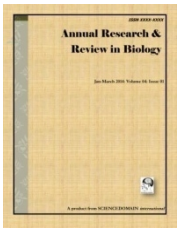

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Analysis of Egg Production System at Al-Karak Governorate in Jordan

Sami K. Al-Khamaiseh[1*]

[1]*Animal Production Department, Mu'tah University, P.O. Box 7, Jordan.*

Author's contribution

This whole work was carried out by author SKAK.

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ABSTRACT

This study aimed at analysing eggs' production system in Al-Karak governorate, Jordan for better development of poultry layer farm. Analysis of strengthens, weakness, opportunities and threats (SWOT) was performed utilising collected questionnaire data. The SWOT analysis aimed at finding factors that increase the production and maximise the profit by improving supply chain into value chain. The results of this study indicated that self-owned farm (n=10) raised 72,000 layer birds, representing 3% of total number of the layer farms in the country. Farmers are totally dependent on their farms for employment and income to support their families and to meet household needs. The farms possess basic facilities including a proper conventional housing. The farming started by raising 16 week-age-pullet purchased along with feeds and poultry equipments. The production period of layers ends by the 80th week of age. Overall egg production of theses layer farms is inadequate for local consumption of Al-Karak governorate. The daily egg production is estimated at 51,000 eggs, leads to a daily shortage of about 106,000 eggs. Therefore, it is an indication that scope of layer farming development for self sufficiency is needed.
The current weakness of layer farming is inexistence of corporative to enhance production (up to 51,000 egg/ day) and instable market. Therefore, formation of cooperative of layer farms to produce and stable market is an opportunity that strongly requested by farmers.

Keywords: Egg production system; SWOT analysis; value chain; Jordan.

**Corresponding author: Email: khmaiseh@yahoo.com;*

1. INTRODUCTION

Layer farming is a profitable business venture with growing demand for egg. It provides venturing farms with income and employment opportunities of secure, return and profit over investment. Al-Karak Governorate located in middle-south part of Jordan with a total population of 255,225 [1]. The governorate has a semi arid climate with an annual average temperature between 12-15ºC and rainfall of 300mm. The summer temperature seldom rises up to 40ºC as a result of hot waves that last for few days. In the winter, the temperature drops down up to -5ºC due to sudden cold waves for few days [2,3]. The governorate has a large area of land which is suitable only for livestock farming. In addition, the climate favours livestock farming that does not require expensive animal housing. The conventional system of natural heat and air regulates heating and cooling.

The governorate has ten layer farms with a capacity of 72,000 birds that producing about 1.87million eggs/ year [4]. The owners of these farms are considered as small scale farmers. The average family size of the farmers is 8 members. The father, the head of the family, manages the farm. In addition, the sons help their father in the farm during vacations and holidays. The layer farms have a good market potential within Al-Karak governorate itself. Taking into consideration the egg demand in Al-Karak governorate (daily egg consumption = 151,000 eggs) and production capacity (daily capacity of production is 51,000 eggs/day for total of ten farms), it can be concluded that there are deficiency around of 106,000 eggs/day [5]. Owing to relatively large consumer population in Al-Karak governorate, market opportunity for layer farming is as high as 51,000 table-eggs daily for the existing ten layer farms. With their current production capacities there is a market scope left open for producing three times more per existing layer farms. This is also an opportune for non-layer farmers to venture into this business. Therefore, this study aimed at analysing the current status and future perceptive for layer farming in order to improve the production in the Governorate.

2. METHODOLOGY

A survey study was conducted during October and November, 2011 in Al-Karak governorate-Jordan. The information was collected from two sources. The primary source was collected from the layer-farm owners through a survey and an interview. The second source was gathered from the internet, documents which is already published by governmental organisations (Ministry of Agriculture, 2011), Jordan Department of Statistic (DOS, 2011), Meteorological Department (MD, 2011) and the available scientific literatures.

The problems (technical, logistics, and marketing problems) of the layer farms in Al-Karak governorate were sorted out based on SWOT analysis method and mapping the existing supply chain was the first step which was taken for identifying opportunities, and it was performed following the procedure of Abu-Iteleh (Fig. 1) [6]. For better understanding how egg product moves through the market channels and to identify partners involved in the value chain project, mapping the major actors (suppliers, layer farms and customers) were performed [7]. This was done with one or two of existing chain partners that enable to provide valuable perspective on the strengths, limitations and opportunities for the chain.

Portal's Five Forces Model was used to analyze the business strategy development, which determines the competitive intensity and, therefore, attractiveness of the market. The objective of corporate strategy should be to modify these competitive forces in a way that

improves the position of the farms. Porter's model supports analysis of the driving forces in a business. Based on the information derived from the Five Forces Analysis, management can decide how to influence or to exploit particular characteristics of their industry.

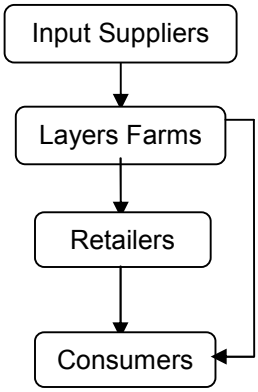

Fig. 1. Identifying problems in the existing Supply Chain

Marketing Margins' analysis was applied to indicate the trends in costs and profits. It is the difference between what the consumer pays for product and what the farmer receives [8]. Gross margin is a measure of sales profitability and represents what portion of sales revenue is available to cover the other costs of running business and provide net profits. Farmer can compare his gross margin percentage with other competitor farms data to measure his farm performance. Margins lower than competitors may be the result of lower volume or higher costs.

