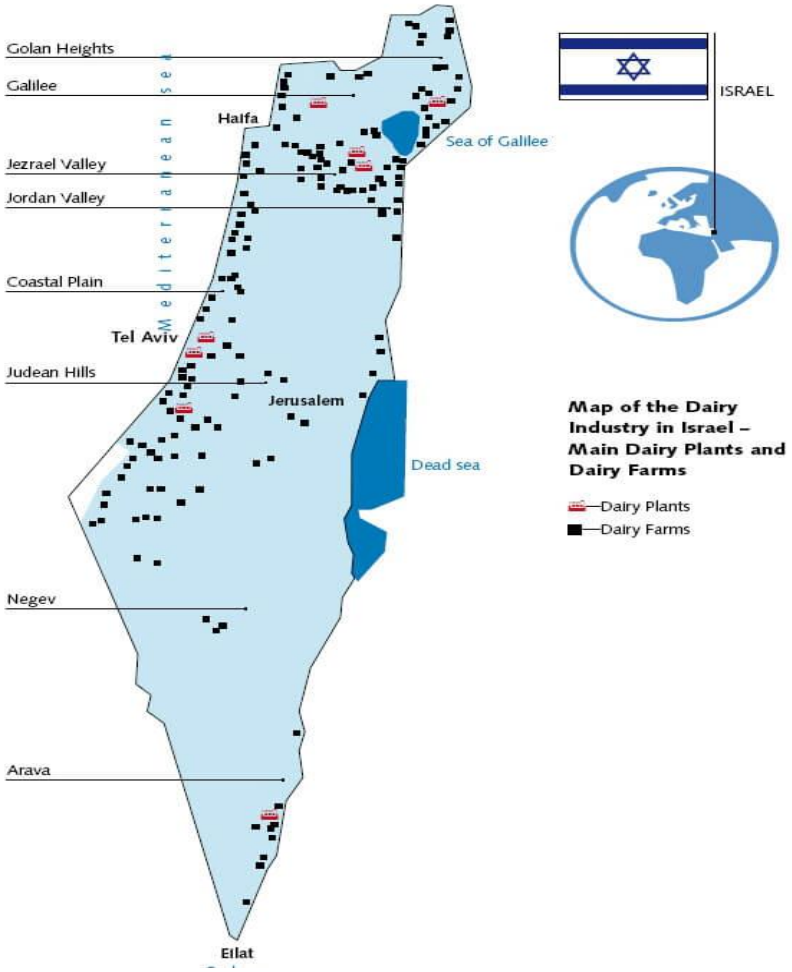

Figure 1. Map of the Dairy Industry in Israel-Map Dairy plants and Dairy Farms

Source: Israeli Dairy Board, 2012

Israel provides a unique example for exploring the various environmental impacts of dairy-based practices. Israel is located in arid zone , with only a small area of humid land. So it faces a challenge in providing food security. Over time, various ethical groups have settled in the land of Israel, and it is one of the few places in the world where newly adapted modern, zero-grazing techniques of livestock management coexist alongside with pastoralism grazing. It`s small size makes monitoring easier, and regulatory policies have been introduced over the past fifty years. .Intensive and extensive livestock management provide very different types and degrees of environmental impacts. They are regulated by various policies, which constrain the choices of livestock growers. Development in agriculture practices alleviated to reach higher yield, with this yield increase accompanied by population growth in the state over the period of time. This paper will provide the

various practices (management, breeding, housing system, feeding and so on) and policies of dairy production in Israel, and to understand their success and overall impact on society.

2. Objectives

The thesis sets out following partial objectives:

- To make a comprehensive literature review of current and past approaches, trends, technologies and systems used in dairy industry.

- Connection of cattle breeding development with subsequent development of dairy industry.

- To make a comprehensive reason for breeding in Israel and the motivation to achieve high level of production.

- What are the characteristics of the dairy sector in Israel and which players are involved.

3. Literature review

There has been a growing interest in the dairy industry, as agriculture is one of the main contributors to the economy of Israel. Plenty of researchers in this field have produced a wide range of literature focused on the dairy industry, cooperatives, bedouin, significant development of state breeding program, integration of different ethnic groups, and many other related topics. For each chapter and subchapter, it will be used different sources because my Bachelor's thesis comprises themes that are similar but give a general overview of this broad topic. The main source for the part of dairy farming are books and articles by Daniel Hojman who is works at Israel Cattle Breeders Association and actively participating in dairy farming activities. I also consider the book Heat stress in lactating dairy cows that was primary reason for writing my thesis about Israel. Other literature sources I consider to be important: (E.Ezra 2007, Rummel et al., 2003, Rouhana 1998).

4. A brief historical overview

Israel dairy sector is the leader in tearms of production and efficiency nowadays, but if we look into history, things were different, I reviewed shortly the last 100 years of it`s development in the land of Israel and divided it into important factors.

First experimental dairy farm in 1910s.

In the first decade of 20th century, cattle population was less than 1000 in Israel, but it started to change from 1911 when new farm obtained a population of cattle and bagan to produce at around 1000-5000 killograms of milk annually. Furthemore, first kibbutz started their own cattle population.

First cross breed practises in 1920s.

After the beginning of Jewish colonization in Israel, dairy industry started to be one of the most important sectors for new settlements. First attempts of cross breeding were made in order to increase productivity. Farmers and veterinary services started to import from Holland Dutch fresian cattle breed for cross breeding purposes with local breeds.

Health related issues in 1930s.

Numbers of cattle herd were increasing steadily and farmers and officials started to pay attention on health issues of cattle. As the Government started a campaign to extirpate the Brucellosis as well as occurring mastisis related issues. Also immunization against Theileriasis was applied. First experiments of artificial insemination were also implied.

Rise in numbers of cattle in 1940s.

Farmers were steadily adapting to locality and it led to the increase in numbers of cattle. More milk and dairy related products started to be producing. In 1946 heads of cattle were imported from Canada, marking important conversion from Dutch breed to Holstein-Fresian breed. Meanwhile, ICBA (Israel Cattle Breeders Association) started assisting dairy farmers in how to implement milking machines. Due to all this improvement over time, the number of cattle was 33 000 with 75 million litters of milk per year at the end of the decade.

Demand and organizational regulation in 1950s.

Due to Israel independency in 1948, there was dramatic increase of immigration and demand for milk rised respectively in the country, and many people started their own farming practices. In 50th , about 19 000 heads of cattle were imported from Europe but mainly from USA that throughout time changed the Israeli dairy herd. Due to increase of dairy herd, new regulation and organizations were estabilished such as Israel Dairy Board in 1956.

From import to export in 1960s.

Since 1960s, began not only import cattle breed but also export it. The beginning of export of cattle begin with an exported 60 heifers to Iran, but It was just the beginning with further export of Israeli breed globally (Weintraub 1969) .

Improvement In quality in 1970s.

FAO compared breeds of cattle from 10 different countries around the world in the year of 1975, and Israel was ranked first as a breed with highest improvement in early maturity, milk and fat production and body measurements. It showed recognition and respect towards Israel`s development in dairy industry.

