

Economics of Dairy Farming in Jordan

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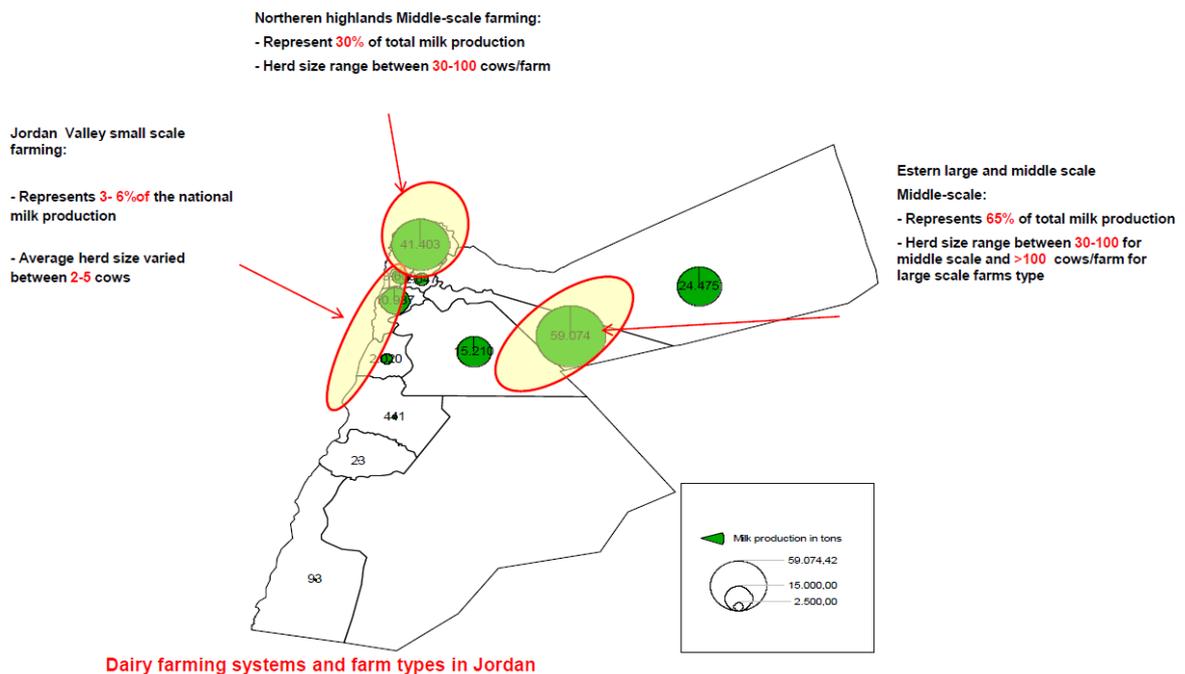
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Introduction

The main purpose of this study was to gain insight into milk production and farm economics in Jordan. Three regions were used for this study; Al-Duhlel, the highland and the Jordan valley. The Al-Duhlel area lies in the east of Jordan and produces more than 55% of national milk. Intensive production systems are dominant in this region, where the average annual rainfall is less than 200 mm per annum. The highland region has an annual rainfall of about 300 mm, milk production represents about 35% of national milk produced. The third area is located in the Jordan valley where annual rainfall is less than 200 mm. Small scale dairy farming is mainly practised in this region. Two major production systems exist in Jordan, the extensive and intensive dairy farming.



Methods background

The research approach of the study consisted of four phases as follows: 1) data collection for dairy sector analysis, 2) farm selection and interviews with farmers, 3) collection and analysis of physical samples, 4) model application and results presentation.

