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Participatory Assessment of Incidence and Perception of Bovine Trypanosomosis by Cattle Farmers in Dano, Western Ethiopia

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Introduction

Trypanosomosis counts as a major constraint to small scale cattle keepers in Sub-Saharan-Africa. So in Dano, a district in central Ethiopia. Extrapolating the impacts of trypanosomosis from studies in several African countries into the life of Dano farmers, they suffer from weak animals, small cattle herds, constraints in plant production due to reduced draft power and expenses for trypanocidal drugs (Swallow, 2000). To free farmers from the burden of this disease, plenty of approaches are available which could be applied to eradicate trypanosomosis and its main vector, the tsetse fly from the area. Participatory approaches are promosing due to independency from external support but strongly rely onto high involvement and the identification of target groups with the actions at all steps of development and conduction of applied actions to ensure sustainability. This study seeks firstly to analyze trypanosomosis prevalence in Dano, and secondly to investigate farmers incentives and behaviors to the disease for an optimal embedding of potential eradication efforts into farmers background of cultural and knowledge.

Materials and Methods

The research took place in Dano, approx. 300 km west from the countries capital, Addis Ababa. Elevation in the research area ranges from 1400 to 1700 meters above sea level and daily temperature ranges between 15° and 30° Celsius. During two rain seasons, one long and a short one, the land receives 800-1200 mm rain per year. About 83 000 people live in Dano, which is distributed over an area of 639 sq. km. They mainly feed on teff, (which is a local grain) maize and sorghum. Farmers also keep a wide range of livestock, including chicken, small ruminants, equines and cattle. In a previously conduced study, farmers were reporting drought, diseases and feed shortage to be the three limiting factors for cattle raising.

Three different kinds of Data were collected to prove bovine trypanosomosis presence in Dano and to record farmer's incentives and behaviors to the disease. Firstly, a state of the art infection

rate was detected by using the field applicable trypanosomosis detection method "buffy coat technique" (BCT), as described by Murray et al. (1977). 248 randomly selected cattle from three different locations (Dano Shannan, Gidda&Abbu and Seyo Gambella) were tested by microcentrifuging blood samples in plain capillary tubes, measuring packed cell volume (PCV) and examining the buffy coat zone microscopically for the presence of trypanosomes, according to the method description.

Secondly, a survey was conduced which aimed to analyze the effects of the disease and farmers incentives to the disease. 63 Farmers, 21 from the three sub locations, respectively, were asked semi-structured interviews which included questions about locally occurring cattle diseases and about transmission and treatment strategies of trypanosomosis. Additionally, questions about the presence and problems with tsetse flies were included.

In a next step, farmers were tested about their practical skills in identifying trypanosomosis infected cattle. In a farmers meeting, those farmers with actually trypanosomosis infected cattle were asked to raise their hand, register their names and infected cattle. Later they were asked to take their infected animals to a meeting point to receive free treatment, if blood tests would confirm trypanosomosis infection. 83 Cattle from 72 Farmers were registered and appeared to the meetings. The registration form for the treatments included questions about animal's age, its disease history and applied treatments at the particular animal. All cattle were examined for PCV and trypanosomosis infection, according to BCT (Murray et al., 1977). Those animals which could positively tested for trypanosome in their blood and those with a PCV below 26 received a trypanocidal drug treatment.

Results

Household size was found to be 8.5 persons per family. The sampled households cultivate 3.16 ha of land (min 1 ha, max 12 ha, ± 1.86) for crop production and keep 14.9 cattle. Assuming a 100% recognition rate of infected cattle with the applied methodology, the overall prevalence of bovine trypanosomosis in Dano was 14.4%, including infection of T. congolense (12.5%) T. vivax (4.6%) and T. brucei (0.4%). 2.4% were mixed infections of T. congolense and T. vivax. Significant differences were observed in the prevalence amongst the three sub locations: Dano Shanan (9.6%), Gidda Abbu (18.4%) and Seyo Gambella (11.5%). Similar distribution of trypanosome infection was found among the three body condition categories ($p>0.1$). Animals with poor body condition had same infection rates as the ones with medium and good body conditions. Additionally, no differences in prevalence could be identified between sex and age groups.

