



Challenge and Prevalence of Fasciolosis in Cattle in Pursat Province, Cambodia

Research article

VANDARA LOEURNG*

Faculty of Veterinary Medicine, Royal University of Agriculture, Phnom Penh, Cambodia
Email: vandara_loueng@yahoo.com

BUNTHON CHEA

Faculty of Veterinary Medicine, Royal University of Agriculture, Phnom Penh, Cambodia

SOTHYRA TUM

Department of Animal Production and Health, Phnom Penh, Cambodia

MOM SENG

Royal University of Agriculture, Phnom Penh, Cambodia

Received 21 December 2015 Accepted 11 April 2016 (*Corresponding Author)

Abstract Poor nutrition and fasciolosis have significantly decreased cattle productivity. Flood is one of the well-known Climate Changes affected cattle production in Cambodia. The present of permanent water bodies in these inundated areas may be provided favorable environment for lymnaeid snail, the intermediate host of *Fasciola gigantica*. Therefore, the study aimed to identify challenges in cattle production and the risk factors of *F. gigantica* infection in cattle after flood in Ou Tapong, Bakan, Pursat, Cambodia during December 2014 to June 2015. The 88 households were interviewed on challenges and risks of husbandry practice by using questionnaire. The total 171 fecal samples from flooding area (n=108) and non-flood area (n=63) depend on the number cattle in each area. Age, sex and health status were determined individually. Fecal were examined by using Modified Balivat Fasciola egg and counting technique. The result found that there was significance ($p < 0.001$) between the prevalence of fasciolosis in flooded areas (25.00%) and non-flooded areas (1.60%). It was noted that higher infection rates in female (19.70%) and male (2.90%) were found. The present of *F. gigantica* was found in older cattle (≥ 3 years) that was significantly higher than young cattle (< 3 years) at the rates of 23.20 % and 7.90 %, respectively ($p < 0.01$). The prevalence *F. gigantica* was highly different ($p < 0.001$) among emaciated, thin, medium and fat of body condition score of cattle. Risk factor for cattle fasciolosis infection was demonstrated that cattle was fed by cut and carry water grass derived from inundated area (natural lake) and had significant association ($OR = 0.61$) with prevalence of fasciolosis in cattle through logistic regression model. Following by focused group discussions, problems encountered in cattle raising caused flood including pen flooding, lack of feed and susceptible to disease. However, only 25.00% prepared feed before flood season and others did as habitation in local. Therefore, flood may be a factor to contribute to occurrence of fasciolosis in cattle. Traditional adaptation in cattle raising of farmers seems to be neglected to improve cattle production.

Keywords *Fasciola gigantica*, cattle, prevalence, flood, climate change, Cambodia

INTRODUCTION

Cattle production plays a vital role in the rural Cambodia economy, providing draught power, cash income and as a source of fertilizer. In 2013, livestock accounted for 14 percent of total agriculture

GDP (MAFF, 2014). Climate change has various impacts on the livelihoods of rural farmers in Cambodia as they majorly depend on agriculture for living. Flood, one of the well-known climate changes, is a core factor for low cattle productivity due to the loss of grazing pasture and shelter and occurrence of diseases (MoE, 2014). The presence of permanent water bodies in these inundated areas provided favorable environment for lymnaeid snail, the intermediate host of *Fasciola gigantica*. The lymnaeid snail population and its habitat are disturbed by flooding as they are dispersed by floodwater (Copeman, 2008). Alves et al. (2011) stated that flood might be associated with the presence of lymnaeid snail where prevalence fasciolosis in cattle was higher in flooded areas than non-flood areas. Cambodia experiences with flood every year, particularly the provinces along Mekong River and Tonle Sap (Leng, 2014). The anticipated impact of climate change and variability on agriculture include frequency increase and intensity of flood and incidence increase of pests and disease (MOE and UNDP, 2011). Flood causes economic loss, crop, and livestock destruction. As consequence, NCDM (2014) reported that an estimated cost that flood damaged and lost livestock was about US\$3.33 million in 2013. Stock, poultry, and pig losses together with dying cattle during flood also found.

