

## Effect of type of diet fed to growing-finishing pigs on production results and fattening efficiency

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**Abstract:** *Effect of type of diet fed to growing-finishing pigs on productivity and fattening efficiency.*

The aim of the study was to compare productivity and fattening efficiency of growing-finishing pigs fed farm-produced vs. commercial mixtures on a farm specializing in producing fattening pigs. A total of 2,028 Danbred hybrid weaners with a mean initial body weight of 31.8 kg were placed in two bedding-free piggeries (1,008/1,020 pigs in groups 1 and 2) and divided into smaller groups (60 animals per pen). Pigs were fed continuously from automatic feeders (farm-grown feeds in group 1, commercial mixtures in group 2) and had constant access to water. Fattening lasted 90 days (phase I – 40 days, phase II – 50 days). Compared to the farm-produced feeds, the commercial mixtures for I and II fattening phase were more expensive by 4.95 and 6.52%. The energy to protein ratio of the farm-produced and commercial mixtures was higher for the former. The fattening and slaughter value results were very good in both groups, weight gains slightly better, and mortality slightly lower in group 1 compared to group 2. Unit revenue when feeding farm-produced feeds (group 1) was higher than that in group 2 (difference of 10.14 PLN per pig, 17.7%), which shows the appropriateness of taking measures to reduce feeding costs through the use of high value, cheaper farm-grown feeds. The present results justify the search for and the use of practical solutions, including better balanced diets and reduced feeding costs, as essential to improving the economic efficiency.

*Key words:* fattening pigs, feeding, production efficiency, revenue

## INTRODUCTION

The utilization of low-value feeds, in particular low-protein feeds, is not appropriate for intensive fattening. High-lean pigs can be produced when feeding balanced diets with a high energy and nutrient concentration, which meet the requirements of growing pigs. Protein (lean muscle tissue) deposition in the body is contingent on its intake in feed as well as the energy to protein ratio of the diet (Kulisiewicz et al. 1995, 1996, Quiniou et al. 1995, 1996, Więcek et al. 2002, Rekiel and Olejniczak 2009).

Because feeding costs account for more than 60% of the total production costs for pigs, efforts are made to reduce them. One way to do so is to reduce the purchase of manufactured feeds or protein components for on-farm making of complete diets. It is worth considering to replace them with compound feeds prepared from farm-produced feed materials (cereals, leguminous plants). However, they should be supplemented with a few purchased components, which are necessary to balance the diets and meet the energy and nutrient requirements of a specific production group of pigs. This is

easiest to achieve with a group of growing-finishing pigs.

The aim of the study was to compare the production results and efficiency of fattening pigs with farm-produced and commercial mixtures, in a pig fattening farm.

## MATERIAL AND METHODS

The study was conducted in an open-cycle private farm specializing in growing-finishing pigs production and located in central Poland. A total of 2,028 Dandred hybrid weaners with a mean initial body weight of 31.8 kg were placed in two piggeries (1,008 and 1,020 pigs) and divided into smaller groups. Animals were placed in four compartments, each of which held four pens. Around 60 pigs were grouped into each pen. Animals were kept on concrete slats without straw bedding. Pens were equipped with automatic feeders which were supplied from two external 13-tonne silos via a spiral conveyor. The silo assigned to building 1 was supplied with farm-produced feed (group 1) and that assigned to building 2 with commercial mixture, which was delivered in feed wagons (group 2). Feed was supplied continuously from tube feeders equipped with membranes maintaining a constant water level in the feeder pit, and water from available from automatic drinkers. Basic welfare standards were provided for the animals (Regulation of MARD 2003, Directive 2008/120/WE, Kondracki et al. 2014).

A 90-day fattening period was divided into phase I (40 days) and phase II (50 days). The farm-produced feeds,

which were given to pigs from group 1, contained wheat and barley (Table 1), soybean meal (Table 2) and premixes, the proportion of which in the diets for phase I and phase II of fattening followed the manufacturer's recommendations. Tables 3 and 4 provide the composition and value of the farm-produced feeds.