Electronic equipment application in 1980s.

In 80th , the world started to use technological tools in different industries including farming sector. The use of technology showed improvement in productivity and efficiency. Instead of importing technology, local manufactures started to produce their own technologies such as milk meters that became popular among farmers and also electronic identification was implied in dairy sector. New technological tools led to more effective management and overall development.

Highest ranking milk yields in 1990s.

At the end of 20th century, Israel started to be known as a state with the highest milk yield producer in the world, and it was a decade when the milk production was more than a billion liters annually for the first time since the establishment of Israel as a country. The average milk yield hit the 10 715 liters per cow per year (Tal 2007) .

5. Ethnic groups and communities

5.1 Bedoin

The region of present Israel was in under influence by different countries and there are two main periods which is Ottoman and later British rule. There were mainly Palestine (Arabs) inhabitants before Israel estabilishment as a country, local people were divided into two groups in terms of livestock: the Arab peasants, that main actions were concentreted on cultivation with a choice of goat as a primary livestock, and the Bedouins whose living habitat was pastoralism and primary livestock was the Awassi sheep that was popular in Midle East. In the period of British rule , the system had fulfilled with some changes as the transhumance in a specific area of hoe was replaced by nomadism (Rummel et al. 2003). Generally, there was evolution and improvements in the livelihood of Bedouin grazers in 20th century according Rummel et al. (2003). However, afrer the estabilishment of Israel as a country , the Bedouin husbandry and lifestyle has changed (Abu- Rabia, 1994).

Bedouin is pure Arabs as they name themselves, cause since ancient times their livilehood has not changed that much relative to globalization of the world. Nowadays, most of the Bedouins live in Negev desert in a place known as Syag region 10% of total land that they owned during the reign of British and Ottoman empire. They move from place to place with livestock gathering feed for them, and tend to live in a arid zone due to unavailability of fertile soil for cropping.

The total amount of Bedouin sheeps increased significantly after state of Israel declaration. The amount of livestock involved and people in it was hard to record those times. According to Ginguld et al. (1997), it was estimated that around 35 000 people were Bedouin livelihood in 1997, and approximately 10 000-18 000 were shepherding full time. In the last decade, Israel`s Grazing Authority estimated that the amount of Bedouins were around 20 000. Officially, in 2000 , there were 1 395 herds reported with the Ministry of Agriculture (Stavi et al.2006).

Livestock in Bedouin population is kept primarily for meat and milk consumption, and livestock plays a role as an insurance and food security for pastoralists cause of unemployment rate issues in Bedouin community that lives outside of town (Rummel et al. 2003). The computerization and management are less developed in Bedouins as the milking is primarily done by hands. In Bedouins

, the role of milker is mainly done by female in a small scale system, with further processing of dairy products inclusively for local consumption. Whereas for marketing the dairy products such as cheese and yogurt that was produced in a Bedouin community exists several obstacles in terms of sanitary condition and hygiene that is regulated by Israeli Ministry of Health, due to this issues the dairy products are primarily for inside consumption of the community (Degen 2003).

The Health issues were one of the reasons that was slowing the development of Bedouin grazing, whereas the health of flocks has improved significantly in a period of Israel. It is obligatory, in Israel that sheeps gets vaccinated against common illnesses that occurs: mouth and foot diseases, PPR disease and brucellosis. There is specific regulation of getting vaccination at the age of 2 months for sheeps. Due to improved crossbreeds with local awassi breed, reproduction rate is increased. In the past the main feeding resources was grazing in pastures while in modern days, concentrates are feed annually that makes shepherds more independent from climatic conditions but concentrates are imported from outside of the community that makes Bedouin dependent from outside (Rummel et al. 2003). Meanwhile the Bedouins habitat has changed, community welcomes improvements in terms of technology and veterinary services that promote well-being of sheep's, and enabling sheeps to produce more than before (Elizabeth Wachs 2009).

At glance, the statistics presents developments of Bedouin over time, but there are some issues that influence the community. Bedouin herders complain that technical assistance that will allow them to have more prolific sheep is not disseminated quickly enough. The strict enforcement of animal transport laws and general bureaucracy associated with maintaining a pastoral lifestyle present further barriers. Traditionally Bedouins brings sheep or goat as wedding gift, but they must to through several documentations in order to get the permission for bringing it as a gift nowadays. Also on of the main challenges is the land given for herd grazing . Firstly, there are couple of institutions that gives permission for grazing such as Jewish National Fund, Israel Defense Forces, Israel Lands Authority, Green Patrol and Bedouin Affairs Department (Abu-Rabia 1994). The list of demands varies thorough the organization to get permission for grazing. The permission for grazing is valid only for one season that usually does not exceed several months and Bedouins needs to get license that represents vaccination for sheeps and goats and some fee for grazing, land and water reservoir. (Elizabeth Wachs 2009). The main challenge of Bedouin is Israel`s government bureaucracy. Israel was declared as a Jewish country and its land is designed to encourage Jewish settlement, and over time the habitat of Bedouins has changed as they are different ethinical group

(Arabs) (Rouhana 1998; Yiftachel 1999) . For example, in 1960 was created Israel Lands Administration that was primary institution that controlled the land distribution in the country (Forman 2006). Green Patrol was established in 1977, organization that is in charge of preventing illegal intrusion on land and settlement. The Green Patrol started aggressive actions towards both Jewish and Arab sheepman, but after they obtained reputation for targeting pressure interfering on Bedouin grazing sector (Tal 2002) .

Over the decade, the reports shows relative stability in a population of livestock among Bedouin, the future of it is difficult to answer. A survey that was made by Rummel et al. 2003 represents that pastoralists in a extensive systems see their future prospect in this livelihood primarily negative.

However, we have to take into consideration that over time Bedouin community has became more organized and politically active by taking a role in life of the country and for their economic interests.

The dairy production connected with sheep and goat is enlarging, although the Jewish dairy sector developing significantly faster. Unavailability of dairy infrastructure in the Bedouin society makes it relatively harder for them to take part in this industry, as well as, the Bedouins are not willing to make infrastructure of dairy industry (Elizabeth Wachs 2009) as it is financially pressuring and traditionally not practiced widely in the pastoralists. In addition, Jewish cattle farmers tend to get more grazing land compared to Arab cattle farmers. The figure 2 shows the share of livestock between different ethnical groups.

