The development prospects of rabbit sector in Tunisia based on a value chain diagnosis

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Abstract— *This study is to identify barriers to the development of rabbit sector in Tunisia using value chain approach, as an instrument of strategic analysis and value-cost optimization. To this end, a survey was conducted with a representative sample of industrial rabbit breeders. The results prove that the development of the rabbit value chain is conditioned in promoting the efficiency and the quality at the breeding system. Rabbit feed quality is the main constraint for the majority of breeders, followed by animal feed prices. This justifies the increase of the consumer sale prices of rabbit meat, affecting its domestic supply. Thus, the growth of the Tunisian rabbit sector is based on a reform and an upgrade of the productive systems and also on a better organization of the sector through the promotion of the vertical and horizontal integration. Promoting rabbit meat consumption is also a determining factor of rabbit sector development.*

Keywords— Rabbit, Tunisia , Value chain.

I. INTRODUCTION

Rabbit breeding in Tunisia contribute to the agricultural and rural development. It has a great development potential as regards projects and job creation and food security improvement. This sector is dominated by traditional systems, but during the last decades the industrial systems are in increase. Industrial rabbit breeding is characterized by the installation of modern breeding system, using races with more successful exotic origins and in fenced hutches installation (Tunisian Office of Livestock and Pasture, 2014). This sector is confronted with several constraints, mainly technical, such as the poor quality of production factors (animal feed, livestock buildings) and the low technicality of the breeders (inappropriate food supply, problems of reproduction control, bad hygiene) (Bergaoui, 1992). This situation leads to a low productivity and profitability of the rabbit breeding. In addition, the rabbit breeding in Tunisia suffers from marketing problem and from low request. In this context, and because of the contribution of this sector to food security and rural development, a strategy for upgrading the Tunisian rabbit sector is essential (Tunisian Poultry and Rabbit Association, 2012).

This work proposes a functional and organizational diagnosis of the rabbit breeding sector in Tunisia, using an analysis of the value chain to investigate the barriers to the development of this sector and to identify its progress perspectives. The remainder of the paper is organized as follows: the next section describes the survey with Tunisian industrial rabbit breeders, data processing and organization based on a value chain approach. This is followed by a section on data analysis and the discussion. The last section presents the concluding remarks.

II. MATERIAL AND METHOD

2.1 Value chain approach

The value chain approach is one of several market systems approaches to development. In recent years, it was an largely implemented approach. Value chain is the sequence of consecutive activities which are required to bring a product or service from conception and procurement, through the different phases of production (combination of physical transformations and intervention of diverse services) and distribution, to the final customer.(Porter, 1985, 1998 ; Kaplinsky, 2004). For the agriculture sector, Miller and Da Silva (2007) define value chain as a set of process and of flows from the farm at the table, a set of public and private actors(suppliers, distributors/sellers and customers), and also a set of the value-adding activities carrying a product from production phase to the consumers. This value chain approach includes diverse aspects: physical, economic and social logistics between the raw product and the consumer, supply chain, flows of remuneration which set the generated margins. It allows the authorities and especially the breeders to approach the value chain questions, to maximize the value during their commercial transactions (BIT, 2012). Therefore, the methodological approach is organized into three stages:

- A descriptive analysis of the Tunisian rabbit sector is based on a bibliography reading, leading to the sector delimitation and the identification economic actors. The Tunisian rabbit value chain map was so drawn.
- An explanatory analysis of the Tunisian rabbit value chain is conducted with an accounting analysis based on a decomposition of the costs, the prices and the margins throughout the value chain. This diagnosis is based on a survey with Tunisian industrial rabbit breeders and collected data from secondary sources. it analyses factors that influence the performance of the different segments of the Tunisian rabbit value chain and its studies relationships among the economic actors to identify the main constraints to the increased efficiency, productivity and competitiveness of this sector.
- A SWOT analysis of the Tunisian rabbit sector is built.

2.2 Survey with Tunisian industrial rabbit breeders

To make the diagnosis of the Tunisian rabbit value chain and to analyze it, according to the degree of vertical integration of breeders in this sector, a survey was realized with 10% of total industrial rabbit breeders (260 breeders) (Tunisian Poultry and Rabbit Association, 2015), practicing or not the slaughter.

