



## Effect of substituting a commercial grower diet with fermented sweet potato vine-cassava tuber-based diet on the performance of growing pigs

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### ABSTRACT

In Uganda, the major limitation to pig production is the high cost of quality feeds. Consequently, smallholder farmers resort to using non-conventional feedstuffs within their surroundings, which are seasonal and do not solely meet the nutritional requirements of the pigs. In order to reduce feed costs, this study assessed the performance of growing pigs fed on a mixture of a commercial diet and a fermented composite of commonly used local feedstuffs namely sweet potato vines (SPV), cassava tubers (CT) and rice bran (RB). A completely randomised block design with two treatments (diets), each replicated three times was adopted for the study. The diets were; commercial diet (control), and a 1:1 mixture of commercial diet and fermented sweet potato vine-cassava tuber-rice bran composite. The chemical composition of SPV, CT and RB varied, with SPV having the highest crude protein (10.8%), CT having the highest digestible energy (3032 Kcal/kg) and RB having the highest crude fibre (20.3%). The crude protein content of the commercial feed was higher (16.5 %) than that of the mixture (13.33 %), while the mixture had a higher crude fibre content (11.6 %) than the commercial feed (6.3 %). However, the fat content and digestible energy content of the two diets did not differ. Grower pigs fed on the commercial diet registered higher daily weight gains and better feed conversion ratio ( $p < 0.05$ ) than those fed on the 1:1 mixture of the commercial diet and fermented composite. Therefore, feeding the 1:1 mixture of commercial and fermented SPV-CT-RB feeds to pigs lowered the performance of grower pigs and did not meet the goal of reducing feeding costs. Further research should be conducted at different levels of substitution of the commercial with the mixed feed to establish the combination that can reduce feeding costs without compromising the performance of the pigs.

Key words: Commercial diet, feeding costs, fermentation, non-conventional feedstuffs, pig production

### RÉSUMÉ

En Ouganda, la principale limite à la production porcine est le coût élevé des aliments de qualité. Par conséquent, les petits exploitants agricoles ont recours à des aliments non conventionnels dans leur environnement, qui sont saisonniers et ne répondent pas simplement aux besoins nutritionnels des porcs. Afin de réduire les coûts d'alimentation, cette étude a évalué la performance de porcs en croissance nourris avec un mélange d'un régime commercial et d'un composite fermenté d'aliments locaux couramment utilisés, à savoir des boutures de patate douce (SPV), des tubercules de manioc (CT) et du son de riz

(RB). Un plan en blocs complètement randomisé avec deux traitements (régimes), chacun répliqué trois fois, a été adopté pour l'étude. Les régimes étaient : le régime commercial (contrôle), et un mélange 1:1 du régime commercial et du composite fermenté de bouture de patate douce, tubercule de manioc et son de riz. La composition chimique du SPV, du CT et du RB variait, le SPV ayant la plus forte teneur en protéines brutes (10,8 %), le CT ayant la plus forte énergie digestible (3032 Kcal/kg) et le RB ayant la plus forte teneur en fibres brutes (20,3 %). La teneur en protéines brutes de l'aliment commercial était plus élevée (16,5 %) que celle du mélange (13,33 %), tandis que le mélange avait une teneur en fibres brutes plus élevée (11,6 %) que l'aliment commercial (6,3 %). En revanche, la teneur en matières grasses et la teneur en énergie digestible des deux régimes ne différaient pas. Les porcs en croissance nourris avec le régime commercial avaient enregistré des gains de poids quotidiens plus élevés et un meilleur indice de conversion ( $p < 0,05$ ) que ceux nourris avec le mélange 1:1 du régime commercial et du composite fermenté. En conséquence, l'alimentation des porcs avec le mélange 1:1 d'aliments commerciaux et d'aliments fermentés SPV-CT-RB a diminué les performances des porcs en croissance et n'a pas atteint l'objectif de réduction des coûts d'alimentation. Des recherches supplémentaires devraient être menées à différents niveaux de substitution de l'aliment commercial par l'aliment mixte afin d'établir la combinaison qui peut réduire les coûts d'alimentation sans compromettre les performances des porcs.

Mots clés: Régime commercial, coûts d'alimentation, fermentation, aliments non conventionnels, production porcine

## INTRODUCTION

Pig rearing is an important venture with potential to alleviate poverty among smallholder farmers. This is because pigs exhibit remarkably high prolificacy, faster growth rates (Adeshinwa, 2008), and are easy to manage (Ninh *et al.*, 2019).