TABLE 1. The results of analysis of purchased cereals (Agricultural Advisory Centre)

Parameters (%)	Wheat	Barley
Protein	11.1	9.5
Starch	61.5	55.1
Fat	1.4	2.2
Water	14	12.7
Carbohydrates	2.1	1.7
Fibre	2.3	3.7
Ash	1.3	2.3

TABLE 2. Characteristics of the value of HI-PRO soybean meal (Glencore Polska Sp. z o.o.)

Parameters (%)	HI-PRO soybean meal
Protein	46.0
Fibre	4.0
Fat	3.0
Moisture	12.0

In building 2 (group 2), animals received commercial mixtures: Grower M in fattening phase I and Finisher M in phase II (Table 4).

The cost of commercial mixtures was 1060 PLN/t ("Grower M") and 980 PLN/t ("Finisher M"). The farm-grown feeds cost less (grower diet – 1,010 PLN/t, finisher diet – 920 PLN/t). The tables provide averages values for groups.

TABLE 3. Composition, energy content and nutritive value of grower and finisher diets produced on the farm (own elaboration)

Item	Diet	
	Grower	Finisher
Wheat (%)	39.0	42.0
Barley (%)	38.5	41.5
Soybean meal (%)	20.0	14
Supplementary mineral mixture		
Rolmix W* (%)	2.5	–
Rolmix WT** (%)	–	2.5
Energy content and nutritive value of the diets***		
ME (MJ)	13.1	13.1
Crude protein (%)	17.2	15.8
Crude fibre (%)	4.35	4.70
Calcium (%)	0.80	0.77
Total phosphorus (%)	0.49	0.45
Digestible phosphorus (%)	0.26	0.23
Sodium (%)	0.18	0.18
Lysine (%)	1.02	0.87
Methionine + Cysteine (%)	0.54	0.48
Tryptophan (%)	0.21	0.19
Threonine (%)	0.61	0.54

\* In 1 kg: lysine 14%, methionine 3.7%, Ca 12.9%, Na 7%, P 4.8%, vitamin A 600,000 IU, vitamin D<sub>3</sub> 80,000 IU, vitamin E 4,500 mg, Cu 5,000 mg, Zn 5,500 mg, Mn 2,000 mg, Fe 4,500 mg, Se 10 mg, I 40 mg.

\*\* In 1 kg: lysine 12.5%, methionine 2.5%, Ca 15.45%, Na 7.5%, P 3.0%, vitamin A 500,000 IU, vitamin D<sub>3</sub> 100,000 IU, vitamin E 3,000 mg, Cu 5,000 mg, Zn 5,333 mg, Mn 3,226 mg, Fe 11,667 mg, Se 33 mg, I 55 mg.

\*\*\* Calculated.

## RESULTS AND DISCUSSION

The productivity and fattening efficiency are presented in Table 5. The calculations did not include the costs of utilities, buildings and equipment depreciation, and labour.

The price difference between the diets fed to groups 1 and 2 was 50 PLN/t for fattening phase I and 60 PLN/t for fattening phase II. Compared to the farm-

grown feeds, the commercial mixtures were more expensive by 4.95 and 6.52%, respectively. In the purchased and farm-produced feeds used in fattening phases I and II, the energy to protein ratio, expressed as the amount of crude protein (CP) per MJ ME, showed some differences: it was lower in commercial mixtures (12.63 and 11.69 CP/MJ ME) than in farm-produced feeds (13.13 and 12.06 CP/MJ ME). These differences might

TABLE 4. The energy content, nutritive value and ingredient composition of the commercial mixtures (manufacturer's information)

