

PROCESS MODELLING IN DEMAND-DRIVEN SUPPLY CHAINS: A REFERENCE MODELL FOR THE VEGETABLES INDUSTRY

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—Abstract —

The lifestyles are getting change and it is effect the customer needs and demands. Many different consumer segments is identified in the market. If the supply chain want to be competitive they have to react with suitable product in a good quality and quantity in time in the target market, with appropriate cost and information supply. If the demand drives the the well organised vegetables Supply Chain it can reach economy advantageous.

The vegetables consumption is increasing steadily. The one of the reasons of the growing are healty lifestyles the fashionable diets. The vegetables reference model is necessary because the food supply is getting be the biggest problem in the world.

The goal of the reseach to make a reference modell which can give souldution the fresh vegetables supply which is based on the customer demands and which able to solve the current problems of the sharing of the tasks and trust. The results of the reference modell are based on primary and secondary research. The producers, wholesalers and retailers are asked by interview. The customer habits is measured by standard questionnaire and with secondary research.

Key Words: *supply chain management, demand-driven, vegetables industry,*

JEL Classification: D20

1. INTRODUCTION

The aim of the research to make a vegetable supply chain structure, which meets the customer needs based on the long-term economy sustainability, but first the problem of the Supply Chain is analysed.

It is an economic fundamental assumption that the quantity of resources is limited and that a company does not have all the resources to satisfy consumer needs. In order to create values, the company needs to establish business relations. (Dyer – Chu, 2003; Ford et al, 1986).

The success of the relationship between companies is determined by the product or service which is the object of the relationship, the standard of customer serving and the trust between the parties. If a mutual trust is established between the organisations, a higher level of relationship success can be achieved. According to Nagy (2012) the conformity / harmony between companies is determined mainly by the material and the information flow, which needs to be achieved within the company and beyond company boundaries as well (ERP). Enterprises operate in chains, recently in Supply Chains, where they act as buyers and distributors. The whole chain is successful if the aims, expectations and sustainability are achieved. (Mohr-Spekman 1994).

All the published definitions agree that the aim of the enterprises, who operate in one Supply Chain and who are dependent of each other, is to achieve consumer satisfaction. In conclusion, the supply chain is propelled by customer demand. In order for the companies to appear on the market with useful products or services, they need to be familiar with solvent consumer needs.

The Demand-driven supply chain is similar to the Supply Chain with pull strategy. The Point of Sale information leads the SC. One of the most important factors for this type of organisations is the communication system in the whole SC. The Demand-driven supply chain user as early alerted firms has to respond to changes in demand or supply quickly (Lee and Wang, 2000; Li et al., 2007;). If a conscious and structural data processing is established in the system, which provides useful information for the whole supply chain, the system will be more transparent, controllable, flexible and it will improve the effectiveness of the supply processes. (Nagy 2012).

At first we will analyse the problem of the total chain. Fristly the information flow is the problem which makes push strategy in the first part of the system, because the producer have not any information about the demand of the wholesaler or the retailer.

The producer can not make a demand forecast which is based on fresh information, production plan of the producers's are based on the last tendence. The producer and the wholesaler is not supplied with information and they can not organise the competitive product portfolio. It is means they need to use information system (EDI) which can provide information for the total chain. If the second part of the total chain change to pull system by the POS information, the stock in hand will degrease in the SC. (Szegedi 2012) If the information flow is continous the SC is getting change to flexible system. (Nagy 2012)

The demand information can help to decrease the total stock, but it is not available for the producers. The secret dates means the lack of trust. The missed information casue higher stock, less purchasing price, oversupply or defficit in the chain. The winner is the retailer in the chain, but the position of the other actors is unstable. (Rábade – Alfaro 2006)

The ecological factors of the vegetables Supply Chain is the productions time (which is independent from the producers) and the fluctuated output (sensionable production) regarding the field-grown vegetables (such as potato and carrot). One of the soulution is the storing, the other one is the processing and preserving. On the other hand, the farmer cannot influence the growth time of the plant, but they can production scheduldng in greenhouse and plastic tunnel, but it causes higher cost by 50 percent. (Agárdi-Szabó-Téglá 2012) It is a solution for perishable products for example tomato.

The next problem is the quality of the vegetables, because the consumers (wholesalers, retailers and the final consumers) always want the same product in a same quality at the same price from different producers, but it is not solved in the small organisations. The difference is made by the different technology, knowledge and production methods. Many of the producers have not applied a quality system yet.

After the ecological problems, we have to collect the logistic problems which arise from the three specific features of the vegetables, namely the sensitivity, vulnerability and perishability.