The sample selection was based on the total number of female units. In fact, breeders with more than 7106 units females offer 26% of the total production of rabbit meat from industrial rabbit breeders. It's a purposive sampling. Subsequently, the sample was structured of industrial rabbit breeders, having more than 7106 female units, spread over the regions of Nabeul, Jendouba, Sousse, Sfax, Monastir and Mahdia. 73% of them practice only rabbits breeding activity.77% use artificial insemination and 27% practice the slaughter.

The survey was conducted on face to face with the selected breeders, using an interview guide. It covered technical and economic, quantitative and qualitative, aspects of the breeding system, to:

- investigate the functioning the different categories of value chains in Tunisian rabbit sector,
- to study the structure of the rabbit meat cost, etc.
- explore the main strengths, weaknesses, opportunities, threats in the different segments of the value chain,
- identify needs and expectations of industrial rabbit breeding.

III. RESULTS AND DISCUSSION

3.1 Descriptive analysis of the Tunisian rabbit sector

3.1.1 The Tunisian rabbit sector and its actors

This section presents Tunisian rabbit sector with its economic actors and their interconnected links, leading to the construction of the Tunisian rabbit value chain map.

- **Input supply**

Supply in strain of breeding rabbits

In industrial rabbit breeding, the breeders use several races: white Giant of bousca, New Zealander, Californian, Wildcat of Burgundy, Giant Butterfly, Chinchilla, Dutchman, Chamois of Thuringia, Big Russian and Alaska. To renew rabbit livestock, the breeders produce their own reproductive females or buy their rabbit breeding from Government-approved reproductive breeders. There are two types of breeders in Tunisia:

-Breeder-fattener: Those who insure only rabbits fattening,

-Rabbits multipliers: assure the pure or hybrid race renewal.

In Tunisia, the distinction between these two types of breeding is not always obvious.

Supply on rabbit feed

The number of animal feed factories in Tunisia is in increase. Actually, three factories dominate this market and influence the quality and the price of these products: the SNA (with two companies in the North and in the South of Tunisia), PROVITAL and the NUTRISUD.

- **Rabbit factory farms vs. rabbit traditional farms**

Rabbit breeding sector in Tunisia passed from a traditional breeding system (family activity with around 10 mothers, local populations) to an industrial breeding (more successful exotic origins, installed in fenced in hutches). To assure this transfer, the State set up several financial and organizational encouragements in the late 70's. This allowed the development of professional rabbit production in Tunisia (Lebas, 2008). The statistics of the Tunisian Office of Livestock and Pasture (2014) show the changes on rabbit breeders structure in Tunisia, passing from 120 thousand female units in 2004 to 128,5 thousand in 2006 and 55 thousand in 2014. Actually , the Tunisian rabbit breeding system consists of 49% of industrial rabbit breeding against 29% in 2004. This industrial system offers 76% of the total rabbit meat production in Tunisia in 2014 (Tunisian Office of Livestock and Pasture, 2014; Tunisian Poultry and Rabbit Association, 2015).

On the geographic distribution, the big rabbit breeding farms are mainly situated in the coastal regions (58 % of the Tunisian rabbit livestock). The region of Nabeul and Jendouba contribute to 58% of the rabbit meat production. In the center, Sousse contributes with 22% of the rabbit meat production, followed by the region of Sfax, Monastir and Mahdia (Tunisian Poultry and Rabbit Association, 2015).

Different public institutions (the Agricultural Investments Promotion Agency , the Regional office of agricultural development, the Tunisian Union for Agriculture and Fishing , the Tunisian Office of Livestock and Pasture and the Tunisian Poultry and Rabbit Association, etc.) intervene in the organization of the rabbit sector via the encouragement of the industrial breeding, the elaboration of contracts with slaughterhouses, the provision of financial aid, etc.

- **Slaughter**

In Tunisia, the industrial slaughterhouses are among three: a slaughterhouse rabbit in Takelsa with a capacity of 400 rabbits/day, the slaughterhouse of the cooperative Ennejma in El jem with a capacity of 2000 rabbits/day and another one in the North of Tunisia with a capacity of 2400 rabbits/day. Among these three industrial slaughterhouses, only one is operative since 2008, it's systematically controlled by the veterinarians inspectors (Tunisian Poultry and Rabbit Association, 2012).

All the industrial slaughterhouses detain a traceability of their products. These slaughterhouses are encouraged to have contracts with rabbit breeders. But, the establishment of production contracts remains annoyed by the prices cap applied by the Trade Ministry and by the presence of the small scale and artisanal slaughters.

