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Use of rapeseed cake for improving competitiveness in swine production

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SUMMARY

The piggery branch is still keeping its leading role in meat production/consumption worldwide – having about 40 percent share of it. The European Union has enrolled pork into the category called ”light market regulation product paths” hence the development of production/consumption is exposed mainly to the extremities of the markets. Feeding costs of pigfattening are fluctuating depending dominantly on fodder prices. Feedstuffs do have about 50–60 percent share of the ”total” as concerning the cost structure of slaughter hog production. Fodder and feeder pig, these two main production factors amount to 90 percent of the total cost. Regarding changes of slaugther pig procurement prices the lack of market rules causes peculiar situation and tendencies very often, notably the development of fodder prices in opposite direction. Hog raising/fattening farms in Hungary and in each member state of the European Union 27 are under the stress of the market to minimize the production costs further and further more, because of being able to survive. Nowadays, an emerging new industrial sector – the biofuel-producing – provides opportunities to utilizable by-products of this branch as feedstuffs, in a much higher volume. In the case of reasonable use, these novel feedstuffs could be one of the most effective means to increase competitiveness of animal husbandry, as well as of pig farming. Through applying feedstuffs – the so called ”traditionals” and the novel ones reasonably together – costs of pig fattening could in merit be reduced. Since soya (beside feeder pig) has got deerminant role in development of the fattening cost (especially if its price is too high, as usual), replacement of this component for example with rapeseed cake could be a cost effective tool for improving profitability of pig farming. As the result of work, there was a model elaborated and presented in this paper. Through applying this model (based on fix parameters, as well), the extention of cost reduction – according to the rate of substitution – can be calculated. Considering the present conditions, it is possible to reach cost saving up to 1000 HUF per pig, in fattening.

Keywords: pig-farming, utilization of novel forage, cost reducing.

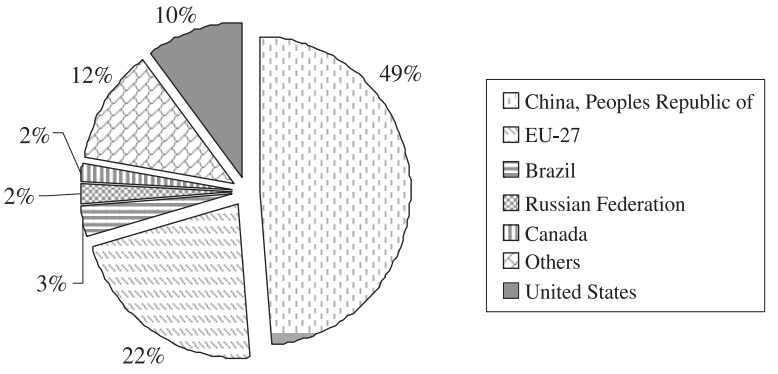
Introduction

The importance of keeping the quality of animal nutrition at a high level is undoubted. There are other determinant factors, such as: application of new and modern production technologies, breeding animals of high genetic value, and sustenance of adequate animal health conditions, that are influencing the economic efficiency also basically. Anyway, being the most important factor of the economy (because of having the biggest share within the total costs) animal nutrition is the crucial point of increasing efficiency, thus it has got a primer determinant function. The reduction of nutriton/forage-costs must be reached parallel to keeping up the productivity (the expected daily weight gain, etc.) and the end-product quality. In recent times, the significance of use of by-products as forage has increased. The main reason of this is the rise of forage-prices, as mentioned before. Beside the by-products of the alcohol and beer industry, – that were used during the past decades and are nowdays, too, – the application of vegetable-oil industry by-products has been extended. The use of novel by-products, the ones for example obtained during the production of organic fuel (rapeseed cake, glycerin) are the potential alternatives for increasing profitability through reducing forage costs. According to *Babinszky* (2002) Hungary's yearly 650–700 thousand tons. The European Union puts also a special emphasis on bio fuels, consequently stimulates the production of by-products, as well. Directive 2003/30/EC of the European Parliament and of the Council obligates the European Union member states to achieve the 5.75 percent share of organic fuel products in consumption – concerning the total continental transport – by 2010. Based on the 2007 March decision of the European Council, by the year of 2020 the prescribed market share of organic fuel must be (at least) 10 percent. According to mumbers released by the European Biodiesel Board (EBB) in July 2007, the European Union (EU) increased biodiesel production from 3.2 million metric tonnes in 2005, to nearly 4.9 million tons in 2006 (*Neményi et al*. 2008). Due to the measures mentioned before, increased interest surrounds the production and usage possibilities of rape. In the case of increasing organic fuel production, changes in crop structure are inevitable, as well as the decreasing grain feed supply with further rise in prices is also projected.

