

A participatory approach for the sustainable management of internal parasites and goat health through targeted selective treatment and plant based treatment.



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# **PROJECT INFORMATION**

The research underpinning this project is being produced by an international cluster of research institutions, including Queen's University Belfast (QUB), Lilongwe University of Agriculture and Natural Resources (LUANAR), Botswana International University of Science and Technology (BIUST), University of Pretoria (UP), Harper Adams (HA) and Rothamsted Research (RRes).

The NGO Self Help Africa (SHA) represents an additional delivery partner and is a leading international development charity with over 30 years' experience in delivering interventions aimed at improving the lives of smallholder farmers across Africa. SHA has been implementing Farmer Field Schools (FFSs) in Malawi as part of the BETTER project, under the EU's KULIMA project.



The cluster is working together to produce 'Goat Health Farmer Field Schools' (FFSs), advocating the use of the Five Point Check© (FPC) system, Targeted Selective Treatment (TST) of gastrointestinal nematodes (GIN) and the use of locally available plant based treatments (PBT), already proven in principle in Botswana (Walker *et al.*, 2015).

Goats are commonly owned livestock in Malawi (Fig. 1). They are highly resilient and adaptable, able to survive and produce in most ecosystems and under highly variable climates (Kaumbata et al., 2020).

In light of the challenges posed by climate change to crop-based food systems, goat ownership by the resource-poor is increasingly being recognised for purposes of climate adaptation and risk management. Based on current project data, goats also act as an investment and buffer against economic shocks. Maintaining the health and productivity of goats is thus of paramount importance.



Fig. 1: Livestock ownership in Malawi. Source: Current project data (2020).

UNDERPINNING RESEARCH



Fig. 2: Graphs showing: (a) the distribution of gastrointestinal nematode (GIN) eggs per gram of goat faeces, and (b) distribution of eggs per gram of goat faeces according to detected GIN genus. The red dotted box illustrates the 80:20 rule, where 20% of goats carry 80% of worms. Source: Ongoing study with LUANAR in Central Malawi.

#### Gastrointestinal nematodes and their impact on goat health in Malawi

GIN parasites represent a major constraint to goat health and productivity across the world, adversely affecting goats' fertility, milk production and growth rate, while additionally causing increased susceptibility to other diseases (Walker et al., 2015).

Haemonchus contortus is regarded as the single most important GIN affecting goats of the resource-poor in less economically developed countries (Perry et al., 2002; Krecek and Waller, 2006). It is of great importance in Malawi as infections of goats often leads to impaired growth and death.

Anthelmintics (or dewormers) have historically been widely used to treat GIN infections in livestock. However, over-reliance on them and thus resultant overuse has led to drug resistant GINs, including *H.contortus*. Many GIN species are now resistant to multiple drug classes, which can mean farmers have little ability to cure their livestock. To reduce the risk of drug resistance, precaution must be exercised when applying anthelmintic drugs. Reducing their use is also likely to help maintain drug efficacy for when needed the most while reducing costs.

## **Proposed Solution**

We propose to incorporate Targeted Selective Treatment (TST) and Plant Based Treatment (PBT) as a sustainable solution. Both aim to lengthen the lifespan of currently used drugs, reducing the cost of those treatments while making use of traditional, local knowledge of bio-active, nutrient rich and locally available plants.

# TST with the Five Point Check© (FPC)

This method assesses goats at the individual level, rather than advocating for the treatment of the whole herd. The treatment decision is made based on a health scoring system known as the Five Point Check© (FPC).

# TREATMENT DECISION CHART



Fig. 3: The FPC treatment decision chart, with thresholds for intervention with plants (green) and drugs (red). See van Wyk and Bath (2002) for more detailed information.

#### The Five Point Check<sup>©</sup> (FPC)

This method assesses goats at the individual level, rather than advocating for the treatment of the whole herd. The treatment decision is made based on a health scoring system known as the Five Point Check<sup>®</sup> (FPC).

The FPC system comprises of five simple checks on the animal body. *(Fig. 4 and 5).* 

- 1. Nasal exam: check for nasal discharge.
- 2. FAMACHA: A measure of anaemia in goats, typically caused by GIN infections (requires official FAMACHA card).
- **3. Bottle jaw:** although rare, provides a near instantaneous indication of GIN infection.
- 4. Scouring exam (dag): observe the presence of faecal matter attached to skin and hair around the anus. Note: in arid/semi-arid conditions, sick goats are unlikely to show this sign due to lack of moisture both in the environment and the excretion of goats.
- 5. Body condition score: farmer measures muscle deposits on the lower back posterior to the last rib and anterior hip of the goat. The goat is healthy if this muscle is large and convex, however if it is small, concave or bones of the vertebrae can be felt, then the goat could be sick, undernourished or both. This assessment is assisted by the use of a body condition grading diagram, where a "change of 1 point represents an average change of 12% of the body weight" (Honhold *et al.*, 1989).



Fig.4: The FPC. Illustrated by Hannah Coombs



Fig. 5: (1) Nasal discharge, (2) FAMACHA, (3) bottle jaw edema, (4) dag scorecard, and (5) body condition scorecard. Sources: (1) and (2) current project, (3): https://attra.ncat.org/, (4) illustrated by Hannah Coombs, and (5) Honhold et al., 1989.

