

Infection prevalence of ovine fasciolosis
in irrigation schemes along the Upper
Awash River Basin and effects of
strategic anthelmintic treatment in
selected upstream areas

by

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Outline

- Background and rationale
- Objective
- Materials and Methods
- Major findings - Discussion
- Conclusion and recommendations
- Acknowledgements

In collaboration with

Addis Ababa
University
(Since 1950)



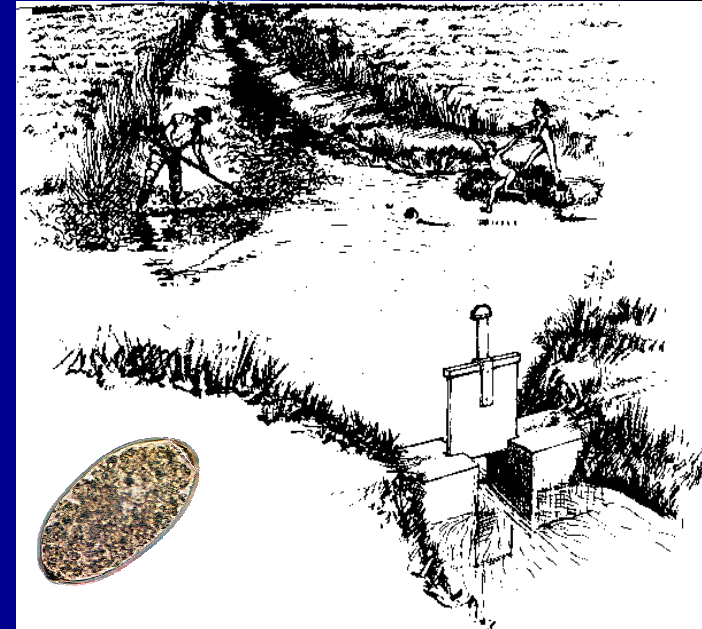
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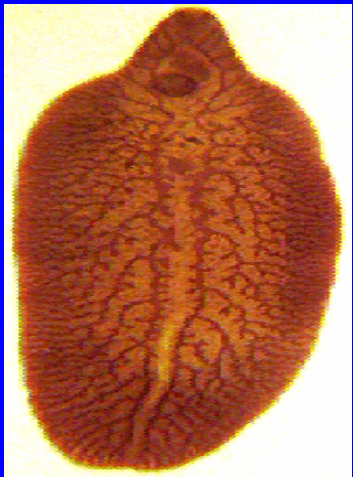
Ethiopian Agricultural Research
Organization (EARO)

Background and rationale

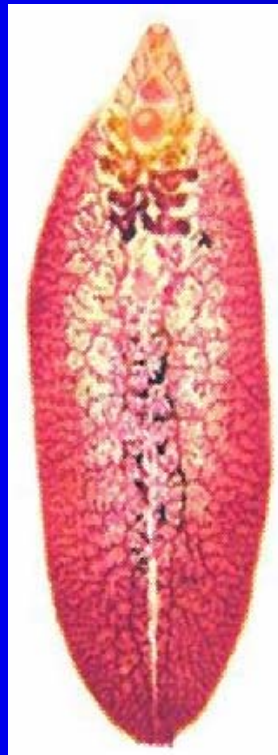
- Ethiopia - Agriculture is pillar of the economy
- Considerable dependence on natural rain
- Subsistence crop-livestock mixed farming in highlands and pastoralism in the lowlands
- Expansion of irrigation projects
 - Change in land use pattern
 - Intensification of labour
 - Enhance food security
 - Ensure sustainable agriculture
 - Increase risks of water-borne diseases (e.g. fasciolosis, malaria, schistosomosis)



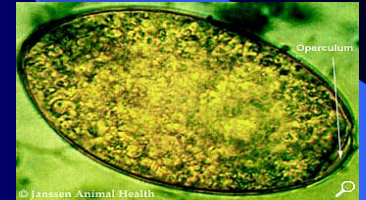
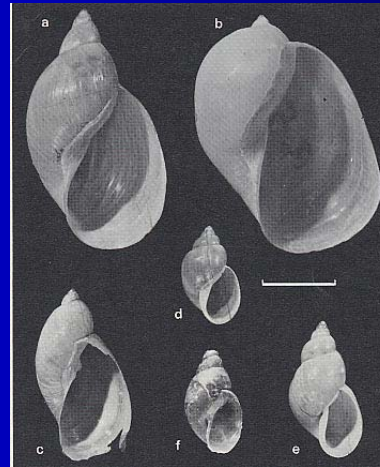
Ruminant fasciolosis