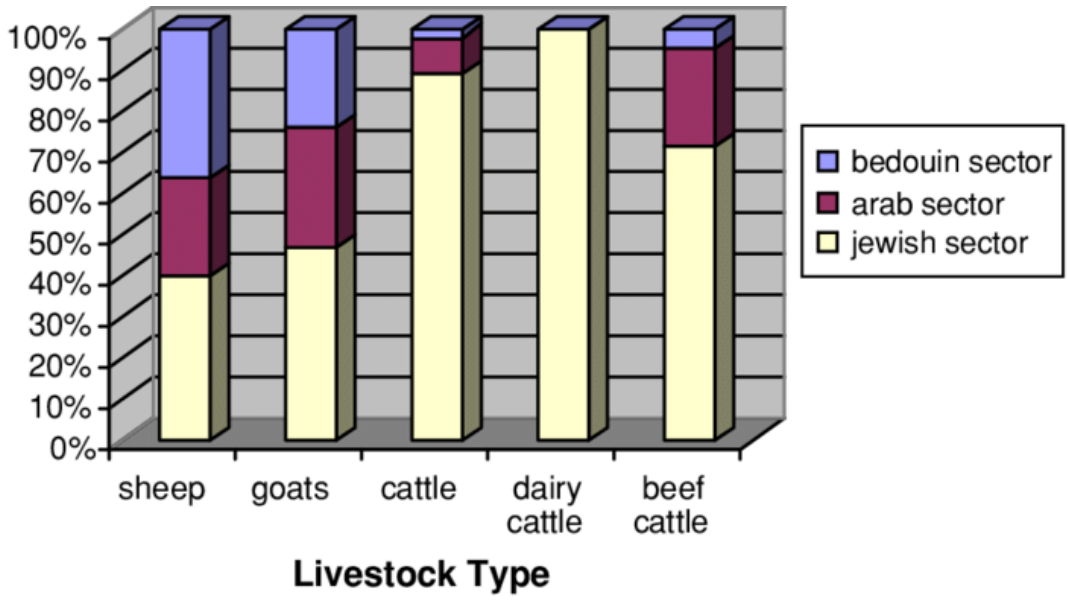

Figure 1 Ownership of livestock in Bedouin, Arab and Jewish sectors.

Source: Israel veterinary services, 2005

As you can see Bedouin share of livestock is mainly concentrated on sheep and goats as shown in the figure 2, while the cattle share in both dairy and beef is relatively small compared to jewish sector.

5.2 Kibbutz and Moshav

The kibbutz and the moshav are two types of Jewish settlements. The kibbutz is a unique, worker-controlled, agricultural manufacturing cooperative, while the moshav is a service cooperative where the members are individual farmers living within the settlement. The kibbutzim and the moshavim have been operated democratically, maintaining communal meetings where members able to vote on every decision. These days kibbutzim are 270 in number and moshavim is 443 settlements while 1947, the number was 127 and 87 respectively. The Kibbutz and the Moshav currently account for 83% of the country's agricultural produce.

5.2.1 Kibbutz

Kibbutzim (collective agricultural settlements) is perhaps the most famous feature of Israeli life. Only three percent of Israelis live in kibbutzim, but their importance to Israel is disproportionately high compared to their share of the population. It was the first development in Israel towards not only dairy sector of habitants but for the whole state prospectively. There were specific objectives and goals that were pointed towards by kibbutz community as listed below. However, it has changed over time, after crisis 1980s, the tendency started to alternate as socialism stated to be less popular among community. However, with the planned steps in the liberalization of the economy, situation stabilized. Development of the agricultural economy was directly connected to kibbutz and moshav and has changed compared to industrial sector of the the settlement after 1980s. Production growth of industrial activities was 15.9 percent growth annually during the period of 1972-2010 while at the same period, there was only 2 percent growth annually in agricultural activities

1.Nation building;

2.Revival of Jewish agriculture;

3.Back to manual labor;

4.Creation of a just society;

5.Promotion of socialism.

The first kibbutz, Degania, was founded by Jewish settlers in 1910, 3S years before the state of Israel was born. Jewish immigrants at best had a poor understanding of agriculture: in Russia, where the first Zionist settlers came from, Jews were not allowed to own land at all. The firm principle of Zionist ideology was that the Jews did not achieve sovereignty until they learned to work on earth. Since there were many socialists among the newly arrived settlers, they opposed private farming in favor of joint ownership of the land, its cultivation, and general life in the commune (Weintraub 1969) .

An extensive network of kibbutzim in different parts of the country before and after the emergence of the State of Israel played an important role in solving one of the main tasks of the Zionist movement - the creation of a class of Jewish farmers who can provide the Jewish population with

the necessary agricultural products. In a relatively short period of time, new settlers, only a part of whom were trained at training farms, organized by groups of settlement activists abroad, created highly productive agriculture in the Land of Israel that is not inferior in level to the economies of developed countries with a centuries-old agricultural tradition.

Each of the more than three hundred kibbutzim created after Degania was built on the same economic model. Land, agricultural implements, and houses — all belonged to the kibbutzim. In a word, the kibbutz is a social-communist type of society, and the only communist society, in fact, guided by the principle of "from each according to his ability, to each according to his needs." At the same time, the kibbutzim differ from other communes in that all their members united on a voluntary basis. Members of the kibbutz, who wished to leave, receive their share for all the years of their work, which allows you to settle in a new place and start a new life if you wish. However, nowadays this tendency has changed since the early 2000s, the era of the “renewed kibbutz” began. The utopia of complete and universal equality, as well as the former asceticism, had to be abandoned. Now, in most kibbutzim, in addition to collective ownership, there is also private (land and means of production are common, and the personal economy of the kibbutznik is private), and besides, the members of the kibbutz began to receive differentiated wages, and even completely keep most of the salary received from non-kibbutz activities, instead of putting them into a “common pocket”. However, the kibbutz fraternity, kibbutz solidarity, and kibbutz pride have not disappeared (Rosenthal et al 2014) .

Education and, in some federations, the rearing of children in age-graded dormitories, are communal as well. In fact, it is a settlement that was established with a small number of people with further enlarging while becoming a full community at the end with it is own rules and lifestyle.

In the late 1960s, in addition to agriculture, industrial sectors have begun to develop in kibbutzim. All over Israel, for example, stores are open where you can buy furniture assembled in kibbutzim. The practice of hiring seasonal workers “from the outside” to work in the fields and factories has also become more frequent, which in practice means a return to the capitalist path, which the ideology of the kibbutzniks had previously denied (Rosenthal et al 2014) .

By the figure provided below can be seen that the number of kibbutz settlements have increased over the decades both in number of residents as well as kibbutz settlements

Year	Total number of residents in kibbutz	Total number of Kibbutz
1910	10	1
1920	805	12
1940	26 554	82
1950*	66 708	214
1970	85 110	229
1989	129 000	270
1990	125 100	270
2001	115 500	267

Figure 3. The Center for Agricultural Economic Research,

Source: THE HEBREW UNIVERSITY MAGNES PRESS, 2001

5.2.2 Moshav

Moshav (Hebrew מוֹשָׁב - lit. “settlement”; plural מוֹשָׁבִים - moshavim) is a type of rural community in Israel. The original fundamental principles of the moshav were

1. Farming as the main source of income;

2. Family units;

3. Self-labor;

4. Mutual aid;

5. Mandatory cooperation in services;

6. National land.

The founders of the moshavim tried to create a model of the settlement in which independent agricultural work by the family contract method would be combined with the social life of the settlement, based on the principle of equality of members of the settlement, but also respecting their individual choices. The first moshavim were Nahalal and Kfar Yehezkel, founded in 1921 on lands bought by Yehoshua Khankin in the Jezreel Valley. Until the end of the 1920s, an additional eight moshavim were founded there (Weintraub 1969).