2. RESULTS AND DISCUSSION

2.1 Analysis of Agriculture Farming System

The socioeconomic of agriculture production system was described in general in Fig. 2. The analysis of biophysical parameters indicted that Al-Karak governorates' climate is considered a semi arid with annual rain full range from 200 - 300ml temperature range from 8ºC (January) to 25ºC (July/August), [3]. In their report, (DOS, 2011) reported that the average income of household in Al-Karak governorate is about 5,905 US dollar and their main income source comes from different agriculture sectors (fruit , vegetable, dairy and poultry farming). Each 1000m^2 of land in Al-Karak governorate is worth of 1390- 4167 USA dollar. The size of the cultivated land ranges from (4000-100,000) m^2 per household. Only the crop growers use the land for the cultivation of crops like wheat, barley, lentils, fruit plants and vegetables. A part of owned cultivated land is used for the construction of family house and animal /poultry farm. Al-Karak governorate has roughly 31900 households with an average family size of 8 members. The family members consist of a father, mother, sons, daughters and grandparents and grand children. Members of household works at different sectors as there are various government institutions and private companies in Al-Karak governorate. The capital investment is the money invested in operating the layer farms, family houses and children's education. The labourers are mostly family based and rarely hire any external labour outside family members except when there is a big demand for labour force (due to peak of egg production) for the layer farms. The man (household head) and his adult son/s

are responsible for livelihood. The hired labourers are paid approximately 417 USA dollars per month. In some cases, children were employed in the services sector in order to support their families. Extra income might be generated from off-farm activities like carpentry, plumbing, electrification and masonry as cash income. Cash money is normally invested and spent on farm activities and children's education. Survey study revealed that all farmers had secondary education level where they conducted all they study in Al-Karak governorate. They haven't enough knowledge regarding the idea of the cooperative associations in term of associations goals, objectives and the benefits will come from it. Also there was a lack of volunteers in the area of the establishment of cooperative associations in the poultry sector.

As an approach to support egg production sector, farmers get loans, when needed, from the Agricultural credit corporation with low-interest as a governmental support [9].

2.2 Analysis of Animal Production

The results of questionnaire indicated that animal production includes horses, donkeys, mules, dairy cattle, goats, sheep and chickens (broiler and layer). Al-Karak governorate has ten poultry layer farms and 188 broiler farms, and one broiler breeder farm. The breeder farm produces one day-old chick and sold to broiler farms. The household members depend either on their farm production for their consumption or use the farm revenue to meet the household requirements. Depending upon the nature of activities, the cash income starts to flow back from the sale of farm products where cash was invested earlier with attempt to increase profit on the long term. For layer farms, cash starts to flow immediately with the start of egg production and sales at market. The marketing of eggs is normally organized through direct market where eggs price is determined according to forces of extent of supply and demand. During trading process in central market, buyers and sellers interact directly.

2.3 Analysis of Egg Prodution System

Layer- farms in the governorate are made of concrete structure of opened sides' houses with natural ventilation (i.e. open system). The layer birds are fed using ordinary cone-shaped feeders and red round drinkers for water consumption. The farms have manual eggs collection and grading system. Layer feed can be obtained directly from the local feed mills or produced at farm level after buying ingredients from suppliers distributed in Al-Karak governorate. The production cycle starts from raising pullets 16^{th} week of age until hens' age reach 80^{th} weeks which is considered the economical production period. Under Jordanian conditions, hens start laying from $18\text{-}21^{th}$ week when the production rate become 50% and peaks at 27^{th} week of age(where peak production rate is about 93% during season period (first Jan-first Jun) and decline to 90% out of season period (first Jun- first Jan). Chemical composition of layer feed is categorized into four diets based stage of production : (A) from start of production till production peaks (diet contain 16.25% crude protein (CP) and 2865 kcal/kg) (B) after peak of production until production rate decline to 90% (15.75 CP% and 2850kcal/kg) (C) when production rate decline to 89-85% (15.25 CP% and 2830 kcal/kg) (D) when production rate decline below 85% (14.75% and 2820kcal/kg). Leghorn (Hy-line CV_22) is the only commercial breed raised in Al-Karak governorate. The daily feed consumption is (99-111gm/hen) with average about 108 gm/hen. The system adapted in the layer farms is all-in-all-out system. Usually, layers are replaced by new pullets once layer reach 80 weeks of age and rarely undergo moulting. The capacities of layer farms are 7200 layers where hen-lay approximately 260 eggs per year. The daily production of table eggs is around 51,000 eggs. A layer lays about 310 eggs from 21-80 weeks of age during season

period (first Jan-first Jun) and 280 eggs out of season period (first Jun- first Jan) out of season. Tem raised and decreasing day light are the main factors affected on production that farmers cant manipulated it well. On the other hand, there are mixed chicken breed reared at back yard that produce 65 eggs during season only. It isn't used for commercial purpose.

