



# BOTTLE FLY TRAP

## KENYA

The nomadic Maasai families of Kenya depend on their livestock for a living and care for the animals as part of the family. This tradition, combined with their housing construction methods, which are usually within the livestock enclosures, causes the Maasai to be troubled by flies, which are attracted to the livestock and their dung. Disease spread by the flies directly affects the families' health as well as that of the livestock. Children are highly susceptible to diseases such as trachoma and diarrhoea, which are easily transmitted by flies feeding on animal dung. A low-cost design of fly trap, made from two plastic bottles, helps reduce the prevalence of these diseases.



A Maasai woman outside her traditional style home.  
Photo: Practical Action / Carol Reesby.

### Maasai Housing

As nomadic people, the Maasai traditionally draw on locally available natural resources. Maasai homes (*enkaji*) serve as a base from which the families earn a living, interact socially, and shelter from the elements. It is a place where both people and livestock can live and grow. The house consists of a rectangular formation with rounded edges and a slightly domed roof. Ventilation and lighting are provided by holes in the walls near the roof. The holes are usually closed at night during the less warm seasons.

The walls and roof are made from a mixture of earth and animal dung, which is plastered over branches and twigs that have been intertwined together. A balance of clay, sand and silt is required for the soil to bind properly. Some Maasai families use the earth from termite hills to plaster their roofs, which has a good level of cohesion and through practice people have found that, when applied in a plaster mix, it increases the impermeability of the roof, thus helping to keep the rain at bay. Cow dung is used in its natural state, as well as in conjunction with mud and ash, as a plaster for floors and walls, both internally and externally. The fibre-rich nature of cow dung makes it a useful reinforcing agent, which reduces the soil's tendency to crack when it dries.

Every Maasai family that keeps livestock will use the hides of those animals once slaughtered. Treatment is limited to scraping and drying, after which the hides are used as walling and roofing materials, as well as for added security across the entrance of the abode. Often, a traditional Maasai bed structure is built into the house walls, over which a hide is stretched to create a type of mattress. Hides are also used to form shelters when people relocate and their *boma* is not yet constructed.

These characteristics of the housing invite flies, which can have serious health implications for Maasai families. Not only do the homes contain animal dung in their construction, they also suffer from poor ventilation and often house the Maasai family's livestock when weather conditions are harsh. The housing therefore offers a ripe feeding and breeding ground for flies.

## Attracting Flies

Flies have developed a close relationship with human habitation over many centuries, to the benefit of the fly populations. This association has resulted in the deaths of thousands of people, due to the ability of this humble insect to transmit disease. Non-biting flies have adapted to the different niches available within human populations, which permit them to feed, grow and reproduce. Their feeding and breeding habits enable these flies to be effective mechanical vectors of disease to humans. Flies are often responsible for the contamination and spoilage of foodstuffs, annoyance, mechanical transmission of disease-causing pathogens, and invasion of living tissues (myiasis).

Non-biting flies are often associated with domestic dwellings, especially throughout the warmer months when flies breed prolifically. Flies are equipped with special sensory cells on their antennae and feet, which enable them to locate suitable food and egg laying sites. These sensory cells aid in detecting substances such as ammonia, carbon dioxide and other strong compounds that are emitted from decomposing organic materials, such as carrion and faeces. Being attracted to these locations means that the flies are laden with bacteria on their mouthparts, body hairs and the sticky pads of their feet, as well as in their stomachs (where the bacteria rapidly multiply), faeces and vomitus. Contact with any foodstuffs, or feeding, which often involves vomiting and defecating, will contaminate food, preparation surfaces and utensils with potentially disease-causing organisms. Eggs or young larvae may also be deposited if the material is deemed suitable for egg-laying by the fly.

Flies can also be strongly attracted to uncovered, malodorous wounds, body openings, open sores or damaged skin. Some species will deposit their eggs or larvae on the site if the circumstances are suitable. This can result in myiasis, where young maggots feed on healthy or diseased tissue to complete their growth cycle.

In Maasai communities, common fly-borne diseases include trachoma and diarrhoea. Trachoma is an eye infection caused by the bacterium *Chlamydia trachomatis*. Trachoma is highly infectious, and in some areas of the world the infection rate in children is 100 per cent. About 400 million people are affected by trachoma in parts of Africa and Asia. It is transmitted when eyes come into contact with infected fingers, flies or contaminated materials. It tends to occur between people living in poor social conditions. Symptoms include scarring of the inner lining of the upper eyelids, which causes the lids to curl inwards (known as entropion) so that the lashes rub against and scar the very front of the eye (the cornea). This opens the way to further infection, which can result in permanent blindness if not treated.

Diarrhoea is the passing of frequent, watery stools. People with diarrhoea may also have cramps in their stomach, feel sick (nausea), feel feverish (high temperature) and lose their appetite. Diarrhoea is a symptom, and can be acute (short term) or chronic (if it continues for more than two weeks).

