

Dairy cattle, livelihoods and resilience in Gaza Strip: a case study

CRISTIANO M. ROSSIGNOLI*, FRANCESCO DI IACOVO*,
ROBERTA MORUZZO*, PAOLA SCARPELLINI*

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1. Introduction

The article presents some of the results of a research conducted by the Department of Veterinary Science (DVS) of the University of Pisa in Gaza Strip (GS). The research has been developed in coordination with an International NGO¹ active in the humanitarian relief of the GS for many years. In particular, the DVS has conducted the research in the framework of a 3-year project started in 2011. By following a market chain approach the project aimed to contribute to the economic recovery and socio-economic empowerment of the dairy sector. The collaboration with the International NGO has offered to the DVS the opportunity to conduct a research in one of the most difficult environments in the world. As a valuable example of academic-NGO collaboration this research has mainly offered the opportunity to analyse the way and the meaning of keeping livestock in the study area and the role of international cooperation.

In the article we initially present an analysis of the context of the GS with a particular reference to the agriculture sector. This overview should provide a general understand-

Abstract

As an effect of a protracted situation of conflict, the economy in Gaza Strip has largely developed through international humanitarian assistance. Over the time, the isolation of markets, widespread unemployment, and the economic crisis have caused a serious decline in the population living standards, with a high level of food insecurity. Today, the population in Gaza Strip has dramatically increased reaching an estimated 1.65 million in an area of only 360 km² (PCBS). The rapid increase in urban population (3.2% of yearly growth rate), land scarcity and the challenge of food security have accelerated the phenomenon of urban agriculture. In Gaza Strip, despite many constraints, agriculture and related activities are still offering the opportunity of food, income and employment for the local population. By participating in activities related to projects of international cooperation promoting the dairy cattle sector we have investigated ways of breeding cattle and proposed a reflection on the sector, highlighting the main strengths, weaknesses, opportunities and constraints. We have also explored the livelihoods of dairy cattle keepers and analysed related resilience and sustainability.

Keywords: dairy cattle, food security, livelihoods, resilience, sustainability.

Résumé

A cause des effets d'un conflit prolongé, l'économie de la Bande de Gaza s'est développée grâce aux aides humanitaires internationales. Au fil des ans, l'isolement des marchés, le chômage généralisé et la crise économique ont provoqué un sérieux déclin des conditions de vie de la population, avec un niveau d'insécurité alimentaire élevé. Aujourd'hui, la population de la Bande de Gaza a augmenté jusqu'à environ 1,65 million sur une superficie de seulement 360 km² (PCBS). La croissance rapide de la population urbaine (3,2% du taux de croissance annuelle), la rareté des terres et le défi de la sécurité alimentaire ont accéléré le phénomène de l'agriculture urbaine. Dans la Bande de Gaza, en dépit de nombreuses contraintes, l'agriculture et les activités corrélées offrent toujours la possibilité de nourriture, de revenus et d'emplois pour la population locale. En participant à des activités liées à un projet de coopération internationale visant à promouvoir les bovins laitiers, nous avons étudié les moyens d'élever les bovins et proposé une réflexion sur le secteur, mettant en évidence les points forts, les faiblesses, les opportunités et les contraintes. Nous avons également exploré les moyens de subsistance des éleveurs de bovins laitiers et analysé la résilience et la durabilité corrélées.

Mots-clés: bovins laitiers, sécurité alimentaire, subsistance, résilience, durabilité.

ing of the situation for easing the reading of the topics covered in the paper. Secondly, we describe the methodology used to carry out the research. In the result and discussion we present the synthesis of what we observed during the study. In addition, we propose an analysis of the livelihood of dairy cattle keepers in the GS and thanks to a SWOT approach a reflection on its related economic, environmental and social sustainability.

1.1. Brief situation analysis: the conflict effects

The GS is a land of 360 km² in front of the Mediterranean Sea that borders Israel and Egypt (Figure1). As one of the most populated places in the world, the GS is home to more than 1.6 million people (UNSCO, 2012). As a key feature, the GS has been characterised by one of the most enduring

and explosive conflicts of the world: the Israeli-Palestinian conflict (BBC²). This conflict has been going on for almost six decades characterised over time by a chronic tension interspersed by periods of acute conflict (O'Callaghan *et al.*, 2009). As a result, there has been a recurrent stalemate in the peace process as well as a growing importance of the humanitarian issues in the area.

The Israeli-Palestinian conflict has been widely analysed and a lot of documents, books and reports have been published by international humanitarian agencies such as UN³,

* Department of Veterinary Science, University of Pisa, Italy.

¹ Non Governmental Organizations – NGOs

² British Broadcasting Company (BBC) available at www.bbc.co.uk.

³ United Nations (UN) – www.un.org



Figure 1 - The Gaza Strip on the map. Source: our elaboration from Humanitarian Atlas, West Bank & Gaza Strip, 2011 (OCHA, 2011).

WFP⁴, World Bank, FAO⁵ on the humanitarian effects of this issue. From these various analyses it emerges that the protracted crisis has deeply impacted the society, the economy and the environment of the occupied Palestinian territory (oPt).