In Uganda, smallholder farmers constitute the biggest population of the pig farming community (Roesel *et al.*, 2016). Compared to other livestock species, however, pig population in Uganda is low with only 4.245 million pigs in 2018 as opposed to the 48.901 million poultry, 16.419 million goats and 14.572 million heads of cattle (Uganda Bureau of Standards [UBOS], 2019). The low pig production in the country is attributed to the high cost of quality commercial feeds (Ikwap *et al.*, 2014). The commercial feeds can hardly be afforded by the smallholder farmers, and their use is, therefore, unsustainable in smallholder pig production systems. In an attempt to sustain their piggery enterprises, smallholder farmers resort to use of non-conventional feedstuffs because they

are readily available and less costly (Das *et al.*, 2018).

Analysis of the non-conventional local pig feedstuffs in Uganda revealed that they could substitute commercial feeds with limited compromise on the nutritional requirements of the pigs. Among the commonly used pig feedstuffs in Uganda are sweet potato (*Ipomoea batatas*) vines (19% CP), *Amaranthus* (26% CP), cassava (*Manihot esculenta*) leaf (23% CP) and *Carica papaya* fruit (11% CP) (Carter *et al.*, 2015). These are always obtained as crop residues (sweet potato vines and cassava leaf) and readily grow with in the farmers' surrounding, hence their use involves little or no cost. Despite this potential, non-conventional feedstuffs such sweet potato vines and cassava leaf are seasonal in nature and unreliable for pig production, especially in northern Uganda where pig production is still low. In addition, farmers are less knowledgeable in the efficient use of non-conventional for optimal pig production (Ouma *et al.*, 2017).

The seasonal nature of these feedstuffs could be addressed by preservation, for example, through fermentation, a method which was recommended by Ojakol *et al.* (2017). An intervention of this kind could contribute towards boosting pig production in northern Uganda. However, performance of pigs fed on fermented readily available non-conventional feeds in the region is understudied. A preliminary study in northern Uganda indicated that sweet potato vines (56%), fresh cassava tubers (70%) and rice bran (44.5%) were the commonly used local feedstuffs for pig feeding. This study, therefore, determined the effect of including a fermented composite of sweet potato vines (SPV), cassava tubers (CT) and rice bran (RB) in a commercial grower diet at a 1:1 ratio on the performance of growing pigs.

## MATERIAL AND METHODS

**Experimental site.** The study was conducted in the districts of Gulu and Omoro in northern Uganda. These two districts have the highest pig population in northern Uganda (Ministry of Agriculture, Animal Industry and Fisheries [MAAIF], 2008). Gulu district is located between longitudes 30-32 degrees East and latitudes 02-4 degrees North. It is bordered by Omoro district in the south, Amuru district in the west, Lamwo district in the north and Pader district in the east. Omoro district is located between 02°35'N and 32°22'E. It is bordered by Gulu district in the north, Pader district in the east, Oyam district in the south and Nwoya district in the west.

**Preparation and fermentation of the SPV-CT-RB composite.** The CT were chopped along the length into sizeable pieces, wilted for 4 hours and then chopped into pieces of 3 cm length. Similarly, the SPV were wilted for about 4 hours and were chopped into pieces of 3 cm length. The chopped SPV and CT were then mixed with the rice bran in the ratio of 2:1:1, respectively. After thorough mixing the SPV-CT-RB composite, the mixture was heaped on a polythene sheet and then covered with a tarpaulin. The mixture was compacted to

remove air before covering with tarpaulin and finally with heavy stones or pieces of wood. The composite was then left to ferment for three weeks prior to the feeding trial.

## Housing and management of growing pigs.

Eighteen grower pigs (Camborough x Large white) aged 3.5 months with an initial weight of 15.2 kg were obtained from Mega Country Farm, Gulu. The pigs were randomly distributed into six units of 3.0 m<sup>2</sup>. The units were set up in farmers' homesteads. The pigs were housed on concrete floor housing and identified by ear-notching.

**Feeding experiment.** The feeding trial that lasted seven weeks was conducted to assess the responses of the 18 growing pigs to two diets, which included commercial diet (control) and a mixture of the commercial diet and a fermented SPV-CT-RB composite in the ratio of 1:1. The composition of the experimental diets is shown in Table 1.