Overview of literature

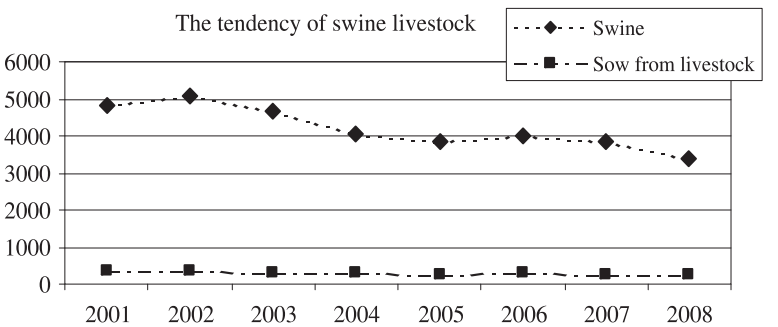
Concerning world's pork production/consumption China has got – of course – the leading role, followed by the European Union 27, the United States of America, Brazil and Canada, as *Figure 1.* is showing the data. These countries produce the determinant part of the (slightly more than 100 million tons per year) total world production. The leading export countries are the United States of America, the European Union 27 and Canada, providing together approximately 80 percent of the total export. Among the importers Japan, Mexico, China and the United States of America fill should be mentioned. As for the total world consumption of pork, China has got a nearly 50% market share, somewhat more than 20% the European Union (27), and nearly 10% the United States of America.

Figure 1. Distribution of total pork production of the world
Source: United States Department of Agriculture (2009)



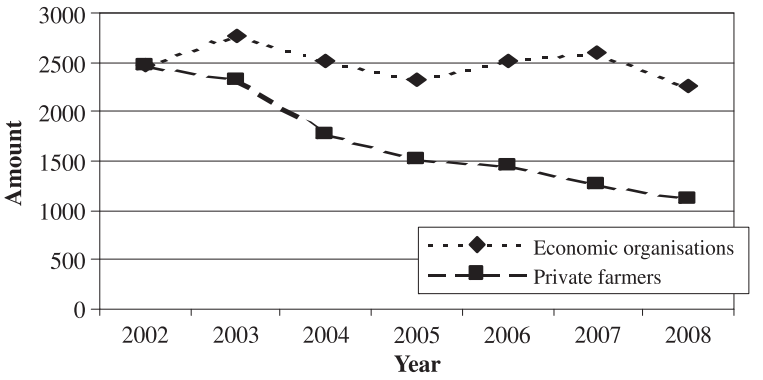
The different branches of animal farming (as well as the pig sector in particular) have undergone extraordinary changes during the last two decades in Hungary. Beside the well known factors (Hungary has got the excellent endowments for grain production not to mention the traditions) – transform of agriculture within permanently changing conditions as well as the openings to study means and methods of others – all these motivate carrying out economic investigations regularly (*Márkus* and *Tell* 2007). While in 2002 nearly 5 million pigs were kept in Hungary, in 2008 this number was not quite 3.4 million, which means that the local stock fell back with more than 30 percent. Decline sped up after Hungary joined the European Union, then – between 2005 and 2007 – it was stagnating, while in 2009 the size of the livestock is about 3.2 million *(Figure 2.).*