During the years, it has been possible to look at a progressive deterioration of the Palestine economic life, and an accelerated de-development process that has been heightened by the effects of a progressive restriction and closure affecting Palestinians (Roy, 1999). The increasing restriction has led to a progressive economic decline and deterioration of livelihoods – including job opportunities, access to livelihood assets, trade and export – resulting in rising unemployment, food insecurity and poverty. The UN estimated that in 2011 the real GDP per capita was only 88% of the level of 1994 (UNSCO, 2012). In accordance with the WFP (2011), in terms of social and economic conditions, the living in the GS is extremely difficult: around 30% of people

⁴ World Food Programme (WFP) – www.wfp.org

⁵ Food and Agriculture Organization of the United Nations (FAO) – www.fao.org

⁶ UN Office for the Coordination of Humanitarian Affairs (OCHA) – www.unocha.org

⁷ Until November 2013 livestock were smuggled through the tunnels with Egypt. After this date these same tunnels were destroyed by the Egyptian Authorities.

⁸ Palestinian Central Bureau of Statistics (PCBS) - www.pcbs.gov.ps.

are unemployed and 70% are dependent on some kinds of external aid.

The population in the GS lives with a severe sense of powerlessness due to the inability to protect their families and satisfy their own needs in terms of both food and non-food goods. From a social point of view, people in the GS have increasingly found harder to construct a viable community and to have a productive and healthy life (Roy, 2004). This has guided to a deconstruction of the infrastructure of their society (Palestinian society) - physical, technical, economic, social, political, and human - that has affected the way of thinking, planning, organizing, and building of people (Roy, 2004).

As in a vicious circle developed during the last 60 years, the economy of Gaza is today still influenced by two main factors deriving from the conflict: a complex political situation and the international aid. Currently as observed by WFP, OCHA⁶, UN and FAO, the economic situation for Gaza remains unsustainable. Gaza is today an urban economy that is kept alive through external funding and the illegal tunnel economy⁷ (UNSCO, 2012). Despite the declarations to ease the closure for Gaza and due to the recent recrudescence of the conflict in November 2012, the economy continues to be a consumption economy instead of a productive one, largely dependent on public sector and international humanitarian assistance.

Also in environmental terms the GS has been deeply affected by the conflict. The World Bank in 2012 observed that the situation of water and sanitation in GS is critical. Today 90% of water from the aquifer is not safe for drinking without treatment because of its salinity and pollution (UNSCO, 2012). As observed by Mason *et al.* in 2011, the protracted conflict is a reason of the social vulnerability of communities in the GS to climate variability and has significantly affected the way to cope with key climate risks.

As observed by the main humanitarian agencies such as OCHA, FAO, WFP and World Bank, as an effect of the conflict, food insecurity and vulnerability of the communities in the GS is today the most pressing problem that needs to be addressed. However, despite the contingency of the conflict, food insecurity in the GS is mainly a matter of economic access to food items as an effect of the lack of income for the households (WFP, 2011). In other terms, as observed by the main humanitarian agencies, food insecurity and poverty in Gaza are strongly related to the high rates of unemployment (45 % in 2008 and 37.8% in 2010 - PCBS⁸), which are among the highest in the world. Also, unemployment is particularly severe for women and youth. In 2008, 56% of people of the GS were food insecure with 75% receiving food assistance (WFP, FAO and UNRWA, 2008). By looking at the trend of the level of food insecurity over time, WFP in 2011 assessed that 54% of households of the GS were food insecure while in June 2013 the FAO estimated that 57% of households in the GS were food insecure. Also, the future trends for the GS seem not promis-

Table 1 - Population growth and urbanisation of the GS. Source: our elaboration on UNSCO, 2012.

Population	1,64 million	2,13 million
Population Density	4,505 people per km ²	5,835 people per km ²
Children aged 0-17	839,000 (51% of total population)	1,029,000 (48% of total population)

ing. As observed by UNSCO in 2012, without a radical change and with a forecast increment of 500,000 people in the population of Gaza within 2020, this situation seems to have no improvement for the future (Table 1). In all likelihood, at the continuation of the conflict, we can expect that the poor, marginalised and food insecure people of the GS will increase in the future.

1.2. Agriculture sector in the GS

Agriculture seems to play an important but limited role in Gaza (UNSCO, 2012).

Although in 2008 PCBS estimated that agriculture contributed by 8.1% of the GDP in oPt, we can observe as in a densely populated, largely urban area such as the GS food self-sufficiency does not seem an option. Also, the current level of exports, that is limited to a small amount of strawberries, flowers and cherry tomatoes⁹, cannot impact the overall economic situation.

However, traditionally agriculture has a crucial role as a shock absorber for communities when other social safety nets fail to operate (FAO and OCHA, 2009). In addition, agriculture might play a critical role in protecting and promoting livelihoods.

In the GS, with high rates of food insecurity among the population, agriculture, including home gardens, dairy and small-scale animal production, provides a more affordable option to fresh foods. Agriculture in Gaza is traditionally the primary source of income for poor households and can play an important role for the employment sector (UNDP, 2011). In fact, it has the capacity to absorb a significant percentage of the work force (World Bank, 2012). Although as observed by WFP in 2011, the employment rate in the agricultural sector in Gaza varies during the seasons. Also the political situation strongly affects the level of employment in the agricultural sector. Today more than one-third of agricultural land in the GS is inaccessible or out of production because it is located in the access-restricted area next to Israel.