In its classical form, moshav is an agricultural community operating on a cooperative basis in the supply and marketing sector with the partial or full socialization of labor and ownership of the means of production, but, as a rule, while maintaining individual land use by members of the moshav in the form of renting separate land plots and implementing principles of individual consumption (as opposed to the collective consumption characteristic of a kibbutz). As kibbutz, originally devoted solely to agriculture, but these, tendency has changed. Most moshavim residents in Israel were no longer directly involved in agriculture. Many of them found work outside the moshavim, continuing to live in moshavim; others founded enterprises, factories and tourism projects in moshavim (Rosenthal et al., 2014)

Land plots in moshavim are usually divided into three categories: Alef allotment (plot on which the moshav's house is located), Beth allotment (moshav's agricultural allotment) and Gimel allotment (common moshav agricultural allotment).

Today, there are three main models for the distribution of land rights among members of moshavim: The "Tripartite Agreement": The Land Administration of Israel, which owns, among other things, state-owned land and land owned by the Jewish National Fund, transfers the land for a three-year lease (extended at the end of the term) to the settlement department of the Jewish Agency, which in turn, it transfers the right to use the land to the moshav, and the moshav transfers the right to use the allotments to the members of the moshav in accordance with the charter of the moshav. "Bilateral agreement" (a model designed to simplify the contractual arrangement): Land administration in Israel transfers the right to use land or rent for a three-year term (renewable at the end of the term) directly to the moshav, and the moshav transfers the right to use allotments or sublease to members

of the moshav. Repeating the previous model when adding the process of direct contracts between members of the moshav and the Land Administration of Israel (Rosenthal et.al 2014).

6. The current situation of dairy production and consumption

Agriculture in nowadays Israel region has started to develop in modern way after Israel estabilishment in 1948, while even before there were nomadic and pastuaralism livestock sytems were widely practised .The dairy industry in Israeli agriculture in 2019 changed into one of the largest agricultural sectors. The dairy industry has maintained continuous great-established and steady increase through the years. Since the early 1990s, production increase has been -4% per year (Hojman et al., 2012). Israel has evolved special breeding and feeding methods which might be appropriate for climatic situations and constraints of land and water. The long-term implementation of these strategies has changed milk production in Israel into a highly evolved and efficient computerized system. The method geared toward growing efficiency and rationalization in Israeli dairy farms has been ongoing constantly and sequentially for approximately five decades and is manifested within the high productiveness of milk per cow. The first Jewish pioneers who got here to Israel from East European countries more than one hundred years ago, were acquainted with using milk and its merchandises. They settled within the country intending to develop regional dairy cows. However local cow manufacturing was in a poor situation, and european cows that produced more milk yields did not adapt to regional harsh conditions. The settlers, consequently, determined to expand a special local breed of cows, produced via cross-breeding local Damascus and Dutch Friesian breeds. Numerous generations of repeated cross-breeding led to a local cow with excessive milk yield and also characterised via wonderful resistance to harsh environmental conditions. The breed that was obtained through several cross breeding methods is known to the world as Israeli Frisian breed.

During the lactation period the average milk yield is 11500 kg. Similarly to their high milk production, additionally they produce excessive levels of protein (3.24%) and fat (3.70%). With the assistance of artificial insemination from imported bull semens from other countries with settled cattle systems they achieved increase in perfomance. However, nowadays 99% of cattle are Israeli Friesian that are bred in that region (Hojman et al., 2012).

6.1 The Agricultural Sector in Israel

Israel's agricultural activity is defined by the means of intense production system, which comes from the need to overcome shortage of natural resources, especially water, land and labor, work. Half of the arable land is irrigated. Israel is specific among developed countries in terms of land and water as almost all are government-owned. Growing labor productivity was a key contributor to the nearly double increase in total factor productivity in agriculture in 1990- 2012, much higher than in any other sector of the Israeli economy (Hojman et al., 2012).

The high level of improvement of the agricultural sector is mainly caused by close communication and interaction between scientists, extension advisers, farmers and agriculture industry. These four terms have come together to improve advanced technologies in all areas of agriculture. It leads to modern agriculture in the country, half of which defined as a desert. The total agricultural output in 2012 was 1.6% GDP. Despite a decrease in the number of farmers and the share of agriculture in GDP, agriculture plays significant role as the main food supplier for the local market and is an important factor in Israeli exports. About 60,000 people were directly employed in agriculture. in 2012. This number is 2.3% of the active workforce. Significant increase in the last twenty years in the number of foreign labors employed in Israeli Agriculture. Their total number and distribution are fully regulated by a government that decreased the number of work allowances allocated to agricultural area from 25,900 in 2008 to 18,900 in 2015. Investments will be offered to farmers as compensation support for 56 years (provides up to 40% of investments) for replacement of labor with machinery (Abraham et al., 2019)

Population	7.91 million inhab.
GDP per cápita	117,430 NIS =27.53 Euro
GDP of Agricultural Sector	11.89 NIS Billions = 2.7 Euro Billions
Share of Agriculture in National GDP	1.3%
Share of Agriculture in the Business Sector GDP	1.8%
Direct Employment in Agriculture as share of National Labor Force	2.0%
Self-sufficiency of Agricultural Products	80.0%

Figure 4. Economic and financial data of Israel and its agricultural sector.

Source: Israel Cattle breeders Association, Rachel Borushek, 2012

6.2 Annual Milk Quota and Milk Supply

In general, the dairy industry is one of the leading sectors of the Israeli economy and almost completely satisfies the state's domestic need for cow, sheep and goat milk.

In accordance with the notification submitted by the State of Israel to the World Trade Organization, the volume of state support for agriculture in 2014-2016 decreased by 12.8% to $ 945.5 million, including to support milk production - by 28.1% to $ 367.3 million and to support egg production - by 9.6% to 136 million $.

The main instrument for supporting milk and eggs in Israel is the state regulation of prices and a quota system. Milk's price support accounts for more than 60% of all distortion trade spending support measures. The volume of subsidies for milk makes up more than half of the cost of milk production, almost 2/3 of the budgetary funds allowed by the obligations for agricultural support go here. Owners of dairy farms in Israel are well organized and receive support from specialized agencies associated with the Ministry of Agriculture, universities, dairy plants, cooperatives, providing veterinary care (Möcklinghoff-Wicke 2012) . Dairy production is tightly regulated and controlled by the state. Cow's milk in Israel is produced under a quota system with an annual volume divided by monthly quotas. Due to seasonal fluctuations in milk production, economic incentives are established for dairy farmers to regulate monthly production so that milk supplies to the domestic market are at the desired level throughout the year. At the same time, three processors that control the entire local market - Tnuva, Strauss and Tara - have a great influence on the allocation of quotas. They are members of the Dairy Industry Council, which is involved in coordinating the base price of milk with the government. This price reflects the average cost of production and the agreed compensation of farmers' labor and invested capital. These three companies actually form an oligopoly, controlling purchases and prices in the market, they produce hundreds of dairy products, covering all the needs of customers. In addition to them, there are small firms for the production of cheese or individual dairy products, but they are too few to influence the market as a whole. In addition to price support, milk producers receive financial assistance in the amount of 50% to compensate for investment costs in infrastructure and environmental protection systems (Abraham et al., 2019).