We have to analyse the balance of power in the supply chain. As in all the FMCG sector we need to recognise that the retailer is the supply chain leader. The retailer makes the rules for the total channel like payment deadline, quantity, quality, price, type of products, size, class etc. The retailer has the biggest part of the profit while the producer has problems with the liquidity, investments, refinancing and they have not

got any information about the demand or the activities of other competitors. (Szegegi 2012)

One of the most important tasks is to manage the lead time (from the producer to the end consumers), because it can effect the perishability and the freshness of the products. The freshness is influenced on the special packaging (which is also a safety factors), special (cold-) storing solutions and transportation.

2. MATERIAL AND METHODS

The present paper examines the problems of task sharing and the lack of trust of the demand-driven vegetables supply chain. The success of the research is basically affected by the correctly selected methods, therefore both primary and secondary forms of research are applied in our work.

2.1 PRIMARY RESEARCH

Out of the methods of quality research, individual deep interviews were carried out in the analyzing of the organisations. The individual interviews meant talks with selected people in private, about a given subject, according to a given train of thought, but actually in an informal way.

19 stakeholders was asked by individual interviews from segment of the international and Inland vegetables Supply Chain from Hungary furthermore 3 leaders from France, douch and Polland.

Standard interview were carried out to recognise the customer habits and groups. SPSS statistic program package was applaid for the analysis, because it is reliable and this program was developed expressly for the exploration of the social researches. Factor and cluster analysis were carried out.

2.2 SECONDARY RESEARCH

The secondary data were gather to help to recognise the best solution of the mentioned problems. The desk research is helps to identify, approach the problems and helps to find the answer of the questions of the riport. (Malhotra, 2009). The database of KSH was used for the secondary research.

3. VEGETABLES CONSUMPTION HABITS

The demand for vegetables is affected by the changing lifestyle, income, trends, weather and the import. (FAO/WHO, 2005) (KSH 2009) Nowadays the consumers are

shopping more and more in a chainstore, and it takes the purchasing power from the classical producer's market. (Papp 2012) The highest vegetables consumption of the household is in the second and third quarter. (KSH 2009)

The vegetables can be divided into two groups based on their demand - price flexibility. One of them is the flexible group, where demand is changing because of the income, these products are replaceable like tomato. The second group is the group of inflexible products. Here the demand does not change due to the income changes such as onion and rooted plants. The reasons of the inflexibility are usage, irreplaceability and storing. In the previous periods the researchers found out that the demand of the vegetables decreases, if the weather is not so good (KSH 2009).

4. ANALYSING OF CONSUMER BEHAVIOUR IN HUNGARY

We have analysed the customer behaviour about the vegetables purchasing, because we have to know their needs if we want to operate a flexible and competitive fresh vegetable supply chain. The results are not representative but guidance.

4.1 Material and methods

The base of the analysis was the details of a questionnaire primer research in Hungary. During the researching 379 consumers were asked about their vegetables buy and consumption customs. The questionnaires were reported in personal and electronic forms in March 2012. We used Likert scale, because it provides useful data to the factor analysis (Marahotra, 2008).

The gist and aim of the factor analysis is to reduce the factors and to summarise them. We can select the data and we are able to get results. The analysis results those factors which are effective for the decision of final customers. The factor analysis is a multivariate statistical method.

The goal of the questions is to get information about how the factors affect the purchasing decision of the Hungarian consumers in the region. (1 is meant that not important, 5 is meant most important). If somebody does not give an answer it is a missing data, it is not used in the research, so it does not distort the results. We analysed the following factors: quantity, class, freshness, taste, origin, packaging, vitamin content and the bio production.

4.2 The factor analysis

At first we calculated the KMO indicator, because it is the null process to make a factor analysis. If the KMO indicator is higher than 0,5, we can make a factor analysis. In the our modell the indicator is 0,71, so we can make a group from the factors. We used varimax rotation to select the sample. The output of the analysis is 2 groups. (1 st table)

Table 1: Rotated Component Matrix

		Component	
		1	2
1 st factor	Organic vegetables	0.794	-0.061
	Vitamin content	0,678	0.250
	Packaging	0,635	-0,200
	Origin	0,499	0,387
	Class	0,461	0.426
2 nd factor	Freshness	0.080	0,784
	Taste	0,019	0,757
	Quality	-0,010	0,570

Source: own calculation based on primer research

The name of the first group is the LOHAS and the second is the tradicionales. We can see the attribution of the factors. (1 st table) We gave a LOHAS name for the group, because it means Lifestyles Of Health and Sustainability. This factors shows that, not the classical attribution (like taste and quality) is the most important, but the responsibility for the health and the environment. If these group of factor is important for the customers, we have to pay more attention to the environmental aspects in the vegetables reference supply chain.

Some of the factors could be influenced by the logistics efficiency and sollutions. The factor which can influence by the logistic directly is the: packaging, origin, freshness and quality. So we have to pay more attention to these factors, because they are factors which is influenced direct by the methods and sollution of logistics. The second one, when the logistics effect on the quality and taste by the production timing, stock in hand, transportation indirectly.