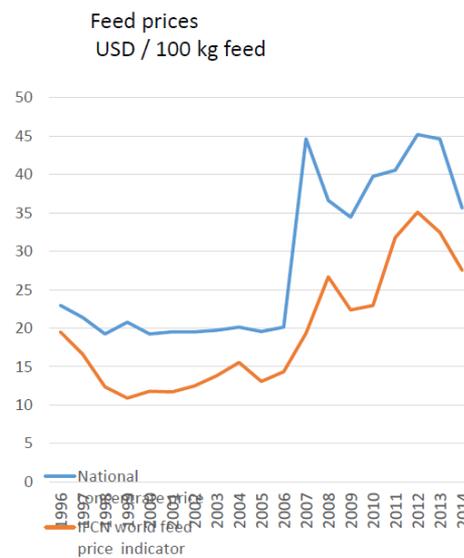
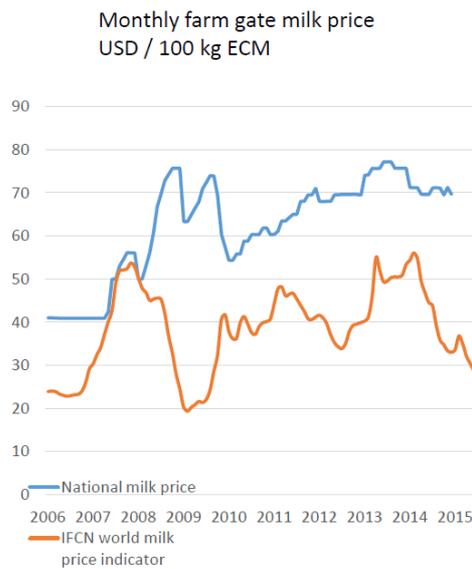
Data on dairy sector developments and farming systems were collected and analysed using the International Farm Comparison Network (IFCN) dairy sector model. This model possesses data on milk industry in more than 100 countries world-wide and can aggregate regional developments of milk production, showing the drivers for milk developments in a country or a region. In addition, it analyses trends and enables description of the historical growth in milk production, consumption, demand and the time series analysis of milk and feed prices at national and regional levels. The evaluation of dairy farming systems and feeding programs was conducted via physical farm data collection from typical dairy farms in the field. In this study, a typical farm represents the most common farm type within a production system which has an average management and performance and that produces the largest proportion of milk in a region. Typical farms were built and validated by a panel of dairy experts.

The economic evaluation of dairy farming systems in the current study was assessed using the TIPI-CAL model (Technology Impact, Policy Impact Calculations model) of the IFCN. TIPI-CAL calculates for each typical farm the cost of milk production per 100 kg of milk and gives an indication on the drivers for cost differences between dairy farming systems. This model is a think tool for better understanding farming systems and is based on the concept of typical farms. TIPI-CAL model has recently been extended with a partial life cycle assessment model to estimate greenhouse gases (GHGs) emissions at the farm level and convert them to their CO₂ equivalents. This model extension was used in the current study to estimate emissions from dairy farming systems. The economic performance of dairy farms was characterized by the following indicators: cost of milk production, share of dairy costs by activity, assets structure and return on investment (ROI).

Results

Milk production in local and global context

Jordan is counted No. 102 in the world milk production with milk production estimated at 0.3 mill t ECM (Energy Corrected Milk with 4% fat and 3.3% proteins) in year 2014 (with about 95% of milk delivered to dairy processors). The country has a long tradition both in milk production and consumption of dairy products. Between 2009 to 2014, the average growth in milk production estimated at 3.1%. The growth over this period is mainly attributed to a strong increase in the domestic demand of dairy products which was driven by the population growth. The five years average lactating cows population increased by 5.7% for the same period.



Milk and feed prices versus world market prices

Farm gate milk price was on average +79% above the world market, this was attributed to the high input prices such as land, livestock and feed prices. In 2008, when there was a peak of the world market price, the milk price in Jordan followed the world market price trend closely. In 2009, the milk price in Jordan rose significantly while the world milk price dropped to a historic low level. Feed price (concentrate feed) was on average +42% above the world market, and followed the world market price trend more closely, in comparison to the milk price trend. This was attributed to the fact that majority of feed resources such as grains and meals are imported from overseas.

Per capita consumption and self-sufficiency

The average per capita consumption of milk was estimated at 95 kg milk equivalent per capita in 2013 with annual growth rate of 0.3%. The self-sufficiency in milk production was estimated at 64% in 2013. The national annual growth in self-sufficiency was estimated at 0.8% between 2008 and 2013.