- **Rabbit meat distribution and trade**

Rabbits are marketed following several distribution channels (Fig.1). Besides the direct sale (ultra short circuit), rabbits are intended to supply the local markets and the retail sales points. A part of the rabbits production is forwarded by companies of slaughter and distribution or the breeders-collector, without real contract of integration between these economic actors (Tunisian Poultry and Rabbit Association, 2012).

Traditional breeders usually market directly their rabbit in lively in the farms, in local markets or in retail sale points. Some traditional breeders, after transit through small scale and artisanal slaughters, market rabbit meat in rotisserie or in some retail sale point. Industrial breeders, using both small scale and artisanal slaughters and industrial slaughterhouses, market cooled and frozen rabbit meat in retail sales points, supermarket, franchised points of sales, rotisserie and in mass caterers (Tunisian Ministry of National Defense).

- **Domestic consumption of rabbit meat**

Despite the benefits of rabbit meat, the Tunisian consumption seems small and widely lower than other white meats consumption. The average of rabbit meat consumption per capita in Tunisia is approximately equivalent to 0,250 kg/capita/year (Tunisian Poultry and Rabbit Association, 2015). The Tunisian Poultry and Rabbit Association (2015) asserts that the consumption of rabbit meat far exceed the domestic offer and that it's in regular progress. The annual consumption average in Malta is 8,89 kg/capita while it's 2,76 kg/capita in France (Lebas &al., 1997). Approximately the 2/3 of the Tunisian rabbit meat production is intended to the tourism sector and to the Tunisian Ministry of National Defense. The third part is dedicated to self consumption in rural area (subsistence farming), and to a minority of customers, in cities, which consider rabbit meat as a high quality product and with health benefits (Tunisian Poultry and Rabbit Association, 2015).

So, there is a potential of rabbit meat demand improvement through rabbit meat advertising. Rabbit meat orders of public and private institutions, such as hospitals, academic homes, hotels, can upgrade rabbit meats demand. There are also a potential of export of rabbit meat and by-products. Importer countries (especially China) especially request rabbit skin. By-products such as the blood and the intestines are in great demand by laboratories and cosmetics industry (FAO & Tunisian Poultry and Rabbit Association, 2011).

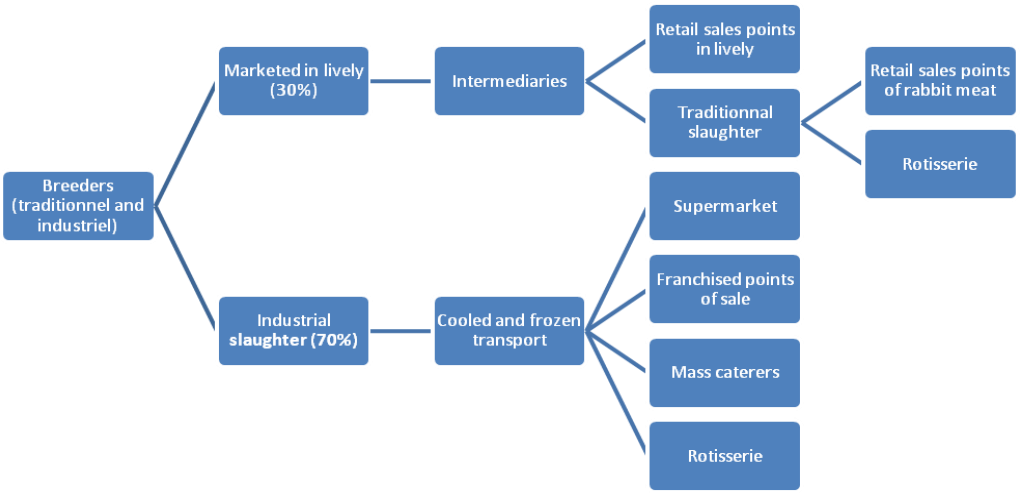

FIGURE 1. DISTRIBUTION CHANNELS OF RABBIT MEAT IN TUNISIA
(Tunisian Poultry and Rabbit Association, 2012)

3.1.2 The Tunisian rabbit value chain map

Based on the above descriptive analysis, the Tunisian rabbit value chain map is presented in the figure 2, describing the different functions, the economic actors and the service providers throughout the value chain. It mainly describes the products flows.