	T. congolense	*T. vivax*	*T. brucei*	Infected total	not infected
Dano-Shanan	8.22%	2.74%	0.00%	9.60%	90.40%
Gidda&Abbu	14.97%	7.48%	0.68%	18.40%	81.60%
Seyo-Gambella	11.48%	0.00%	0.00%	11.50%	88.50%
Total	**12.46%**	**4.63%**	**0.36%**	**14.40%**	**85.60%**

***Table 1**: Trypanosomosis infection rates from random cattle herds in three PAs of Dano*

The minimum detected PCV was 14%, and the maximum value was 45%. Both extreme values were found in Seyo Gambella. Significant differences were not found between PCV of cattle from Dano Shanan (25.6% ± 3.5) and Gidda Abbu (25.4% ±3.5) but Seyo Gambella animals had slightly ($p < 0.001$) higher PCV (27.07 ±4.5) (Table 1). If the suspected outlier (45% PCV from

one animal in Seyo) was taken out, the differences were not significant. Cattle which were negatively tested for trypanosomosis had a significantly ($p < 0.001$) higher PCV value than infected ones (26.11±3.6% vs. 23.95% ±4.1).

One hundred percent of the interviewed farmers named Trypanosomosis as major disease in their area, followed by Anthrax and Blackleg with 92% and 69.8% of respondents, respectively. Farmers show consistency in drug supply behavior. Four methods were mentioned (Self-treatment, Drugstore, veterinary clinic and the consultancy of local healers) of which each of them was practiced by more than half of interviewed farmers (74.1%, 63.5%, 61.9%, and 58.7% respectively). Explanations about the transmission of the disease are manifold. However, many responses could be identified as "physical contact" and thus, were summarized in one group. 49% of respondents believe that the highest risk for their animal to become infected by trypanosomosis arises from "physical contact with infected" cattle. Adding "contact with contaminated dung", "contaminated water" and "breath of infected animals" would accumulate the number of answers for the category "physical contact" to 79%. 33% of farmers do not know the method of transmission and 6% name Tsetse fly as the disease transmitter. All but two (97%) of farmers believe that Tsetse flies are present in their neighborhoods. The two farmers are from Dano Shanan and are not even familiar with the insect. The main problem with tsetse flies was reported to be blood sucking, resulting in thin animals (94%). Forty-six percent see disturbance of animals as the main problem from the fly. Some farmers are emphasizing the problem when the flies attack plowing-oxen. Animals then become aggressive and sometimes even destroy plowing tools. Causing weight loss in the animals is found to be the major problem by 37% of the farmers. Only 25% of the respondents recognize transmission of diseases as a problem. Seven farmers (11%) knew that Tsetse fly is a vector for trypanosomosis transmission thereby the remaining 14% did not know which particular disease is transmitted by the fly.

From eighty-eight cattle, of which all were declared to be sick from trypanosomosis by their owners, twenty-six could be positively tested for trypanosome in their blood by applying BCT (Murray, 1977). In 66% of all cases, a PCV below 25 could be observed. Slight differences were found in PCV values between infected (22.7) versus not infected (24.5) animals ($p=0.44$). Ten of twenty-four (42%) apparently sick cattle of Dano Shanan farmers were positively tested for trypanosomosis. From twenty-four samples which were taken of Gidda Abbu cattle, nine were found to be positive for trypanosomosis (37.5%). In Seyo Gambella, seven of forty (17.5%) tested cattle were found to be infected with trypanosomosis. According to interviews with the owners, only three cattle - which all were negatively tested for trypanosomosis - received trypanocidal drugs within the last four months prior to the bleeding.