A completely randomized block experimental design was used with three replicates, each replicate containing three pigs. The CRBD was used because the units were situated in the homes of farmers. Restricted feeding was used where one portion of the feed was given in the morning and the other portion in the evening, while water was provided *ad libitum*. Prior to the feeding experiment, the pigs were starved for 12 hours to allow for emptying of the digestive tracts of contents of the previous feeding (Gregory *et al.*, 1990). The pigs were then randomly distributed to the units and subjected to the two diets. Body weights of pigs were taken at the start of the experiment and at the end of each week for seven weeks. Weight gain was calculated by subtracting the weight at the start of the experiment from the weight at the end of the week. All the feed provided was weighed. Feed intake was determined weekly for each replicate by subtracting the feed rejected from the feed given. Feed conversion ratio (FCR) was calculated as feed to gain ration following procedures of Diarra

(2017). The cost of feed required to produce 1 kg of pork was calculated as a product of the cost of producing one kg of feed and FCR. The cost of producing one kilogramme of feed was calculated as:

$$C_y = (C_x1 * Q_x1) + (C_x2 * Q_x2) + \dots + (C_xn * Q_xn) + C_l + C_t$$

Where  $C_y$  = Cost of producing one kilogramme of feed;  
 $C_x$  = unit cost of any ingredient

$Q_x$  = Quantity of any ingredient in one kilogramme of feed

$C_l$  = Cost of labour required to produce 1 kg of feed

$C_t$  = Cost of transport involved to produce 1 kg of feed.

Note: Cost of labour and transport required to produce 1 kg of feed were calculated by dividing the cost of producing a tonne of feed by 1000 kg.

### Chemical analysis

#### Collection and preparation of samples.

Samples of SPV and CT were collected from pig farmers in triplicates. Three portions from each CT were cut (lower, middle and upper parts of the tuber). The portions were grated through a 7mm grater to enhance easy drying and grinding. The oven dried (60°C) samples of SPV, CT, RB and fermented SPV-CT-RB mixture were milled before the analysis.

**Table 1. Composition of experimental diets (air dry basis)**

| Feedstuff (%)                                                                       | Diet                      |                                                 |
|-------------------------------------------------------------------------------------|---------------------------|-------------------------------------------------|
|                                                                                     | Commercial diet (control) | Commercial diet+ fermented SPV-CT-RB diet (1:1) |
| Commercial diet <sup>1</sup>                                                        |                           |                                                 |
| Maize bran                                                                          | 74.0                      | 37.0                                            |
| Soybean meal                                                                        | 10.0                      | 5.00                                            |
| Fish meal                                                                           | 5.00                      | 2.50                                            |
| Sunflower cake                                                                      | 5.00                      | 2.50                                            |
| Lake shell                                                                          | 4.00                      | 2.00                                            |
| Bone meal                                                                           | 1.00                      | 0.50                                            |
| Salt                                                                                | 0.50                      | 0.250                                           |
| Premix <sup>2</sup>                                                                 | 0.50                      | 0.250                                           |
| Fermented diet <sup>1</sup>                                                         |                           |                                                 |
| Sweet potato vines                                                                  | -                         | 25.0                                            |
| Cassava tubers                                                                      | -                         | 12.5                                            |
| Rice bran                                                                           | -                         | 12.5                                            |
| Total                                                                               | 100                       | 100                                             |
| <b>Calculated nutrient composition (% unless otherwise specified) (as is basis)</b> |                           |                                                 |
| DE (Kcal/kg)                                                                        | 2971                      | 2780                                            |
| Digestible Crude Protein                                                            | 13.6                      | 11.0                                            |
| Fat                                                                                 | 5.10                      | 4.70                                            |
| Crude Fibre                                                                         | 6.30                      | 11.6                                            |
| Feed cost (UGX/kg)                                                                  | 963                       | 539                                             |

<sup>1</sup>The commercial diet and the fermented SPV-CT-RB diet were prepared separately before they were finally mixed together in a ratio of 1:1 for the experiment.

<sup>2</sup>Composition of Premix per 0.5 kg: Vitamin A 7,000,000 I.U; Vitamin D3 750,000 I.U; Vitamin E 4,000 I.U; Vitamin K 400 mg; Vitamin B1 200 mg; Vitamin B2 600 mg; Vitamin B6 600 mg; Vitamin B12; 2 mg; Pantothenic acid 1,000 mg; Niacin 200 mg; Choline Cl 60,000 mg; Biotin 60 mg; Folic acid 100.00 mg; Iron 40,000.00 mg; Cobalt 100.00 mg; Copper 1,200 mg; Manganese 25,000 mg; Zinc 25,000 mg; Iodine 200 mg; Selenium 40 mg; Antioxidants 5,000 mg. Source: Super Feeds Farm Products Ltd; Distributed by: MULCHICK

**Proximate composition.** Proximate composition of the ingredients was determined using procedures of AOAC (1990). Digestible energy (DE) was estimated using the following formula developed by ARC (1977):

$$\text{DE (Kcal/kg)} = 5.5 \times \text{g.dCP} + 9.5 \times \text{g.dEE} + 4.2 \times \text{g.dCF} + 4.2 \times \text{g.dNFE}.$$

Digestibility coefficients (d) of 82.2% for CP, 82.5% (EE), 20% (CF) and 80% (NFE) were assumed.

