

# Commodity chain and strengthening of the agro-food sector competitiveness

## *Komoditní vertikála a posilování konkurenceschopnosti agrárního sektoru*

I. BLAŽKOVÁ

*Mendel University of Agriculture and Forestry, Faculty of Business and Economics, Brno, Czech Republic*

**Abstract:** In the last decade, the character of agro-food chains functioning has changed significantly. Globalisation elements in the food processing and distribution are changing conditions in agro-food sector and influencing also agrarian markets. Due to higher food finalisation and market force of processing and distribution stages in the agribusiness commodity vertical, farm value share in the final food price has decreased. Increasing competition makes agribusiness firms look for possibilities to strengthen their competitiveness, which is increasingly determined by the ability to develop successful partnerships within commodity verticals, i.e. vertical integration, eventually co-ordination, enforces. In this study, potential benefits and risks of these forms of vertical interconnection are reviewed with respect on specific market and production characteristics of agro-food chains. The problem is presented on the example of the commodity chain of bakery and pasta production in the Czech Republic. At the end of the paper, main arguments for the interconnection of particular stages of this vertical are derived, especially between mills and bakeries.

**Key words:** competitiveness, agro-food chain, market force, vertical integration and co-ordination

**Abstrakt:** V posledním desetiletí dochází k významným změnám v charakteru fungování potravinových řetězců. Globalizační prvky v rámci zpracování potravin a v distribučních podnicích mění obraz zemědělsko-potravinářského sektoru a ovlivňují také zemědělské trhy. Vlivem vyšší finalizace potravin a růstu tržní síly článků zpracování a distribuce v komoditních vertikálách agrobiznesu klesá podíl zemědělských výrobců na konečné ceně potravin. Rostoucí konkurence nutí firmy v agrobiznesu hledat možnosti posílení konkurenceschopnosti. Ta je stále více determinována schopností vytvořit úspěšnou pozici v rámci komoditních vertikál, proto dochází k rozvoji různých forem propojení jako např. vertikální integraci, případně koordinaci. Práce podává přehled potenciálních přínosů a rizik těchto forem propojení s ohledem na specifické tržní a produkční charakteristiky potravinového řetězce. Problematika je prezentována na komoditní vertikále výroby pekárenských a těstářenských výrobků v České republice. V závěru příspěvku jsou odvozeny hlavní motivy propojování jednotlivých článků této vertikály, zejména první a druhé fáze zpracování zemědělské suroviny.

**Klíčová slova:** konkurenceschopnost, potravinový řetězec, tržní síla, vertikální integrace a koordinace

## INTRODUCTION

In the last decade, industrialisation and consolidation became characteristic features in the agricultural and food sector. Technological progress in production, development of information systems, new ways of trade and distribution systems have caused changes in the various stages of agro-food chains, from input supplies through agricultural products, their processing and distribution to retail outlets.

Farmers are more influenced by competition and expanding world food market. The farmers' position in agribusiness chain has worsened, and this is mainly caused by increasing market position of the subsequent stages

of the chain. Due to increasing competition in the saturated agro-food markets, there is a continuous increase and concentration in the manufacturing industry and retail trade sector. There are also other factors affecting particular stages of agro-food chains, e.g. liberalisation of trade, changing consumer demand and increasing interest in food quality, animal welfare and environmental issues. Agribusiness firms, in general, are confronted with rapidly changing markets and an almost world-wide competition. As a consequence, markets have become more dynamic and complex.

These developments accentuate the degree of interdependence among different levels of food production in the agro-food chain.

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## OBJECTIVES AND METHODOLOGY

The paper is based on the agricultural statistical reports of the Czech Statistical Office and research results published by the Ministry of Agriculture of the Czech Republic and the Ministry of Industry and Trade of the Czech Republic (Panorama of Food Industry 2000, 2001). Furthermore, analyses and market evaluations of the Economic Research Service of the United States Department of Agriculture (ERS USDA) were used. The common statistical methods, e.g. analysis, synthesis, comparison, were employed in the data processing.