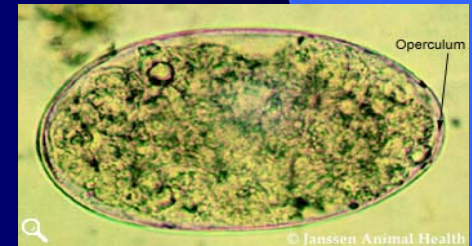
F. hepatica



F. gigantica

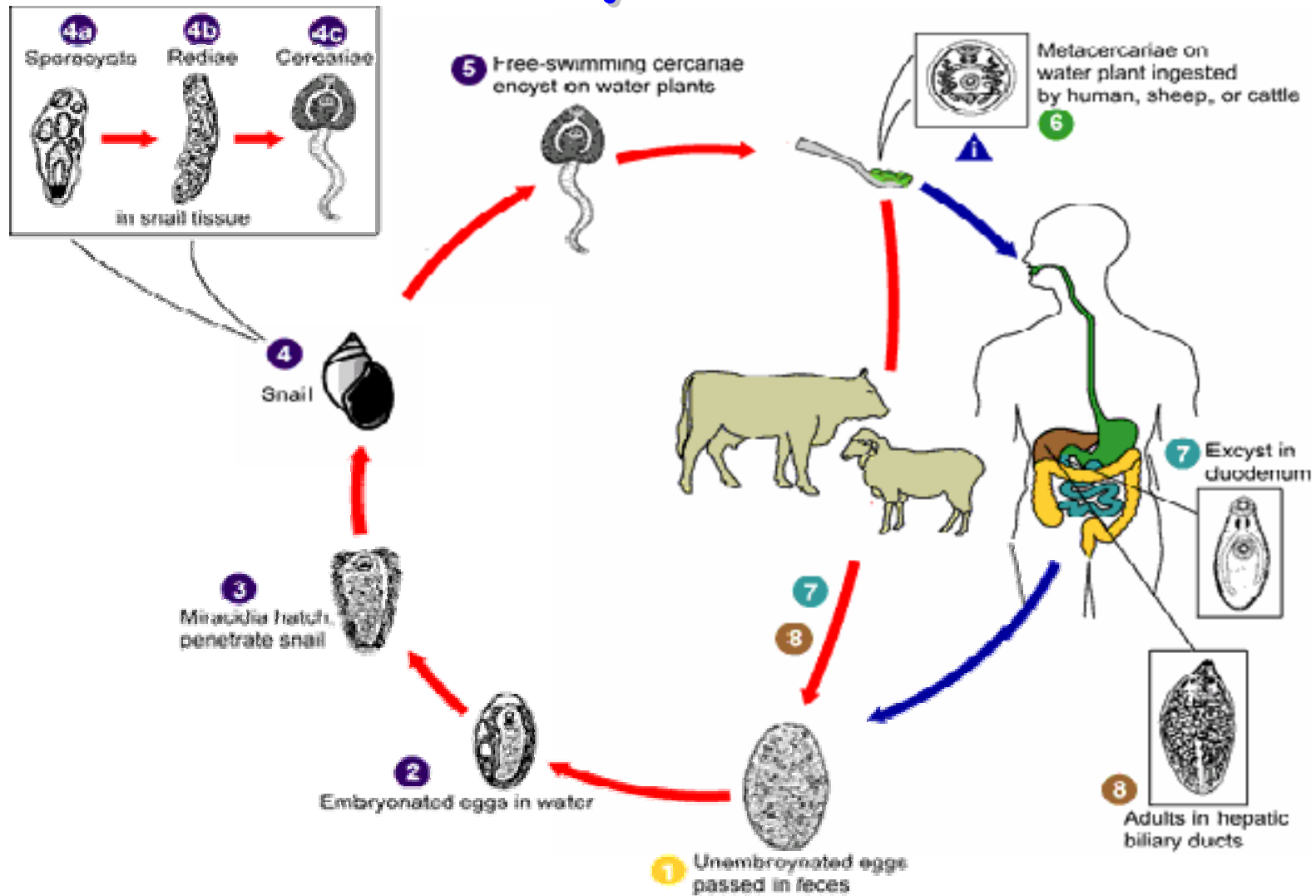


Fasciola egg

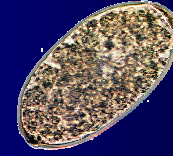


Paramphistome egg

Life cycle



Background (cont'd...)