**Statistical analysis.** Data on feed intake (feed given minus feed rejected), weight gain (weight at the end of the week minus initial weight), feed conversion ratio (feed intake to weight gain ratio) and cost of feed required to produce 1 kg of pork (cost of producing one kg of feed and FCR) were subjected to an independent t-test at 5% significance level ( $P \leq 0.05$ ) using the procedures of R software, version 3.6.1 (2019-07-05).

**Ethical consideration.** The study was approved by Gulu University Research Ethics Committee (GUREC) with approval code GUREC-059-19.

## RESULTS AND DISCUSSION

Proximate composition and digestible energy of

SPV, CT, RB and fermented SPV-CT-RB

The results of the proximate composition and digestible energy values of SPV, CT, RB and fermented SPV-CT-RB are shown in Table 2.

The proximate composition and digestible energy varied among SPV, CT, RB and fermented SPV-CT-RB. The SPV had the highest protein content (10.8%) while CT had the least (1.37%). Crude fibre was highest in RB (20.3%) followed by the SPV (18.9%) and then CT (2.46%). CT had the highest digestible energy (3032Kcal/kg) which is 16% and 13% more than that of RB and SPV, respectively. Fermented SPV-CT-RB had low fibre content than either raw RB or SPV.

The 10.8% CP of sweet potato vines in the current study is higher than the 4.2% to 6.5% CP reported by Mbithe *et al.* (2016) but lower than the 15.9% reported by Ngoc *et al.* (2012). The CP of sweet potato vines in the current study, however, lie in the range of 10.8% to 20.5% reported by Baba *et al.* (2018). This variation in CP content is probably attributable to the variations in environmental conditions in the study areas.

**Table 2. Proximate composition of local feedstuffs as offered to the pigs by the farmers (% dry matter)**

| Composition (%) unless otherwise stated       | Rice Bran | Cassava tubers | Sweet potato vines | Fermented SPV-CT-RB |
|-----------------------------------------------|-----------|----------------|--------------------|---------------------|
| Dry Matter (DM)                               | 91.8±0.54 | 98.3±0.09      | 95.5±0.61          | 94.9±0.43           |
| Crude Protein (CP)                            | 7.77±0.09 | 1.37±0.73      | 10.8±2.87          | 10.2±0.88           |
| Digestible crude protein                      | 6.44±0.04 | 1.13±0.6       | 8.90±2.36          | 8.42±0.73           |
| Crude Fibre (CF)                              | 20.3±1.64 | 2.46±0.84      | 18.9±1.69          | 16.9±9.42           |
| Fat                                           | 5.01±0.64 | 0.594±0.11     | 2.78±0.64          | 4.24±0.56           |
| Ash                                           | 10.2±0.38 | 7.43±5.37      | 10.4±3.02          | 9.39±0.57           |
| Nitrogen Free Extract                         | 48.5±1.23 | 86.4±6.67      | 52.6±5.30          | 54.1±10.7           |
| Digestible Energy (DE) (Kcal/kg) <sup>1</sup> | 2545±67.1 | 3032±191       | 2634±59.2          | 2757±210            |

<sup>1</sup>Calculated from chemical composition

The low CP of cassava tubers in the current study agrees with an earlier study by Montagnac *et al.* (2009) which revealed that cassava tubers are poor protein sources. Nevertheless, in comparison to the current CP of 1.3%, higher cassava tuber CP values of 3.9% and 2.3% were reported by Lukuyu *et al.* (2014) and Tesfaye *et al.* (2013), respectively. The lower value of CP in the current study is probably because the tubers were neither peeled nor washed unlike in the previous studies (Lukuyu *et al.*, 2014) and Tesfaye *et al.* (2013) where the tubers were first washed and then peeled. This implies that if farmers wash and peel cassava tubers prior to giving to pigs, it would enhance the amount of CP available to the pigs from the cassava tubers.