Year	Milk SUPPLY (millions of ltrs.)	Milk QUOTA (millions of ltrs.)
1999	1,132	1,124
2000	1,128	1,140
2001	1,174	1,200
2002	1,154	1,170
2003	1,122	1,150
2004	1,146	1,150
2005	1,150	1,150
2006	1,124	1,130
2007	1,166	1,185
2008	1,273	1,212
2009	1,217	1,220
2010	1,252	1,240
2011	1,338	1,313
2012	1,344	1,318

Figure 5. Cow milk-annual supply and quota (millions of ltrs.).

Source: Israel Dairy board, Liron Tamir, 2012

6.3 Effective heat abatement

An increase in living standards in recent years in developing countries have increased demand for dairy products due to increase in population. The increased demand for milk and the inability of the global dairy sector to provide it have led to higher prices for international dairy products such as dried milk, butter and cheese. As a result of this situation, many developing countries have begun to develop their local dairy sectors to ensure milk self-sufficiency. On the other hand, countries that can reduce production costs have recently expanded their dairy industry and contributed to the international trade in dairy products (Hojman et al., 2012).

Global warming and a constant increase in the level of cow production (more heat is produced and it is necessary to dissipate it), which leads to heat load in the summer, which is a financial problem, which leads to large losses for a significant part of the dairy sectors in the world, especially those located in the warm areas and use European breeds, under intense production systems.

Heat stress negatively affects highly productive cows, the best ways to solve the problem, the expected improvement from the proper installation and operation of heat stress reduction and cost-effectiveness of the process. Providing this information to dairy producers on another continent, as well as dairy companies, professional support systems and government officials, will help increase

global milk production, increase farm profitability and reduce the seasonality of milk supplies to consumers, mainly due to climatic factors. The reason for working on this item was the combination of warm and the humid climatic conditions that people encounter in the summer and the high yields obtained by farmer cattle (in fact, an average of 12,000 kg / cow annually), which means that more heat will be released to the atmosphere.

Optimum temperatures for a dairy cow are in the range of -5 to 22 degrees Celsius. In tropical and sub-tropical areas, a highly productive dairy cattle will begin to suffer from “heat stress” even at temperatures below 20 degrees. “Heat stress” is a physiological and behavioral situation caused by a cow's inability to dissipate all the heat that it generates into the environment. Readers should be aware that the amount of heat generated by a highly productive cow is equal to the amount of heat generated by 20 lamps of W100 each. The incability to waste all the generated heat comes at the first stage to the operation of a “protective mechanism” designed to decrease heat production (by reducing activity and feed consumption), and later, in the second stage, trying to increase heat loss (breathing hard and increasing blood flow to the surface of the cattle). In both cases, cows are faced with a reduction in the availability of energy needed to meet the energy demand for milk production (Flamenbaum et al., 2010).

Under conditions of heat stress, cows cannot balance their body temperature to a normal level (in the range from 38 to 39 degrees Celsius). At body temperatures above 39 degrees, cows are considered “overheated”. The intensity and duration of heat stress during the day, as well as the number of hot days in a year, are closely related to the degree of summer decline in cow well being and loss of production. Heat stress can result in a reduction in daily consumption of cows by approximately 20% and a decrease in feeding efficiency by more than 10% (the rate of conversion of food into milk). As a result of these effects, milk production is expected to decrease by at least 10–20% compared to winter. Summer heat stress negatively impacts the annual productivity of cows. It is expected that cows from highly productive herds will lose between 500 and 1,500 kg per year as compared to similar cows grown in temperate parts of the world (Kadzere et al., 2002). The fat and protein content in milk additionally reduces, amounting to 0.4 and 0.2 percent, respectively, in summer compared to winter conditions. In parallel and as a result of “stressful” conditions, cows should also have a higher number of somatic cells in milk, about 100,000 units. The conception rate of inseminated cows in summer can fall significantly compared with those obtained during the insemination period in the winter months. Cows inseminated in the summer months reach less than

10% of the conception rate, significantly differing from 40-50% achieved during winter insemination. The low conception rate achieved in the summer increases the "calving interval", which reduces the efficiency of milk production and also leads to increase the proportion of cows leaving the herd due to infertility, creating a large gap in milk between seasons (Flamenbaum et al., 2010).

COUNTRY / % improvement	5% improvement in milk and feed efficiency	10% improvement in milk and feed efficiency
Israel (Coast)*	170	340
USA (South)	150	345
México (North)	165	380
China (South)	140	310
Argentina (Santa Fe)	80	200
Peru (Coast)	145	240
Brazil (Minas Garais)	145	310

Figure 6. Additional annual income per cow (U.S $) as a result of the implementation of intensive cooling means in the summer in various countries around the world

Source: Israel dairy board, 2010

Over the past thirty years, intense efforts have been made in Israel to develop effective means to improve heat stress. Emphasis was placed on the development of coolants that match the climatic conditions and characteristics of the hull, trying to achieve it at the lowest cost in order to be economically viable.

There are two main ways to cool cows in the summer. One of them is the "direct cooling" system, in which we cool the cows by evaporating water through the skin of the cow, using a combination of variable humidification and forced ventilation. Direct cooling should cool the cow, without any effect on the ambient temperature. The second method is "indirect cooling ", where the barn sheds are cooled by mechanical means. Typically, an indirect cooling system requires closed and, if possible, insulated sheds. There are various ways to provide indirect cooling of cows, among them air conditioning (the method was investigated and recognized as inappropriate from an economic point of view), fogging and evaporative cushions. These products are usually effective in dry rooms where the relative humidity does not exceed 30%. In more humid areas, air cooling by evaporation

is limited to midday and afternoon hours, where relative humidity tends to be low (Flamenbaum et al., 2010).

Direct cooling is the most common cooling method currently used on global dairy farms. This is mainly due to the fact that its installation and operation are relatively cheap, and also because it can be easily adapted to different types of climates. Cooling through a combination of wetting and forced ventilation was carried out and first tested in Israel in the early eighties. Cooling can be provided in the "waiting room" before and between milking sessions, in the feeding line and in the rest area. In a study we conducted in Israel in the mid-eighties, we found that by directly cooling the cows several times a day for 30 minutes each, we prevented the expected increase in the body temperature of the cow, keeping them all day below 39 ° C. however, the body temperature of uncooled cows during most of the day reached more than 40 ° C (Hojman et al., 2012).

Appropriate and efficient cooling systems, designed and successfully used in Israel, are now available to dairy producers around the world. These coolants can reduce the negative impacts of summer heat on cow performance. Correct installation and operation of cooling systems at the farm level can increase the annual production of cow's milk by about 10%, as well as the composition and quality of milk and feeding efficiency. Thus, cooling cows in the summer significantly reduces production costs, which leads to a significant increase in annual income and profitability per cow and farm. At the same time, cooling helps to improve the welfare of cows by allowing them to rest and meditate longer on warm days and makes dairy production more sustainable, reducing greenhouse gas emissions into the atmosphere for each unit of milk produced (Flamenbaum et al., 2008).