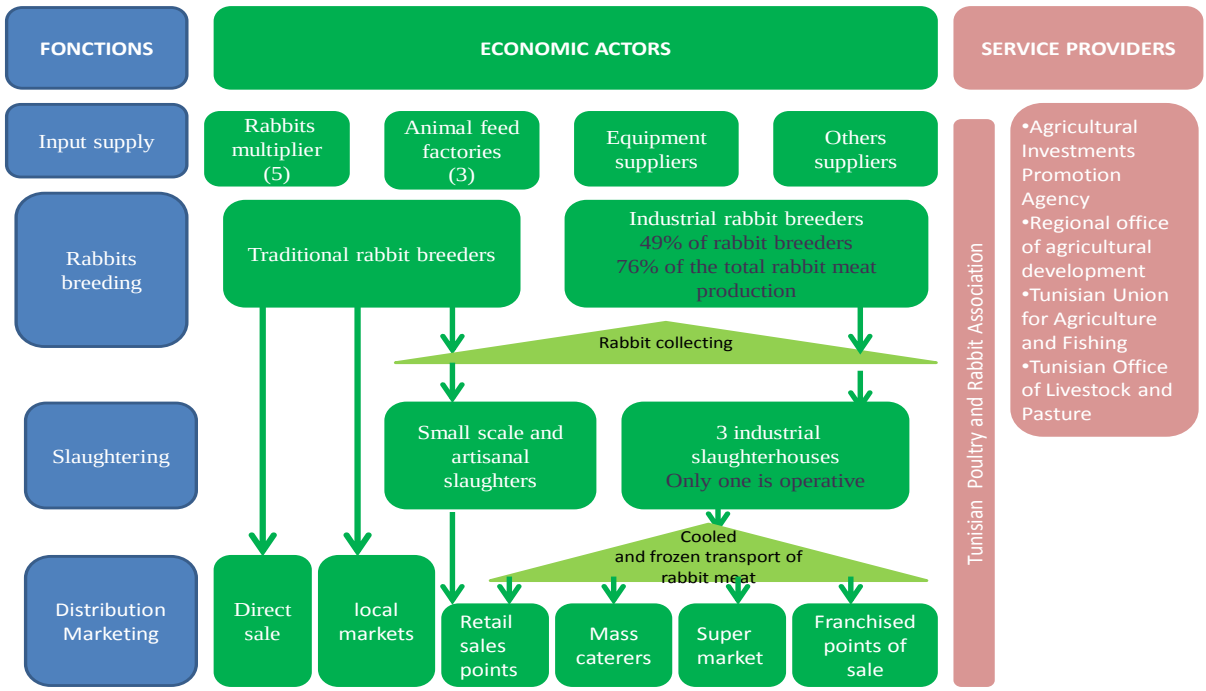

FIGURE 2. RABBIT VALUE CHAIN MAP IN TUNISIA
(author's elaboration, 2016)

3.2 Explanatory analysis of the Tunisian rabbit sector

Based on the survey, an explanatory analysis of the Tunisian rabbit sector is presented. It diagnoses the sector functioning, the actors expectations. Through a SWOT analysis, the main constraints and the development opportunities of the sector are detailed.

- **Input supply and the major problem of rabbit feed**

An organized *supply on raw materials* can help rabbit breeders to reduce the costs and to be more competitive on the market. The supply concerns essentially the supply in reproductive rabbits and in rabbit feed. To renew the reproductive livestock (males and females), 80% of the interviewees stock up with approved breeders centers. The others produce their own females. Concerning rabbit feed, the availability is averagely criticized: 43% of the breeders complain about the regularity of the supplies. 57% of the breeders judge that its quality is binding and not approvable. Because of the low tonnage of rabbit feed comparing to other farm animals feed and because of the seasonality of rabbit breeding in Tunisia, the producers of animals feed do not guarantee a perfect quality of feed for rabbits, especially regarding content and nature of fibers. Furthermore, the major problem of raw materials supply is the increase in prices, particularly for animal feed. These represent more than 53% of the total cost of rabbit breeding, according to the survey.