Figure 2. The changes of pig livestock in Hungary
Source: Hungarian Central Statistical Agency (2009), Wekerle (2009)



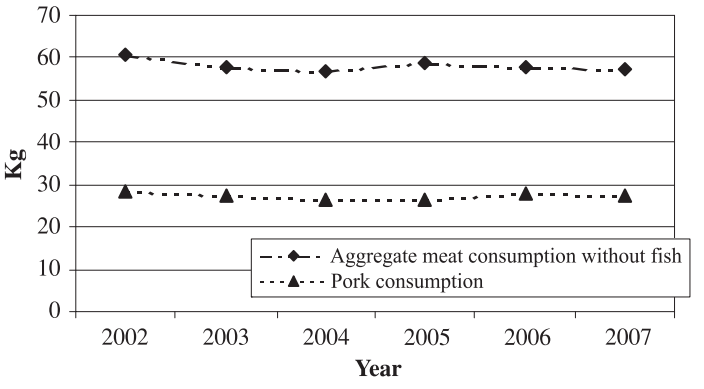
As it was already mentioned before, during the recent years significant decreases of livestock were observable – concerning private farms in particular, whereas there was a more even but nevertheless decreasing tendency at companies, co-operatives and other partnerships, as well. *Figure 3.* shows the structural changes in the pig sector between 2002–2008.

Figure 3. Changes of pig livestock within economic framework in Hungary
Source: Wekerle (2009)



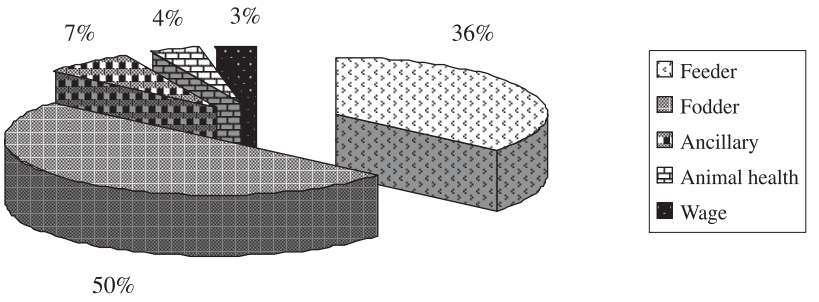
According to *Figure 3.*, the conclusion can be drawn unambiguously. ”Small-scale producers” could not meet the requirements of the existing competition conditions, the emerging challenges and many of them gave up pig farming, even though the share of this sector used to be decisive in the domestic production of pork. Pork has a significant role in food consumption, both in the domestic one and in the European Union countries, as well. According to the data of the Hungarian Central Statistical Agency (*HCSA* 2009) the pork consumption was 27.6 kg per capita in Hungary while in the European Union approximately 42 kg. As it can be seen – *in Figure 4.* – the local population covers nearly half of its meat consumption with pork.

Figure 4. The meat consumption in Hungary
Source: Hungarian Central Statistical Agency – STADAT (2009)



The cost structure demostrated in *Figure 5.* was drafted according to the data basis of the *Hungarian Central Statistical Agency* (2009) as well as of the *Research Institute of Agricultural Economics* (2009). As the model shows, fodder and feeder pig, these two factors amount to 90 percent of the total cost.

Figure 5. Cost structure of fattening
Source: Own research based on Hungarian Central Statistical Agency (2009) and Research Institute of Agricultural Economics (2009) data