6.4 NOA – The Israeli Dairy Herd Management Program

NOA is an extensive dairy herd management program established by the Israeli Cattle Breeders Association (ICBA) in 2000. NOA affects all sides of the dairy industry. NOA was designed to provide the herd manager with updated information on all aspects of dairy activities.

Key Features of NOA

Herd Management - Updating activities for breastfeeding, production, and reproduction. Penetration of cows, selection, and movement between groups in the herd. Veterinary data: diagnosis, treatment, medication, etc.

Feeding - linear programming and ration composition, feed production and PMR planning, inventory management, and inventory reports. Communication with power controllers. Complete tracking and monitoring of feed intake (Ezra 2007).

Milk production - updating milk marketing, milk accounting, and summary reports, including summary information on lactation. All Herdbook options are available at NOA. Communication with various brands and types of commercial milk meters (online milk data).

Genetic control - a graphical representation of data on cows and bulls. Marriage program. Simple tools for implementing breeding programs in accordance with the specific goals of the herd.

Economic module - gives the farmer the ability to record all financial transactions, including invoices and accounts. A dynamic income statement can be easily obtained. This module gives the dairy farmer an effective tool for better monitoring of present management.

Additional functions - Common database (network), powerful report generator, PDA application for pocket PCs (iNOA), which includes data from all cows, very usefull tool to record data from the herd even being farm from the stable

Present days around 700 livestock farmers and feed centers use it in a daily basis, including large scale dairy farms. Everyday number of NOA users increases with total number of cattle while nowadays it is around 100 00.

NOA operates in all producing units of dairy farms such as feeding regulators and milking mashines. It makes the life of farmers much easier with user friendly platform integrated in a single tool (Ezra 2007).

7. The Israeli Breeding Program

Company SION A.I. was founded in 2001 through the merger of cooperatives On and Hasherut A.I. There are currently 240 bulls on three different farms owned by the company. Approximately 50 young gobies undergo annual inspections.

The sperm of about 20 bulls that brought successful offspring is used on Israeli dairy farms for general purposes. Most of these bulls are evaluated on the basis of qualitative indicators of offspring production, while the rest are young bulls with high breeding rates (SION 2019).

A genetic examination is carried out twice a year. Bulls and cows are classified according to the Israeli Selection Index PD07. Every year in Israel, approximately 350 thousand inseminations are performed, of which 92.5% of them are sperm from bulls of the Israeli Holstein breed. SION employs 350 insemination technicians. Currently, about 88% of the dairy cattle stock is covered by the dairy herd improvement program. Information about insemination is entered by technicians into "pocket" computers.

Such a system ensures the transmission of correct and accurate data to the central computer of the Israel Cattle Breeders Association (ICBA). Seed collection begins as soon as the bulls are 14 months old. Twice a year, a genetic examination is carried out, based on which the status of bulls and cows is reviewed. The livestock of dairy cattle in Israel provides the highest milk production and the production of dry milk residue in the world despite the difficult conditions for keeping animals in Israel (heat stress in most parts of the country for most of the year). Bulls in Israel produce offspring, characterized by excellent genetically determined indicators of milk yield and milk quality, the highest level of fertility and life expectancy, as well as improved characteristics of the state of the udder (The Israeli Breeding Program 2019).

Every 6 months, SION publishes a new list of bulls from 20 verified Israeli Holstein bulls for general service of Israeli dairy farms. These bulls are selected from 250 young bulls over a 5-year evaluation period. Bulls are ranked according to the Israeli PD11 selection index and genomic selection (Hojman et al., 2012) .

PD11 = 7.9 (Fat Kg) + 23.7 (Protein Kg) – 300 (SCS) + 26 (Fertility %) + 0.6 (Durability days herd life) + 10 (Persistency %) – 3 (Dystocia %) – 6 (Calf)

Expected genetic gains after ten years of selection using this index are: 509 kg milk, 20.0 kg fat, 17.7 kg protein, - 0.11 SCS (The index coefficient for somatic cell score) , 1.2% daughters' fertility, 107 days herd life, 1.7% persistency, -0.83% dystocia, and -0.67% calf mortality (Weller et al., 1997) .

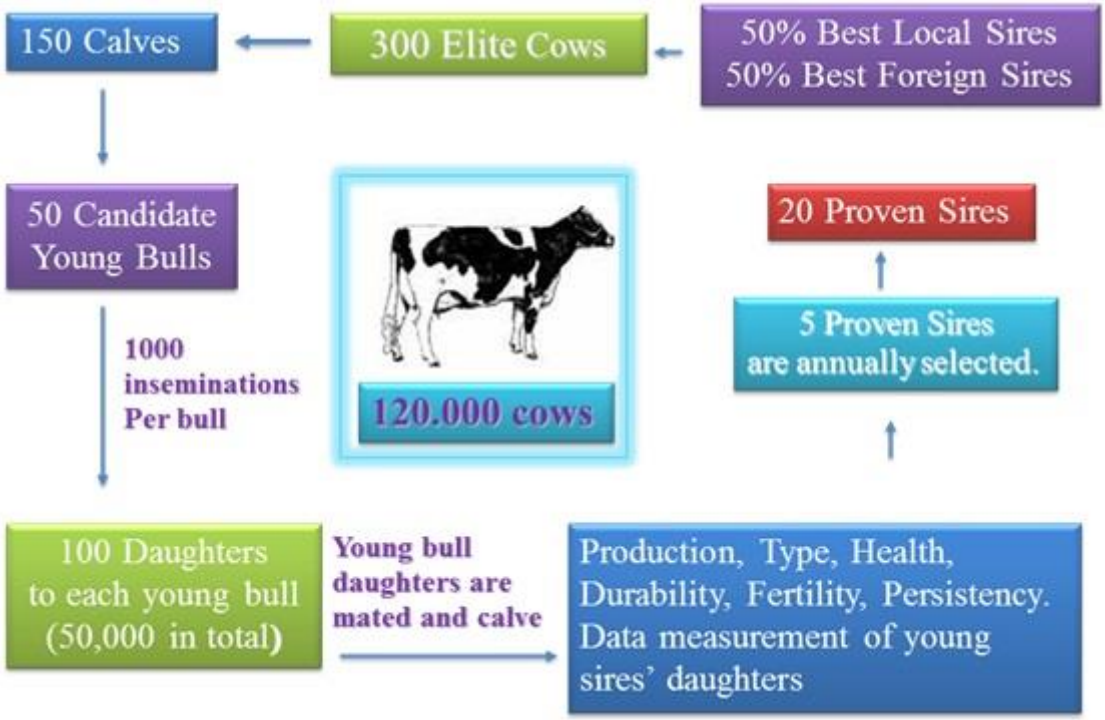

Figure7. SION's 5 year breeding program

Source: SION - Israeli company for artificial insemination & breeding LTD, 2010

In 2015, gross indicator, Israel received 1217 million kg. milk per year. In Israel, the amount of milk is 2.65 billion shekels(676 million euro) a year, for dairy products - 8.5 billion (2.2 billion euros). Dairy products account for 9% of the total volume of all diverse agricultural products. This is a high economic indicator.