- **Typology of rabbit breeding systems**

The production capacity and the technologies are involved in the typology of rabbit breeding systems and influence their profitability. The survey shows that 65% of the Tunisian rabbit breeders use "paving stone" buildings and the others use "in vault" buildings, knowing that a technical statement of work governs breeding buildings and equipments. The artificial insemination is used by 77% of the interviewees; it's practiced systematically in the case of unique band and also in conduct in multiple bands, but occasionally in weekly conducts. The conducts in unique band is the dominant and it's in increase. 94% of the rabbit breeders, practicing artificial insemination, regularly follow a crawl space. About human resources and according to the survey, only 4% of the breeders appeal to the outside workforce, in particular for the insemination, the cleaning and the disinfection.

- **Vertical integration and competition between breeders**

Competition between simple breeders and those with vertical integration in the Tunisian rabbit value chain can be considered as uneven because the latter have access to the mass-market retailing and have consequent ways for the promotion and the marketing of their products. The relationships between these two types of breeders are relationships of customers to suppliers. The big structures supply the simple breeders with reproductive rabbits. Besides, a rivalry becomes established between breeders with vertical integration and distributors because of the weak growth of sales due to low consumption, the attempts of integration of breeders giving them more independence and a better marketing for their products, and also because of the breeders concentration due to the immensity of the investments in front of a stiff, seasonal and risked market.

- **Rabbit and rabbit meat distribution and marketing**

Based on the survey, the distribution system of rabbit is dominated by alive rabbits sale (73%) via multiple trade channels, such as municipal markets, specific points of rabbits sale in conglomerations, as well as on the weekly markets. Besides, vertical integration of breeders in rabbit value chain via practicing slaughter and distribution, in addition to breeding, is in increase. It's accompanied with the development of the marketing activities. It targets niches markets such as tourist market (hotel units), institutional catering (Ministries, schools, hospitals, etc.) and mass-market retailing. But it's facing some commercial constraints such as the commercial standards and the competition of the other categories of white meats.

- ***Accounting analysis of the Tunisian rabbit sector***
    - ***Variable costs throughout the value chain***

<u>Decomposition of rabbit breeding costs</u>

Based on the survey, the average of production cost in Tunisia is 3,9 Tunisian dinars for one kilogram of rabbit. This average is lower than the sale price equivalent to 4.6 for the lively rabbit kilogram. Animal feed represents more than 53% of the total variable cost of rabbit breeding. Septic and sanitary maintenance and workforce represent respectively 15% and 13% of total rabbit breeding cost (Fig.3).

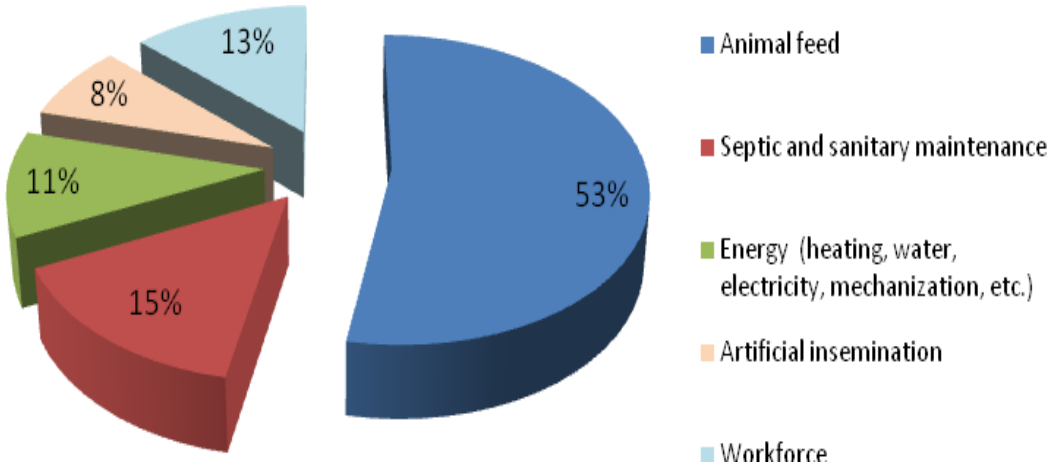

FIGURE 3. TOTAL RABBIT BREEDING VARIABLE COST
(author's calculation, 2015)

As described on table1, the livestock size and the practice or not of artificial insemination influence the production costs. Generally, the practice of the artificial insemination in an important seized livestock allow an optimization of the technical performances, a reduction of the production cost, and consequently a better remuneration.