2.4 Analysis of Marketing System

The eggs from the layer farms are marketed directly to retailers. The retailers sell the product to the local consumers in Al-Karak governorate. It is also common for the consumers to procure eggs directly from some farms as shown in Fig. 1. The egg price is 0.06 Jordanian Dinar (JD) (USA dollar= 0.083). The marketing margin of the farmers was 60.0% and 40.0% for traders (retailers) as shown in Table 2. The ten layer farms produce about 51,000 eggs daily to the retailers worth around 3060.0 JD (USA dollar= 4250). The eggs laid are collected manually in trays, and then packed in the distribution boxes for sale. The egg boxes are transported to the retailers in small vans. The Table eggs produced are graded for quality based on egg weight as the following: grade A (>65 g), grade B (58-64g), grade C (51-57g) and grade D (< 51g); eggs with higher weight have higher market price. The quality of the egg is influenced by type of feed offered to the birds and the age of laying birds [10]. The bio-security of layer farm birds is weak due to many factors. Firstly, farms are located close to each other (within a radius of less than 3km) [4]. Secondly, increases thoroughfare of people and other animals into the layer farms. Thirdly, the dead birds disposed-off not properly. Finally, there is no wise usage of antibiotics.

The SWOT analysis of market indicates various points (Table 1). The marketing plan is important not only in making decision to produce eggs but more to do consumer awareness to product quality especially in emerging economics such as in Jordan where consumers expect a good product with a competitive price. Therefore, it is challenging for egg producers to meet consumers demand. Thus, analysis of market and marketing strategies becomes a driving force in business sustainability. In this case, producing high quality table egg with competitive price is crucial for the egg producers to maximize customer satisfaction in order to achieve long-term profitability. Summing up that SWOT stated that the layer farms as corporative should capitalise on the strength and opportunities and avoid or reduce weaknesses and threats as much as possible [11].

The opportunities were found to be available at different level. The customers need high quality eggs for affordable price. However, the market price is worked out and negotiated based on the level of improvement on quality, inputs and services costs in local and international markets [12].

Portal's Five Forces Fig. 3 represents the portal's five forces. Firstly, threat of new entry where the farmers of Al-Karak governorate are not new to egg production business. They have been there for many years. They are aware of the problems and opportunities of egg business in Al-Karak governorate, Jordan. Competitive rivalry is second force where in fact there is absolutely no rivalry in layers farming as of now. There is opportunity for the new farmers to take up this business without any significant affect. Thirdly, Suppliers are the main player in the current supply chain. The absence of any cooperation between the farmers and other actors in the supply chain was revealed. The absence of contracts between the farmers and inputs suppliers who monopolize the production inputs particularly feed ingredients which imported and controlled by 5 large companies. Consequently rapid and sudden price fluctuation of the inputs (feeds and pullet) is expected because it mainly

depends on supply, demand, import and export circumstances. The absence of an effective agricultural strategy from the government in terms of sufficient and effective awareness and cooperative extension service to the farmers on a voluntary action, organization, coordination to improve and develop the production and marketing systems.

Table 1. SWOT for egg market analysis, Al-Karak governorate

Internal	Strength	Weakness
	1. private land for expansion 2. skilled/experienced family laborer 3. existing layer houses 4. perennial water source 5. working capital (no loans) **6.** Suitable climate (does not require heating & cooling system al the production period)	1. Low production capacity of farms 2. Farms not fully mechanised 3. Depend on manual labour 4. Low price for local eggs 5. Brand name and level missing **6.** Inexistence of assured market
External	**Opportunity**	**Threat**
	1. Export and national market for eggs 2. More people consume eggs 3. Inputs (pullet, feeds, equipments) 4. Foreign labourers (low wage) 5. Training and advisory Services (Research & Extension) 6. Technology (Poultry) 7. Supportive govt. policy (Agri. policy) **8.** Financial institutions (agri and commercial banks	1. Inexistence of farmers' cooperative 2. Out-break of poultry diseases 3. Raise of input prises

Table 2. Net marketing margins distribution depends on the average prices at period (01/01-31/10/2011) in JD/Tray (30 eggs with about 2.0 kg)

Marketing margin	Producer	Trader & Retailer
Revenue(JD piaster)	4.50	6.00
Purchase price	-	4.50
Costs	3.00	.050
Net marketing margin	1.5	1.00
Margin share (%)*	60.0	40

** (Margin share %= net margin of producer or Retailer/total net margin); Source: Prepared by researcher based on research survey and interviews*

Layers farms as corporative are strong to suppress the bargaining power of the suppliers. Because the corporative can avail tax-free import license from the government to import inputs if the present supplier raise prices [13]. Fourthly, threat of substitution which is considered to be a weak effect due to perishable nature of eggs and absence of imports and high cost of transportation involved. Finally, buyer power is existed as bargaining of the wholesaler and retailers may be strong. The corporative needs to negotiate the price based on the value share. Also the product is located closer to centre of consumption that cuts the selling price than other competitors.