Before the closure, agriculture provided permanent and temporary jobs for around 40,000 people in Gaza (13% of the work force) as well as supported the livelihoods of small-scale producers who cultivated for their own consumption as well as for marketing purposes.

Since the closure, the percentage of the labour force working in agriculture has decreased to 7,4% in 2009 (FAO and OCHA, 2010). In 2010 and 2011 the employment rate in the agricultural sector (agriculture, fishery and forestry) was around 10%.

⁹ High-quality agricultural products exported mostly to Europe thanks to the support of international organisations.

¹⁰ Non Governmental Organizations – NGOs.

Also for farmers the situation is increasingly difficult. Most of the agriculture production of the GS was based on

cash crops for export and has been heavily undermined by the closure. Farmers are unable to cultivate and produce goods for consumption or sale, and herders are unable to provide sufficient natural food for their animals. With limited access to agricultural areas, increasing levels of salinity in the water that makes it unsuitable for cultivation of most crops, and difficulties in having access to agricultural inputs, the local production has declined and farmers' livelihoods are increasingly precarious. In this context of land scarcity and high unemployment, agriculture is increasingly becoming urban (Laeremans and Sourani, 2005).

1.3. The International Cooperation: roles and effects

In 2004 Sharer indicated the oPt as the largest aid recipient per capita in the world. This high level of aid is raising several concerns especially if it is protracted in time as in the case of oPt. As observed by Lensink and White (2004), this kind of aid may induce aid dependency rather than lay the basis for self-reliant development. If on one hand, the humanitarian assistance has shielded Palestinians from the full effects of the conflict, on the other there is a role of the humanitarian aid in maintaining the situation as it is or in producing negative effects (Feldman, 2009). However, in accordance with O'Callaghan *et al.* (2009), humanitarian assistance plays an important role in contrasting the increasing levels of vulnerability of Palestinians.

Historically, the way of aid in oPt has passed through intervention of food and cash. UNRWA started the provision of food aid to Palestine refugees in 1948. In 2008, the Palestine Economic Policy Research Institute surveyed 669 organisations distributing food aid in the oPt (O'Callaghan *et al.*, 2009). Generally, relief assistance has mainly been provided to food insecure people, but in addition international organizations have implemented actions to support people livelihoods.

In Gaza the livelihood intervention and the humanitarian support were mainly designed to meet basic needs, provide or protect assets and help people in accessing markets, land and services. However, instead of having a development approach, almost the majority of the programmes and projects in the GS have been implemented with an emergency approach. In this way, the vulnerability of individuals and households to food insecurity and/or temporary shocks has been developed to produce short-term responses instead of reinforcing long-term adaptability. In Gaza, international agencies and NGOs¹⁰ have utilised different approaches which bring alternative income strategies including the provision of agricultural and livestock inputs to the beneficiaries. However, these kinds of intervention are still following an emergency approach characterised by short implement-

ing cycles of 6–12 months. As a result, these interventions seem not to increase the self-sufficiency of people in the long term, although they are working properly as a complement of the food assistance interventions.

2. Materials and Methods

In the light of the collaboration with an international NGO, the DVS has adopted a methodology based on the Rapid Rural Appraisal (RRA) (Crawford, 1997). In fact, RRA and also the Participatory Rural Appraisal (PRA) are widely used by NGOs and international agencies involved in international development as an efficient and cost-effective way of learning and getting evidence. Therefore, the RRA has offered the opportunity to meet the methodological needs of both the NGO and the DVS.

The research methodology has combined secondary and primary data collected around three main phases in which the research work was structured: a) Desk phase; b) Field phase; c) Analysis of information.

During the desk phase we initially carried out the secondary data collection and analysis to have a first picture of the context and a general identification of the livestock sector. This has included a literature review of both quantitative and qualitative data collected. In particular, we reviewed published and unpublished key documents from the main humanitarian international agencies. During the desk phase we have also planned the field phase by identifying information gaps. Finally, we have elaborated preliminary hypotheses to be tested during the field phase and designed the *ad hoc* questionnaires for the primary data collection.

Additionally, we conducted meetings with the NGO to plan the field work and identify all the relevant stakeholders. The field phase was carried out from the end of August 2011 to June 2013 as for the following steps:

- August 2011: meetings with relevant stakeholders (15 interviews) and preliminary survey of the breeders (25) identified by the NGO in the GS. – Qualitative data collected.
- December 2011: a baseline study was carried out to identify the size of the dairy cattle sector in the GS. The assessment was mainly quantitative and covered the entire GS. During the assessment we were able to identify and interview 580 breeders in the whole GS. – Quantitative data collected.
- January 2012: two discussion groups were conducted with all the relevant international and national stakeholders thanks to two workshops organised by the NGO to present the results of the baseline study. – Qualitative data collected.
- March and April 2012: in this period we surveyed in field visits 15 breeders randomly identified among the 90 breeders targeted by the NGO as part of the project. In addition we interviewed 10 relevant stakeholders. – Qualitative data collected.
- June 2013: 35 breeders were surveyed and interviewed. Breeders were identified randomly among the

90 breeders part of the NGO project. A questionnaire was prepared specifically for the collection of the quantitative and qualitative data that could be compared with the baseline. The interviews were semi-structured. – Qualitative and quantitative data collected.