Acute diarrhoea is usually caused by a viral infection or a bacterial infection and affects almost everyone from time to time. It usually clears up in a couple of days and is not serious. However, it can be serious in babies and the frail and elderly, because of the risk of dehydration.



Livestock market Photo: Practical Action / Simon Ekless

Chronic diarrhoea may be a result of a more serious disorder. Diarrhoea is caused by intestinal pathogens, which are transmitted from the anus of the infected person to the mouth of a susceptible person. This faecal-oral transmission can take place directly (such as on hands) or via contaminated food or water. In transferring the pathogens from faeces to food or water, a fly can easily contaminate the only sources of nutrition available to Maasai families.

It is not just the health of the families that is at stake, but also the health of their livestock, which is their livelihood. Cows that leak milk in between milking periods are frequent targets for feeding flies. Cows that leak milk are more likely to have mastitis (a bacterial infection causing inflammation of the udder), making it likely that the fly will pass on these bacteria.

Biting flies are also a problem for livestock. They often bite on the teats and teat ends of cows where the skin is thin, which causes wounds and scabs where mastitis bacteria readily grow. The *Moraxella* bacteria that cause pinkeye are also prominent in the tears and discharge from calves for flies to feed on. When fly populations are high, pinkeye spreads rapidly from calf to calf as flies feed from one moist area to another.

## Fly Control

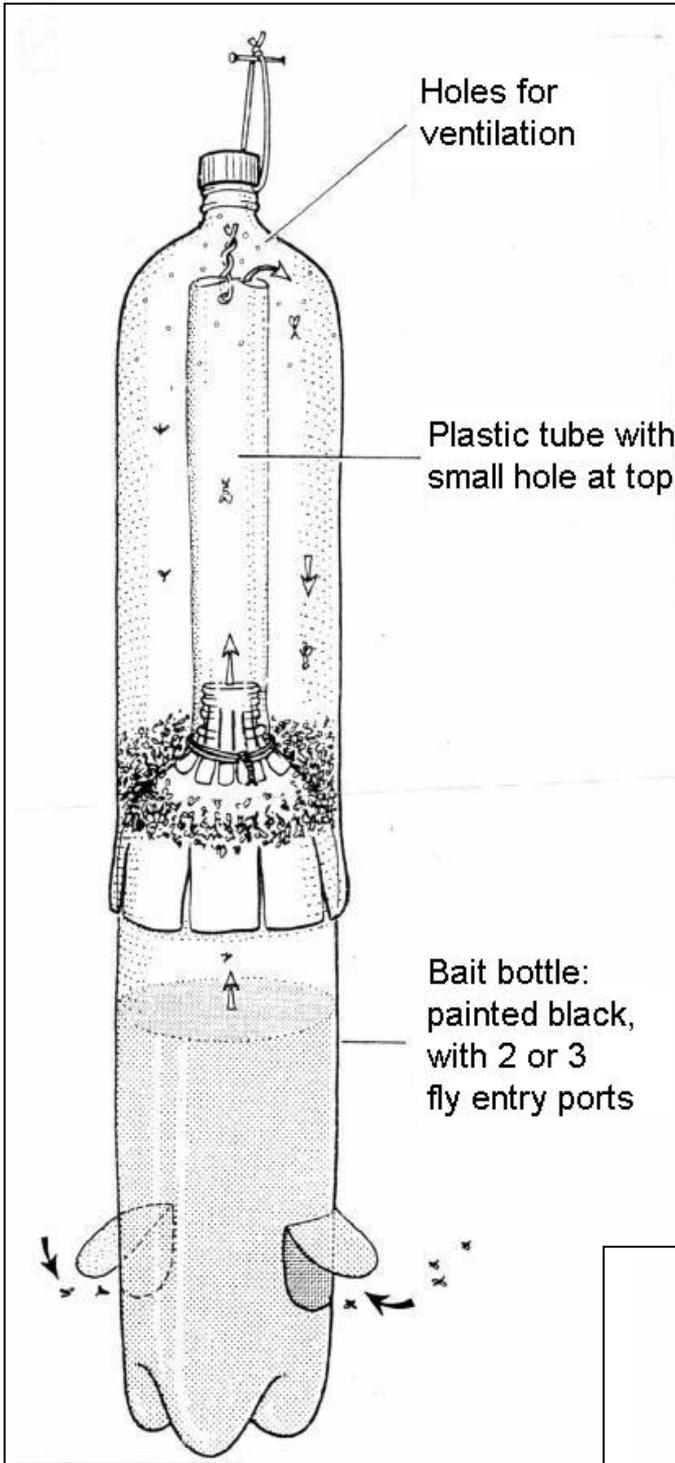
The basic strategy for controlling flies is to reduce the number of potential breeding locations. The primary fly breeding locations are in fresh manure, in bedding materials such as straw, or around decaying plant material such as silage or hay. Removal of these breeding sites is the cheapest means of controlling flies. However, the lifestyle of Maasai families is not always conducive to such changes, which may negatively affect their coping strategies. More expensive steps for fly control may include biological control and insecticides, which are unavailable to nomadic Maasai families.