● Fasciolosis

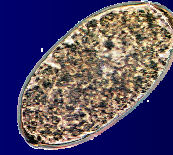
➤ Economic importance

- found 5 continent (WHO, 1995)
- loss US\$ 200 mill. /annum (Ramajo *et. al.*, 2001)
- 600 mill. animals infected (Ramajo *et. al.*, 2001)

➤ Zoonotic Importance

- 1970-1990: about 2600 pos. from 42 countries (Slifko *et. al.*, 2000)
- 2.4-17mill. global prevalence (Slifko *et. al.*, 2000) and 180mill. at risk (Ramajo *et. al.*, 2001)

Background (cont'd...)



➤ Common transmission route

- Ingestion of contaminated vegetation.
Eg. irrigated area
- water containing floating metacercariae

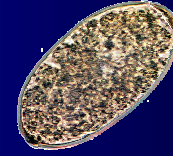
➤ The risk factor

- waste water effluent for irrigating vegetables
- use of animal manure as fertilizer

➤ Epidemiology of the disease influenced by

- grazing habits
- rate of egg production

Background (cont'd...)



➤ Control

- Control of snail population
- Environmental sanitation and manipulation
- Application of cost effective treatment

➤ Situation in Ethiopia

- 23.62 mil. Sheep (CSA, 2004)
- 75MT of mutton/annum (FAO, 2002)
- Financial loss due to fasciolosis
 - ★ 48.8 mill. Eth. birr/annum (Ngategize, *et. al.*, 1993)
 - 46.5% weight loss
 - 48.8% liver condemnation
 - 4.7% mortality

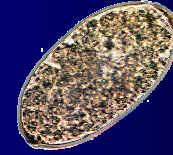
Objective



General objective: -

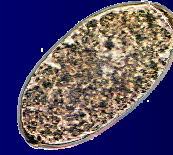
To assess the potential impacts of community-based irrigation on the spread of fasciolosis in the Upper Awash River Basin.

