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**Conference Paper**

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**Provided in Cooperation with:**

The Research Institute for Agriculture Economy and Rural Development (ICEADR), Bucharest

*Suggested Citation:* Ion, Raluca Andreea (2016) : Models for short vegetables' chain, In: Agrarian Economy and Rural Development - Realities and Perspectives for Romania. 7th Edition of the International Symposium, November 2016, Bucharest, The Research Institute for Agricultural Economy and Rural Development (ICEADR), Bucharest, pp. 397-402

This Version is available at:

<https://hdl.handle.net/10419/163404>

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# MODELS FOR SHORT VEGETABLES' CHAIN

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## Abstract

*The paper presents models for short chains of vegetables, considering integration as the main mechanism of coordination agents' activities on the chain. Among other mechanisms, such as subsidies system, price, contracts, horizontal and vertical integration, the latter has been chosen because, as other research show, it provides the highest performance for operators of agro-food system. The research question is how efficient are activities of vegetables' chain in this particular form of integrated operations of collecting vegetables, store and process them into cans and sell them to the market in a single economic unit. The objective of the research is to assess business' efficiency. In achieving this purpose, economic data regarding investment, production, revenues and expenses have been analysed, for an associative form of processing and selling vegetables, which develops such a business. The results show that investment is feasible, because revenues are higher than expenses, the rate of return is 22.6 per cent, and the return of investment is ten years, less than the machineries' period of operation. The model can be implemented by farmers who want to apply for structural funds and to develop, as such, their business in the direction of integrating activities down-stream the chain.*

**Key words** *short chain, vegetables, efficiency, integration*

**JEL classification:** Q13

## INTRODUCTION

This article aims to identify models for short vegetables' chain within the wider concern for increasing performance. The need of this piece of research consists in offering solutions to farmers who face difficulties in selling their output to the market. As seen in previous research (Manole, 2006; Turek, 2008), farmers deliver small quantities of vegetables, difficult to be sold to hypermarkets and supermarkets who require large and homogenous batches of products. In addition, vegetables chain registers high level of losses, 37 per cent of total production (Istudor, 2007). These shortcomings can be overtaken by integrating post-harvest activities into one single economic unit, creating, as such, the short chain of vegetables.

Vegetables chain and market in Romania were studied in numerous papers (Istudor, 2000, Preda, 2001, Ion, 2005, Manole, 2005). This piece of research emphasis, particularly, the role of integration and it aims at designing a model for short chain in agriculture. The research question is whether short chain of vegetables is efficient or not, considering the short chain as a business where post harvest activities are integrated and performed in one single economic unit.

In order to answer this question, economic data regarding investment, production, revenues and expenses have been analysed and indicators of economic efficiency have been assessed. The research objective is to identify the feasibility of the business which integrates post harvest activities of collecting and processing vegetables and selling cans.

According to Manole (2006) "the highest performance is recorded if the chain is coordinated through the mechanism of integration, because efficiency, equity, economy of transaction costs and access to markets are high, just prices and income stability are average". In this paper, a model of a short chain is presented, in a form of a project that can be used as an example for farmers who want to set up a cooperative of processing vegetables and apply for structural funds in order to finance their

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investment. Thus, the present study is useful for farmers who plan to develop their businesses in the direction of integrating post harvest activities and increase, as such, profitability.

## MATERIAL AND METHODS

The short chain involves post harvest activities integration in one economic unit which collect and process vegetables and sell cans. The business is developed in a form of a cooperative set up as initiative of farmers who apply for structural funds in order to finance this project. It aims at establishment of new production or processing lines for broth and tomato juice and pickles, optimum use of labour resources in rural areas affected by unemployment, labour productivity growth by making post-harvest activities in semi-automated system, using machinery and equipment purchased by the project, obtaining products with higher added value, namely broth and tomato juice and pickles, compared to tomatoes and vegetables that have lower values. Specific project objectives are subscribed to measure 4.2. Support for investments in processing / marketing of agricultural products: DI 3A Improving the competitiveness of primary producers through better integration in the agrifood chain through quality schemes, adding value to agricultural products, promoting local markets, short circuits, producer groups and interbranch organizations and DI 6A Facilitating diversification, creation and development of small businesses and creating jobs (National Program for Rural Development, 2016).

The investment refers to purchase fixed assets: machinery and equipment for processing vegetables, land for the location of the plant and factory and warehouse construction. The latter will have spaces for processing vegetables, for its storage and end products, laboratory, office, boardroom for meetings of cooperative members. The products have been selected following a market study. Its results reveal the fact that, among vegetables cans, tomatoes juice and broth and pickles are the most demanded. The structure of production is presented in Table 1.