Computerization with robotization, an extensive network of service cooperatives is the highest time for the dairy industry, the time to save milk. Even the traditional occupation of preparing feed was taken over by the industry. In one of these combines and all the contractors: substandard vegetables, beer shot, whey, cotton and peanut stalks, cutaneous citrus fruits and many more. This set allows for filling up the lack of feed up to 60%.

A completely new word in increasing the productivity of dairy herds in Israel was said in the company Maximilk. This is not a process of artificial insemination, but a process of implantation of embryos.

7.1 Maxximilk

Maxximilk product - breeding dairy embryos ready for transplantation, can dramatically increase dairy productivity and farm profitability ... in record time. Raise a new elite herd of dairy cows in 32 months. Maxximilk manufactures in VITRO, the highest quality ready for transplantation of pedigree embryos. These embryos will allow dairy farms to bypass the long-term selection program and quickly acquire a new herd of elite dairy cows. All genetic material was obtained only from highly productive animals, with an average milk yield per lactation of at least 11.5 thousand tons (Maxximilk 2019) .

Cattle

In 2011, Israel estimated that a total herd of 100,000 Holstein Friesians gave an average annual milk yield per cow of 11.755 kg of milk, 381 kg of protein and 430 kg of fat (in the same year, the highest yielding individuals produced over 18.775 kg of milk!). This is extremely high productivity, and it's not just milk. This is a high quality milk, with a surprisingly low number of bacteria and somatic cells.

Improving herd productivity leads to a decrease in livestock numbers.

Producers

The selection specialists select groups, take into account their ability to transmit outstanding genetic traits that give high milk productivity, excellent fertility, excellent health, and cows have exceptionally healthy udder characteristics. Embryo transplantation accelerates the transmission of genetic progress.

Embryo transplantation is an excellent tool to quickly improve genetics, increase milk production and at the same time fight disease. Unlike artificial insemination, which involves the use of producer seed, implantation of the embryo can radically accelerate the rate of genetic progress of the herd. This is because, then, we are talking about the maximum transfer of genetic information, and from a highly productive mother and proven highly productive father.

Maxximilk Products

Elite selection of female embryos

Embryos are made from eggs taken from elite cows; the elite is 0.3%, in Israel the highest Holstein productivity is cows obtained from fertilization by the selected (by gender) sperm of the tested Holstein bulls. These embryos have great potential because the cows received from them produce about 9% more milk than in Israel annually (an average of 11.755 kg).

Meat breeds

Embryos are obtained from thoroughbred highly productive donors, which ensures the breeding of an elite highly productive herd. These embryos can also be selected by sex (although this is less relevant for beef cattle breeding). Maxximilk regularly achieves 90% success in breeding female embryos.

Cryobiology

Experienced Maxximilk specialists use the advanced achievements of cryobiology and animal breeding.

Namely, the production of high-quality embryos:

-In vitro products

-Latest cryopreservation methods (freezing)

-Embryo sex selection

-Proven implant technology.

-Laboratory with high standards of work.

The company complies with all international standards for quality control, requirements for the production of embryo products. Finished embryos are produced, cultured and frozen in a sterile environment. The laboratory is located in a disease-free area. There is a bank of embryos ready for dispatch at the time of order (Maxximilk 2019) .

Bio technology

(In vitro fertilization)

Eggs are obtained from high-performance donor cows, embryo culture is grown in the laboratory, using bull seed with an excellent pedigree to fertilize. Embryos are in culture until a certain phase of development. During this process, each embryo is evaluated for its implantation potential. Only embryos that have excellent morphological characteristics are selected for cryopreservation.

Sexually selected embryos

The use of sexually selected embryos is a particularly effective way to increase herd size without spending money on replacing heifers and without purchasing heifers from other farms (with the risk of disease) (Gendelman et al., 2010).

Cryopreservation

Maxximilk uses the latest cryopreservation technology, called vitrification, and uses other latest achievements of cryological science. Practical tests have shown that the chances of implantation using this technique are significantly increased compared to traditional cryopreservation methods (40% for Maxximilk compared to 10%). Embryo production and cryopreservation complies with strict international quality standards; Maxximilk embryos can be stored for an unlimited period of time (Ravel 2005).

Production Practibility

-High productivity (fewer cows - more milk).

-Embryos from record holders in the industry (both maternal and paternal).

-Strict selection of embryos according to the morphological criteria selected for implantation.

-Gender selection of embryos will radically improve herd management.

-The advanced cryopreservation of modern procedures will increase the percentage of pregnancy in recipient cows by an average of 40% (compared with 10% for traditional methods).

-Embryos are manufactured in accordance with the most stringent international standards.

-Improving herd health through genetic selection.

-Reducing the risk of disease due to procurement, transportation of livestock from other households.

-Individually selected embryos ready for implantation are stored in liquid nitrogen at minus 196 ° C.
-Embryos can be stored for an unlimited period and are ready for delivery at the time of notification.

-While transporting animals is a troublesome, expensive and full of restrictions event, the convenience of delivering a whole herd in the form of cryopreserved embryos is undoubtedly more, cheaper and easier(Gendelman et al.,2010).

Comprehensive herd management support

In addition to excellent genetics, a large number of factors affect milk productivity. Excellent genetics is necessary, but it is only one aspect of successful dairy farming.

The company's specialists can provide professional herd maintenance services. Maxximilk is proud of its excellent professionals with international experience in the field of dairy herd management - experts who can help you achieve high milk yields. Maxximilk will help you with any chosen development program, in all its aspects (Maxximilk 2019).

7.2 Israeli cow is small but productive

By looking in more detail on the most widespread Holstein Israeli breed, with which breeders have been working for 30 years. A local cow from a European or North American is distinguished by its lower weight (600-650 kg), resistance to heat, cold and high humidity, as well as a high level of survival and productivity (Udasin 2011).

The entire population is on artificial insemination. Seed material can be selected at the request of the farmer: someone wants to increase the herd faster, others want to increase milk production or improve the quality of milk according to certain parameters, for example, protein, fat or somatic. Accordingly, breeding work is carried out according to the so-called efficiency indexes, which include fecundity by heifers, milk yield stability, ease of calving, longevity, feed consumption for the production of a certain amount of milk and others.

These parameters, which are not directly related to milk quality, can bring a considerable profit to the farmer. For example, the stability of milk production allows you to get more milk during the second and subsequent lactations since the parameter decreases not so much. In fact, the farmer receives additional milk during the entire life of the animal (on average, 3.5 lactations live in Israel). And to produce a liter of milk, a local cow needs 20% less dry feed than 10 years ago - and this is another achievement of Israeli breeders (Ezra 2007).

8. Sheeps and goats

Breeding sheep and goats for milk and meat is one of Israel's ancient agricultural sectors. Nowadays, 56 sheep and 81 goat farms produce milk in a wide range of production systems: from traditional semi-nomadic herding herds to intensive dairy and meat shops with zero-grazing on moshav and kibbutz farms in different parts of the country.

In 2017, 10.6 million liters of sheep milk and 14.3 million kilograms of goat milk were produced.