The field phase was mainly organised to collect primary data through structured and semi-structured interviews with dairy cattle breeders and the relevant stakeholders of the dairy sector in Gaza. In particular, we have interviewed various actors and agencies with experience and interest in the dairy sector of Gaza such as the Ministry of Agriculture, Ministry of Economy, Ministry of Health, FAO, WFP, NGOs, veterinarians, wholesalers, middlemen, traders, retailers, carriers, supermarkets, shops, minimarkets, breeders and farmers, consumers, etc.

As a consequence of the context issues, during the research work it was possible to interview only a sample of breeders, selected randomly, that were part of the 90 beneficiaries of the project. In fact, due to the limited movements on the field for security reasons, budget and time limitations and in light of the humanitarian environment in which we were operating it was neither possible nor ethic to work in a counterfactual logic. As a matter of fact, we were not able to observe the effects of the project intervention thanks to a counterfactual population but we just conducted our study making a comparison between consecutive observations of similar samples. As a result this limited our capacity to observe the “real” change promoted by the project intervention. In fact, without a counterfactual approach we were not able to identify the confounding factors that may affect the result of the intervention.

In the results and discussion, following an approach based on the Sustainable Livelihoods Framework (Carney, 1998), we propose an analysis of the livelihood of dairy cattle keepers in the GS. Finally, we propose our conclusion and what we have learned. Then, following a SWOT approach, we present the synthesis of what we observed during the survey and learned from all stakeholders that we have met and interviewed. Specifically, during interviews, workshops and focus groups, each stakeholder provided a general but personal picture of the dairy sector, identifying and evaluating (rank) its key elements. Each stakeholder also provided more details and information following his specific interest, experience and/or knowledge. For example, the veterinarians provided specific information about the cattle health and productivity whilst processors focused on milk quality and marketing. Finally, thanks to comparison, triangulation and synthesis of the information collected we were able to identify the main strengths, weaknesses, opportunities and threats (SWOT) that characterise the dairy cattle sector in the GS.

3. Results and Discussion

3.1. Way of keeping dairy cattle

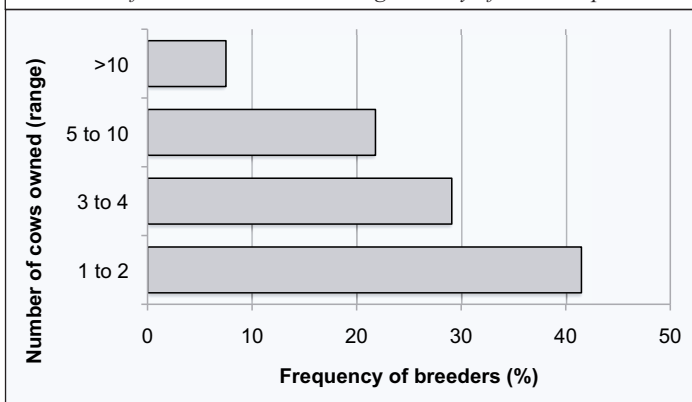
The dairy cattle sector in the GS shows specific characteristics due to the particular context in which it has developed.

The number of dairy cattle in OPt remained relatively constant from 2004 to 2008 (about 20,000 heads) while there has been a negative trend in the GS¹¹ due to a limited profitability of the production model as a consequence of increasing restrictions in trade movements and raising prices of raw materials (i.e. fodder prices) (PCBS, 2011).

In 2010 a study commissioned by WFP and Oxfam International (Creti, 2011) estimated in the GS the presence of 200 dairy farms breeding 1,500 dairy cattle. Compared to the period before the military operation named “Cast Lead”, conducted by Israel from December 2008 to January 2009, the number of cattle has decreased substantially¹². The PCBS in 2011 estimated 4,355 cattle (out of a total of 13,148, 8,793 males) in the GS but without disaggregation between dairy and beef cattle.

In December 2011 we surveyed all the GS and we identified a total of 518 dairy farms breeding 2,332 dairy cattle¹³ for an average of 4.5 dairy cattle per farm. In details, around 70.5% of farms owned up to 4 cows - 41.5% had 1 or 2 cows - while 29% of farms had at least 5 cows but only 7.5% more than 10 (Fig2). The farm owning more dairy cattle in the GS had 40 dairy cattle.

Figure 2 - Frequency of breeders (%) per cows owned. Source: our elaboration from data collected during a survey of Gaza Strip in 2011.



Although different breeds of dairy cattle are reared in the GS, farmers largely prefer the Holstein Friesians. Other kinds of dairy cattle are generally identified as local breeds that are generally characterised by erratic productive performances. These local cattle are usually crossbreeds of Holstein Friesians coming from Egypt¹⁴ or produced locally where the HF is often crossbred with beef cattle in order to increase profit and spread risks (dairy products vs. meat products). It seems very common among breeders to crossbreed dairy cattle (female) with beef cattle (male). Farmers adopt this as a strategy of income diversification – milk and meat.

¹¹ From around 4,000 dairy cattle in 2004 to 2,500 dairy cattle in 2008.