The objective of the paper is to define changes in the agro-food chains as to the way they function in the agrarian markets and to find possibilities to make them more competitive as well as to gain competitive advantage. The problem is presented on the example of Czech milling and bakery industry, where the first stage of processing is represented by flour production in the mills and the second stage of processing is represented by bakery and paste production.

## RESULTS AND DISCUSSION

### The agro-food chain – the new approach

Following the traditional approach, the agro-food chain is represented by flow of basic agricultural commodity from the farm gate through processing to the final consumer. Nowadays, the position of farmers has become quite different. This is determined by the situation in the markets within the subsequent processing stages. Agricultural commodity market equilibrium and market decisions of farmers are derived from the supply and demand situation in the food market. Food demand should be transformed into agricultural commodity demand through market signals, so that food demand determines the amount and structure of farm production. On this principle, the research of demand orientated commodity verticals is based, as used in Bečvářová (2001).

Food demand has changed substantially from basic food with low value added to more value added food through processing. This is the consequence of changes in our modern society (higher women employment, lower number of children in families, changes in eating habits), and of new production technologies, processing and packing of fresh products. With increasing incomes, the pattern of consumer demand has changed drastically (higher income results in higher quality food demand)<sup>1</sup>.

### The development of the farm value share in the final food price

The result of this development is a decrease in the share of farm value in the final food price. The costs of

subsequent activities, such as processing and retail, have created the major part of food price in the last few years. Tracy (1993) indicates, that in general the farm value share of consumers' expenditures on food declines in favour of higher marketing and processing value share. Cramer and Jensen (1994) establish, that less than one quarter of the total consumer expenditures on food returns to farmers, whereas over three quarters of these expenditures go to marketing costs, it means such activities as storage, transport, processing and distribution of food to final consumers. In average, the farm value is about one fourth of the final product costs. It implies, that the key factor of competitiveness has become efficiency of the whole agribusiness with the assumption, that food is supplied in adequate volume, required structure and for reasonable prices.

The decrease in the farm value share has been approved by researches of ERS USDA, too. Its reports imply, that the farm value share in the USA was about 35% in the years 1965–1980, about 25% in 1990 and about 20% in 1999. This share differs for various products according to the complexity of processing the product and the proportion of basic farm commodity in the final value of the processed food. The development of this share for high processed bakery products is shown in Figure 1. The share decreased rapidly and farm value share of consumer price was only 6% in 1999.

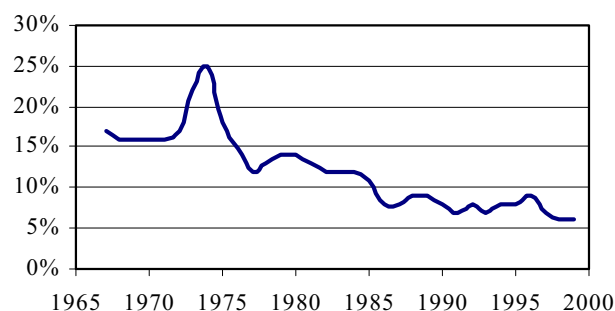


Figure 1. Farm value share in consumer price (bakery products)

Source: Data from ERS USDA.

The farm value share is computed as the farm-to-retail price spreads for individual food items. This farm-to-retail spread is the difference between the price consumers pay for a retail food product and the value of the farm ingredients used in that product. Price spreads measure the aggregate contributions of food manufacturing, wholesaling, and retailing firms that transform farm commodities into food products demanded by consumers. Therefore, price spread variations reflect the interaction of changes in the types of marketing and processing services provided by food industry firms resulting from changes in consumer preferences for retail food prod-

<sup>1</sup> Food quality differs by such attributes as comfort, safety, special production processes, environmental characteristics and animal welfare.

ucts. According to the ERS researches, the farm-to-retail spread increased by 42% in the years 1990–1999.