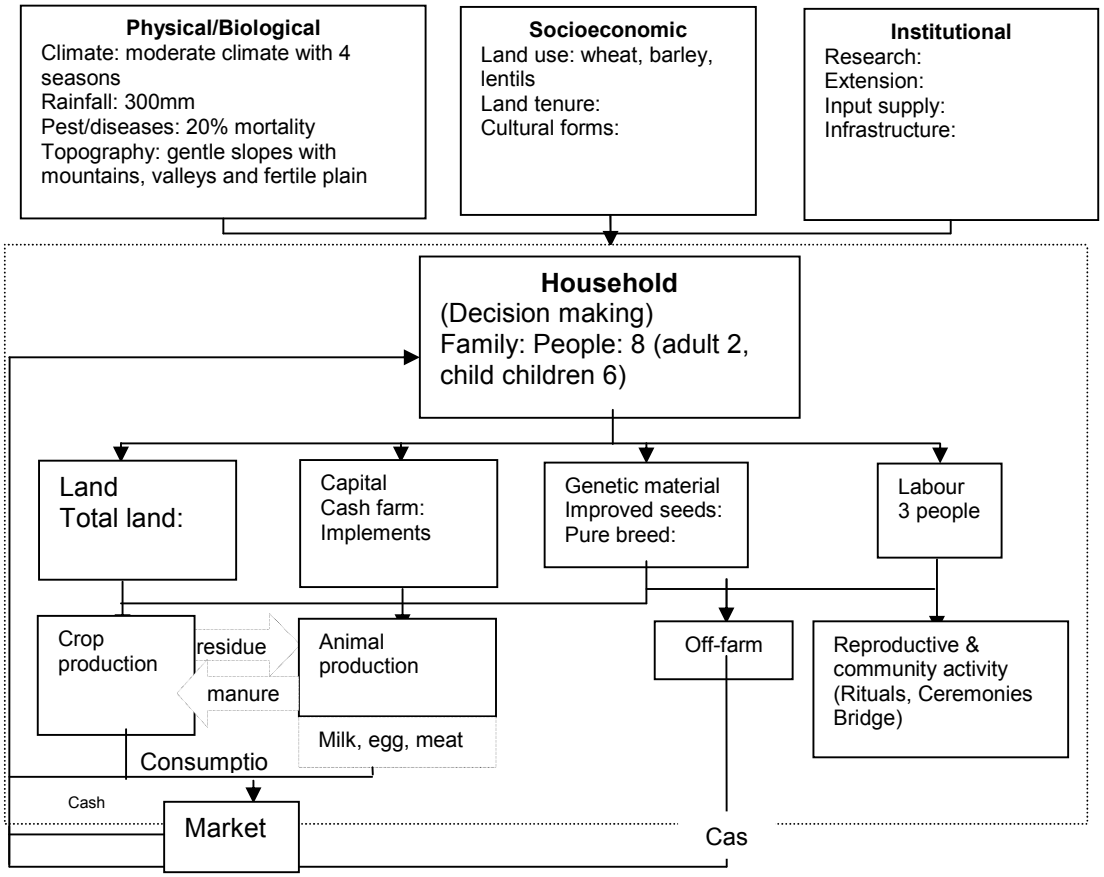

Fig. 2. Farming system analysis of Layer Farms, Al- Karak, Jordan describing boundary between farm household and external factors

2.5 Suggested Production Value Chain

The production chain of the layer farms is based on the concept of value chain. It is a fairly new technology for most developing countries like Jordan. Barnes explained value chain as union of enterprises that collaborate to accomplish rewarding position in the market vertically. In this stiffly competitive world of changing markets and technologies, businesses are faced with new demands, making it difficult to remain sustainable [14]. Therefore, production chain approach is one business strategy used to adapt to these changes for layer farms in Al-Karak governorate. The basic characteristic of a layer farms value chain needs to be market-oriented focusing on different actors of the layer chain to work together to produce quality table eggs for local market in Al-Karak governorate. The value chains will allow egg businesses to respond to the market by linking production, processing and marketing activities to market demands. The vertical alignment of actors along different segments of the chain is connected from one end of the primary production process through processing and possibly into the final marketing stages where consumers purchase a finished product

i.e., the table eggs. At each stage the egg value increases. This is different from supply chain, which considers horizontal alliance with no value is added to the product. The actors with different chain functions in value chain are interdependent as they have common goal (to produce and supply table eggs) and work collaboratively to achieve. The value chain provides a platform to work together over the long term issues and resolve problems together persist in within the chain.

A need for value chain is felt due to the presence of weak supply chain. The value chain helps to identify opportunities for a value chain by first mapping and evaluating the existing supply chain. This probably gave an idea of resources with clear defined objective of producing table eggs. Developing a business plan with clear goals, plans and measures minimize some risk by allowing layer farms and their actors in the chain to commit them to work-out any problems while proceeding on a level of their production capacity. All relevant actors are identified for the value chain. The layer farms will adapt the concept of production chain and implement in order to determine whether a full-scale value chain is possibly rewarding. Layer farm value chain is presented in Fig. 4.