¹² Over 4,000 units – restriction of imports and good access to the GS (WFP, 2011)

¹³ It considers only heifers and cows.

¹⁴ With the recent closure of a large number of tunnels between Gaza and Egypt, cow smuggling from Egypt is believed to have stopped.

Dairy cattle in the GS are typically reared until they are productive. Leading reasons for the cow turnover are old age, infertility and/or health issues (diseases). The newborn calf can be fed with milk or milk replacer, but it depends on the availability and price of milk and milk replacer on the market. Usually, female calves are kept as a replacement for old heifers or sold to other dairy farms. Alternatively, both female and male calves can be also kept until reaching a good size for slaughtering (profit maximization). Choices for housing the animals are various and taken in accordance with the space available and the size of cattle group. Usually, farms are equipped with a shelter, built with various materials, and the animals are reared in one or more groups. Breeders having no cattle-shed, usually the smallholders, tend to keep the dairy cattle chained, while calves are free in a separate group. The bedding that is usually made of sand or other soils is not properly managed. In fact, in all the cases we observed that the bedding in the barn was not properly maintained as well as working efficiently. As a consequence dairy cattle are frequently immersed in the mud with negative effects for their health and for the quality of the milk produced (Figure 3).

Fig. 3 - The picture shows the poor breeding conditions of dairy cattle in the Gaza Strip. Cattle try to emerge from the mud that surrounds them and prevents movement. Photo by C.M. Rossignoli, 2013.



In general, all farms have a cattle feeder while only larger farms have also a milking area that is usually poorly managed.

On average, milk productivity in Gaza is quite low with an average of 12-18 litres/day and a lactation of 210 days (260 maximum) (source: our survey, 2011). The estimated calving interval is around 360 days (from interviewed breeders). On the basis of these productive parameters, total milk production in Gaza is estimated to be in the order of 10,000 tonnes per year, covering only around 40% of local demand which is estimated to be around 25,000 tonnes of milk-equivalent products per year (PCBS, 2011).

The reasons for this gap are several. As we have seen, the conflict has deeply impacted the agriculture sectors in GS, by blocking concretely new opportunities and depressing the initiative of farmers.

Since 2006, the restriction of imports from Israel has reduced the chance to import many goods among which cattle of good quality. At the same time, as we have seen, at least until November 2013 some cattle have been smuggled from Egypt with the effect of raising serious health concerns. Many stakeholders have noticed that the poor quality of animals raised in Gaza have deeply affected the milk productivity.

Additionally, the GS is not self-sufficient for the animal feed production. As we observed, there are almost no pastures and the fodder production is very low. As a consequence farmers need to purchase almost all the fodder they need with the effect to be completely exposed to external factors for their business (i.e. availability of inputs and volatility of the market).

In addition, for the local farmers, especially for smallholders, the price of the fodder is usually too high with the effect that animals are poorly fed. Livestock is kept with low investments. They use by-products and low quantities of bought concentrates to feed the animals. Also during our field visits we observed that the quality of the animal feed is on average poor. With such a feed regime the dairy cattle are not well nourished with the consequence that milk yields drop down and diseases are more frequent. This has a multiplier effect exacerbating the abuse of medicine by the breeders that administrate drugs without any veterinary advice. In this situation the veterinary system, both public and private, as well as the extension service as a whole appeared inadequate. They lack resources and seem to have limited capacity to respond effectively to the sector needs.

During the assessment we also identified a total of 1,619 people employed in dairy cattle farms, especially in the small dairy cattle farms. Thus, dairy sector is considered quite labour intensive although the majority of workers and especially youth and women are unpaid and informal family work force. The dairy sector is characterised by a large participation of youth and women of the household, who are often directly involved in the farm activities (animal feeding, milking and dairy processing). Youth usually deal with low-skilled jobs while are learning more specific functions; women are predominantly involved in the milk processing. Therefore, it can be concluded that dairy production is a typical family business where men usually buy fodder, feed the cows, take care of cleaning works and removing manure, while women are highly involved in milking and processing work.

3.2. The livelihood of dairy cattle keepers

In Gaza the households tend to diversify their income sources between farm and non-farm activities, and between family-owned enterprises and wage labour in order to survive under unfavourable conditions (FAO, 2012). Most of households manage their food security keeping livestock and cultivating vegetables, also in urban area, for self-consumption and for income diversification. Somehow, we could observe that the Israeli-Palestinian conflict has great-

ly expanded the scale of households (smallholders) practicing small agriculture activities or keeping some livestock in the GS. Thanks to their resourcefulness, people in the GS have re-adapted the way of cultivating vegetables and breeding livestock to fit with the context and to satisfy their needs. Livestock and agriculture produce a partial self-reliance on food production that seems crucial for many households. In addition, livestock as cattle, sheep, goats, and poultry, produce a positive effect on livelihood and income of people. Following the approach of Sustainable Livelihoods Framework developed by Carney in 1998, it is possible to analyse the livelihood of livestock keepers in the light of the concept of capital assets. The capital assets are defined by the Livestock Emergency Guidelines and Standards (LEGS, 2009) as *“the resources, equipment, skills, strengths and relationships that together are used by individuals and households to pursue their livelihoods. They are categorized as: human, natural, financial, physical and social”*.