Analysis of typical dairy farms (data from year 2014)

Based on the IFCN methodology, three farm types were identified as 'typical' and were subjected to detailed analyses. A small dairy farm, JO-3 (3 HF cows and < 0.5 ha of land, feeding grains and agriculture by-products), a medium-size farm, JO-76 (HF cows and < 1 ha, feeding system is based on concentrate and cut and carry grass or alfalfa hay), JO-412 (HF cows and >7<10 ha land, feeding system is based on concentrate and cut and carry grass or alfalfa hay) which represents the more commercially managed dairy systems in the area. The selected farm types closely match the 2007 national statistics on farm structures, which show that about 60 percent of the organized dairy farms held 40 or more cows.



Dairy Farming system

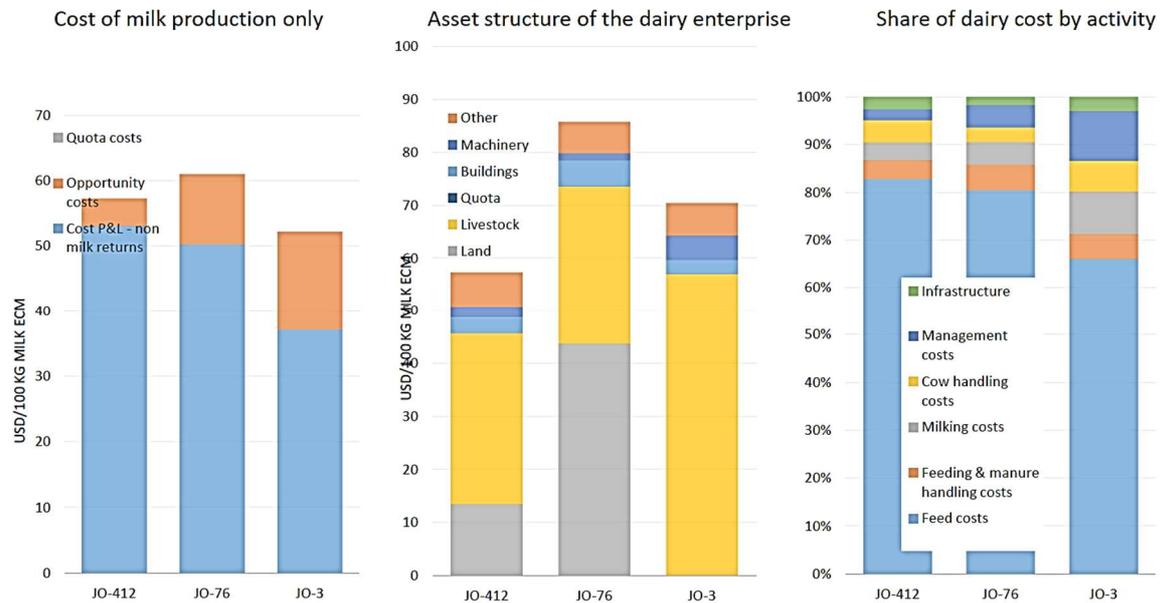
Despite the importance of dairy breeds other than Holstein Friesian (HF) for household families, imported HF remains the dominant (represents 96% of national herd population) breed in all farm types and the most important in efficiency and economic terms. This was attributed to the high animal performance compared to local breeds and due to the commercialization of milk production sector and farmer's interest in farm improved technologies.

Small farm size is managed by the household members and animals are mostly kept on house yard. Feeding practices differ between farms in terms of concentrate and forage quality offered. In small farm size grain concentrate is the main source of energy in the diet, low quality by-products (vegetable by products) and straws are the main fibre sources. In middle and large scale farm types, high quality concentrate (mixture of grains, meals and commercial feed additives) in addition to either cut and carry raygrass, fresh alfalfa or hay are used to feed high yielding cows. Land size in all farm types is small and zero grazing system is applied. However, during the spring period which sometimes short (from February to April), cows in small farms graze on pasture in areas where communal land is available.