The structural transformation and changes of livestock unambiguously reflect the lack of success of the national pig sector, during the past two decades. The pig-stock of nearly 10 million that Hungary had in the mid 80'-s has been reduced to a fraction up to these days. Competition is keen more and more, therefore continuous innovation is necessary. Regarding animal nutrition, one of the innovative opportunities is the use of new by-products, such as rapeseed cake. A widely known method of extracting oil from rape is "pressing", in which case the by product after the pressing process (cold or warm pressed rape pressment) has about 8 to 12 percent raw fat content providing as feedstuff significant energy source. The other comprehensively known method is extrahation which makes (according to some opinions) the extraction of the basic ingredient of organic fuel more economical. During the production of fuel (estherization) another by product – the "glycerine" is also obtained. The involvement of this glycerine into the feeding system as well as its utilization for energetic purposes (heating) are also actual subjects of research activities. Several factors influence the optimal ratio of rapeseed cake in the mixture (feed ration), primarily the species, the age group as well as the kind of use. It is necessary to highlight that rapeseed cake can be used in the feeding system of both the monogastrics as well as the ruminants. *Weiss* and *Schöne* (2006) recommend to include it at the rate of 7 to 10% of the total ration dry matter for fattening pigs, while in the case of breeding sows at a level of about 5 to 10%. The manner of how to use it will be primarily determined by the development of market prices, in the future. Nevertheless we can not forget that Hungary imports about 700 to 800 thousand tons of coarse soya bean meal, per year. The current market prices of rapeseed cake – according to *UFOP-Marktinformation* (2009) – fluctuate between 187 to 190 euro/ton, while that of soya is 440 to 445 euro/ton.

Materials and methods

Based on the *Hungarian Central Statistical Agency* (2009) data available, the slaughter hog, the piglet and fodder (maize, wheat, barley, soybean) prices were analysed by the Statistical

Package for the Social Sciences 17.0 (for Windows, SPSS INC., Chicago, United States of America) program. Data were disposable from January 2001 till July 2009, broken down into monthly figures, so the number of items in sampling exceeded up to 100. According to the domestic and foreign scientific literature, fodder can often reach 60 to 70% of the total slaughter pig production-cost. In the analysis, relations of price developments of the different fodder components as well as of slaughter hog were examined substantially. Beside using descriptive statistics, the Pearson correlation as a statistical method was also involved into the analysis according to *Sajtos* and *Mitev* (2007, Equation 1).

$$r = \frac{\sum_{i=1}^{N}(x_i - \overline{x})(y_i - \overline{y})}{\sqrt{\sum_{i=1}^{N}(x_i - \overline{x})^2 \cdot \sum_{i=1}^{N}(y_i - \overline{y})^2}} \qquad (1)$$

Through using the average procurement prices of July 2009 (based on the data of the Hungarian Central Statistical Agency as well as of the feeding companies concerned) – shows price-changes of the feedstuff, according to the different (increasing) rate of rape-seed cake in it. Data were analyzed by the "Winfeed 2.8 program" (UK Ltd., Cambridge, United Kingdom) through linear optimization. In the modell used components were maize, wheat, barley, soya-meal, rape-seed cake and premix distributed by the Feeding Industrial Company of Tendre Ltd. The final fattening pig nutrient deamand was determined according to the *Hungarian Feed Kodex* (2004) considering the conditions of small scale farming, as well. The digestible energy was in all cases: 13.4 MJ/kg.

Evaluation of results

In *Table 1.* there are, some descriptive statistics of the examined variables (number of items, minimum and maximum values, mean, standard deviation) are shown. The data base of the examined variables drawn into the analysis extends from January 2001 until July 2009.

Table 1. Extreme values of prices of the variables (HUF/kg)

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Slaugther pig	103	198.9	367.0	283.0	37.4
Wheat	103	19.5	64.6	31.4	11.3
Barley	103	19.1	59.4	29.9	9.0
Maize	103	16.4	53.7	28.8	9.5
Soybean	101	48.9	131.2	68.1	14.6
Feeder pig	103	192.1	557.6	374.8	80.6

Source: Own research based on HCSA data (2009)

Concerning soyabean, the number of items are 101 while the number of other variables are 103.