### Market force and the incidence of margin change in retail and farm price

Substantial decrease of farm value share on processing costs in favour of processing and wholesaling share was caused by technological, consumption and economic factors. Redistribution of value share between farmer, processor and retailer is influenced not only by technology or degree of product processing, but also by market forces asserted by distribution and processing stages, which do not favour farmers in the agro-food chains. In the view of this, food firms can influence their revenues through the use of high margins. The influence of a margin change on farm and retail prices can be illustrated with using a theoretical generalising, but it may be somewhat misleading when applied to a “real world” situation, because other factors are not constant.

Figure 2 shows the incidence of margin ( $M$ ) increase in retail price ( $RP$ ) change and farm price ( $FP$ ) change, using the partial equilibrium theory<sup>2</sup>. An increase in the margin means a decline in derived demand (downward shift) and derived supply (upward shift) with a consequent increase in retail price and decrease in farm price. The magnitude of the price changes at the retail and farm levels, with a given margin change, depends on the slopes of the demand and supply curves. For many agricultural products, the supply relation is thought to be more price inelastic than the demand relation. In these cases, to the extent the theory is appropriate, the incidence of a given margin change would be greater at the farm level than at the retail level (Tomek and Robinson 1990).

The final price, paid by consumers for food and agricultural products on various processing stages, is created by the situation on a particular market within the food chain. This influences the level and structure of prices at the particular manufacturing and distribution stages. If a commodity passes through the agro-food chain from farm to consumer, price changes at each stage should be passed on, if perfect competition is assumed. If there is a market force at one or more stages of this chain, then price is not fully transferred to the subsequent levels of the agro-food chain. The price transfer can be an indicator, whether the markets are competitive or not. If the price transfer between particular stages of agro-food chain is not perfect, consumers do not benefit from the decrease in farm prices. The development of prices in the food chain in the Czech Republic in 1991 can be used as an example – according to the Czech Statistical Office, the abolishing of negative food turnover tax and price liberalisation farm prices caused an increase in farm prices by only 3% (in animal production only by 1.5%), but food processors’ prices increased by 25% and consumers’ prices by 60%.

### The development of vertical integration and co-ordination as a consequence of the agro-food market changes

Food and agribusiness firms are confronted with great competition in agro-food markets. The trend will be towards greater interdependence, when the main aspect of competitiveness will not be the only ability to be responsive to changing customer needs and business environmental challenges, but also cost decreasing, product efficiency and delivery reliability. Thus, the costs of producing the diverse products demanded by consumers

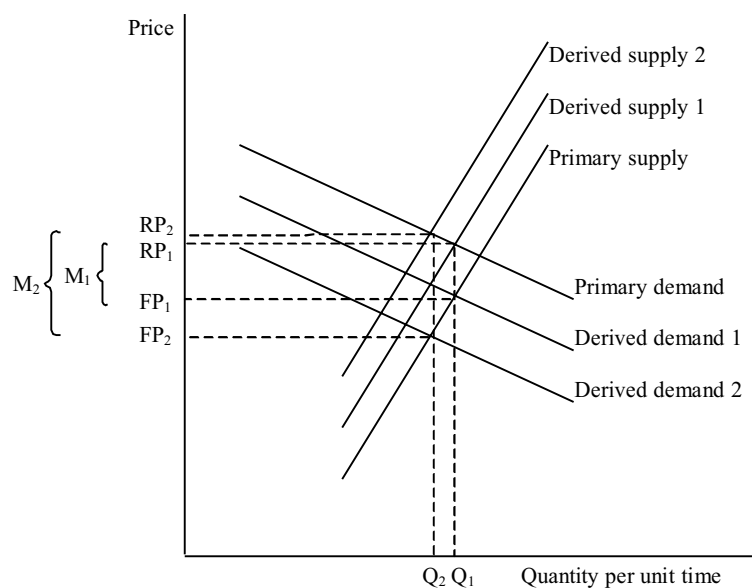


Figure 2. The incidence of margin increase on retail and farm price

<sup>2</sup> An equilibrium situation for single product is depicted; one variable – the marketing margin – is changed; other factors are assumed constant; and the new equilibrium position is observed.