**Table 1 Production structure**

Product	Number of cans
Broth	20359
Tomatoes juice	37845
Pickled cucumbers	5920
Pickled cabbage	8120
Assorted pickles	3160
Seedlings	2500*

Source: authors' calculations, \*pieces

Production of broth is 12 kilograms per hour, meaning 20.6 jars of 580 ml, or 11,808 kilograms per year or 20,358 jars per year. Production of tomatoes juice is 38.46 liters per hour or 37,845 bottles of one liter per year. Production of pickles is 10 jars per man hour, or 2,400 jars per man month. Seedlings are obtained during early spring, to ensure continuity of activity in the plant.

The raw materials used in processing tomatoes into juice and pulp, obtaining pickles and seedlings are: tomatoes, cucumbers, cabbage, tomatoes, cauliflower, carrots, salt, sugar, water, jars, bottles, cartons, vegetable seeds, seedbeds, diesel, electricity and water. Projecting the assurance needs of these material resources is performed starting with production expressed in jars per hour and specific consumption of these resources. For projecting the fuel consumption, the movement of the means of transport to collect vegetables (9 shifts per month) is taken into account; the average interval between two successive supplies is 3.5 days.

Staffs are projected based on cooperative activities that take place, according to the schedule of activities in the field, especially to phased harvest of vegetables. Cooperative staff consists of permanent staff: manager, assistant manager and driver; and seasonal staff: 7 productive workers and auxiliaries.

**Market and marketing mix**

Product policy focuses on achieving three main products: tomato broth, tomato juice and pickles. The first two products have similar processing technologies, so they use the same equipment. Also, in order to obtain tomatoes juice and broth, the same raw materials, tomatoes, are used, which, after receiving and sorting, are selected to obtaining juice or broth, depending on the pulp consistency. Product policy emphasizes traditional recipe for obtaining tomatoes juice and paste without addition of chemicals. This message can be used in the communication policy and justifying the establishment of higher selling prices than those of competitors.

Promotion policy. The products are released under own brand name, which will be accompanied by specifying "cooperative". The main values communicated through the promotion policy are safety, freshness and quality, using vegetables collected from local growers, cooperative members, and natural ingredients without added chemicals.

Price policy. Product prices are slightly higher than those of the products perceived by consumers as similar. Therefore, in order to differentiate products from the competition, the denomination "cooperative" and quality of raw materials used shall be communicated to the target audience, mainly by brand and label information source. The extra price is justified because it is perceived by consumers as an emotional investment in the development of agricultural production and supporting the phenomenon of cooperation so necessary for Romanian agriculture.

Distribution policy. The distribution channel is short: manufacturer (cooperative) - retailer - consumer. The main customers are small grocery stores and large supermarket and hypermarket stores. Currently, Carrefour, Metro and Mega Image stores carry their own insurance programs with products from local producers. The cooperative will apply to these programs.

The sales program is presented in Table 2. Tomatoes juice has the highest weight in total sales, 60 per cent, followed by tomatoes broth with 27 per cent. Pickles are obtained to add value to vegetables and to ensure continuity of activities for farmers during late autumn and winter. It means that obtaining pickled vegetables is justified not only economically, but also socially. Almost the same reason drives the production of seedlings.

**Table 2 Sales program (lei)**

Product	I	II	III	IV	VIII	IX	X	XI	XII	Total
Broth	0	0	0	0	35918	35918	34759	35918	0	142513
Tomatoes juice	0	0	0	0	81074	81074	78458	81074	0	321679
Pickled cucumbers	0	0	0	0	12400	12400	4800	0	0	29600
Pickled cabbage	7440	7440	0	0	0	0	2160	3720	3600	24360
Assorted pickles	0	0	0	0	0	0	2880	4960	4800	12640
Seedlings	0	0	1250	1250	0	0	0	0	0	2500
Total	7440	7440	1250	1250	129392	129392	123058	125672	8400	533292

Source: authors' calculations, \*pieces

## RESULTS AND DISCUSSIONS

The production of vegetables cans implies investments in fixed assets: equipments, machineries, buildings. For financing the assets, the cooperative may apply for structural funds of the National Program for Rural Development. The latter provides 50 per cent of total eligible expenses (for associative forms). The rest of investment is financed 50 per cent through cooperative's members' own financial resources and 50 per cent through taking a loan. From total investment of 1,175,523 lei, the loan is 357,736, meaning 30.4 per cent. The same amount comes from the cooperatives' members' own contribution. The remaining amount of 460,051 lei comes from grant aid of European Fund for Agriculture and Rural Development, EFARD (39.4 per cent), as seen in Table 3.