Regarding *Table 2.* relations between the slaughter pig on the one hand-, and soyabean, feeder pig (piglet for fattening) as well as wheat, barely, maize prices on the other were statistically analysed. An average positive relationship can be traced between the prices of soyabean and feeder pig (next to $P < 0.01$ significance level), while in the cases of wheat, barely, maize there were no significant correlations (next to $P < 0.01$). After representing the data in matrix scatter dot, linear relation is supposed between the prices of slaughter pig (procurement) and of the two other variables (soyabean-, feeder pig). It is necessary to carry out further analysis to explore casual connections of the results.

Table 2. Correlation examination among slaugther pig prices and the other variables

Variables		Slaughter pig	Wheat	Barley	Maize	Soybean	Feeder
Slaughter pig	Pearson correlation	1	–0.99	–0.51	–0.42	0.388**	0.543**
	Sig. (2-tailed)		0.32	0.61	0.67	0.00	0.00
	N		103	103	103	101	103

Source: Own research based on HCSA data (2009)

** Correlation is significant at the 0.01 level (2-tailed)

According to the results represented by *Table 3.* in the case of 12.5 percent rapeseed cake content (hence more than the two thirds of soya meal replaced by rape-seed cake) – the fodder/mixture price per kilogram is 4.5 HUF lower, that means about 11 percent cheaper. Even if we do limit the rapeseed cake content only at 10 percent – as determined by *Weiss* and *Schöne* (2006) – the fodder/mixture price can be reduced by 3.7 HUF. Calculating – for example – for a pig fattening farm with 1000 stocking capacity (supposed the farrowing interval of 2.5 and the feed conversion ratio of 2.8 kg/kg) 2.6 million HUF (about 10 thousand EUR) can be saved – but only if the output and its quality are of the same.

Table 3. Price of different fodder varieties according to the substitutional rate

Mixed fodder variaties	Price (Ft/kg)	Rapseed cake content in fodder (%)	Soya meal content in fodder(%)	Substitution rate (%)	Change in price (%)
1	42.60	0.0	11.20	0.00	0.0
2	41.90	2.5	10.10	9.90	–1.7
3	40.30	5.0	7.67	31.50	–5.4
4	39.60	7.5	6.30	43.80	–7.0
5	38.90	10.0	4.90	56.25	–8.7
6	38.19	12.5	3.54	68.40	–10.4

Source: Own research (2009)

The next table *(Table 4.)* shows the result of SWOT analysis in the case of feeding rapeseed cake in pig farming.

Table 4. SWOT analysis of rapseed cake utilization as feedstuff

Strengths	**Weaknesses**
Relatively high fat-, energy- and protein content	Used in higher quantities cause decline in feeding/feedstuff quality of the granulate
Significant methionine and cistine content	Lower protein content in comparsion to the coarse soya bean meal
Specific market price lower than that of soya	Use of high ratio endangers key performance indicators of production
	Amino acid content – less favourable in comparison with soya bean meal
Opportunities	**Dangers**
Improving domestic protein management	Questionable/uncertain development and future of organic diesel production (competitiveness of this sector)
New techniques available for producing cheaper feed-mixtures	Increasing demand from heat power plants for rapeseed cake (production of organic gas)
Lower rapeseed cake prices through increasing volume	Yield fluctuations – inadequate capacity utilization of processing plants producing fuel of organic origin
More effective transport possibilities – improving cost – efficiency	Long term storage can cause serious damages of feeding value

Source: Own research (2008)

Conclusions

Regarding the previous economic tendencies influencing Hungary's piggery branch unfavourably, not to mention the instable situation at present, there is no expectation of an increase of the livestock. Feeding and feeder pig are the most important cost-factors in fattening because of amounting together to almost 90 percent of the total production costs. Beside the changing market prices of feeder pigs, that of soya is also basically determinat, influencing the development of the feeding cost as well as the profitability of fattening substantially. Hence, replacement of soya through applying substitute materials that are much cheaper such as the rapeseed cake and others could be a possible way of the profitability improvement. According to the model calculations, reduction of feeding costs proved to be – in cases of the appropriate substitutional rates – really possible. Considerable cost savings are feasable if the measurable technical (efficiency) indicators of fattening (such as the feed intake and conversation, etc.) as well as the quality of the end product remain constant. There is no doubt, that the extend of the use of rapeseed cake as fodder will be primarily depending on the development of the market prices of both soya and this substituting by-product. Local production, through the decreasing transport costs, could also improve the economic-efficiency, rentability of using protein feeds. Regarding their

