

AN INVESTIGATION INTO THE PRESENCE OF LEAD IN PIGS MANURE FED ON
COMMERCIAL RATIONS AND WATER ON THE 6 FARMS IN NAKAWA
SUBCOUNTY, KAMPALA DISTRICT.

BY



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DECLARATION

I, **Nannozi Joyce**, declare that this dissertation is original and has not been submitted to any university or any other institution of learning for an academic award.

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APPROVAL

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DEDICATION

With love and great concern, I dedicate this report to my dear parents Mr. and Mrs. Ssekate Charles, My sweet grandmother Ms Nagaddya Margret; my sisters and brothers- Namata Suzan, Nakaweesi Angela, Namiyingo Kyler Charity and Lukyamuzi Henry; also to my dear friends Akampulira David, Musiitwa Joseph, Bukenya Tom and very many others. I love you all.

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LIST OF ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
<i>et al</i>	and others
HCL	Hydrochloric acid
HNO ₃	Nitric acid
n	Study population (sample size)
Pb	Lead
UBOS	Uganda Bureau of Statistics
UNEP	United Nations Environment Programme
USEPA	United States Environment Protection Agency
WHO	World Health Organization

ABSTRACT

Animal manure is commonly being applied to agricultural land to improve soil fertility and organic matter content. Animal manure, however, is the main organic fertilizer that contains heavy metals as contaminants. Residues of heavy metals in pigs manure can be accumulated in surface soils as a result of long-term agricultural use and may also find their way into the food chain. Pig production and consumption of pork in Uganda is increasing at a high rate. Increase in pig production comes with increased manure production. The heavy metals found in pigs manure are derived from the feeds onto which the pigs are fed.

Kyambogo University farm, and other farms within its environs in Nakawa sub county, is producing pigs fed on commercially purchased feeds. The manure generated by these pigs is being used as fertilizer in the university and the neighboring crop gardens. This practice of applying pig manure in agriculture has the potential of causing serious environmental problems resulting from lead (Pb) pollution. A cross sectional quality assurance study was carried out to investigate the presence of Pb in pigs manure fed on commercial rations in the 6 selected farms in Nakawa Sub County.

The study, which lasted three weeks, profiled the presence of Pb in feed concentrates, water supplied and manure generated by pigs of Kyambogo University, Kabanda, Kasana, Moses, Steven and Katushabe farms. The samples collected were analyzed using atomic absorption spectrophotometer at Wandegeya chemotherapeutic laboratory.

Ten (10) pigs were sampled from each of the 6 farms and their fecal material used to make 6 composite samples; one for each of the six farms. The samples were recovered fresh from the rectum with no fecal material picked from the ground. Concurrently, one water & one feed concentrate sample from each of these farms was taken to the laboratory for analysis. The data was analyzed using the Statistical Package for Social Scientists (SPSS) version 16 and results interpreted at $p < 0.05$.

All the samples tested positive for Pb in the feeds, water and manure. Kabanda farm had the highest concentration of lead in feed concentrates (0.277mg/g) while Katushabe farm topped the list for Pb in water (3.453mg/l) and manure (0.2644mg/g). The levels of Pb in water were much

higher than the minimum acceptable levels of 0.01 mg/l by WHO and 0.015 mg/l by USEPA. Pb in feed concentrates and water was comparatively higher than Pb in pig manure. This is probably as a result of Pb sequestration in the soft tissues and bones of the pigs, an indication that pork on the market may not be safe. Measures should be put in place to ensure that pork coming to the market meets the minimum public health safety standards. The Spearman's correlation test returned no significant relationship between Pb in pigs manure and Pb in water or feed concentrates.

That notwithstanding, the presence of Pb in pig manure is potentially dangerous to crop gardens using this manure and by extension to livestock and human health when this Pb finds itself into the food chain. Farmers should be encouraged to routinely carry out tests on pig manure to ensure that it is free from Pb contamination before it is applied as an organic fertilizer into the crop gardens. It is also recommended that the Uganda National Bureau of Standards commissions a study to benchmark the minimum acceptable levels of Pb in feed concentrates.

CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Pig production has become an important activity in Uganda with the pig population rising in the last three decades from 0.19 million to 3.2 million pigs (Uganda Bureau Of Statistics UBOS, 2009). The production is widely spread in the country with the average number of pigs owned being highest for farmers in urban areas than in the rural areas. Both the production and consumption of pork is increasing at a high rate. Uganda has the highest per capital consumption of pork in sub Saharan Africa estimated at 3.4 kg/person/year and representing a ten-fold increase in the last 30 years (Ouma *et al.*, 2013).

Increase in pig production comes with increased manure production. In China, for example, the rapid development of intensive animal farms has led to production of animal manure to the tune of 3456 tones annually (Wang *et al.*, 2006). Animal manure is commonly being applied to agricultural land to improve soil fertility and organic matter content.

1.2 PROBLEM STATEMENT

Animal manure is the main organic fertilizer which contains heavy metals as contaminants (Luspascu, 2009). The heavy metals found in pigs manure are derived from the feeds onto which the pigs are fed (Chambers *et al.*, 1999). These feeds, though useful in facilitating weight increase for pigs under intensive farming, easily cause environmental problems (Zhang, 1995) when they generate manure loaded with heavy metals. Residues of heavy metals in pigs manure can be accumulated in surface soils as a result of long-term agricultural use and may also find their way into the food chain. Though it is being applied in Uganda as an important organic fertilizer source, the presence of heavy metals in pigs manure is yet to be determined.

1.3 JUSTIFICATION

Kyambogo University farm, and other farms within its environs, is producing pigs fed on commercially purchased feeds. The manure generated by these pigs is being used as fertilizer in the university and the neighboring crop gardens. This practice of applying pig manure in agriculture has the potential of causing serious environmental problems (Zhang, 1995) resulting from Lead pollution. A quality assurance study was carried out to investigate the presence of Pb as a pointer to the general presence or absence of heavy metals in pigs manure fed on commercial concentrates in and around Kyambogo University farm.

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