Point	Colour	Clinical sign	Exam type	Score if	Score	Test
1	Red	Nasal discharge	Visual	0	1	Nose
2	Green	Anaemia in conjunctiva	FAMACHA	1-2	3-5	Eye
3	Yellow	Bottle jaw / pitting oedema	Visual and touch	0	1	Jaw
4	Blue	Body condition	Touch	2-4	1-1.5	Back
5	Purple	Faeces on tail and legs	Visual	0-2	3-5	Tail

## Table 1: The FPC scoring system

# **TREATMENT: DECISION AND METHOD**





# Drug and plant- based treatment (PBT)

Fig. 3 displays the treatment decision chart for the TST-FPC system and is used for translating FPC scores into treatment decisions. Both FAMACHA and the body condition score are key indicators of treatment as they are more likely than scour/ dag to be of value in tropical climates. Although bottle jaw rarely occurs in healthy animals and thus indicates a requirement for treatment, it is less likely to occur than FAMACHA and body condition score indicators.

**PBTs** draw upon farmers' traditional knowledge of plants that are both nutritious and have pharmaceutical properties (hence being coined 'nutraceuticals'). These nutraceuticals contain bio-active compounds and plant secondary metabolites (PSMs)

such as condensed tannins, which can disrupt elements of the internal parasite's lifecycle (French, 2018). A major benefit of PBTs is that they use locally available resources, representing a sustainable solution (e.g. Fig. 6). However, farmers must be careful not to overharvest plants, so directing them to only the goats in need is more efficient and sustainable. Information about plants will be provided alongside communicating the importance of sustainable harvesting practices.

Unlike anthelmintics, which only require a single dose per visit, plants must be provided daily. Approximately >150g of plant per goat is needed for at least 5 days, but optimally 7 days contiguously. Plants are only used for mild infections; in more serious cases, plants are used **in addition to drugs** (Fig. 3).

### Why TST?

TST reduces drug costs by using 83% less drug yet yielding the same outcome (Walker *et al.*, 2015).

GIN infections, like many other diseases, follow the **80:20** principle; 80% of infections are found in 20% of hosts (Fig. 2). Applying TST limits the risk of selecting for drug resistant traits in GINs. This occurs through a process known as **refugia**; GINs that are not exposed to the drug escape selection for resistance, meaning that drugs are more likely to be effective when needed (van Wyk, 2001).



TST leads to the same outcome with 83% less dewormer (Walker *et al.*, 2015).



Goat kids eating Bolwetsa in Botswana. Source: Current project.

#### Structure and delivery

The FFSs will be delivered through Self Help Africa (SHA), who have already undertaken 4970 FFSs under the BETTER project.

The project will pilot the Goat Health Farmer Field Schools in Salima district (Fig. 7). Five master trainers (MTs) have been identified, who between them will implement 21 FFSs in Chipoka Extension Planning Area (EPA), Chinguluwe EPA, Katerera EPA, Tembwe EPA and Chiluwa EPA. FFS groups will meet every 2 weeks.

The FFSs developed are structured on the FAO's KULIMA Farmer Field School Guidance Document (2016). The TST-FPC FFS approach has been presented to and discussed with FAO Malawi, who offered detailed guidance, for which the project is most thankful.



#### FFS basic learning cycle

The basic learning cycle will run 'kid to kid' over the course of one year, commencing early February 2021. Each MT will provide participants with a preliminary survey, which will capture information about current goat management practices, plants currently being used for treatment as well as socioeconomic and agricultural data.

The FFSs represent a blended top-down and bottom-up approach; they will commence by covering the FPC and TST, where participants will observe and then practise the method.

Each FFS session will include: 1) a goat ecosystem analysis (GESA); 2) a group dynamics exercise; 3) a special topic, chosen by farmers based on what they would like to know; and 4) opportunity to provide feedback. Similar to the agroecosystem analysis, the GESA is formulated of 4 steps:

- Field observations: in small groups, farmers will perform the FPC, conducting observations of the goats' ecosystems that may affect productivity and health. This will likely include climate observations on climate, pests, diseases, pasture condition, plants (both nutraceutical and toxic), and presence of plastic pollution.
- 2. Analysis and recording findings: farmers will next come together to analyse and discuss findings, and reach consensus about what steps to take next.
- **3. Presenting feedback:** each farmer subgroup will present their analysis and findings back to the rest of the FFS.
- Action plan: this is the opportunity for farmers to undertake farmer-led research, where FPC scores can be tracked against different management practises and plants used for TST.

# THE GOAT HEALTH FARMER FIELD SCHOOLS

#### **Training materials & resources**

Each MT, lead farmer (LF) and respective veterinary extension officer (VEO) will attend a 3-day training course at LUANAR, receiving a certificate upon successful completion of a practical and written exam. In addition, they will be provided with a drug box, containing key items such as ear tags, a tagging gun, syringes, dewormer and hoof clippers. These resources are to be shared with FFS participants when required. MTs, LFs and VEOs will also receive a training manual, record book and information sheet.

FFS participants will receive FFS record books to note down GESA observations and other notes on agricultural production (e.g., how their goats [and crops if applicable] have been performing). They will also receive FAMACHA cards, laminated overviews of the FPC and other goat management tips and project t-shirts showing the FPC.

#### Treatment

When FPC scores indicate a need for treatment, farmers will contact their MT, LF or VEO who will confirm FPC score. For a small fee, drug will be supplied and administered, using weigh tape and a conversion scale to assess dosage requirements. The fee is necessary so as to ensure the long-term impact of the project beyond its expiry; MTs, LFs and VEOs can continue to purchase the drug and supply for a fee once the project ends. The fee will be based on feedback from the preliminary survey to ensure it is affordable.

The FFSs will be conducted in such a way that every farmer will have a voice and chance to meaningfully participate. Careful attention will be made to possible power and gender inequalities. Budget has been allocated for quality and monitoring purposes to ensure high standards of facilitation.

### COVID-19

FFSs will undergo social distancing measures that align with Malawi's national guidelines for public meetings, as well as protocols in line with FAO's (2020) 'Running farmer field schools in times of COVID-19' guidance. Farmers will be informed of social distancing guidelines in place and hand sanitiser will be provided at each meeting.

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