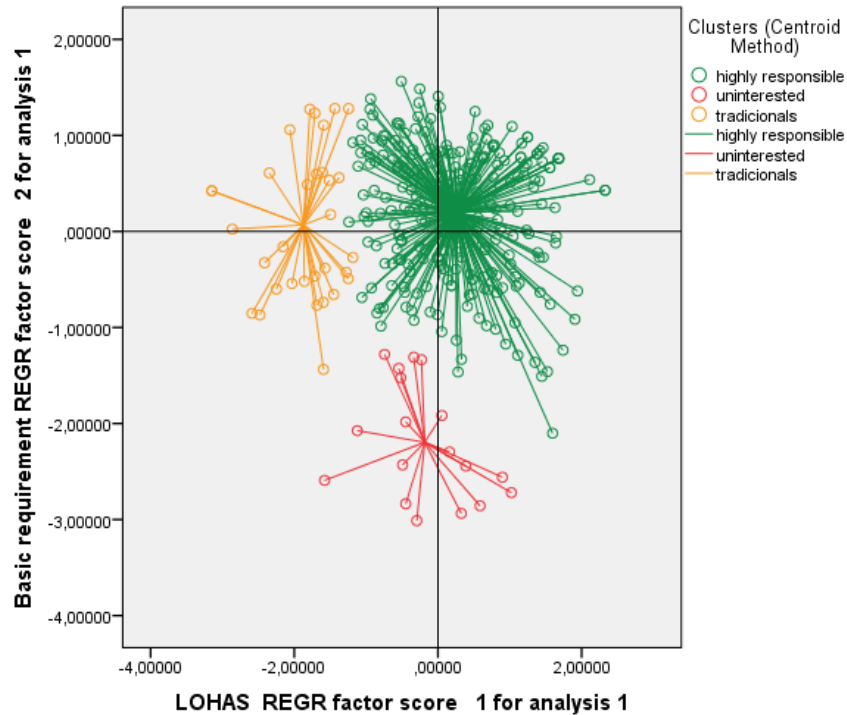
4.3 The cluster analysis

Consumer groups are made by the factors. The cluster analysis is one of the best statistic methods to make a customer teams (). We used the resoult of the factor analysis (LOHAS, tradicionales). In the first analysis the SPSS statistic program made a group, which is involved only 3 elements. After the peer review, we did not work with this group.

After the selection of datas we got 3 clusters from the database. The names of the gropus are: highly responsible, uninterested and the tradicionales. The groups and the position of the factor are showed by Scatterplot. (Figure 1)

The “highly responsible” consumers is 83 percent of the respondes, so at first we have to focus this group needs in the reference modell. The consumers are interested all of the indntified factors in the “highly highly responsible” groups. Them customer habits is changing like the global tendence in the responsibility of idea. The “unintrested” is 5.81 percent and the “tradicionalis” is 10.32 percent of the respondes

Figure-1: Factor store of the customers



Soruce: own work based on the primary research (2012)

The “highly responsible” consumers is 83 percent of the respondes, so at first we have We looked for the relation between the cluster and the gender by cross table analysis. We found a soft connection (0,042) between the 2 analised factors by Pearson’s chi-squared test. We resoult is acceptable if the significance is uner 5 percent in the social science. Based on the results from the sample we can accept that the modern vegetables consumption is important for the women.

We are interested in do the origin of the vegetables effect the decision of the purchasing? We got 0,002 significance level of Pearson's chi-squared test between the mentioned factors, so it is effect the choice as specially for the member of the "high responsible" group.

The database is not represantitive, but it is showed the tendence of the factors like how effect the factor the decision of the vegetables purchasing.

5. FINDINGS AND PROPOSITIONS

In the last chapters we analysed the problems, trends and oppourtunities of the Supply Chains and the behaviour of final costumers

The basic problem is the leader of the chain, so we define a new one, it is called pool, the place of the pool is in the place of wholesaler, but the wholesaler is deleted from the total process (chain). It is important, because the trust is able to increase in the chain by the new organization. The pool can be founded by the chamber of industry.

The basic task of the pool is to organise the vegetable market between the producers and the retailers, so the new organisation buys the products from the producers. The second task is to provide a predictable price for the producers. The support activites have 2 groups, the first group (is connected to the product) supports the pool with tasks like cleaning, processing, tracking, storing and final packaging the product. The second one provides services connected to system development like education, quality management, follow-up management and demand forecast. The annual demand forecast helps to manage the producing planning and it helps to solve oversupply and deficit of the vegetables. The support activities can solve uneconomic activities.