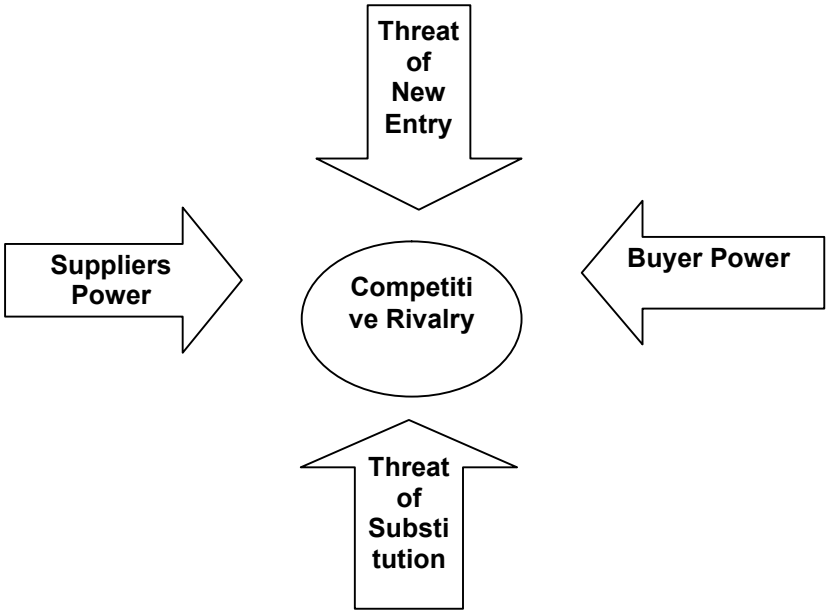

Fig. 3. Protal's five forces

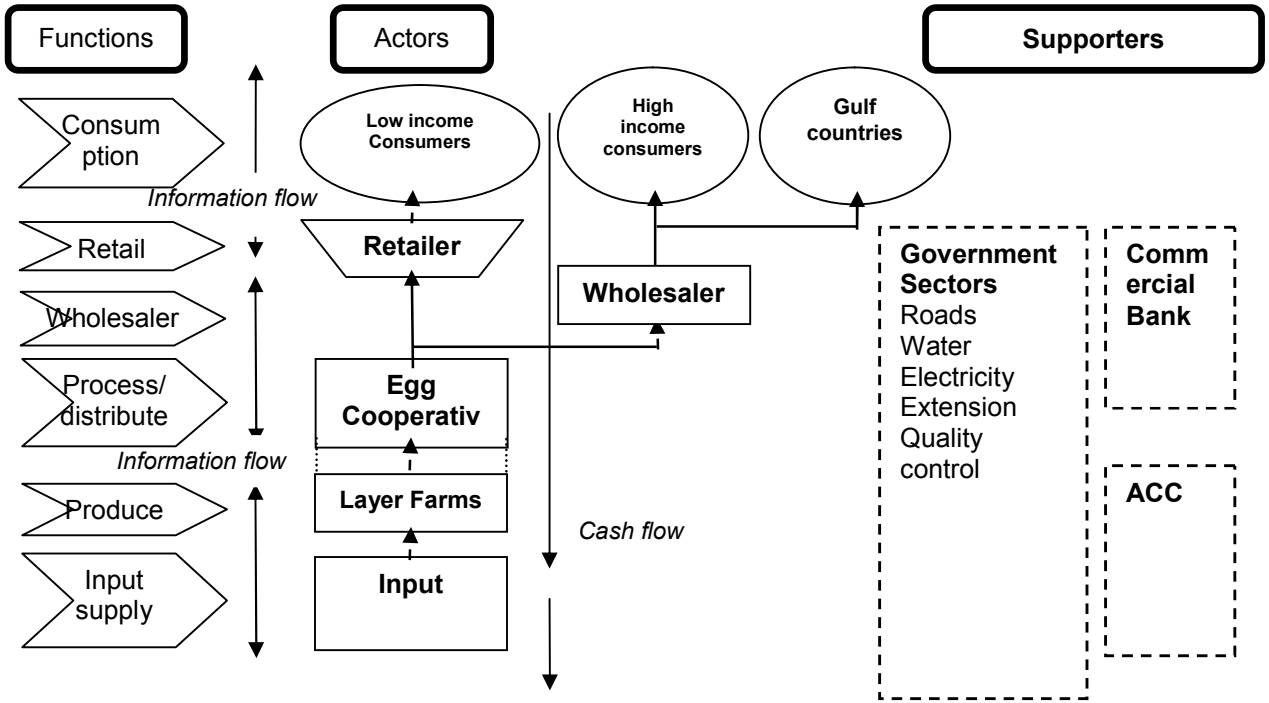

Fig. 4. Suggestion Layer Farm Value Chain, Al-Karak governorate

2.6 Environmental Factors

The environmental factors studied here were covered internal and external. The internal environment is related to control of thoroughfare of outsiders and other animals into the farm premises for bio-security reason. Since the poultry birds are very sensitive to diseases bio-securities need to be strict to prevent diseases coming into the farm. Outbreak of diseases would mean economic loses to the farm. Internal environment also includes cleanliness of poultry sheds, feed stores, egg store including all structures within farm premises. The room floors should be washed and disinfected. There should be foot bath with chemicals added in every house of the poultry houses. The carcasses of dead birds should be disposed off with incineration. Practice should be adopted to segregate sick birds to isolation rooms for proper check-ups, medication, treatment and post-mortem diagnosis. On the other hand, external factors represented as provision for controlling rodents and wild birds getting into the sheds needs to be checked with traps and wire-mesh. Changing rooms with proper dresses (lab coat, dungaree, boots, etc) needs to be put in place. The concept of clean and dirty roads should be introduced and demarcated with proper fences and walls within farm premises both for human and vehicles.

2.7 Production Plan and Stakeholders

The assumption goal of this business plan is to produce table eggs for export, national and local market. The producers comprise of existing layer farms and new farmers interested in Al-Karak governorate. The layer farm size is aimed for 10,000 layers in all-in and all-out system of production with 90- 93 percent laying percentage. The produced eggs in assumed farms will be distributed by the layer egg corporative in case of establishment.