An intermediate measure is the introduction of low-technology fly traps. Commercially produced fly traps of a variety of shapes and sizes have been used for decades in the developed world, but due to their costs have not spread to the most rural areas of developing countries. In Kenya the Maasai families are learning to construct their own simple fly traps from two discarded plastic bottles. Traps of this type have led to a 40 per cent decline in the fly population and a 30 per cent reduction in new cases of trachoma.

It has been observed that, after feeding, flies fly upwards towards light. The bottle trap makes use of this trait. Fly bait, such as goat droppings and cow urine, is added to a darkened lower bottle. After the insects have fed, they are attracted to the light and fly up the plastic tube and into a clear bottle above, where they die of exhaustion and exposure to ultra violet (UV) light.

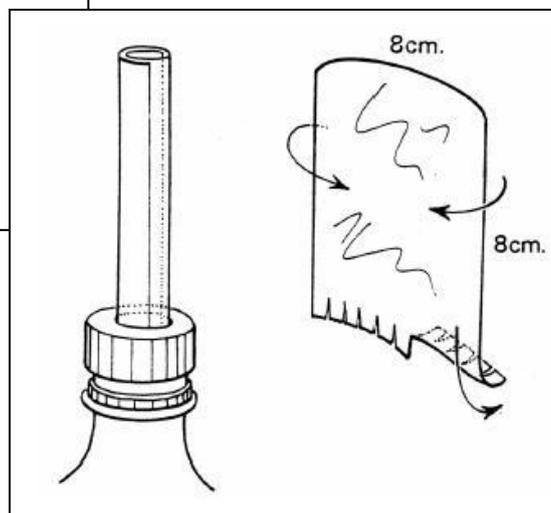


The fly trap in use: Photo: Practical Action / Simon Ekless.



Points in construction:

- The lower bait bottle should be opaque. This can be done by painting it black or plastering it with mud.
- Keep the inner tube the right size with rubber bands while wiring the bottom to the bait bottle. The holes at the upper end should be quite small.
- Positioning the bottle. It is best hung just off the ground in the shade.
- Bait. In Kenya goats droppings and cows urine have been used. Flies also favour the morning urine and stool from a small child. Sour milk can be used.



An alternative, and perhaps simpler, method of making and fixing the tube © TALC, 2005.

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To make the tube inside the catch bottle, a piece of plastic (roughly 8cm by 8cm) can be cut from the body of another bottle. Small slits need to be cut in the bottom and bent out as shown in the diagram to make a 'frill'. Roll the plastic around a pencil, wrap a piece of string

around it and place it in hot water (3 parts boiling to 1 part cold). Remove the string; it should keep its shape. Make a hole in the screw top by holding it over a candle, allowing the plastic to darken and soften. Push a pencil through and enlarge the hole. Push the tube up and through this hole, leaving the frill emerging beneath the cap. The frill should now be pinched between the bottle top and the cap when the cap is screwed onto the bait bottle.

### Other Fly Traps: The Tsetse Problem

Farmers and nomadic pastoralists in Kenya face a constant battle against a particular pest – the tsetse fly. This tiny insect carries a disease called trypanosomosis, which can devastate whole herds of cattle and destroy the livelihoods of farmers and pastoralists and their families.



A tsetse fly trap: Photo: Practical Action / Simon Ekless.

Research carried out by the Kenya Trypanosomiasis Research Institute, the national research organization mandated to research and control tsetse and trypanosomosis in Kenya has shown that the tsetse fly hide and breed in thickets. The Kathekani tsetse flies are commonly found in game parks, where they are carried by buffaloes and elephants. The fly then moves on to cows on neighbouring villages in Kathekani, with devastating effects for local farmers. The research had also shown that the tsetse fly could be tricked into thinking that a cloth model of a cow is a real animal. The flies are attracted by the smell from two bottles hanging on the model, one containing acetone and the other cow's urine. They are attracted to the underside of the model, in an attempt to suck the cow's blood. When they realise that it is not a cow, they fly towards the light, which is provided at the apex of the model cow being made from mosquito netting and a polythene cage, which are supported by a stick. There in the polythene cage, they die from exhaustion and exposure to UV light.

Pilot testing has been carried out by Practical Action in the Kathekani area of Kenya. When it began, with ten traps, each trap caught 2,000 flies every day (a total of 20,000 tsetse fly). Over time and with the number of traps increased to 160, just 22 tsetse fly catches are made a day (a total of 3,520 flies). Accordingly, the level of livestock infection by trypanosomosis has reduced to 6% from 32% in a period of 6 years since 1998. This shows how successful the traps have been in reducing the fly population.

### References

[Community-based Tsetse Fly Management: Through the Use of Trapping Technology](#). Practical Action Technical Brief

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Teaching Aids at Low Cost. (2005) *Plastic Bottles in Primary Health Care*. St Albans: [TALC](#).

## Resources

*Teaching Aids at Low Cost. (TALC)*

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There is a downloadable publication on flytraps available on:

<http://www.talcuk.org/accessories/talc-fly-trap.htm>

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