Pig Production in Uganda – Adapting to Climate Change

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There is limited attention to impacts of climate change on pigs in Uganda by stakeholders despite the potential vulnerability of pigs to climate change, especially heat stress.

Pigs are very sensitive to heat stress as they do not have functioning sweat glands (as other livestock species do) and have small lungs which reduces their ability to disseminate heat by panting.

It will be worse in the future!!!!!
This study aimed to determine climate change impacts on pig farming with focus on heat stress and explore the heat-stress adaptation options towards better pig production in Lira District, Uganda.
Specific Objectives

i) To determine heat stress status for pigs and the factors influencing heat stress in pigs in Lira District, Uganda.

ii) To identify, rank and recommend adaptation options to heat stress and assess gender implications of adaptation options especially labour and decision making.
Lira has low pig density, high poverty level and expected heat stress throughout the year in Lira district.
The data was collected from 104 households and 259 pigs in Lira district, Uganda.

More data was collected during the four focus group discussions held in Barr and Ojwina sub sub-counties.

Some of the meteorology data was obtained from the local weather station.
The heat stress indicators included rectal temperature and skin temperature.
Conceptual framework

**Climate change extremes**
- Solar radiation
- Temperature
- Relative humidity
- Wind movement

**Metabolism**
- Catabolism (Heat is produced)
- Anabolism (Heat is used)

*Pig management including: shelter type
*Pig characteristics including: color,
*Others: location, time of the day

*Pig characteristics including: age, size, reproduction cycle, breed.
*Pig management like feeding

**Heat stress in pigs**

**Induced adaptation**

**Natural adaptation**

**Better pig production**
Analysis for objective 1

• The heat stress status were assessed basing on farmers’ perception and simple regression with the heat stress indicators.
• The factors influencing heat stress were analyzed using Stepwise elimination ordinary linear regression model.

Analysis for objective 2

* The adaptation options rating was analysed by finding average preference rating by the participants in the focus group discussions
* Qualitative data analysis was done basing on the data recorded from the FGDs
RESULTS AND DISCUSSION
According to the farmers, 48.45% of the pigs had no heat stress, 51.55% of the pigs were heat stressed and these groups were significantly different (p<0.01).

<table>
<thead>
<tr>
<th>Mean temperature</th>
<th>Not heat stressed (°C)</th>
<th>Heat stressed (°C)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectal</td>
<td>38.75 (0.74)</td>
<td>39.31 (0.83)</td>
<td>0.01</td>
</tr>
<tr>
<td>Skin</td>
<td>35.85 (1.88)</td>
<td>36.70 (2.02)</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Other study**: The upper critical rectal temperature for 60kg group-housed pigs fed ad libtum was between 24.6 °C and 27.1 °C (Huynh et al., 2005).
Factors influencing rectal temperature

The results showed that rectal temperature is influenced by:

- the external temperature humidity index,
- pig management system,
- pig category, color, heart girth,
- water quantity given during day in dry season,
- pig’s body condition score, and
- time of the day.

<table>
<thead>
<tr>
<th>Rectal temperature</th>
<th>Coef</th>
<th>Std error</th>
<th>t^1</th>
</tr>
</thead>
<tbody>
<tr>
<td>External THI^6</td>
<td>0.056</td>
<td>0.020</td>
<td>2.83***</td>
</tr>
<tr>
<td>Housed^3</td>
<td>-0.213</td>
<td>0.108</td>
<td>-1.97*</td>
</tr>
<tr>
<td>Pregnant^4</td>
<td>-0.428</td>
<td>0.150</td>
<td>-2.85***</td>
</tr>
<tr>
<td>Young^4</td>
<td>-0.409</td>
<td>0.209</td>
<td>-1.96*</td>
</tr>
<tr>
<td>Fully white^5</td>
<td>0.182</td>
<td>0.106</td>
<td>1.71*</td>
</tr>
<tr>
<td>Heart girth</td>
<td>-0.008</td>
<td>0.004</td>
<td>-2.20**</td>
</tr>
<tr>
<td>Water quantity</td>
<td>-0.023</td>
<td>0.008</td>
<td>-2.89***</td>
</tr>
<tr>
<td>Thinner^2</td>
<td>-0.293</td>
<td>0.125</td>
<td>-2.34**</td>
</tr>
<tr>
<td>Fatter</td>
<td>0.127</td>
<td>0.136</td>
<td>0.93</td>
</tr>
<tr>
<td>Time</td>
<td>0.085</td>
<td>0.028</td>
<td>3.03***</td>
</tr>
<tr>
<td>Constant</td>
<td>36.981</td>
<td>0.830</td>
<td>44.54***</td>
</tr>
</tbody>
</table>