Item	Grower M	Finisher M
ME (MJ)	13.30	13.00
Crude protein (%)	16.80	15.20
Crude fat (%)	2.60	3.40
Crude fibre (%)	3.90	4.50
Crude ash (%)	4.00	3.90
Calcium (%)	0.67	0.55
Total phosphorus (%)	0.43	0.47
Sodium (%)	0.16	0.15
Lysine (%)	1.04	0.89
Methionine (%)	0.34	0.31
Methionine + Cysteine (%)	0.66	0.65
Mineral-vitamin PREMIX		
Vitamin A (IU/kg)	6 500	4 343
Vitamin D <sub>3</sub> (IU/kg)	1 650	1 004
Vitamin E (mg/kg)	105	33
Iron (mg/kg)	140	140
Copper (mg/kg)	18	10
Zinc (mg/kg)	113	54
Manganese (mg/kg)	75	17
Iodine (mg/kg)	1.00	0.50
Selenium (mg/kg)	0.30	0.20
Ethoxyquin (mg/kg)	0.09	0.06
Gallate (mg/kg)	0.01	0.01
Phytase (FTU/g)	+	300
Endo-1,4-beta xylanase (VU/g)	+	1 360
Acidifier (-)	+	-
Feed materials		
	Grower M	Finisher M
	wheat, barley, triticale, wheat bran, maize bran, soybean meal, rapeseed meal, maize DDGS, calcium carbonate, fatty acids and oils of plant origin, sodium chloride	wheat, barley, triticale, wheat bran, soybean meal, rapeseed meal, sunflower meal, maize DDGS, calcium carbonate, fatty acids and oils of plant origin, sodium chloride

TABLE 5. Fattening results and production efficiency (own elaboration)

Item	Group 1 (farm-produced feeds)	Group 2 (commercial mixtures)
Number of pigs at the start of experiment (head)	1 008	1 020
Number of pigs at the end of experiment (head)	992	997
Average initial mean body weight (kg)	31.5	32.2
Average body weight at the end of the phase I (kg)	70.5	70.2
Average final body weight (kg)	120.7	120.2
Mortality – phase I (head/%)	2 / 0.2	5 / 0.5
Mortality – phase II (head/%)	14 / 1.4	18 / 1.8
Total mortality (head/%)	16 / 1.6	23 / 2.3
Total feed intake – phase I (kg)	75 000	75 000
Total feed intake – phase II (kg)	180 000	172 000
Total feed intake (kg)	255 000	247 000
Average daily feed intake (kg)	2.84	2.72
Average daily gain – phase I (g)	975	951
Average daily gain – phase II (g)	1 004	1 000
Average daily gain fattening (g)	991	978
Feed conversion ratio – phase I (kg/kg)	1.91	1.94
Feed conversion ratio – phase II (kg/kg)	3.62	3.45
Feed conversion ratio during fattening (kg/kg)	2.88	2.81
Total production of live pigs (kg)	119 734.4	119 839.4
Cost of weaners (PLN)	302 400	306 000
Cost of mixtures – phase I (PLN)	75 750	79 500
Cost of mixtures – phase II (PLN)	165 600	168 560
Total cost (PLN)	543 750	554 060
Value of live pigs sold (PLN)	610 645.44	611 180.94
Total revenue (PLN)	66 895.44	57 120.94
Unit revenue (PLN per animal)	67.43	57.29

have resulted in 13 g (1.33%) better weight gains during fattening (group 1 compared to group 2), which, with 0.66 percentage point lower mortality and lower cost of farm-grown feeds yielded better unit revenue of 10.14 PLN (17.7%) for the group fed farm-produced feeds (group 1) compared to the

group receiving commercial mixtures (group 2).

The experimental pigs willingly consumed the feed, which according to Tyra et al. (2015) is determined by the quality, taste (expressed as flavour and aroma), fibre level, and proper balancing of the feed. Constant access to water is also

essential. Fatteners from both groups achieved very good results expressed in weight gains. Studies performed by Bojko and Rekiel (2014), Goszczyński et al. (2016) and Taraska et al. (2016) confirm a very high genetic potential of hybrid pigs imported to Poland and fattened in Polish piggeries. This was reflected in a very good rate of growth, feed conversion ratio and meatiness of around 60%, regardless of the housing system. It is concluded from the present study that fattening success is conditional on meeting the nutrient requirements of animals by ensuring adequate intake of feed (*ad libitum* feeding, fattening phases) that meets the standards of a complete diet for growing pigs.

Mortality in groups 1 and 2 was within normal limits and did not exceed 3%, although it was slightly elevated in the group receiving commercial mixtures. The majority of deaths occurred in the final month of fattening. Supplementation of water with a liquid acidifier prevented further losses. The beneficial effect of acidifiers during rearing of young pigs and growing animals was confirmed by many experiments, including Rekiel et al. (2017). They have the advantage of reducing digesta pH and thus forming an environment in which pathogens cannot multiply. This shortens the duration of diarrheas and makes them less frequent, which is of benefit to health and prevents mortality.