will be likely lower in a more closely co-ordinated system. It implies that market position and financial performance will depend increasingly upon successful negotiation and linkages between suppliers and distributors and also upon the proper external partners. These developments will bring about the need for durable partnerships. Vertical integration (or co-ordination) could be one of the solutions.

Porter (1994) defines vertical integration as “the combination of technologically different production, distribution, sales, or other economic processes in the frame of one firm, when the firm decides to use preferably internal or administrative transactions instead of market transactions to achieve its economic goals”.

Before deciding about vertical integration, it is necessary to think about its important general contributions and costs, depending on a given sector. As motives in favour of vertical integration, there can be considered (Bečvářová 2001; Blažková 2002; Porter 1994; Ziggers and Trienekens 1999):

– *Reduction of transaction costs*

Transaction costs are the costs associated with the process of exchange itself. Thanks to vertical integration, a firm may potentially save part of sales costs, price negotiations, or marketing costs.

– *Enhanced ability to innovate and to differentiate*

Backward integration may allow a firm to obtain specialised inputs through which may improve or at least distinguish its final product. Forward integration gives a firm better or more timely access to market information allowing a more rapid or specified adjustment of product characteristics.

– *Reduction of risk*

Vertical integration can reduce supply or demand uncertainty and price fluctuation risks.

– *Improved market position*

Vertical integration creates entry barriers in case of significant economies of scale or requirements of capital. The more important net contributions of integration there are (e.g. high prices, low costs or risks), the greater pressure on other firms there is to integrate.

– *More efficient exchange of information and organisational structures*

Vertical integration may cause the firm to require less information and so it is reducing costs. Of course, the potential cost advantage must be balanced against the disadvantage of the possibility of missing advantageous external opportunities. An integrated firm can use the prediction of consumer demand for final product at all stages of its vertical chain. Besides, vertical integration facilitates the introduction of more efficient and specialised procedures and organisational structures to improve production.

Vertical integration may have several disadvantages, such as dulled incentives and reduced flexibility. The big scale of differences between the various stages in agro-food chains is also one of the arguments against vertical

integration. The potential costs and risks of vertical integration as compared to market exchange are (Bečvářová 2001; Blažková 2002; Porter 1994; Ziggers and Trienekens 1999):

– *Dissipation of resources*

Due to the dependence of all vertical chain performance on its each stage, the firm can be obliged to invest in marginal stages to keep operating of the whole subject. Either the firm must accept cost disadvantages due to inefficient operating scales or it has to sell/purchase outputs/inputs at the market. Moreover, the firm may foreclose itself from access to independent suppliers or buyers.

– *Reduced flexibility*

High investment may reduce flexibility. Changes in technology, product design and market developments may cause the production or technologies to become more costly, inferior in quality or inappropriate compared to those of independent suppliers or buyers. An integrated firm is then confronted with higher switching costs than in the case of contracting independent partners.

– *High demand for capital*

To make vertical integration profitable, high investments need to be offset by substantial cost savings or returns greater than or at least equal to the firm's opportunity cost of capital<sup>3</sup>.

– *Rigidity of organisational structures*

Managing various vertical stages may require distinctly different managerial approaches. However, vertically united firms operate together and that is why there is a tendency to think of them as similar from the management viewpoint. Moreover, tightly linked and assured linkages between the stages within an integrated firm may cause dulled incentives. In general, markets promote high-powered incentives and restrain bureaucratic distortions more effectively than compared to internal organisation.