N = 225
F(12, 212) = 6.19
Prob > F = 0.000
Factors influencing skin temperature

<table>
<thead>
<tr>
<th>Skin temperature</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t1</th>
</tr>
</thead>
<tbody>
<tr>
<td>External THI</td>
<td>0.106</td>
<td>0.039</td>
<td>2.74***</td>
</tr>
<tr>
<td>Tethered³</td>
<td>0.590</td>
<td>0.548</td>
<td>1.08</td>
</tr>
<tr>
<td>Pregnant⁴</td>
<td>-0.933</td>
<td>0.362</td>
<td>-2.58**</td>
</tr>
<tr>
<td>Mixed Management³</td>
<td>0.530</td>
<td>0.299</td>
<td>1.77*</td>
</tr>
<tr>
<td>Time</td>
<td>0.239</td>
<td>0.068</td>
<td>3.53***</td>
</tr>
<tr>
<td>Thinner²</td>
<td>-0.554</td>
<td>0.275</td>
<td>-2.02**</td>
</tr>
<tr>
<td>Constant</td>
<td>30.524</td>
<td>1.612</td>
<td>18.94***</td>
</tr>
</tbody>
</table>

N = 227
F(6, 220) = 6.32
Prob > F = 0.000
R-squared = 0.147
Adj R-squared = 0.124
Root MSE = 1.896

*** ** * denote significance at 1 %, 5 %, and 10 % level, respectively.

The results showed that skin temperature is significantly influenced by external temperature humidity index, pig category, pig management, time of the day and body condition score.
Adaptation options preference

- pouring water on the ground/floor
- Provide shade
- mixing/addition of water to the feed
- allowing pigs to rest by not disturbing them
- giving pigs salt to replace lost electrolytes
- Chopping feeds into small particles
- feeding pigs during the coolest time of the day
- Adding stocking density
- feeding pigs during the coolest time of the day
- Improvement of pig facility design
- pouring water on the pigs
- allowing pigs to swim/wallow
- Constructing a grass thatched house
- Leaving the door open
- Provide shade

High Preference
Low preference
Adaptation option rating
Implication to Gender

Labor and decision making for adaptation options are mostly done by female
Constructing pigsty (pig shelter)

No:
- Expensive to construct
- Poor designs

But only 52% have ever used a pigsty

Yes:
- Protect pig from bad environment
- From thieves, diseases, etc.

Just like; Kamal et al., 2018
Providing shade

Under mango tree

Under citrus tree

Under banana plant

Yes: Reduce solar radiation

Just like: Polsky & Keyserlingk, 2017
What some advanced pig farmers use?

Using fans, misters, showers, and sprinkler systems to cool animals is among the advanced animal cooling mechanisms (Polsky & von Keyserlingk, 2017)

Photo:https://projects.ncsu.edu/project/swine_extension/healthyhogs/book2001/bottcher.htm
Farmers should be vigilant when the day is hot
Pig shelters should be designed to minimize overcrowding
Incorporating ways to improve air flow and evaporative cooling by having a high roof, and / or using grass.
Availing water ad lib or even mixing water in the feed
Allows pig swimming/ wallowing and pouring water on the pigskin
More awareness about the locally suitable adaptation option to heat stress
Acknowledgements

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* Thanks to TRECCAfrica and ICCA department at University of Nairobi

* Thanks to Lira district veterinary department and the pig farmers
I WELCOME ANY COMPLIMENT, QUESTION AND COMMENT

Thank You!
Merci!
Danke!
Asante Sana!
Webale Nyo

For your attention

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