Main actors of the value chain along with the stakeholders were included in Fig. 4. For example, input suppliers supply all necessary inputs required by the layer farms. Inputs for layer farms include pullets, feeds, equipments (drinkers, feeder, de-beaker), and egg trays. The layer farms route these inputs from the private companies located in Amman. Other inputs for the layer farms are poultry technologies (Ministry of Agriculture) and finance (Financial institutions-Banks). All inputs desired by the farms should be of good quality, need based, and at reasonable price and timely delivered. The input suppliers and producers need to negotiate on all these aspects closely for a win-win situation and build-up long term formal relation for quicker delivery of goods and services in demand.

The value chain includes also all layer farms that produce table eggs currently in Al-Karak governorate and new farmers interested to venture into this business in future. There are seven layer farms operational in Al-Karak governorate at present. Production of quality table eggs should be their main focus. The quality of eggs should not be comprised for want of cheap feeds and other low quality inputs in any case. They should be able to deliver all eggs produced to the egg corporative for processing on daily basis. The price for the eggs may be negotiated with the co-operative based on the cost of production and available market price in Jordan. Formal link may be developed and if need be contract may be signed for successful business of long term sustainability. The producers are access to basic required facilities like the roads, public and private transport and telecommunication facility.

2.8 Egg Producer Cooperative

The proposed cooperative should be formed with members comprising of ten existing layer farm owners and other actors led by an elected chairman. The existing farms can operate as a cooperative collaboratively. The idea of introducing cooperative is to strengthen the egg producers and to improve market and marketing strategies, develop plans, proactive roles and responsibilities. An external support (NGO, Government sectors, companies ...etc) may be contacted to support cooperative initially to address the terms of reference and frame rules and regulations [15,16]. Consequently, the farms should become well established in terms of resources (land, labour, and capital), planning capacity, working skills, bargaining and negotiating power. The purpose of introducing cooperative is also intended to reduce the workload of individual by employing professionals in egg production chain. Egg producer cooperative can possibly reform current grading system in attempt to reduce work load on individual and increase profit. The proposed grading system may be involve both quantitative and qualitative quality properties as the following: AA (HU=72 or more), A(71-60)and B(59-31)and C (30 or less). Suggested new grading system should be depended on weight and quality (Haugh unit=HU). Grade AA eggs may be marked for export (mainly to gulf area) , A and B for national market in Jordan and -Al-Karak governorate. It can be expanded to other countries depending on the availability of market demand. The activities of Egg producer cooperative should be integrated with the wholesalers. The corporative can be the chain coordinator in this egg value chain as they can link well with the producers as well as the wholesalers. The link between corporative and wholesaler is found missing in the current supply chain. The additional role the cooperative can take is procurement of needy inputs and supply it to the farms. This can save layer farms' time and resources.

2.9 Wholesalers and Retailers

The role of the wholesalers in this production chain is to liaise with the cooperative for receiving the egg consignments meant for export for high income consumers in the international and national markets. They deliver the consignments to the exporters for export outside Jordan to the gulf countries and national markets. The presence of this actor can connect the product to the export as well as national market quite well rather than the producers doing it themselves. The wholesalers have the export hands in reaching the local product to the international markets helping producers to get premium price. Therefore, their role in this chain is to export quality table eggs to the export market and to the international consumers. They also have indirect role in local product advertisement in the international market. On the other hand, the supermarket and shops are the retailers. The retailers' role in the chain is to sell eggs of B and C grades in the national and local market. They also have the liberty to sell in bulk to the institutions.

2.10 Consumers

Consumer satisfaction is the key to successful chain operation. Consumer preference for quality and taste needs to be considered carefully for market sustainability. Losing faith and trust of product from the consumers may result into the failure of the whole business. Therefore, consumers demand needed to be understood and communicated well by all the actors of this production chain.

2.11 Supporters

The supporters in this production chain are the government institutions like research centers and, and veterinary under the Ministry of Agriculture. The research requires generating appropriate technology applicable to the layer farms to suit their immediate needs in enhancing productivity. The extension needs to be proactive in delivering their quality services required by the farms like dissemination of new technology and render advisory services in areas where farms need them most. The veterinarian services are important in terms of disease surveillance and effective control measures. They should also help the farms in implementing strict bio-security measures in their farms for prevention of diseases. Further, the service of quality controlling agents is important in monitoring quality production of table eggs and regulating the rules and regulation pertaining to quality as per national and international standard since export of eggs is involved here. They should also introduce tracking and tracing system of Al-Karak governorate eggs by developing brand name and level with lots number, date of production, name of farm, place name,... etc. They should certify and declare the eggs for consumption free of hazards with identification of critical control points at producers and processors level. The financial institutions are important supporters required in this chain. They can help producers and processors by providing loans to start or expand their production and processing works. There should not be lengthy procedure involved in processing and receiving loan by their clients. The interest rate may be kept low and liquidity period long enough to give sufficient time to pay-off.

2.12 Farm Description/Farm Technical Parameters

The target client for this business plan is the layer farms in Al-Karak governorate with 10, 0000 layers. The farmers are engaged in rearing layer pullets from 16 weeks of age. They procure pullets from private breeder farms in Amman. Though the price of pullets may be bit higher than procuring DOC, but the farmers can drastically cuts down rearing costs for 15 weeks, saves space and reduce mortality. The business plan recommends the farms to continue to procure pullets of 16 weeks as usual. As for the inputs, farms can liaise with cooperative for supplying them with basic needs. The terms and condition conducive to both the parties may be worked out jointly and operationalize the work as planned. The functions of the farms and other actors will remain as specified as above under the section ‘stakeholder’.