In the GS, dairy cattle contribute to human capital allowing to the households of livestock keepers to meet their own consumption needs and requirements as well as aspirations. Dairy cattle produce food as milk, dairy products and meat, but also produce an income to buy other food as well as non-food item or financing education and medical expenses. Like other financial capital it represents a fundamental form of savings for the household. Dairy cattle can be source of social capital giving to people in the GS a safety net to sustain them in emergency (live animal offered for sale). This aspect is particularly important for high vulnerable communities such as those in the GS which usually lack safety nets.

In addition, dairy cattle provide a tangible measure of personal and/or family status. In fact, rearing livestock has an important traditional and recognised value in the Palestinian society. Thus, dairy cattle are a source of work and dignity for breeders and their households.

Dairy cattle can also provide income and employment and opportunities for people, especially youth, along the dairy market chain, although it appears quite short. Finally, among other kind of livestock, dairy cattle promote a gender balance in the GS due to the crucial role that women play especially in the milk processing.

At the same time, keeping dairy cattle in an area so highly populated and urbanised such as Gaza raises concerns and presents constraints. First of all, comparing with other kind of livestock, large ruminants require higher maintenance costs, as they need daily fodder equal to about 10% of their body weight – i.e., 30 to 40 kg of fodder per day – while chickens can survive on 30 to 50 g of feed per day by scavenging and from kitchen residues (FAO, 2012).

Also, the scale of economy of the dairy cattle keepers is, as we observed, quite small, a fact that raises concern about the production efficiency in the light of the costs of production. As a matter of fact, those small breeders have lim-

ited capacity to face marketing costs and invest, and have a limited access to information and technology.

In addition, without a proper approach, small breeders lack power in the value chain and are generally more vulnerable to diseases (livestock), climate and natural disasters, and political constraints. Consequently, the dairy cattle farms in the GS show a short business life span due to their high vulnerability that is exacerbated by the raising of breeding cost and the difficulty in profiting from the dairy market.

In general, the quality of local dairy products is poor and they lack competitiveness with foreign dairy products imported from WB and Israel that are highly preferred by consumers (Figure 4).

Figure 4 - The picture shows a kind of cheese made at household level in the Gaza Strip. This cheese is commonly known as white cheese. Source: C.M. Rossignoli, 2012.



Local dairy products are almost totally marketed along informal channels that are unstable. Despite it could represent an advantage for smallholders, trading the dairy products at the base of the pyramid of consumption in Gaza seems to be a “dirty job”. The profit margin is very low and the scale of economy remains too small for the growth and development of a real market. This marketing approach, based on price competition, seems relatively suitable for smallholders that are usually producing their own cheese at household level and marketing directly to end consumers, mostly in their area of residence. On the other hand, breeders with a bigger economy of scale are able to produce more than they can process and market. As a consequence, they tend to find a relation with one of the dairy factories available in Gaza.

The different scale of economy allows them to sell the raw milk directly to the factories for the processing. In fact, due to the lack of a proper transport system for the milk and the erratic power supply issue, supplying the dairy factories would be too difficult and expensive for smallholders. As a

consequence, only 30% of the local milk production is transferred to the local dairy manufacturers and the remaining production is sold to retailers and end consumers as fresh milk, cheese or labneh¹⁵ (WFP, 2011).

Finally, the main constraint for the breeders in the GS seems to be the high dependence from external source of inputs. The GS is not self-sufficient for inputs needed for keeping livestock, especially for the animal feed. This makes breeders highly vulnerable to the increment and volatility of the fodder price, which is highly dependent from the instability of the political situation.

In addition, there is a hygienic and sanitary issue in keeping livestock in areas of high population density such as the urban area of the GS. This could also be a concern for human health. Also, keeping livestock in the urban area of GS represents a big concern for the environment. In fact, wastes from livestock activities such as manure are not usually stored and processed properly. The use of manure as a fertilizer in agriculture is sporadic and occurs without planning. The manure that remains unused is usually buried without any control with unexpected consequences for people health and the environment.

3.3. Sustainability of keeping dairy cattle in the Gaza Strip

A SWOT matrix was developed to analyse the main strengths, weaknesses, opportunities and constraints of the dairy cattle sector in the GS. By looking at the SWOT matrix in Table 2, we can observe that strengths are purely related to the capacity of the dairy cattle sector to increase the solidity of the household system in the GS.

Keeping dairy cattle in the GS seems to have an effect in increasing the persistence of households and their ability to absorb change and disturbance in order to maintain or enhance their level of food security, their social dignity and economic status. In other words, keeping dairy cattle seems to increase the resilience of the household in the GS.

On the other hand, the weaknesses perfectly show the limits of the dairy cattle system in being both efficient and productive as a consequence of mainly: (a) limited access to inputs (quality vs. price) and (b) poor capacity and organisation of the production system (i.e. poor management and poor quality of the milk). In addition, as an interesting point, there is (c) the difficulty of organising the farmers due to their individualistic behaviour. In Gaza there is a lack of livestock associations that affects farmers’ power on the value chain and their chances of influencing institutions through collective actions. Also, (d) the lack of the extension and supply services, such as the vet service, strongly affects the delivery of animal health services that makes the productive system fragile to diseases but also exposes Gaza to public health issues.

