



Correlation between prices of grain legumes and prices of feed, fertilisers and meat.



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Introduction

The undervaluation of domestic-grown legumes in official price reporting is an obstacle to market development in Germany (KEZEYA SEPNGANG et al. 2018) and possibly in Europe. Asymmetric market information between actors and uncertain price expectations are major hindrances (JOUAN et al. 2019). Farm internal use can be an alternative for external marketing but cannot be de-coupled from general market developments due to substitution effects (ZERHUSEN-BLECHER et al. 2019). In earlier studies, price indicators were developed from the main feed substitutes and the unit value in foreign trade (KEZEYA SEPNGANG et al. 2018). However, identifying possible price indicators for legumes remains one of the most important objectives to better understand price setting and to foster price setting transparency as a basis for market development. The aim of the present study is to explore the correlation between the prices of feed, fertiliser and meat and the prices of field beans and field peas as well as to evaluate whether these prices can be used as price indicators for legumes.

Data and Methodology

The data used has been obtained from Agrarmarkt Informations-Gesellschaft mbH (AMI), the prices of pork and young bull meat were taken from the agricultural weekly newspaper of the region Westfalen-Lippe. The prices of all other variables, including data on field peas and faba beans (producer prices) refer to the whole of Germany. The price quotation differed: legumes, feed and fertiliser in €/t, meat in €/kg and in €/piece. With these monthly prices for the period January 2007 to January 2019, a correlation analysis based on Pearson was carried out using SPSS software.

Results and Discussion

There are strong correlations between legume prices and some prices of animal feed, fertilisers and meat products. A systemic difference in the correlations of these variables with producer prices or wholesale prices of legumes could not be observed. Thus, it is not clear at which stage of production prices of the variables studied were more closely related to legume prices. For the sake of simplicity, only producer prices were used for further evaluation.

Table 1 shows the results of the correlation analysis of the producer prices of legumes with the prices of various

feedstuffs, fertilisers and meat. Only those variables are listed for which the correlation with legume prices is at a significance level of at least 5%. In general, the correlation of these variables is higher with faba beans than with field peas in almost all cases. This could be an indication that the prices of field peas are somewhat more related to food markets and that faba beans have a stronger agricultural reference due to the comparatively higher shares in animal nutrition.

Tab. 1: Correlations between the producer prices of legumes and the prices of various animal feed, fertilisers and meat.

Variables		Field peas	Faba beans
Animal feeds	Complete feedingstuffs for middle fattening pig	r 0,894**	0,901**
		N 135	129
	Milk performance feed	r 0,190	0,632**
		N 43	43
	Complete feedingstuffs for pre-fattening pig	r 0,897**	0,916**
	N 135	129	
Fertilisers	Complete feedingstuffs for poultry (laying hens)	r 0,892**	0,901**
		N 135	129
	Calcium ammonium nitrate 27% Nitrogen	r 0,486**	0,574**
		N 54	45
	Granulated urea 46% Nitrogen	r 0,673**	0,760**
		N 54	45
	Ammonium nitrate 28% Nitrogen	r 0,659**	0,722**
		N 54	45
	Triple superphosphate 46% P ₂ O ₅	r 0,315*	0,421**
		N 54	45
Meat	Corn potash 40% K ₂ O	r 0,544**	0,604**
		N 54	45
	Calves Fleckvieh	r 0,325**	0,260**
		N 135	129
	Chicken Ø all target weights	r 0,796**	0,812**
		N 135	129
	Turkeys Cocks 18,5 kg	r 0,703**	0,727**
		N 135	129
Pigs NRW	r 0,529**	0,544**	
	N 131	126	
Young bulls NRW	r 0,600**	0,571**	
	N 133	128	

** The correlation (r) is significant at the level of 0.01 (2-sided). * The correlation (r) is significant at the level of 0.05 (2-sided). N. Sample.

Prices in the feed group show the highest correlations with the prices of legumes. This indicates the main use of legumes in feeding in Germany. Legumes can be used as one of several components in the feed ration. Since prices of legumes on an aggregate level are related to prices of compound feed and since few regional and temporal differentiating price quotations for legumes are available, the prices of compound feed could be used as indicators for legume prices and support price formation.

There are two possible explanations for the relation of **fertilizer prices** with prices of legumes. The first is that there are correlations only with fertilizers containing nitrogen (N), since the symbiotic compound of the nodular bacteria of legumes plants binds nitrogen and thus mineral fertilizers could be replaced. However, the results also show a correlation with other fertilizers (triple superphosphate and potash fertilizer). The second explanation is that the existing correlation with N-containing fertilizers is negative. The argument behind this is that at high N fertilizer prices, more legumes are produced not because of the main product of the grains, but more because of the biologically fixed N as the actual by-product. The by-product would become the main product – as it is the case when legumes would be grown as catch crops. The production of legumes would increase and (ceteris paribus under the assumption of a non-simultaneous increase in demand) put pressure on the prices of legumes. However, the observed positive correlations here show that the correlation on the fertilizer market is less relevant than the correlation on the product markets for protein because of relatively low N prices in fertilizers (in the case of high protein demand, the demand for fertilizer also rises for the grain production that is more in demand). It can be assumed that the positive correlation between legume prices and the prices of fertilizers containing N and other fertilizers is rather due to the protein or total product demand of all field crops and less to the relatively low quantities of legumes in the overall market.

The smaller sample (45 and 54) in the data set of this group represents a limitation of the informative value of this analysis. In addition, it is important to note that the correlation between fertilizer prices on legume cultivation can differ between regions with high and low livestock densities. In regions with high livestock densities there is an oversupply of nutrients, which reduces the production incentives for legumes.

Meat prices, which correlate significantly with the prices of legumes plants, are also shown in table 1. When used in feeding, legume crop prices are related to meat prices as possible

components and as possible substitutes for soya and rapeseed meal for meat production. Thus, the two products are closely related and meat prices could be used as indicators of legume prices.

Legume grains (as raw materials) for meat substitutes would be a possible further link. Due to the low market shares of legume crops in meat substitutes and the low value share of legumes in meat substitutes in this area, the link is not expected to be very strong yet.

The comparison of the correlation of the prices of meat and animal feed with prices of the main **substitutes of legumes** in animal feed (soya meal, rapeseed meal and wheat) shows a lower correlation than between meat & legumes and animal feed & legumes. The opposite holds true when observing the correlation between feeding wheat & fertilizers. Here the correlation is significantly higher than between legumes and fertilizers. This indicates the specific suitability of price indicators for legumes: prices for feed and meat.

Conclusion

The prices of the three groups of variables studied can be used as indicators in the pricing of legumes. It should be noted that the prices of animal feed and meat are better suited to this than the prices of mineral fertilisers. Since the correlation analysis does not allow a statement on causality, open questions remain for an in-depth time series analysis: How strongly the three product groups examined are actually influenced by legume prices? And which product groups in turn influence the price of legumes?

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