**Table 3 Revenues from operational activity and investment (lei)**

No.	Specification	Year 1	Year 2	Year 3	Year 4	Year 5	Total years 1-5
I	Total revenues, of which:	1708814	533291	533291	533291	533291	3841978
1	Broth	142512	142512	142512	142512	142512	
2	Tomatoes juice	321679	321679	321679	321679	321679	
3	Pickled cucumbers	29600	29600	29600	29600	29600	
4	Pickled cabbage	24360	24360	24360	24360	24360	
5	Assorted pickles	12640	12640	12640	12640	12640	
6	Seedlings	2500	2500	2500	2500	2500	
7	Investment financing	1175523					
7.1.	Own contribution	357736					
7.2.	Loans	357736					
7.3.	Grant from (EFARD)	460051					

Source: authors' calculations

**Table 4 Expenditure from operational activity and assets' acquisition (lei)**

No.	Specification	Year 1	Year 2	Year 3	Year 4	Year 5	Total years 1-5
I	Total expenditure, of which:	1610311	434788	434788	434788	434788	3349463
1	Materials	200371	200371	200371	200371	200371	
2	Salaries	116820	116820	116820	116820	116820	
3	Amortization	71772	71772	71772	71772	71772	
4	Other expenditure	9600	9600	9600	9600	9600	
5	Loans and interest paid	36225	36225	36225	36225	36225	
6	Assets acquisition	1175523					
II	Available cash at the end of the year	98503	98503	98503	98503	98503	492515

Source: authors' calculations

In the first year of operation of the cooperative designed, total revenues are 1,708,814 lei and include operating revenues or production activities and financing of the investment from internal and external sources. As a result, income from financing cooperative activity is 60.8% of total revenues. Data in Table 3 show that income calculated for 2-5 years only refers to those obtained from production. At the product level, income is equal for all five years, because the quantities sold and prices of products remain, for comparison, the same.

In the situation of contracting a loan, total expenditure increases compared to the situation in which the economic unit uses only their own contribution and grants. In the first year of production, the growth is 36,225 lei, meaning about 2.3 per cent. By year, total expenditure is 434,788 lei and the total expenses for the first five years are 3,349,463 lei. Total expenses consist of materials, salaries, depreciation, and interests on credit and loan rate. The volume of material costs in the first year is 12.4 per cent (in total expenses including credit), and in the following years they are equal proportions of 46.0 per cent. Depreciation of machinery for which was made the investment was calculated in equal shares, which means that each year it is 71,772 lei or 4.4% in the first year and 16.5% in the following four years. In total, depreciation expense represents 10.2% of spending.

Available cash resulting from the difference between income and expenses is presented in Table 5.

**Table 5 Economical and financial results, lei**

No.	Specification	Year 1	Year 2	Year 3	Year 4	Year 5	Total years 1-5
I	Total revenues, of which:	533291	533291	533291	533291	533291	2666455
1	Broth	142512	142512	142512	142512	142512	
2	Tomatoes juice	321679	321679	321679	321679	321679	
3	Pickled cucumbers	29600	29600	29600	29600	29600	
4	Pickled cabbage	24360	24360	24360	24360	24360	
5	Assorted pickles	12640	12640	12640	12640	12640	
6	Seedlings	2500	2500	2500	2500	2500	
II	Total expenditure, of which:	434788	434788	434788	434788	434788	2173940
1	Materials	200371	200371	200371	200371	200371	
2	Salaries	116820	116820	116820	116820	116820	
3	Amortization	71772	71772	71772	71772	71772	
4	Other expenditure	9600	9600	9600	9600	9600	
5	Loans and interest paid	36225	36225	36225	36225	36225	
III	Results	98503	98503	98503	98503	98503	492515

Source: authors' calculations

Table 5 presents the economic results obtained in cooperative in the scenario of contracting a bank loan for financing part of investment. The total income is 2,666,455 lei; total expenses, including interest on the loan and credit, are 2,173,940 lei, which means a gross result of 492,515 lei and a profit rate of 22.6%. As a result, when the cooperative of processing and marketing of vegetables applies to credit, there is a rise in costs and a decrease in the rate of return.

The return of investment, calculated by dividing investment to yearly profit is ten years, less than the machineries' period of operation of twelve years.

## CONCLUSIONS

This piece of research aimed at answering the question how efficient is the short vegetables' chain, when activities of collecting vegetables, store and process them into cans and sell them to the market are developed in a single economic unit. The economic and financial results show that such a business is feasible, because revenues are higher than expenses, the rate of return is 22.6 per cent, and the return of investment is ten years, less than the machineries' period of operation. As regards the products, broth and tomatoes juice have the highest profitability, and pickles the lowest. In the same time, the social role of obtaining pickles is underlined.

The model of short chain can be implemented by farmers in their efforts of reduce losses, ensure income stability and developing, as such, their businesses. The European Fund for Agriculture and Rural Development offers opportunities for financing part of such businesses of farmers who want to integrate activities down-stream agriculture.

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