The high crude fibre content of the RB, as it also is with the current study, is characteristic of this particular feed ingredient (Supriyati *et al.*, 2015), and this is a limitation to its use as an ingredient in pig diets. As opposed to the current study, lower CF contents of rice bran (10.6% and 14.4%) were reported by Supriyati *et al.* (2015) and Arlina *et al.* (2012), respectively. The variations in crude fibre content could be attributed to differences in varieties (Amissah *et al.*, 2003).

The high digestible energy of cassava tubers is primarily because cassava tubers are rich in starch, which is easily digestible (Tesfaye *et al.*, 2012; Montagnac *et al.*, 2009). Cassava is reported to have up to 83% of starch (Agbemafle, 2019).

Besides preserving the composite, fermentation reduced the CF content of the composite by 16.7% and 10.6% compared to the fibre-rich ingredients, that is, rice bran and sweet potato vines respectively. This is because the fermentation process breaks down the complex indigestible cell wall components, including cellulose, lignin and hemicellulose to easily digestible simple sugars. In agreement with the current findings, Supriyati *et al.* (2015) reported reduction in fibre content when rice bran was fermented. Reduction in CF was also reported when sweet potato vines and cassava peels were fermented (Adeleke *et al.*, 2017).

Composition and digestible energy of the commercial feed and the 1:1 feed mixture of commercial feed and fermented SPV-CT-RB

The results of the composition and digestible energy values of the two diets are shown in Table 3.

**Table 3. Composition of the Commercial feed and the 1:1 mixture of Commercial feed and fermented SPV-CT-RB feed (% dry matter)**

| Composition (%) unless otherwise stated       | Feed               |                                                 | SE   | p-value |
|-----------------------------------------------|--------------------|-------------------------------------------------|------|---------|
|                                               | Commercial feed    | Commercial feed+ fermented SPV-CT-RB feed (1:1) |      |         |
| Dry Matter (DM)                               | 92.30              | 93.60                                           | 1.21 | 0.34    |
| Crude Protein (CP)                            | 16.50 <sup>a</sup> | 13.33 <sup>b</sup>                              | 0.77 | 0.02    |
| Crude Fibre (CF)                              | 6.30 <sup>a</sup>  | 11.60 <sup>b</sup>                              | 0.68 | 0.00    |
| Fat                                           | 5.10               | 4.70                                            | 0.82 | 0.65    |
| Digestible Energy (DE) (Kcal/kg) <sup>1</sup> | 2971               | 2780                                            | 0.82 | 0.08    |

<sup>1</sup>Calculated from chemical composition

Means with different superscripts within the rows are significantly different at 95% confidence interval:

SE = Standard Error of the means

The Crude protein (CP) and Crude fibre (CF) content of the two diets varied significantly. The commercial diet had a higher CP content (16.5%) compared to the 13.3% of the mixture of commercial feed and the fermented SPV-CT-RB composite. Conversely, the commercial-fermented feed mixture had a higher CF content than the commercial feed. However, the digestible energy and fat content of the two diets did not differ.

The low CP content of the commercial-fermented feed mixture could be because a result of replacement of the commercial feed with the low-protein fermented feed. In a related study, Diarra (2017) also reported reduced CP content in grower diets when the fishmeal and soybean meal were substituted with cassava leaf meal. As in the current study, the crude fibre increased with increase in cassava leaf meal, which is a plant-based protein source.

**Response of growing pigs to diets in the feeding trial.** Weight gain, feed intake and feed conversion ratio of the growing pigs are shown in Table 4.

The final weight, daily weight gain and feed

conversion ratio differed significantly ( $p < 0.05$ ) amongst the grower pigs fed on the two diets. At the end of the seven weeks, grower pigs fed on the commercial diet had a final weight which was 18.8 % higher than for pigs fed on the mixture of the commercial and the fermented SPV-CT-RB diet. Furthermore, grower pigs fed on the commercial diet exhibited higher daily weight gains than the counterpart pigs. The daily WG of pigs fed on the commercial diet was 40% more than that of pigs fed on the mixture of commercial and fermented SPV-CT-RB. However, feed intake and the cost of feed required to produce 1 kg of pork were not affected by replacing the commercial feed with the fermented SPV-CT-RB at 50% ( $p > 0.05$ ).