2.12.1 Optimum growth and body development of pullets

This is important to allow the pullets to attain enough maturity and gain weight by the time they reach the point of lay at 21 weeks of age to already start producing standard eggs size. It helps farms to fetch better price from initial lays without having to wait longer for good egg size for the market. Uniform flock with uniform egg production is vital to reduce the rate of culling at early ages of production.

2.12.2 Feeds and feeding

Quality feeding is crucial but excess feed may lead to fattening and low production. The pullets of 16-20 weeks should be given 90-100g and layer 120g per day per bird. For layer, the feed consumption per 25 eggs produced should not exceed 3.6kg for higher return over feed.

2.12.3 Mortality

The mortality of pullets till point of lay should not exceed five percent and layers one percent. The rate of mortality exceeding acceptable limit of farms' to economic losses may be corrected immediately through appropriate intervention.

2.12.4 Egg production per hen-housed

The egg production per bird for a period of 60 weeks may be expected to be 375 (at production rate 90%) from 21-80 weeks of age. It is important to note that number alone does not count but also quality of eggs count for higher monetary gain.

2.12.5 Peak production

The peak production should be expected at 26-27 weeks of age and continue till 30-32 weeks. Longer peak period is better for economic reason.

2.12.6 Technical issues

2.12.6.1 Housing design and standard

Housing is an important technical issue. It demands sound technical knowledge and skills in terms of designing the whole farm plan with required technicalities, longevity, site selection, orientation (direction), floor type, walls, drainage system, and manure management, placement of feed store, isolation ward, store, incinerator, surrounding fences, road, water sources and future expansion areas. For this, due consideration should be given to the soil type, climate, humidity, temperature and rainfall of Al-Karak governorate.

Based on the Al-Karak governorate's climatic conditions, housing design is influenced by the prevailing natural factors as stated above. Since Al-Karak governorate has a semi arid climate, one quarter wall and two quarter wire mesh is good enough to allow natural heating in winter and cooling in summer. The orientation of house towards the direction of sun winter and wind in summer is important for such system. The design for the housing should also include provision for feed store, isolation ward and changing room. Proper fencing or walls to check thoroughfare in the farm is of paramount importance of the farm construction plan.

The housing should consider proper layout of drinkers (3 gallons with space for 30 layers), feeders (5 feet long and open on both sides is adequate for 25 birds) and laying boxes for the birds. The standard floor space requirement per bird is 2 sq feet per bird with 4-6 inches litter [17]. Therefore, the size of the poultry house is determined by the space requirement per birds and the number of birds the shed should hold. There should be enough laying boxes (14" wide, 12" high, and 16" deep) for the number of layers (one box per five birds) housed per shed with 3 inches of litter material [17].

The house should allow for plenty of ventilation and sunlight. Place 1 inch, poultry wire netting over all openings to separate the hens from other birds and animals, both wild and domestic. Removable curtains or doors are recommended so the openings can be opened or closed as the weather changes. Houses should be kept dry and comfortable by ventilating from all sides in the summer and closing most openings in winter.

2.12.6.2 Lighting

Regardless of which production method is used, the 22-week old pullets should be given an increasing daily light schedule after being placed in the laying house. The length of daily light should be increased 15 minutes each week after the birds enter the laying house. The increased light will stimulate egg production and help maintain production throughout the year. The day length increases should continue until the birds are receiving 16-18hours of light each day. The day length should remain the same for the rest of the laying period. After the birds begin to produce eggs, the total duration of light, including both natural and artificial, should not be reduced.

2.12.6.3 Feed quality

The birds should be fed a nutritionally balanced commercial laying mash containing 16 percent protein. The quality of feed determines the growth and productivity of the birds and profitability of the farms. Trying to comprise on quality feed for cheaper feeds to cut down costs for a commercial farms with 7000layers in any case is not a doable option. The type of feed used both for the pullets and layers should contain right amount of nutrient levels (standard) and be tested for quality standards and approved by the quality inspectorates.

2.12.6.4 Automatic Feeder and Egg collector

With the inception of new business, the layer farms are advised to make a shift from ordinary feeder to automatic feeder. It will cost farmers onetime cost worth about 10,000JD with low maintenance afterwards. The use of automatic feeders will help farms to reduce feed wastage and save manual labour and time. The egg collector will also save labour and time.

2.12.6.5 Health monitoring

Routine monitoring for the health of the pullets and layers is a must. The birds should be checked for presence of diseases, ecto/endo parasites, any abnormal growth and symptoms for proper growth and production. Control measures for diseases through routine vaccination and deworming is important. Post mortem analysis of dead birds in the farms must be carried out to indentify the cause of death to curb recurrence and prevent losses. Using a good vaccination program helps to keep most diseases at bay. The schedules may vary depending on the disease condition in the area. The schedule for layer farms in Al-Karak governorate is planned as a Bronchitis vaccination at 14-16 weeks (vaccinate at 16 weeks if the pullets are not vaccinated earlier); Newcastle disease vaccination with repeation every 2 to 3 months; and Fowl Pox vaccination at 16 weeks (vaccinate at 16 weeks if the pullets are not vaccinated earlier at 14 weeks).