TABLE 1
STRUCTURE OF THE RABBIT BREEDING VARIABLE COSTS
(author's calculation, 2015)

	Natural service	Artificial insemination Size <400	Artificial insemination Size>400	Average
Total variable costs (Tunisian dinars/kg)	4,2	3,97	3,73	3,96
Animal feed (%)	59,5	49,36	51,00	53,29
Septic and sanitary maintenance (%)	15,25	13,77	14,80	14,61
Energy (%) (heating, water, electricity, mechanization, etc.)	12,56	15,72	5,20	11,16
Artificial insemination (%)	0	8,47	16,00	8,16
Workforce (%)	12,69	12,68	13,00	12,79
Total (%)	100	100	100	100

Decomposition of rabbit slaughtering costs

The cost of slaughter is especially influenced by the distances between the farm and the slaughterhouse and the client (D*) as described on the tables 2 and 3. The transport towards and from the slaughterhouse is provided by these slaughterhouse. The freezing, slaughtering and packaging charges are stationary per kilogram of rabbit meat. the storage charge is estimated per kilogram of rabbit meat and per month. The total rabbit slaughtering variable costs on table 3 were calculated per one month of meat storage. Slaughterhouses have to diminish the slaughtering costs by reducing the stocks and the duration of storage.

TABLE 2
STRUCTURE OF THE RABBIT SLAUGHTERING VARIABLE COSTS (TUNISIAN DINARS/KG)
(author's calculation, 2015)

	D*< 100 km	100< D* < 200 km	D* >200 km
Rabbits transport to slaughterhouse	**0,07**	**0,09**	**0,11**
Slaughtering and packaging	0,5	0,5	0,5
Freezing	0,05	0,05	0,05
Transport of packaged rabbit meat	**0,07**	**0,09**	**0,11**
Storage/$_{month}$	0,05	0,05	0,05

D*: distances between the farm and the slaughterhouse

TABLE 3
TOTAL RABBIT SLAUGHTERING VARIABLE COSTS DEPENDING ON THE DISTANCE (TUNISIAN DINARS/KG)
(author's calculation, 2015)

	D_1< 100 km	100< D_1 < 200 km	D_1 >200 km
D_2< 100 km	0,74	0,76	0,8
100< D_2 < 200 km	0,76	0,78	0,8
D_2 >200 km	0,78	0,8	0,82

D_1: distances between the farm and the slaughterhouse
D_2: distances between the slaughterhouse and the client

- ***Sale prices and margins throughout the value chain***

Margin on variable costs of rabbit breeding (Two-segments value chain)

The sale prices of lively rabbits exceed the production cost of 0,52 Tunisian dinars in the breeding with natural service, 0,68 Tunisian dinars on farms unspecialized on artificial insemination with a livestock size less than 400 rabbits, and 0,75 Tunisian dinars in the breeding system specialized on artificial insemination and with more than 400 rabbits (table 4 & fig. 4). It is obvious that practicing an economy of scale (important size of the livestock, developed technologies...) contribute to the cost-cutting and consequently to profit improvement.

TABLE 4
MARGIN ON VARIABLE COSTS OF RABBIT BREEDING (TUNISIAN DINARS/KG)
(author's calculation, 2015)

	Natural service	Artificial insemination Size <400	Artificial insemination Size>400	Average
Price in lively	4,72	4,65	4,48	4,61
Total variable costs	4,2	3,97	3,73	3,96
Margin on variable costs	**0,52**	**0,68**	**0,75**	0,65

Margin on variable costs throughout the multi-segments value chain

Knowing that the average sale price of rabbit meat is about 9- 9,5 Tunisian dinars, the margin on variable costs throughout the multi-segments value chain is about 4.48-4.53 Tunisian dinars/kg. The Margin on variable costs throughout the multi-segments value chain far exceed that generated in a two-segments value chain. The integration of secondary activities such as slaughtering, packaging and freezing adds value to the products. It is thus obvious that the secondary and tertiary sectors generate more added value than primary sector such as agriculture (Fig. 4).