The low final weight, daily weight and poor FCR of the pigs fed on the mixture of the commercial and the fermented SPV-CT-RB could be attributed to the high fibre content of the mixture. Daily weight gains reduced with increase in fibre content of the diets among weaned piglets (Kinh *et al.*, 2014). Grower pigs cannot effectively utilize high fibre feeds because they have a poorly developed digestive system (Lindberg, 2014). Furthermore, the poor digestibility of crude fibre by grower pigs

**Table 4. Response of growing pigs to diets in the feeding trial (7 weeks)**

|            | Treatment                 |                                        | SE    | P-value |
|------------|---------------------------|----------------------------------------|-------|---------|
|            | Commercial diet (Control) | Commercial + fermented SPV-CT-RB (1:1) |       |         |
| IW (kg)    | 15.39                     | 15.08                                  | 0.93  | 0.76    |
| FW (kg)    | 27.61 <sup>a</sup>        | 22.42 <sup>b</sup>                     | 1.33  | 0.02    |
| DWG (kg)   | 0.25 <sup>a</sup>         | 0.15 <sup>b</sup>                      | 0.03  | 0.03    |
| FI (kg)    | 1.03                      | 1.07                                   | 0.13  | 0.77    |
| FCR        | 4.17 <sup>a</sup>         | 7.17 <sup>b</sup>                      | 0.53  | 0.00    |
| Cost (Ugx) | 4013.3                    | 3863.8                                 | 365.2 | 0.70    |

Means with different superscripts within the rows are significantly different at 95% confidence interval: SE = Standard Error of the means

IW = Initial Weight; FW = Final Weight; DWG; Daily Weight Gain; DFI = Daily Feed Intake; FCR = Feed Conversion Ratio; Cost = Cost of feed required to produce 1 kg of pork; Ugx = Uganda Shillings

was reported to reduce digestibility of other nutrients in the feeds (Adeshinwa, 2008). This might have reduced the performance of the pigs in the current experiment. Ojakol *et al.* (2017), for example, reported reduced CP digestibility when sweet potato silage was included in pig diets. It is therefore probable that despite the digestible CP of 11% in the mixture, the high CF of the diet could have lowered protein usability by the grower pigs fed on the mixture, and consequently their performance.

The FCR of the pigs fed on the commercial feed was better than for pigs fed on the mixture of the commercial diet and the fermented SPV-CT-RB diet, meaning that the commercial diet was more efficiently converted to meat than the mixture. Grower pigs have poorly developed digestive system and cannot effectively utilize high fibre feeds (Lindberg, 2014). The current findings disagree with Lalthansanga and Samanta (2015) who reported no significant difference when pigs were fed on a standard concentrate and graded levels chayote meal-standard concentrate.

Although feeding costs were not significantly reduced by replacing 50% of the commercial diet with the fermented SPV-CT-RB diet, there was a 4% reduction in feeding costs compared to when the commercial feed was used. This implies that, once the optimal technical and economic levels of substitution of the commercial diet with the fermented SPV-CT-RB is established, reduction in feeding costs could be obtained.

#### **CONCLUSION AND RECOMMENDATIONS**

The current study assessed the effect of replacing a commercial feed with a fermented SPV-CT-RB diet on the performance of grower pigs. The study revealed that feeding grower pigs on a 1:1 mixture of the commercial and fermented SPV-CT-RB diet did not reduce the cost of feed required to produce 1 kg of pork. Instead, substituting a commercial feed with a fermented SPV-CT-RB composite at

50% lowered the performance of pigs fed on the 1:1 mixture in terms of weight gain and FCR. In conclusion, a 50% substitution of the commercial with the fermented composite cannot be an option to improve performance of pigs and neither can it reduce the costs of feed required to produce one kilogramme of pork. It is therefore recommended that the two feeds be tested at different levels of inclusion aside 50% to establish the level of substitution that can produce optimum performance of grower pigs. This will aid in establishing the most economical diet combinations which yield optimal performance of the pigs and ensure profitability of pig production enterprises.

#### **ACKNOWLEDGEMENT**

The authors are grateful to The Mastercard Foundation through The Regional Universities Forum for Capacity Building in Agriculture (RUFORUM) for funding the CARP+1 project “Enhancing Pig Production and Marketing for Smallholder Farmers’ Livelihood Improvement in Northern Uganda” under which the study was conducted. Great thanks also go to the host farmers of the experimental units for the cooperation during the experiment. This paper is a contribution to the Seventh Africa higher Education Week and RUFORUM Triennial Conference held 6-10 December 2021 in Cotonou, Benin.

#### **STATEMENT OF NO CONFLICT OF INTEREST**

The authors declare that there is no conflict of interest in this paper.

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