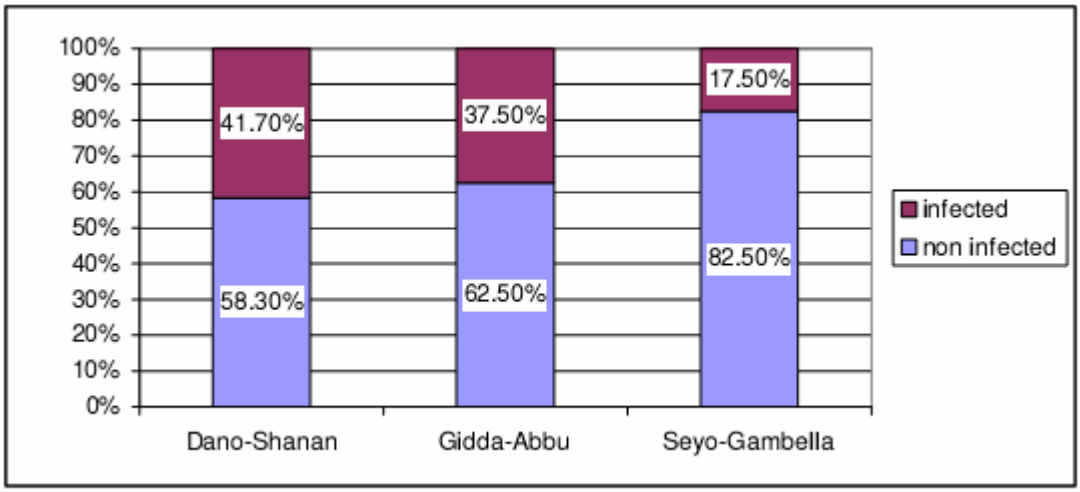

***Figure 1**: Trypanosomosis infection rate of cattle which were declared to be sick of the disease*

Only 17.5% of the farmers are actively undertaking actions to reduce tsetse fly impact on cattle; 12.7% of them were from Gidda Abbu, 4.8% from Dano Shanan whereas no farmers from Seyo Gambella are undertaking any action to lessen tsetse impact. 9.5% of the farmers are protecting animals with homemade ointments from local plant leaves, 6.35% farmers expose their cattle to smoke from a fire, and a single farmer was found to regularly spray DDT onto his animals.

Discussion:

Bloodtests were showing that trypanosomosis is prevalence in the area, especially, when seen in the context of a generated participatory trypanosomosis seasonality calendar, that showed that bloodtests were taken in a season where new infections from the disease only happen sporadically (*Figure 2*).

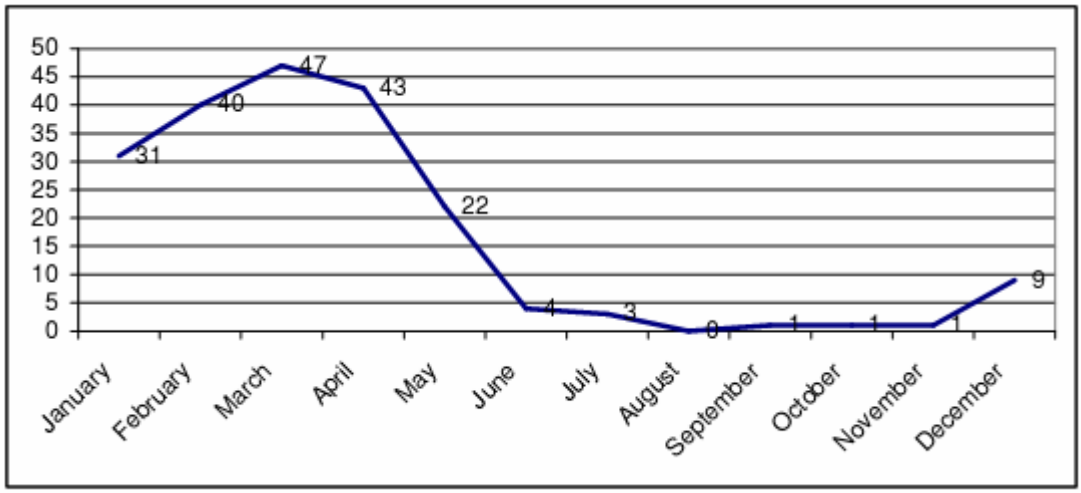

Figure 2: Dano Participatory Seasonality Calenadar of Trypanosomosis infection rates in Cattle - X-Axis Counts Farmers (n=63) which see a high risk of cattle to be infected with trypanosomosis in the particular month

The noticeably high degree of anaemia among analysed cattle might be a hint for recently recovered or undetected trypanosomosis infection. Rowlands et al., (2001b) suggested to treat

cattle in the high tsetse and trypanosome challenge of the Ghibe valley with trypanocidal drugs if their PCV reached a value of below 26%, assuming that internal parasites were not a problem in the area. Findings from this study would then result in a 62% infection rate, drawing a completely different picture. However, a parallel survey about internal parasites prevalence on the same sample herds by researchers from a nearby governmental research station identified a very high prevalence of GIT parasites in Dano cattle (Temesgen, unpublished), which partly explains the low PCV. Also poor nutrition status is reported to be the reason for low PCV in animals (Akinbamijo et al., 1998). Surely suboptimal nutrition can be assumed for cattle in Dano, where farmers were rating "feed shortage" and "overgrazing" as their second and forth most important problems of cattle raising, respectively. It could be concluded that trypanosomosis prevalence in Dano might well be higher than results of this study might suggest. A similar study at the expected peak season of infection is necessary to shed more light on this.

