

Research Application Summary

**Developing appropriate feeding and breeding strategies for improved smallholder pig production**

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**Abstract**

The project aims to improve pig productivity on smallholder pig farms in Uganda through maximizing nutrient utilization from local cereal grains, and increasing access to improved breeding material through enhanced use of artificial insemination (AI) technologies. An evaluation of the effect of malting, and or fermentation through laboratory chemical analyses, digestibility studies and animal growth responses will be carried out. Collection of semen, evaluation of quality and field inseminations after 1-4 days of storage to evaluate reproductive performance in comparison to natural mating will also be conducted. This project will develop diets based on local feed ingredients that provide adequate dietary nutrients available for utilization by the weaned pig. Characterization, knowledge and viability of, and conservation of pig semen under production conditions in Uganda will help to increase access by smallholder farmers to high performing males, reduce the risk of inbreeding while eliminating costs of maintaining boars and risks of using communal boars.

Key words: Artificial breeding, fermenting, pig feeding malting

**Résumé**

Le projet vise à améliorer la productivité de porcs dans de petites fermes d'élevage de porcs en Ouganda, en maximisant l'utilisation des nutriments à partir de céréales locales, et en accroissant l'accès à du matériel de reproduction amélioré par une meilleure utilisation des technologies d'insémination artificielle (AI). Une évaluation de l'effet du maltage et/ou de fermentation par des analyses chimiques de laboratoire, les études de digestibilité et les réponses de croissance animale sera effectuée. La collecte de sperme, l'évaluation de la qualité et les inséminations sur terrain après 1 à 4 jours de stockage afin d'évaluer les performances de reproduction par rapport à l'accouplement naturel seront également menées. Ce projet permettra de développer des régimes basés sur des ingrédients alimentaires locaux qui fournissent les éléments nutritifs adéquats

disponibles pour l'utilisation par les porcs sevrés. La caractérisation, la connaissance et la viabilité et la conservation de sperme de porcs dans des conditions de production en Ouganda contribuera à accroître l'accès des petits exploitants agricoles à haute performance des mâles, de réduire les risques de consanguinité, tout en éliminant les coûts du maintien de verrats et les risques de l'utilisation de verrats communaux.

Mots clés: Reproduction artificielle, fermentation, alimentation brassicole des porcs

## Background

The production of pigs offers rural households opportunities to increase incomes, diversify smallholder farm enterprises, create employment and improve the nutrient status of the soils through use of manure. Pork also contributes directly to food security through direct family consumption and as an important means of income generation. Despite the opportunities that pig rearing offers to smallholders, improved productivity has been limited by low performing genotypes and poor growth rates of most especially weaned piglets mainly due to lack of diets suited to the digestive abilities of weaned pigs.

Another major limitation is poorly performing animals which result from limited access to improved genotypes. In addition there is loss of production and even massive loss of animals to diseases like African swine fever (ASF) because the management system whereby farmers share breeding males is one of the routes through which this disease is spread. Movement of sows on heat in search of breeding boars, allows contact of animals from different herds and the danger is that infected animals transmit disease to the boar and the disease is spread throughout the community. Widespread adoption of AI will not only give farmers access to good quality breeding males but will also eliminate incidences of contact between animals from different farms, hence eliminating this route of spreading of disease.

The purpose of the project is to increase productivity and profitability of smallholder crop-livestock farming systems by developing appropriate diets that permit early weaning and promoting use of fresh semen for AI as a tool to increased access to improved males and control of disease.

## Literature Summary

In modern production of pigs, it is recommended to wean piglets at 3-4 weeks of age in order to increase the number of times

per year that a sow gives birth (Liebbrandt *et al.*, 1975; Xue *et al.*, 1993). Sows by their nature do not become pregnant when they are still suckling their young and therefore the longer the lactation period the fewer times the sow will give birth per unit time. Upon weaning piglets are subject to a post-weaning growth reduction as they adjust to a dry, complex carbohydrate, plant protein-based diet that is not readily utilized. Sub-optimal performance of pigs following weaning is due to poor nutrient utilization (Liebbrandt *et al.*, 1975) as the piglet are transferred from a liquid diet (i.e. milk) to a solid diet. Appropriate diets suited for the early weaned pig are largely based on milk or milk byproducts yet these are unavailable in Uganda. There is lack of fairly priced diets that will permit weaning earlier than eight weeks of age after parturition. Identification of less expensive ingredients that are locally available and are readily utilized by weaning pigs would benefit the farmers by eliminating the stunting that occurs after piglets are weaned.

Processing of root tubers and cereals like sorghum has been shown to solubilise and modify nutrients so that they become nutritionally more available to non-ruminant animals (Hamad and Fields, 1979; Lay and Fields 1981; Taur *et al.*, 1984). To date no documented work in Uganda has been carried out to evaluate the extent of simple processing procedures like, fermentation and malting, on nutrient availability of local feed ingredients. The effect of level of dilution or dose concentration given that tropical temperatures are known to affect concentration of spermatozoa numbers in an ejaculate (Ogbuewu *et al.*, 2007) is also not well documented. There is no record of the use of AI in pigs in Uganda, therefore data on efficacy, local preservatives or extenders and suitable diluents are not available.

## Study Description

The study which will consist of an on-farm and an on-station component will be conducted both at Makerere University Agricultural Research Institute and in Busukuma sub-county of Wakiso district in central Uganda. Maize and sorghum grain will be used in the study. The grain will be subjected to fermentation or malting and sun-dried to a moisture content of 15 - 18 per cent. The dry grain will be ground in a hammer mill and incorporated into experimental diets. A diet in which the grain will not undergo any treatment will be included for comparison. Diets will be mixed to contain 20 per cent crude protein and balanced for all other nutrients to meet NRC recommendations.

Crossbred (Landrace x Largewhite) pigs weaned at 23 - 26 days of age will be allotted in a randomised complete design on the basis of weight, sex and litter to the dietary treatments to determine digestibility and biological performance.

On selected farm households, boars will be trained for semen collection using dummies. Fresh semen will be collected and taken for laboratory evaluation. Parameters will include volume, colour, viscosity, wave motion, progressive motility, concentration, acrosome integrity, proportions of live and dead sperm, and biochemical membrane integrity will be assessed.

Additionally, sows will be inseminated and data recorded on success of insemination, (% non-return), and litter size at birth. The cost of maintaining boars (feeds, labour, routine veterinary care) versus use of AI will also be evaluated. Fresh semen is extended either with short term or long term preservatives. Samples of feeds will be collected weekly, bulked and sub samples of about 200 gm taken for proximate analysis (AOAC,1990). Data on average daily gain, feed intake, digestibility of nutrients will be analysed using the GLM procedures of SAS (1992).

### **Research Application**

Farmers will be involved at the outset. On-station studies will be kept to a minimum. Positive results of the research will be demonstrated as the research progresses and farmers are likely to assimilate these innovations. A leaflet depicting positive results of the research will be developed for wider dissemination of the results. By the end of the project, appropriate feeds and feeding strategies for early weaned pigs will be developed and opportunities for improvement will have been identified. Efficacy of use of AI for breeding and disease control under smallholder production conditions will be demonstrated and capacity built through training two M.Sc. graduate students.

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