Specific Objectives: -

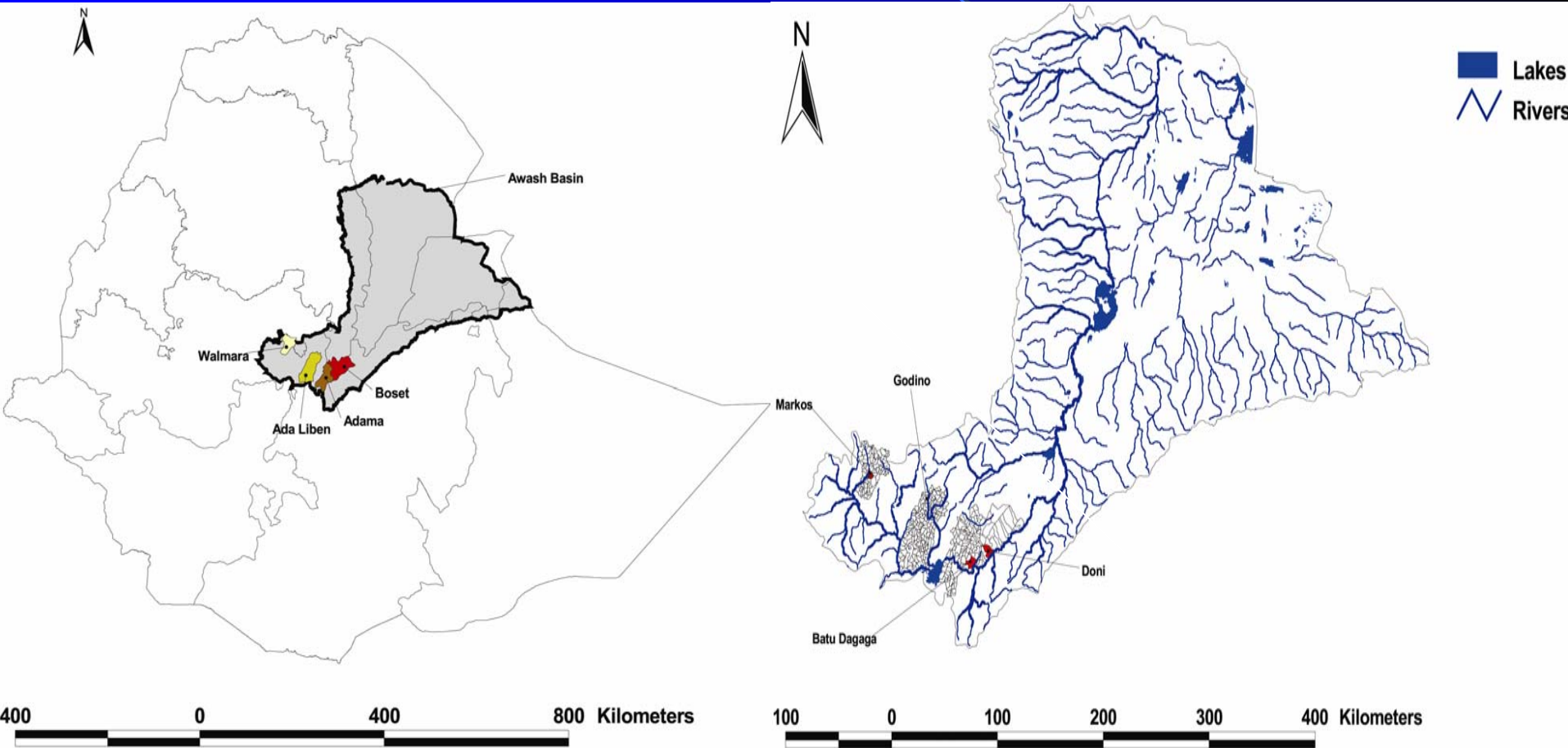


- To determine the seasonal variations in infection prevalence of ovine fasciolosis in community-based irrigation schemes in different agro-ecological zones of the Upper Awash River Basin.
- To assess the fauna of intermediate snail hosts in grazing areas and watering points.
- To evaluate the effects of strategic anthelmintic (flukicidal) drug treatment on some indicative parameters in an upstream (Wolemera) locality.

Material and Methods



Study areas



Map of Ethiopia showing the study sites in the Awash River Basin.

Materials ... (cont'd)



Study animals

Study protocol

- **Infection prevalence**

- ✓ Coproscopic examination (MAFF, 1986)

- **Snail survey**

- ✓ Quadrant (1m x 1m) techniques (Yilma, 1985) & Scoop
- ✓ Snail survey record (WHO, 1968)

- **Effects of strategic anthelmintic treatment**

- ✓ Coproscopic examination (EPG)
- ✓ Packed cell volume determination (PCV) (Hansen and Perry, 1994)
- ✓ Body weight measurement (Kg)
- ✓ Body condition scores (BCS 1-5)
- ✓ Mortality and off-take rates

Materials... (cont'd)



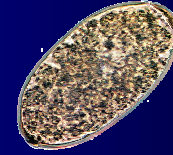
● Estimation of economic benefits from strategic treatment

- ✓ Body weight gain of the animals
- ✓ Cost of treatment

Statistical analysis

- ✓ Chi Square (χ^2) test (SPSS 10.0 for windows)
- ✓ One-way ANOVA and General Liner Model (GLM) (SPSS 10.0 for windows)

Results and Discussion



Infection prevalence (November 2003 – October 2004) (n=1296).

Category	Number examined	Number and percent positive
1) Altitude		
Highland	529	333(62.9%) ^a
Mid-altitude	302	154(51%) ^b
Lowland	465	242(52%) ^b
2) Season		
Dry	690	370(53.6%) ^a
Wet	606	359(59.2%) ^b
3) Grazing land		
Irrigated	732	445(60.8%) ^a
Non-Irrigated	564	284(50.4%) ^b
4) Age		
Young	665	368(55.3%) ^a
Adult	631	361(57.2%) ^a
5) Sex		
Male	306	183(59.8%) ^a
Female	990	546(55.2%) ^a

Different letter (a, b) along columns signify the presence of significant difference

Results (cont'd...)

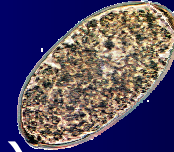


Prevalence by grazing land, season and altitude (November 2003 - October 2004 (n=1296))

Grazing Land	Dry season (prevalence rate (%))				Wet season (prevalence rate (%))				Overall total
	Highland	Mid-Altitude	Lowland	Total	Highland	Mid-Altitude	Lowland	Total	
Irrigated grazing land	64.5 ^a	57.3 ^a	58.3 ^a	61.1 ^a	64 ^a	54.4 ^a	61.5 ^a	60.3 ^a	60.8 ^a
Non-irrigated land	57.3 ^a	37.3 ^b	32.1 ^b	41.8 ^b	63.5 ^a	52.9 ^a	55 ^b	58.1 ^a	50.4 ^b
Total	62.3	47.9	46.9	53.6	63.7	53.8	58.4	59.2	56.3

Different letters (a,b) along columns signify the presence of significant difference ($p < 0.05$).

Results (cont'd...)