2.12.6.6 Egg quality

The hazard analysis and critical control point (HACCP) should be introduced for the layer farm with new business plan. One never knows where things go wrong in the farm. At such times, the farms need to identify them and make plan to prevent them. HACCP will be excellent instrumental tool to help food business to attain higher standard of food safety. Already developing mechanism to reduce risk to a level acceptable for public health is of prime importance. The layer farms are aiming to export their eggs to the export markets outside and national and local market within Jordan critical control points for safety and quality is of national and international concern of consumers. Introduction of legislation with

measurable indicators (e.g. egg weights, storage temperature) is a must. Non-measurable indicators like brand and level should be adopted for tracking and tracing aims. The perquisite program (PRG) like personal hygiene, rodent control, equipment maintenance and cleaning procedures have to be practiced and monitored. A team comprising of layer farm owners and/or quality inspectorate can plan and implement it effectively [18].

2.13 Farm Organisational Plan

2.13.1 Human resources

The farm is headed by the owner who has the inherited property right and makes major decisions pertaining to the farm. He hires a helping hand to run the farm. In Karak, hired foreign labourers are used as a helper. Two persons should be enough of a labour requirement in farm with less than 10,000 layers. In the new business plan, the farms jointly operate as a cooperative with rest of the actors in the production chain.

2.13.2 Additional structures

The existing layer farms require few additional structures like feed store, isolation ward, changing rooms, surrounding wall or fence and entrance gate where necessary. It involves bit of additional costs initially but it is mandatory for poultry farms in terms of bio-security issue. It saves the farms from unforeseen economic losses due to diseases out-breaks.

2.13.3 Plan periodic visit by veterinarian, extension and quality inspectorate

This group of people is the key to the farms for successful and profitable layer farming. The veterinarian will be required to routinely check up for presence of diseases in the flocks, technical inputs in strengthening bio-security of the farms, treatment and diagnosis of diseases. They can also check eggs for presence of diseases and give feed back to the farms of their findings for improvements. The extension is equally important in terms of imparting technical knowledge and skills through trainings and advisory services to the farms. They are also instrumental in bringing in new technologies and update the farm on availability of inputs and services. The quality inspectorate is required to control the quality of the product (table eggs) and certify for safe consumption.

2.13.4 Financial plan: investment budget / trade account

The financial plan is essential in business plan to project revenue, costs, cash flow and financial state of the farms to be able to forecast the state of their business in terms of monetary gain and losses. It is also necessary for financial institutions to evaluate their business performances and warrant approval of loans when necessary.

2.13.5 Income Statement

An Income Statement also known as statement of profit and loss. The need for income statement is to unveil revenues and costs or profit and loss of a business annually. The information of revenue and costs may be tabulated, recorded and updated from time to time as ready-records for ease of making decisions in the farm plans.

2.13.6 Cash Flow

It is basically projection summary cash that come into the farm as income and go out of farm as expenditure. The cash flow information is required for informed decisions of farms' financial capability to keep operational from batch-to-batch basis of layer. This information will enable the farms to indicate the projected increases or decreases of a bank loan that may be required during the year. Monthly summaries may be preferred for efficient recordability for the first year of operation for better understanding parse of cash flow.

2.13.7 Balance sheet

The balance sheet describes the assets, the liabilities, and the equity of the layer farms at a particular point in time. It is useful for accounting as indicator for the economic resources of the farm and the claimant on those resources by creditors. The balance sheet shows what a farm owns and what owes to others. This information is useful to compare estimates as well as past performance, against averages in the farm production sector.

The balance sheets for the existing (old) (Appendix 1) and new business plan has been worked. In the old case the solvency is positive with equity of 56.5 percent. However, in the new plan, an additional loan of JOD 13,400 is required to cover up the cost for additional pullets (2800) and structures.

2.13.8 Loan payment

It is a summary repayment recorded to provide a snapshot view of existing and new loans that is held by the farm. Information should outline the interest rate being paid, frequency of payments, security given, type of loan (amortised versus non-amortised), the expected term of the loan. For existing loans the name of the financial institution should be indicated. Interest on loans is repayable from the first day of operation, and there must be a return on investment, both time and money, within a realistic time frame if the business should be economically viable. The loan repayment on monthly basis comes to about JOD 473 with interest. The liquidity period is 10 years with 3 percent interest rate.

3. CONCLUSION

The production chain of egg production is not integrated. The egg production system in this area is working with independent layer farmers. Egg production sector in Jordan produces about 80% of self sufficient from the table egg only without egg products account. Target area (Al-Karak governorate) produces about 30% of self sufficient which lead to bring table egg from other governorates with high price due to the transport cost and middlemen commission. The current problem for the Al-Karak governorate's layer farms is the inexistence of corporative to enhance production (up to 51, 000 eggs daily) and market. The egg market is also instable beside low production leading to low income. About 25 more farmers with same number of layer and production capacity can take-up layer farm as new business venture since to double or quadruple the production may be a constraint to the existing ten farms. All the layer farms are still traditional in operations. Manual labour is dominant in the absence of mechanisation.

The information on quality, prices and value share are not shared among the supply chain actors and the value focus is on costs and price, and not on improving the quality and differentiated product commodity as value addition. Farmers should be subjected to

extension and training programs that target to encourage on the corporation and improve the bio-security knowledge. Farmers obtained 60% of margin share while the retailers get 40%. In the current supply chain the inputs suppliers are the main player in the current egg chain who are controlling over the feed cost and pullets price.

The production chain (value chain) will helps the layer farms to sustain in competitive world of changing markets and technologies, businesses facing new demands that make them difficult to remain sustainable. The value chain concept would help the layer farms in collaborating vertically to achieve a more rewarding position in the market than it used to be.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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