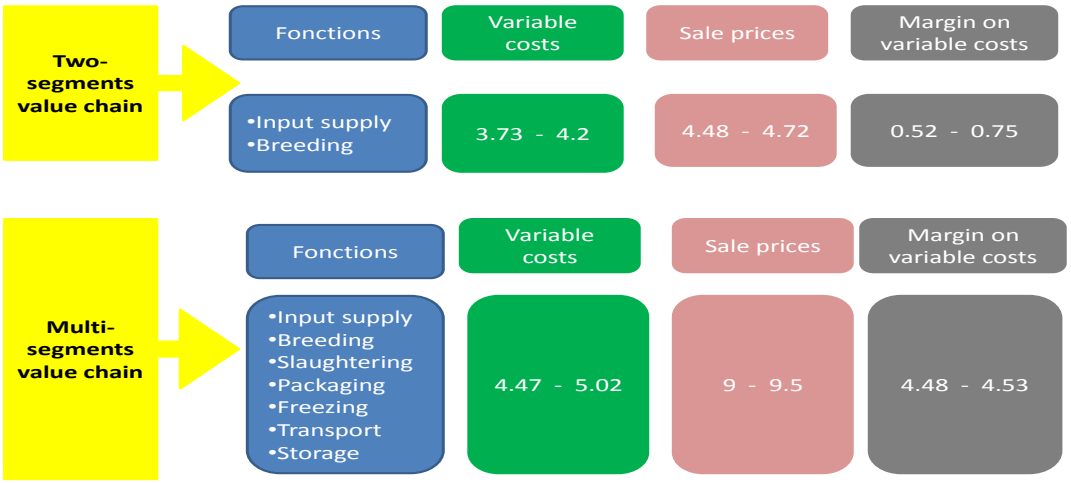

FIGURE 4. MARGIN ON VARIABLE COSTS THROUGHOUT THE MULTI-SEGMENTS VALUE CHAIN (author's calculation, 2015)

To be able to add value, breeders have to reach up to the final markets, to respect the standards and to satisfy the request of the final buyers and consumers. They have to offer an increasingly sophisticated product to attract the customers with a product easy and fast to use, innovative and diversified (cut, seasoned, packed rabbit meat).

In addition, supply chain management implies management of the interactions with the suppliers and with the customers and an optimal organization of the transport and the use of products. It can provide a value to the buyers and to the sellers by putting on sale the product at the right time and at the right place. In this case of rabbit value chain, functions of rabbits transport (to / from the slaughterhouse), slaughtering and packaging, freezing and also storage of the rabbits meat shall be ensured by breeders with vertical integration. These functions weigh on the structure of rabbits meat cost. So for the cost containment, a better management of the supply chain is required.

3.3 SWOT analysis

Based on the biography reading and the survey, a SWOT analysis is elaborated. The figure 5 summarizes the key results.

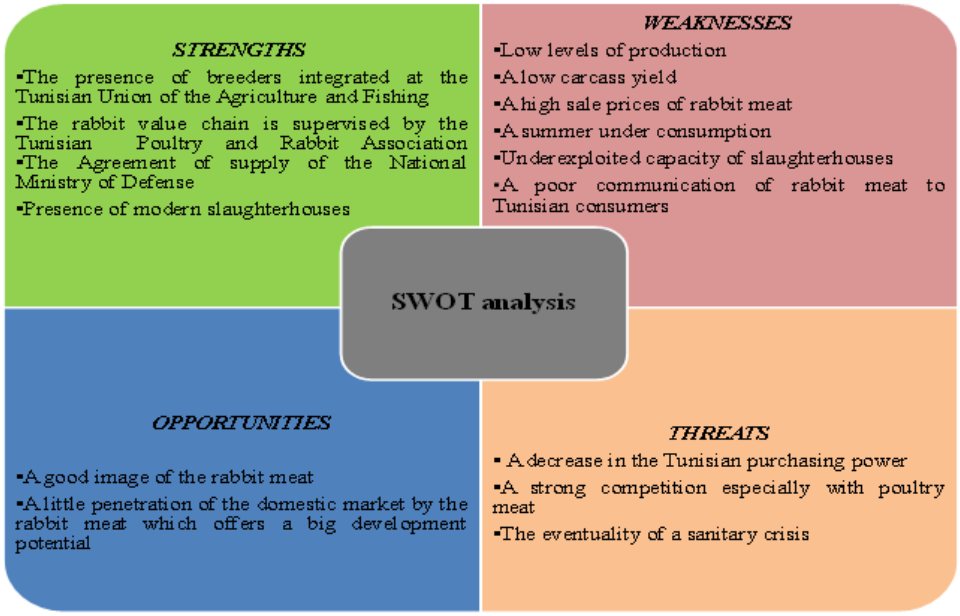

FIGURE 5. SWOT ANALYSIS (author's elaboration, 2015)