Milk yield, efficiency and GHGs emissions

Milk yield was the highest (7300 kg/cow/year) in large scale farm type and the lowest (3600 kg/cow/year) in small scale farm type. Consequently, feed efficiency followed the same trend and was the higher of 1.12 in the larger farm compared to 1.03 kg milk ECM/kg dry matter feed intake in the small farm. Total GHG emissions converted to CO₂ equivalent (equ) was estimated at 187 kg CO₂ equ/100kg ECM in the small farm type compared to 90.3 kg CO₂ equ/100kg ECM in the large farm type, which is similar to emission range in the EU dairy farming. The variations in CO₂ equivalent emissions are attributed to the differences in animal efficiency and milk production between farms.

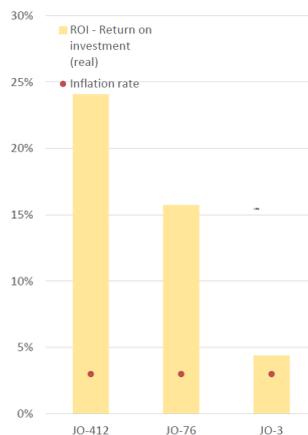
Mitigation of GHG emissions from Jordanian farming systems was studied at the farm scale using a system approach. The two main drivers of GHG emissions per kg milk are the level of feed intake and the milk yield. The milk yield has more impact on the emissions per kg of milk, with higher yield being associated with significantly less CO₂ eq./kg ECM milk. Therefore, yield performance is responsible for much of the variation in total CO₂ eq. emissions between large and small-scale farms. With up to 53% of total GHG emissions, CH₄ is the single most important greenhouse gas in Jordanian milk production, which comes mainly from enteric fermentation in the rumen of the cows (Alqaisi et. al. 2014). Compared to other farming systems in semi-arid environments, emissions from JO-5 farm are similar to those reported for small-scale coastal farming systems in Peru (Bartl et al. 2011).



Cost of milk production

The asset structure of the farm showed that land and livestock have the biggest share of all farm assets which ranged between 45 US\$ in large scale farm and 75 US\$ per 100 kg ECM in middle scale farm. Cost of milk production ranged from 52 US\$ in JO-3 to 62 US\$ in JO-76 per 100 kg ECM. The variations in cost of milk production between farms are attributed to the differences in feed cost, land cost and milk prices. Large scale farm produced milk at lower cost than middle scale farm due to the higher milk yield per animal which could be attributed to technology improvement such as genetics, better feed quality. However, cost of milk production in small scale farm was the lowest since the farm was managed by family members with lower opportunity cost due to household labour, furthermore, animals were kept in the house yard and this implies no land cost allocated to produce milk. Consequently, the return on investment was the highest in the large scale farm with 24% while it was the lowest in the small scale farm with only 4% which was driven by the variations in total milk production. Feed cost represented the biggest portion of cost structure and ranged between 83% in the large farm to 63% in the small farm.

Return on investment



Conclusions

Jordanian national milk production and consumption was doubled during the last ten years and was driven by the demand from the increasing population.

Compared with milk production in neighbouring countries like Saudi Arabia and Egypt, Jordanian milk production is growing in slightly lower rates than in Saudi Arabia (3.4%), but in much faster rates than the Egyptian milk production which was estimated at 0.1%. Jordanian milk exports by far much lower than the Egyptian and the Saudi exports which was attributed to the high national milk production (6.85 and 1.84 mill t in Egypt and Saudi Arabia respectively in year 2014). Furthermore cost of milk production in Jordan is higher than in Egypt where labour, land and feed cost is lower and in Saudi Arabia where milk and feed production is subsidized, which gives more competitive advantage for these countries to export milk. To gain more competitive advantage in the regional markets, Jordanian milk production has to be subsidized to cut the high production cost.

To reach the self-sufficiency in milk, Jordan could further produce 0.2 mill t per year. The current growth in milk production is going beyond the available resources from land and water, therefore resources need to be planned and allocated to meet this growth. Land and feed prices are the main drivers for high cost of milk production in the Jordanian dairy farms. Boosting small scale production potential with low production cost may benefit further from genetic improvement, lower land cost and subsidized feed on farm.

The Jordanian large commercial farm had the highest milk yield, highest feed efficiency, lowest emissions per kg of milk and highest return on investment, showing that such farms would be the most sustainable farms in the future when considering both environmental and economic aspects.

Bibliography / More information

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