The BCT blood analysis to confirm disease presence resulted in a surprisingly low 24% infection rate among those animals which all were declared to be sick of trypanosomosis. A different picture appears, when PCV was taken as an indicator for trypanosomosis infection, as applied in Rowlands et al., (2001b) for trypanosomosis detection in the Ghibe Valley. 75% of tested cattle were found to have PCV below 26. As stated before, anaemia of cattle in Dano is also caused by malnutrition and GIT parasites, and therefore all of those animals with PCV value of below 26 cannot be assumed to suffer from trypanosomosis. A comparable study from Kenya was demonstrating a similar level of knowledge about trypanosomosis among farmers (Machila et al., 2003). Over half of diagnoses were inconsistent with farmers' views. A higher level of knowledge was reported from West African countries Mali, Burkina Faso and Guinea (Grace, 2006), where 46 from 49 cited clinical signs of trypanosomosis were found to be consistent. Shaw (2003) concluded that the higher danger from trypanosomosis and tsetse in western Africa was resulting in higher awareness among farmers, thus in better skills of management and knowledge.

Only 6% of farmers understood the link between tsetse flies and trypanosomosis. Other mentioned factors could be seen as factors which increase the risk of trypanosomosis transmission but also transmission of other diseases, mainly contagious ones: Farmers believe that physical contact with infected animals, grazing in the same area, increases the risk of cattle to be infected with the disease.

Also watering points, which were mentioned by the farmers as a source of transmission, are danger zones because they are often found to be surrounded by trees and shrubs, a favored environment for tsetse flies (Leak, 1999). Additionally, those watering points offer favorable conditions for other disease agents and therefore contamination with a variety of diseases often takes place at communal watering points (Seifert, 1996).

All farmers recognized tsetse flies as a problem for cattle. The most important effect was seen in disturbance of cattle. Some farmers mentioned it in the context of flies disturbing animals while grazing, to the point where some oxen became aggressive and uncontrollable while plowing due to being harassed by flies, sometimes even causing the oxen to destroy plows. Farmers see a linkage between the bites of the fly and thin cattle. Whatever those negative impact might be, farmers recognized the fly as a disturbing factor. This point could be taken as a step-in point to arise awareness of tsetse fly eradication technologies. Surrounding cattle with smoke was found to be one of the applied methods in order to reduce tsetse fly contact on cattle. A report by DFID, (2005) also found similar behavior amongst farmers living in southern Ethiopia. Tests of this method verified greater than 80% reduction of tsetse catches in smoked traps. However, it was concluded, that the reduction from ten bites to one still would infect cattle with trypanosomosis.

This method could be seen much more as an add-on to small scaled integrated packages of trypanosomosis control, rather than a primary form of treatment (Torr, unknown). Effects of local herb ointment might show similar results. No useful information about local herbs for tsetse control was found in literature. No preventive insecticide application was found by farmers, except one for one who was spraying DDT on his cattle.

It could be concluded that the level of knowledge among Dano farmers about trypanosomosis, its transmission and diagnosis, was insufficient to apply effective disease control methods. Basic teaching about trypanosomosis and its characteristics might increase awareness and possibly lead to a higher sensitivity to locally available tsetse fly control methods. However, there might not be enough changes if no external control programs are offered, because even without knowledge about the linkage between trypanosomosis and tsetse, the fly was seen as a problem for cattle and nonetheless no widespread activities had been applied to prevent tsetse flies.

Conclusion

Bovine trypanosomosis was found to be a notable constraint to cattle keepers in Dano. Farmers were aware of the threat but lacked an appropriate level of knowledge to control the disease. Only 24% of apparently sick cattle could positively be tested for trypanosome in their blood. Improvement of farmers' livelihoods through increased utilization from cattle can be ensured if control or even eradication of trypanosomosis in Dano will be included in future actions. Teaching, vector control and controlled drug applications seem to be most suitable methods in the efforts to control the disease. Findings from this study reveal a high unused genetic potential in the local cattle breed to resist diseases resistance. More intensive actions could firstly be an improvement of animal health service, for example by installing a basic animal health service system, and secondly, the genetic improvement of the breed.

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