3.4 Development prospects for the Tunisian rabbit sector

From the above-described diagnosis of the Tunisian rabbit value chains, some approaches to the sector development are so presented:

- Promotion of the technical support of breeding,
- Promotion of the new techniques of breeding: multi-purpose park in "TP-TV" system, artificial insemination...,
- Regulation of the artificial insemination practices to improve the technical and economic management in order to compress the breeding costs,
- Elaboration of the technical guides (best practices of breeding),
- Support of the grouping of rabbit feed purchases to strengthen the negotiation power with the units of food of cattle,
- Creation of a mutual basic company of the agricultural services,
- Encouragement of the vertical integration throughout the value chain,
- Promotion of contracts elaboration between breeders and slaughterhouses,
- Encourage the controlled slaughter in certified slaughterhouse,
- Improvement of the rabbit meat presentation: packaging, cutting, advertisement,
- Valuation of the various rabbit by-products,
- Establishment of quality standards of rabbit meat.

IV. CONCLUSION

Tunisian rabbit sector presents a high potential of development. More productive and big rabbits farm are recommended. Specialized units, unique bands conducts will allow an optimization of places and working time, and in consequence allow economies of scale. In order to increase rabbit breeding productivity and to reduce its variable cost, agreements are required between breeders and manufacturers of rabbit feed to ensure the availability and the quality of this raw material and to control the continuous increase in its price. Supply contracts are also required between breeders, slaughterhouse and customers (Distributors, Tunisian Ministry of defense, etc.) through the Tunisian Poultry and Rabbit Association assistance to guarantee a rather remunerative price of rabbit's meat. Initiatives of organization of the breeders should be established via the promotion of the vertical and horizontal integration in the rabbit's value chain. A better valuation of the rabbit's meat is necessary among distributors and consumers via the product certifications, the cut encouragement, the packaging and the advertising of rabbit's meat.

REFERENCES

[1] Bergaoui R. 1992. L'élevage du lapin en Tunisie peut contribuer à résoudre le problème de déficit en viande du pays. Options Méditerranéennes - Série Séminaires - n° 17, 23-32

[2] BIT (Bureau international du Travail) .2012. Developing the Dairy Sector in North-Western and North Central Provinces: Value Chain Development for more Competitiveness and Decent Work www.entergrowth.com.

[3] FAO & Tunisian Poultry and Rabbit Association. 2011. Rapport de l'atelier national "L'élevage du lapin en Tunisie: un secteur prometteur pour l'emploi et la sécurité alimentaire" à Hôtel El Mechtel- Tunis, 10-11 octobre2011

[4] Kaplinsky R. 2004. Competitions policy and the global coffee and cocoa value chains. Paper prepared for United Nations Conference for Trade and Development (UNCTAD)

[5] Lebas &al.1997. THE RABBIT Husbandry, health and production. FAO Animal Production and Health Series, no. 21) ISSN 1010-9021

[6] Lebas. 2008. Impressions sur l'élevage du lapin en Tunisie, CUNICULTURE Magazine Volume 35 .pages 68- 76

[7] Miller C. and Da Silva C. 2007. Value chain financing in agriculture. Enterprise Development and Microfinance. 13 (2-3): pp. 95-108.

[8] Porter M. E. 1998. Avantage concurrentielle. Available from internet <URL : http: // www.books.google.com

[9] Porter M. E. 1985. The Competitive Advantage: Creating and Sustaining Superior Performance. NY: Free Press, 1985. (Republished with a new introduction, 1998.)

[10] Tunisian Poultry and Rabbit Association. 2012. Le secteur cunicole. Filière cunicole en Tunisie, édition 2012. Les volailles en Tunisie. Groupement Interprofessionnel des produits Avicoles et Cunicoles. Tunis, Tunisie

[11] Tunisian Poultry and Rabbit Association. 2015 . Statistics. Groupement Interprofessionnel des produits Avicoles et Cunicoles. Tunis, Tunisie

[12] Tunisian Office of Livestock and Pasture. 2014. L'organisation du secteur cunicole en Tunisie. Rapport annuel de l'activité cunicole en Tunisie