With respect to the specific market and production characteristics of agro-food chains, additional motives for vertical integration on the agro-food markets may be deduced. They include:

- perishability of production,
- variability of quality and quantity of supplies of farm-based inputs due to biological variation, seasonality, random factors connected with weather, diseases or other biological hazards,
- differences in lead time between successive stages,
- availability of capital,
- increased consumer attention concerning both product and method of production.

### **Vertical interconnections in the cereal commodity chain in the Czech Republic**

To analyse the situation on agro-food markets, one of the most important chains in the Czech agribusiness was

<sup>3</sup> Vertical integration consumes capital that has the value of opportunity costs inside the firm, whereas in transactions with an independent subject the external capital is used.

used – *milling and bakery production chain in the Czech Republic*. Milling industry is the first processing stage of the cereal vertical. Taking into consideration that the total cereal production in the Czech Republic is about 7 million tons, millers process about 22 percent of the total production, which amounts to about 1.5 million tons (from the above figure, wheat is about 1.2–1.3 million tons). This means, cereal processing forms an important part of the whole food usage of cereal production in the Czech Republic. Cereal supplies into mills are provided mainly by purchasing organisations and partly direct by individual large farmers. About 65 percent of the volume of flour produced is processed in bakeries and patisseries, about 8 percent in pasta production and about 16 percent is sold in wholesale or retail outlets in packets of 1 kg. The remaining volume of flour is used for export. (Panorama potravinářského průmyslu 2000, 2001; Situační a výhledová zpráva OBILOVINY 2000, 2001).

Due to the actual excessive milling capacity (about 500 thousand tons per year) and slow decrease in flour consumption per capita (in 1993–1999 flour consumption decreased annually by about 0.1 percent), leading producers in the milling industry have become giant mills with explicit and direct linkages to commodity suppliers as well as mutual connection to the successive processing stages. Due to the above mentioned reason, the consequence of low flour price is eliminated by taking advantage of this lower price to minimise the costs of further processing in the given firm. A relatively low flour price becomes a comparative advantage, because financial capital should be redistributed within the firm and business may be financed partly from the means gained through commodity processing in the successive and final stages.

On the other hand, firms in the second processing stage, e.g. bakeries, have to gain direct contacts to such suppliers, who will guarantee commodity deliveries in the required quality, quantity and at the right time to be able to satisfy wholesale requests as regards the standard quality of food supply and constant delivery.

Vertical integration exists also between the mills and the cereal purchasing organisations. Horizontal integration also appears, which generates production concentration.

## CONCLUSIONS

On the basis of the analysis, main arguments for vertical integration in the cereal commodity chain (between mills and bakeries) in the Czech Republic can be derived.

(a) A commodity vertical is increasingly influenced by external factors – extensive and fast expansion of retailing channels and foreign retail chains that look for suppliers which are able to provide their shops with products of required structure, volume and quality and which operate in the whole republic.

(b) As consequence of increased competition each stage has to seek possibilities of minimising costs in order to be competitive.

(c) Vertical integration enables increase in labour productivity through specialisation, concentration and investment in modern technologies.

(d) The competitiveness of producers requires flour quality assurance and stability, which will ensure better quality by product processing.

Theoretical issues discussed at the beginning of the paper have confirmed the practical example of the specific agro-food chain – the cereal commodity vertical in the Czech Republic. These developments have been enforced by the situation in the agro-food markets and so vertical integration or co-ordination is believed to become a necessity to maintain on the market as well as to be competitive.

There is no doubt that the agro-food chains are developing to more interdependence between particular stages and this development will continue and be necessary in the future with respect of entry in the EU markets.

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### Contact address:

Ing. Ivana Blažková, Mendelova zemědělská a lesnická universita v Brně, PEF, Ústav podnikové ekonomiky, Zemědělská 1, 613 00 Brno, Česká republika, tel.: +420 5 453 2017, e-mail: [blazkova@mendelu.cz](mailto:blazkova@mendelu.cz)