Based on the nutrient requirements of pigs (Grela and Skomial 2015), growth potential of the experimental pigs was intermediate between high (1,000 g/day) and medium (850 g/day). The results obtained in both groups for the entire fattening period (Table 5)

are considered very good (a difference of around 1.4 percentage points). A slightly poorer result was obtained for feed conversion ratio (Table 5), which was similar in both groups but exceeded 2.8 kg/kg. It can be assumed that a small change in the energy to protein ratio, resulting from increased per unit content of energy (e.g. by adding oil to the diet), could have a positive effect on FCR value.

The average final body weight of pigs (after 90 days of fattening) exceeded 120 kg and was similar in the groups, as was carcass meatiness. It was around 59% and most of the carcasses were graded “E” according to the EUROP system. These results are considered very good. They are comparable with, and even slightly better than the results reported by other authors (Rekiel and Olejniczak 2009, Bojko and Rekiel 2014, Taraska et al. 2016).

When comparing the fattening results and the production costs, it can be stated that the values obtained in the compared groups were similar. The total cost of farm-produced feeds for the whole fattening period was 241,350 PLN for group 1, while the cost of commercial mixtures was 248,060 PLN (group 2). The difference of 6,710 PLN appears to be small. However, if we assume that fattening will be conducted in both piggeries all year round, the annual savings from feeding farm-produced feeds will be at least four-fold higher.

## CONCLUSIONS

The unit revenue, when the pigs were fed farm-produced feeds (group 1), was higher than in group 2. This shows that it is appropriate to take measures to re-

duce feeding costs through the use of high value, but at the same time cheaper farm-grown feeds that ensure very good production results. The results of the present study justify the search for and the use of practical solutions, including better balanced diets and reduced feeding costs, as essential to improving the economic efficiency.

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**Streszczenie:** *Wpływ rodzaju mieszanek stosowanych w żywieniu świń rosnących na wyniki produkcyjne i efektywność tuczu.* Celem pracy było porównanie wyników produkcyjnych i efektywności tuczu przeprowadzonego w gospodarstwie specjalizującym się w produkcji tuczników, po zastosowaniu w żywieniu rosnących świń mieszanek własnych i z zakupu. Warchlaki mieszańców Danbred (2028 szt.) o średniej początkowej masie ciała 31,8 kg umieszczono w dwóch chlewniach bezściółowych (1008 i 1020 szt. – grupy 1 i 2). Zwierzęta podzielono na mniejsze grupy, po ok. 60 szt./kojec. Świnie żywiono z automatów paszowych w sposób ciągły, przy stałym dostępie do wody, stosując w grupie 1 mieszanki własne, a w grupie 2 mieszanki z zakupu. Tucz trwał 90 dni, w tym okres I – 40 dni i okres II – 50 dni. Pasze na I i II okres tuczu pochodzące z zakupu w porównaniu do własnych były droższe o 4,95 i 6,52%. Stosunek energetyczno-białkowy mieszanek własnych i z zakupu różnił się – był większy dla pasz własnych. Uzyskane wyniki tuczu i wartości rzeźnej były bardzo dobre w obu grupach, przyrosty nieznacznie lepsze, a upadki nieco mniejsze w grupie 1. Przychód jednostkowy przy żywieniu tuczników paszami własnej produkcji (grupa 1) był większy niż uzyskany

w grupie 2 (różnica 10,14 zł/szt., 17,7%), co wskazuje na zasadność działań zmierzających do zmniejszenia kosztów żywienia poprzez stosowanie pełnowartościowych, tańszych mieszanek własnych. Wyniki badań wskazują na zasadność poszukiwania i stosowania rozwiązań praktycznych, takich jak lepsze bilansowanie mieszanek paszowych oraz zmniejszenia kosztów żywienia jako priorytetowych w aspekcie poprawy rachunku ekonomicznego.

*Słowa kluczowe:* tuczniki, żywienie, efektywność produkcji, przychód

*MS received 30.05.2018*

*MS accepted 05.07.2018*

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