The producer sells the vegetables to the pool and the pool pays in a short time. The money flow is important, because it can solve the refinancing problems of the producers. If the producers have a good financial situation, they can improve and investigate new technologies, plants, soils etc. If modernization takes place, the producer is able to carry out value appreciation activity. The pools have to insure quality management and follow up process.

After purchasing from the producer the product owner is the pool. The pool applies the VMI (Vendor Managed Inventroy) process with the retailer. The retailer gives the POS (Point Of Sale) information for the pool, but it means that the retailer need not keep a stock. The advantage of the new system is the reduction in stock and fresh, good quality

vegetable and less rotten crops. Furthermore, the pool knows the dates about the sales and they can make a demand forecast for the producers for the next year.

In conclusion, the break-point of the pull és push strategy is at the representation. From the previous information we can see that, the break- point of the pull and push strategy is on the pool. The demand has to lead the providing, but the producers can not react to the demand changes. The reason of the inelasticity is ecological, because the forcing time is fixed. The retailer has only one task, to look after the vegetables in the shop like streaming, selecting and keeping the product in cool on the shelf. (4 th figure)

Nowadays the vegetables supply chain is a globalised, but in our opinion is that the supply chain has to be a local (regional) chain as special on those vegetables selles, when we can involve home made crops to the chain. The advantages of domestic vegetables are the effect in the customer satisfied (because of the consumer survey), environmental protection (negative externalials like a carbon emission and the biological diversification as a local plants protection), protection of the national market (actors of the chain).

6. CONCLUSIONS

The changing lifestyle and environments claim different sollution to statisfy the customer needs and it is also true in the vegetable supply chain. Our aim were recognise the current questions of the supply chain and to make a reference modell which can disomtinue the identified problems and customer needs. At first the –leader, finance as a profit, advantages- inequality, trust, sharing of the tasks, leader and inventroy problem is solved between the actors, with the delit of the wholesaler and with the new organisation entered to the SC. The basic task of the pool is manage the chain include the product, information and money flow. The brake point is specified in the push and pull strategy. The braking point is changed from the retailer to the pool. The changes is based on the ecological and economical factors. The task is shared between the actors of the chain, which aim is to eliminate the inefficiency use of the resoures. The new tasks system can help the acitvites of the producers, because they can specialise to the production process. The specialising can solve many financial an inefficiency problems. When the vegetables can produce by local operators at the regional level, the regional supply chain design is the goal. One of the reason of the local chain is the customer needs and the environmental protection. How do identify the envionmental protection in the reference vegetables supply chain? The biggest pollution of the

classical chain is a transportation and the stocking (through the stock level). If the reference model came true it means less vegetables in the total supply chain and it also means less carbon emission by stocking, damaged crops, transport distance. If regional supply chains are becoming more and more popular, the vegetables supply will react more flexible to the customer needs and it cause a sustainable SC in a long run.

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BIBLIOGRAPHY

1. Agárdi, É, Szabó, A. Téglá, Zs., (2012) A Dél-alföldi Régió zöldség-önellátásának logisztikai kérdései, Acta Carolus Robertus: Károly Róbert Főiskola Gazdaság- és Társadalomtudományi Kar tudományos közleményei, (2/1) 7-14
2. Dyer, J. H and Chu, W. (2003): The role of trustworthiness in reducing transaction costs and improving performance: empirical evidence from the United States, Japan, and Korea, Organization Science,
3. FAO/WHO, (2005) Fruit and Vegetables for Health: Report of a Joint FAO/WHO Work-shop 2004, World Health Organization and Food and Agriculture Organization of the United Nations, Kobe
4. KSH - Központi Statisztikai Hivatal (2009) Statisztikai tükör. III. (97)
5. Lee, H.L., Whang, S.J., (2000) Information sharing in a supply chain. Internal Journal of Technology Management 20 (3-4), 373-387
6. Li, G., Lin, Y., Wang, S., Yan, H., (2007) Enhancing agility by timely sharing of supply information. Supply Chain Management: An Internal Journal 12 (2), 139-149
7. MALHOTRA N. K. (2009): Marketing Research: An Applied Orientation pp. 202. 410
8. Mohr, J., Spekman, R., (1994) Characteristics of Partnership success: Partnership attributes, communication behavior, and Conflict Resolution techniques. Strategic Management Journal, 15. (2), 135-152
9. Nagy, J., (2012) Disztribúciós Incmenedzsment gyakorlat Magyarországon. Logisztikai Híradó XXII. Marc. 29-32
10. Papp, M. (2012) Helyi termékek. Kertészet és szőlészet. 61. (44)

11. Rábade, L.A., Alfaro, J.A, (2006) Buyer-supplier relationship's influence on traceability implementation in the vegetable industry. *Journal of Purchasing & Supply Management* (12) 39-50
12. Szegedi, Z., (2012) *Ellátási-lánc menedzsment*, Budapest, Kossuth Kiadó 258