amino acid content, the quantity of the essential amino acids is less in the rapeseed cake than it is in the soya, thus – without completition through additional amino acids (L-lysine HCL) – this may result into deterioration of the above mentioned technical indicators. According to the results of the SWOT analysis that can be found in this paper, the heat power plants appear as competitors of animal nutrition. That means that rapeseed cake is not only suitable for feeding purpose, but through the incineration of it, this by-product is also an excellent raw material for producing heat energy. Concerning the production volume and supply of rapeseed cake, it is necessary to mention the fluctuation of the winter rape crop (caused by the changing weather conditions) and – as a consequence of it – the inadequate operation of the organic fuel factories. There are some other aspects necessary to take into consideration such as the relatively short possible time of storage due to the high fat- and polyunsaturated fatty acid (PUFA) content. (According to the foreign literature for instance *Hickling* (2007) is the average "storage time" of rapeseed cake approximately 3 months.) As a consequence of all these, farm-tests (feeding experiments) are needed to establish the real effect-mechanism of using rapeseed cake as a feedstuff component for pigs. Furthermore, among the opportunities regarding the feeding use of by-products of organic ethanol production, for example the Dry Drilled Grain Solubles should be mentioned which is to some (or perhaps to much more) extent a potential competitor not only for the soya but for the rape based by-products, as well.

A repcepogácsa alkalmazása a takarmányozási hatékonyság javítására a vágósertés-termelésben

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Összefoglalás

A sertéságazat meghatározó szerepét őrzi világviszonylatban, mi sem bizonyítja jobban, mint, hogy a világ összes hústermelésének és fogyasztásnak – közel 40 százalékát – jelentős részét lefedi. Az Európai Unió a könnyű piaci szabályozású termékpályák közé sorolta a sertéshúst, így többnyire a piacra bízva a termelés–fogyasztás alakulását. A sertéshízlalás költségszerkezetén belül a takarmányozás költségei – az aktuális piaci takarmányáraktól függően – 50–60 százalék között ingadoznak az összes költségen belül, így a hízóalapanyag és takarmányköltségek együttesen megközelítik az összes költség 90 százalékát. A sertésfelvásárlási árak tekintetében – a piaci szabályozás hiányában – gyakran a takarmányárakkal ellentétes irányú változások tapasztalhatóak. A gazdaságoknak mind hazánkban, mind az Európai Unió többi tagállamában a költségek további minimalizálására

kell törekedniük fennmaradásuk és versenyképességük érdekében. Az új, kialakulóban lévő iparág – a bioüzemanyag előállítás – várhatóan növelni fogja a takarmányozásban felhasználható melléktermékek körét, melyek ésszerű alkalmazása az állattenyésztés és ezen belül a sertéstartás versenyképességének növelésében is fontos szerepet tölthet be. Az úgynevezett „hagyományos" és „újszerű" takarmányok együttes hatékony használatával a sertéságazat takarmányozási költségei érdemben csökkenthetőek. Elmondható a munka eredményeként, hogy a szója és a malac felvásárlási árának szerepe kimagasló a sertéshízlalás összes költségei között. A repcepogácsában rejlő lehetőségek egy modell segítségével – amelyben egyes paraméterek rögzítve voltak – lettek szemléltetve, amely alapján elmondható, hogy a szakirodalom által megengedett helyettesítési szint mellett 1000 forintot is elérheti a megtakarítás sertésenként.
Kulcsszavak: sertéstartás, újszerű takarmányok alkalmazása, költségcsökkentés.

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