Finally, (e) fuel and energy shortage (availability vs. price) makes the dairy cattle system less efficient and fragile to shocks. This also directly affects the quality of milk and the marketing strategies due to the shrinking of capac-

¹⁵ A kind of traditional yogurt which is of a relatively thick consistency as a consequence of the partial removal of its whey.

Table 2 - *SWOT analysis of the dairy cattle sector in the GS. Source: our elaboration.*

Strength	Weaknesses
Increase food security Produce income and create livelihoods High dietary value and nutritional impact Job creator - Family labor Social value: dignity, gender balance, status, etc. Respond to the conflict: private sector development Way of saving money for the owner There is a local demand for dairy products in the GS Some processors show already good productive performance Willingness to improve productive performance and related business	Inputs price, access, quality – i.e. fodder: limited access, low quality and high price Low productivity per cow (quality of breed/poor nutrition) Lack of service supply: veterinary service (public and private); Livestock associations Poor management Poor quality of milk Lack of proper storage facilities Poor transport system Difficulty to organise the sectors (individualistic behaviour)
Opportunities	Threats
Import good quality inputs – i.e. fodder: good quality, good price Import good breeds of cows Promote alternative productions for fodder Improve milk quality and develop proper storage facilities Improve cow and milking management (availability of techniques, resources and equipment) Diversify dairy products (availability of techniques and equipment) Decrease imports of foreign dairy products Encourage group marketing and organisation of farmers Donors and government plan to support the sector Opening to the international market Willingness of the private sector to pro-actively participate and contribute (private investments) Access to credits (micro-credit/ bank loan) End of the blockade End of the conflict	High vulnerability to temporary shocks Unpredictable and sudden socio-economic changes can make businesses unsuitable to the new situation Access to supplies and shortage of facilities Weak enforcement of health control Diseases and epidemic outbreaks Health and environmental issues (livestock in urban and highly populated areas) Consumers preferences for imported goods (WB and Israel) Lack of stable conditions to make proper plans High risk of investment (due to the conflict) The risk of increasing competition between local businesses

ities of storage and preservation of milk and dairy products by producers but also along the whole market chain.

Again the opportunities explored in Table 2 seem related to a major change in the context that includes a shift in the importation regime and/or the end of the blockade and the conflict. Although this change looks remote, there are other opportunities to strengthen the dairy cattle sector that can move with the support of the international cooperation and within the government framework. In fact, the international cooperation and the local authorities could play an important role in promoting the adoption of suitable techniques and technologies and in making available proper equipment with the effect of improving the cattle and milking management, the milk quality, the storage facilities and promote the diversification of local dairy production.

Finally, also the private sector might play a relevant role to stimulate the local dairy sector. As we would expect, the major threats listed by the stakeholders are directly linked to the context issues. As we observed, the private sector in

In the light of what has been shown in the SWOT matrix, we have explored whether keeping dairy cattle in the GS is currently sustainable. The answer to this question requires to consider which factors are influencing the sustainability of keeping dairy cattle for each of its dimensions – economic, social and environmental – (Table 3). By assuming that the current situation has developed as a consequence of the conflict protracted and exacerbated over time (increasing the restrictions), the main factor that limits the economic sustainability of keeping dairy cattle in the GS is the high cost of the inputs (i.e. fodder). The dairy cattle sector is highly dependent from external resources and is influenced by a highly volatile market. However, Gazans continue to keep dairy cattle because they contribute to the food security and income of the households.

Although we need more evidence to confirm our observation, currently keeping livestock seems not economically viable for levels of production that exceed the household scale. In other words, keeping dairy cattle is economically viable for low level of production. This way of keeping dairy cattle at household level seems to take advantage from its relative spontaneity and simplicity. In fact it works efficiently within a short market chain to meet needs of poor markets.

Also, keeping dairy cattle at the household level finds an important competitive advantage from the fact that

Table 3 - *Positive and negative factors that influence the sustainability of keeping dairy cattle for each of its three dimensions - economic, social and environmental. Source: our elaboration.*

	Economic	Environment	Social
Positive	Self-consumption; Increase of income, food security, informal work; stimulation of private sector, availability of market.	Products are consumed locally or transported over short distances.	Livelihood; Employments; Inclusion of youth and women; Dignity; Culture
Negative	Low profitability; High cost of inputs; Highly dependent from external resources; Volatility of market (i.e. inputs such as fodder)	Land and Water are overexploited (i.e. salinity of the water); High pollution (i.e. water sewage is not properly treated); Manure treatment; Health concerns for humans; Food safety concerns; Most of the resources are imported and not produced locally	Social tension in urban area

workers are usually unwaged. At the household level, people work informally without receiving a salary for the benefit of the household. Somehow, this assumes the characteristic of a strategy, a shock absorber, to contrast the high cost of production and to increase the competitiveness within the market chain. Although it depends on the size of the household, by increasing the level of specialisation and the scale of economy this advantage seems gradually lost. Thus, to be economically viable the big farms need to find the right scale of economy to sustain higher production costs due to the payment of salaries.