Feecal *Fasciola* egg output (Mean±S.E.) (n=729)

Category	Number positive	Mean±S.E.
1) Altitude		
Highland	333	270±1.06 ^a
Mid-altitude	154	188±1.09 ^b
Lowland	242	170±1.07 ^b
2) Season		
Dry	370	162±1.06 ^a
Wet	359	260±1.06 ^b
3) Grazing land		
Irrigated	445	237±1.05 ^a
Non-Irrigated	284	178±1.06 ^b
4) Age		
Young	368	251±1.06 ^a
Adult	361	182±1.05 ^b
5) Sex		
Male	183	218.77±1.09 ^a
Female	546	213.80±1.05 ^a

Different letters (a,b) along columns signify the presence of significant difference (

Results (cont'd ...)



Snail survey

Habitat preference and density (snail/m²) (November 2003 - October 2004)

<i>L. truncatula</i> / m ²		Highland	Mid-altitude	Lowlands
Site 1 (near the diversion point)	Dry	2	2	2
	Wet	6	4	2
	Sub total	8	6	4
Site 2 (between the diversion and farm)	Dry	10	3	3
	Wet	8	6	5
	Sub total	18	9	8
Site 3 (within the farming areas)	Dry	13	8	7
	Wet	16	8	7
	Sub total	29	16	14
Grand Total		55	31	26

Results (cont'd ...)



Effects of strategic anthelmintic treatment (November 2003 - October 2004) (n=80)

Treatment groups	No. exam.	Indicator parameters (Mean±S.E.)			
		EPG	PCV (%)	Body wt. gain (kg)	BCS
Group I (once)	23	0.35±1.55 ^b	3.56±1.16 ^b	0.90±0.73 ^a	0.17±0.08 ^a
Group II (twice)	28	0.03±1.32 ^c	6.50±1.28 ^b	4.10±0.76 ^b	0.57±0.09 ^b
Group III (Untreated control)	29	3.09±1.26 ^a	-2.03±0.91 ^a	0.27±0.90 ^a	-0.02±0.05 ^a
Total	80	0.32±18.20	2.56±0.76	2.30±0.49	0.24±0.05

Different letters (a, b and c) along columns signify the presence of significant

Results (cont'd...)

Estimated economic benefits from strategic treat.*

Groups	Body weight gain (BWG) (Kg)	Approximate unit price of BWG (Kg)	Gross value Birr	Net value Birr
Group I	0.9	6.82	6.14	5.24
Group II	4.1	6.82	27.96	26.16
Group III	-0.27	6.82	-1.84	-1.84

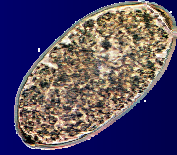
*Price of TCBZ = birr 0.90/300mg (1 bolus)

Conclusions



- ✓ As compared with mid-altitude and lowland areas, the highland grazing areas are more favorable for the propagation and activity of the snail intermediate hosts and progression of the life cycle of *Fasciola spp.* for most months of the year.
- ✓ There was no significant difference in the prevalence of fasciolosis between season and the grazing land types (irrigated and non-irrigated) in the highlands.
- ✓ Significant increase in fasciolosis prevalence associated with irrigation was observed
 - ✓ Mid-altitude = during dry season
 - ✓ lowland = during dry and wet seasons
 - ❖ Irrigation influences prevalence of fasciolosis in moisture deficient areas and seasons

Conclusions (cont'd...)



- ✓ Snails were most abundant in the highlands as compared with mid-altitude and lowland areas.
- ✓ No variation was recorded in water pH and temperature values between the study sites and snails were found to inhabit within the tolerable biotic threshold ranges.
- ✓ Economic benefits of different levels of strategic treatment showed that twice treatment conferred a net-profit of 26.16 birr/sheep and one-time treatment provide a net profit of 5.24 birr while no treatment showed a loss of 1.84 birr/sheep.
- ✓ Smallholder farmers have also appreciated the added non-monetary values.

Recommendations



- Proper management of community-managed irrigation schemes is necessary in order to reduce the losses due to ovine fasciolosis
- Strategic anthelmintic treatments must be applied at appropriate times, and with the aim of reducing worm burden from infected animals and to reduce pasture contamination.
- Twice (Triclabendazole 10mg/kg BW) treatment was confirmed to be the most economical approach recommended in the context of smallholder mixed crop-livestock system in the highlands of Ethiopia.
- It is recommended that small holder farmers and Development agents should be aware of the importance of using anthelmintic and administered it at the right time in order to improve the productivity of sheep.

Acknowledgment

- **My research advisors:-** Drs. Beyene Petros, Yilma Jobre, Don Peden, Yoseph Shiferaw and Girma Tadesse
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Thank you