Milk is utilized for different purposes such as cheese and yogurt products. Due to its high quality and properties, sheep and goat cheeses are exported mainly to the United States.The development of the sheep sector in Israel is a good example of how modern technology has been integrated into the traditional farming system through research and development.

For more than 10 years, goat milk has been in great demand in the Israeli market, due to its high quality and beneficial - in the complex of substances that bring it closer to mother's milk. An increase in demand for goat milk products is also observed in Western European countries (Haenlein 2006).

9. Feeding

Due to the lack of land in the country, most farmers cannot grow animal feed themselves. As a rule, their owners are farmers' cooperatives. This situation has led to the need to create a system of feed centers. Each of these centers serves agricultural producers within a radius of 100-150 kilometers, daily delivering the required amount of feed to each farm.
All of them are engaged in agronomic issues, drawing up diets for different groups of animals, and logistics. The system of feed centers makes it possible to provide farmers with effective feeds and save 30% on their purchase, and most importantly, the quality of feed storage is much higher here (Durst 2020).

The Israeli feeding system uses food waste. These products replace expensive imported cereals and at the same time reduce the amount of roughage in the diet to a minimum.

Nutrition, consisting of highly concentrated proteins and carbohydrates, allows not only to maximize milk production from one cow, but also to keep dairy farms environmentally friendly. The inclusion of a high amount of food production wastes in the diet of cows and the use of fodder are easily accomplished with the help of a full-feed system, which provides all dairy cows and heifers with feed using regional feed centers. Most feed supplied to Israeli cows is represented by winter crops - mainly in the form of wheat silage. This wheat is grown in Israel in the rainy season.

Due to unavailability of forage leads to the significant increase in concentrate number in cattle diet 17-18 kg of concentrate per day. With the increased use of the metabolic and net energy systems and their higher evaluation of forage, the significance of roughage has become more emphasized. Evidently, the manipulation of the feeding level cannot be achieved by changing the amount of concentrates alone (Brosh et al., 1998).

9.2 Energy level

Table 1

Nutrients (on DM basis)	
Net energy for lactation – NE_L	1.74 Mcal
Crude protein	16.6%
Forage dry matter	32.6%
NDF	30%
Forage NDF	18%

Figure 8. Nutrients (on DM basis)

Source: Progressive Dairy Publishing, Ofer Kroll 2015

Energy Levels Until the late 1970s, the Scandinavian feed system (FU) was commonly used for Israeli cattle ration. For maintenance, an average of 5 FU per day and 0.3 to 0.4 FU per kilogram were used. Due to the limited amount of roughage available, resulted in increase in concentrate amounts 17-18 kg of cows per day, which reduced feed efficiency. With the growing appreciation of metabolic systems and the widespread use of clean net energy (ME, NEL), the significance of the forage type of feeds was emphasized. Naturally, changing the number of concentrations cannot affect the level of food. Today it is often used, ME/ NEL system for energy evaluation of NDF(Neutral detergent fiber). or Fiber Acid Detergent (ADF) is used for energy consumption and

assessment. Israeli farmers use NRC 89(recommendation of feed intake to farmers) as the main guide for feeding high yielding dairy cows with local experience. Under the local low-quantity and low-quality roughage conditions, high-energy concentration is a common practice. .For most breeding cows, the energy density is 1.74-1.75 Mcal NEL per kg. Fatty feeds vary from 3 to 5 percent, and various sources of starch are always added (Kroll 2019).

Protein

Protein A few years ago, 500-550 grams of crude protein was the typical resolution to maintain, about 70 grams to kilograms of milk. About 34 to 36 percent of the total protein is non-utilasibale intake protein, and a vast numbers of protein sources is a general solution to cover the needs for the different amino acids. Cows in early lactation may be given 18 to 19 percent protein of DM.

Fiber

In the context of feeding in Israel, it is important to assess the animal's need for NDF in order to ensure proper functioning of the scar. When using intermediate feeds such as wheat bran or orange peel, the amount of NDF increases to 6-6.6 kg per cow per day (30% -34% of the total dry matter), but with an NDF feed of not more than about 3.4 -3.6 kg (17-18% of the total dry matter). Particular attention should be paid to the physical temperature of the feed; straw when finely chopped (Peri et al., 1993).

Table 2

Ingredients (percent of total, on DM basis)			
Barley grain (rolled)	5.2	CMS + urea	1.8
Maize grain	21.5	Wheat silage	26.0
Wheat grain	1.7	Wheat hay	4.4
Soda-treated rye grain	5.6	Alfalfa hay	2.2
Soda-treated cottonseed	1.7	Oil	0.2
Soybean meal (44%)	9.3	Salt	0.4
Corn gluten feed	4.4	Limestone	1.1
Rapeseed meal	1.8	DCP	0.1
Sunflower meal (37%)	2.8	Soda bicarbonate	0.4
Wheat bran	3.7	Magnesium oxide	0.1
Citrus peel	3.8	Vitamin premix*	0.4
Protected fat	1.4		

*Vitamins A, D, E, microelements, biotin, yeast culture.

Figure 9.Ingredients (percent of total, on DM basis)

Source: Progressive Dairy Publishing, Ofer Kroll 2015

10. Caring for the environment

The use of a large number of by-products of agricultural and agro-industrial activities in the diets of cows allowed Israel to significantly reduce maintenance costs, as well as to avoid additional costs for the processing of this material and reduce environmental pollution.

So, in 2007, about 630 thousand tons of by-products and waste were used to feed cows in Israel with a total economic efficiency of $ 40 million per year ($ 360 per cow or 3.3 cents per liter of milk). This number is equivalent to 10% of the total cost of fattening cows.

High cow productivity increases the economic efficiency of the entire production. This is due to a reduction in the cost of feeding a cow and cheaper labor costs. Improving efficiency also reduces the contribution of cows to global warming, as the amount of methane released per cow is reduced. Preliminary results from carbon footprint studies showed that the total amount of CO2 emitted per 1 kg of milk received from Israeli cows was 80% of the total emitted by cows in Eastern Europe and 40% from New Zealand.

11. Conclusion

The experience of an Israeli colleague could serve as a good example. In Israel, the production concept is based on the use of advanced technologies and management methods, which are carried out using a comprehensive computerized “database” that provides dairy farms and organizations with highly professional after-sales service. Of course, this path would be suitable for Eastern Europe or other regions of the world, where the main demand for milk and dairy products would come from the urban population. Most of the milk is produced in new, well-equipped farms.

The proximity of large urban centers will allow the use of a large number of treated wastewater for feed production, the creation of large fodder centers, and include agricultural waste in the diet of cows and heifers. The use of such feed will reduce the potential cost of all animal nutrition, and this will be achieved now in Israel. The use of effective cooling methods developed and tested in Israel will minimize the negative impact on the elevated temperature in cows.

Since the establishment of Israel as state, the dairy industry always develops by becoming world leader in dairy. The area that is not suitable for agricultural activities around 50 years ago, nowadays, is being used widely for the various dairy sector. Israel can be a good model of a rational and appropriate way of development of dairy industry

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