The environmental aspect is very sensitive in Gaza. As we have seen land and water are very precious resources in Gaza due to their shortage. In addition the concerns for human health are becoming very important due to the high level of environmental pollution. Keeping dairy cattle in the GS contributes to raising several concerns for the environment and the human health especially because in Gaza there is an evident urbanisation of agricultural activities. Although keeping dairy cattle close or into the urban areas helps to limit the transport of foodstuff with a benefit for the environment, in a case such Gaza this approach seems frustrated by the need of importing almost all the production inputs from abroad. In addition, the high urbanization of the GS raises doubts also for the promiscuity that might be produced by keeping livestock too close to humans with risks for the health.

By taking into consideration the social dimension of the sustainability, we have to observe as keeping livestock in urban area may produce serious conflict among households due to issues related to hygiene and noise produced by livestock. On the other hand, keeping dairy cattle offers an opportunity of social dignity contributing to livelihoods and employments in a context where high unemployment seems to be a fundamental issue. Keeping dairy cattle offers an opportunity of social and work inclusion for youth and women that in the GS represent generally a disadvantaged group. Finally, as already observed, beside other reasons keeping dairy cattle has also a social and cultural role in the Palestinian society.

4. Conclusions

In the future, without a radical change in the context, the GS will be stuck in the conflict and chronic food insecurity will persist with the effect that people will lack safety nets and will be even more vulnerable to transitory problems. The constraints of this future scenario seem really too much to be solved through a single intervention, but they need multiple solutions. In our opinion, despite its importance the humanitarian intervention cannot represent the only solution for Gaza. The challenge of the GS must be addressed by strengthening and supporting the social, political and economic capacity of the entire system. An inappropriate response to the crisis may deteriorate the base for long-term food security by weakening local markets and creating dependencies. Although livestock keeping in Gaza might be not the main action to promote a radical change in the context, in our view supporting the dairy cattle sector represents an important sign in promoting durable solutions through a longer-term ap-

proach. In fact, despite the doubts related to its sustainability, the dairy sector in the GS looks able to play an important role in securing the livelihoods and the food of people in Gaza. Also if compared with alternative livestock investments (i.e. chickens, rabbits, sheep and goats, etc.) that look ideally more affordable, we can observe as the dairy cattle offer some advantages. First of all, the most important market for livestock products is represented by cattle dairy products as well as for beef meat. Second, there is a consistent demand for this products while for other livestock products the demand seems already satisfied (e.g. chickens). For the small ruminants there may be a market but it seems more seasonal and related to a specific group of herders (Bedouins) that typically raise sheep and goats in the oPt. At the same time, as a clear result of the survey there was the willingness of breeders to breed dairy cattle instead of other livestock due to the high social and economic value that a cow may represent for them.

The efforts in addressing the issues of dairy cattle should result in increasing income and a good standard of living for the breeders involved. This can be achieved through the improvement of the production as well as of the processing practices, requiring producers and processors to capitalise on and use improved skills and practices. In this light, by adopting a sustainable lens the international cooperation may play an important role in supporting the transition of the whole dairy sector through specific and targeted actions such as:

1. Strengthen the capacity of producers on improved processing and production techniques;
2. Encourage the diffusion of alternative fodder crops with a high fitness to the Gaza environment (e.g. saline and drought tolerant).
3. Encourage the adoption of appropriate techniques for drying fodder and/or producing silage to satisfy breeders fodder needs over the year.
4. Support choices for improving storage system (e.g. cooling by alternative sources of energy) to ensure the safety and quality of the product.
5. Facilitate the coordination and learning among the actors within the dairy value chain in order to rationalise the use of information and resources available and reinforce the support services (e.g. training, extension, financial);
6. Stimulate local research institutions to carry out consistent studies about the productive performance of dairy cattle as well as the nutrition values of the fodder in the GS. This will be fundamental to further work on appropriate innovations such as: improved production practices, green fodder production and improved techniques of nutrition, development of new processing techniques and quality control.
7. Support the producers in adopting appropriate techniques for the nutrition of dairy cattle and in the better exploitation of local fodders in order to achieve positive effects on milk yield and quality, and reduce expenses. Although further effects need to be explored with a

proper study, it seems possible to assume as a correct and balanced feed regime that may decrease also dis-metabolic and digestive diseases, but also mastitis. As a result it would have as a double effect to increase the health of the animals and the quality of the milk as well as to decrease the antibiotics abuse that is very frequent in the Gaza (effects on consumers' health).

Although the appropriateness of these suggestions should be supported by evidence and insights, in our opinion these may represent some of the solutions that the international co-operation can promote and introduce in the GS for improving the dairy cattle breeding. However, we also believe that as a crucial step for the implementation of any of these solutions there is the need to develop an inclusive framework on which let the stakeholders participate in an active way.

As we observed, the dairy cattle are able to produce also choice, dignity and resilience for people. In addition, it seems evident that in the GS the concept of sustainability deals with a different array of meanings than those that we are accustomed. The sustainability of the dairy cattle sector looks mainly dependent from social and economic asset while the environmental asset is less important. The dairy sector in the GS has often proven its resilience in being under many hard and diversified shocks such as armed conflict, political uncertainty, collapse of key institutions, high price of inputs and others. At the same time, it is also very crucial to emphasize the contribution that the dairy sector brings to the households of Gaza to build and strengthen their livelihoods and resilience. This seems to be the real key to the success of the dairy sector in Gaza.

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