F. gigantica is being the major internal parasite of cattle health problem in Cambodia (Soun et al., 2006). Losses due to fasciolosis are mainly reduced meat production, draught performance, and lower fertility in infected animals (Spithill et al., 1999). The net benefit per head of cattle and buffalo in these high-risk zones of Cambodia is US\$76-91. These losses and the costs were taken into account of implementing control program (Sothoeun, 2007). Tum et al. (2004) developed a geographic information system model for mapping the risk of fascioliasis in cattle and buffaloes in Cambodia. Mainly around Tonle Sap Lake and along the Mekong River and Bassac River, estimating that 28% of cattle Cambodia is potentially at risk of fascioliasis, with areas of high and moderate risk concentrated in southern and central areas. However, knowledge of the prevalence of parasitic infection including fasciolosis in relation to seasonal flood and challenge cattle production cause flood in these selected study areas is poor documented.

OBJECTIVE

The study aimed (i) to identify problems encountered in cattle and the solutions farmers responded to flood, and (ii) to estimate the prevalence and associated risk factors of fasciolosis in cattle in study area.

METHODOLOGY

Study Area

Two villages in Ou Tapong, Bakan, Pursat province were selected for this study and were taken place from December 2014 to June 2015. Geographically, Ou Tapong commune Bakan district is a peninsular area situated along Tonle Sap River, and these villages are different from Sdock klouk situated in the lower plain of Tonle Sap and are susceptible to flood damage in rainy season, while Robaoh Reang village is a higher land (non- flood area).

Survey of Fasciolosis

Fecal samples were sampling from 63 and 107 of the animals in Robaoh Rang and Sdock Khlouk villages, respectively. Samples were selected out from all cattle in both villages. Two cattle were sampling from household raise at least two cattle and a cattle from a household raise only one. They were randomly collected from male and female cattle with the age of less than 3 years old and above 3 years. Approximately 5-10 g fecal samples were collected from rectum.

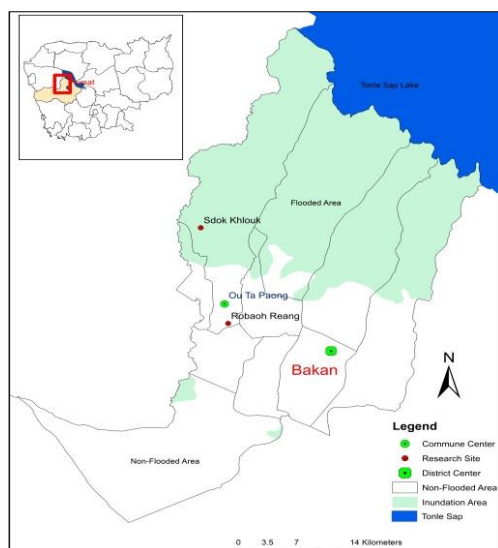


Fig. 1 Map of study area

The samples were independently labeled with the age, sex, body condition score, and village name and were stored in a cooled box containing ice. The samples were transported to Parasitology Laboratory of Research and Extension at Royal University of Agriculture and were analyzed using a Modified Balivat Fasciola egg counting technique to find prevalence of fasciolosis. The association between the independent factors and the prevalence of fasciolosis was calculated by using the Chi-square and confidence level was held at 95%. As part of the study, all cattle owners were selected for interviewing by a set of structured questionnaire that covered aspects of challenges and responses of farmers to flooding in cattle production and possible risk factors for fasciola, for example, feeding and water management, and presence of lymnaeid snail in particular site. Focused group discussion was also done for validation. Risk factors associated with case of fasciolosis were analyzed using a logistic regression model. All statistical analyses were conducted using SPSS version 16.0.

RESULTS AND DISCUSSION

General Characteristics of Cattle Production

Cattle production is considered the second major economic activity for smallholders while the main job is rice production. The majority of cattle production in both villages was raised for breeding purpose, as savings in family. Generally, cattle were grazed together on available pastures in the area, which was depended on the season and availability of feed. The cattle feeds were mainly grasses, rice straw, and stubble. After rice harvest, cattle were herded together in the grazing area where pasture and water are available, especially at floodplain and surrounding natural lake near Tonle sap river. The cattle were released from morning to evening in Sdock Khlouk. Unlike the cattle in Robaoh Reang, they were freely released to grass in paddy field or grassland (farm) with additional feed, such as rice straw.

Problems Faced by Farmers in Cattle Raising

Cattle raising in Sdock Klouk village is very sensitive to be impacted by flood. Water grass such as *Brachiaria* (buffalo grass) and *Oryza rufipogon* from flood plain and flooded natural lake are the main feeds for cattle in flood events.

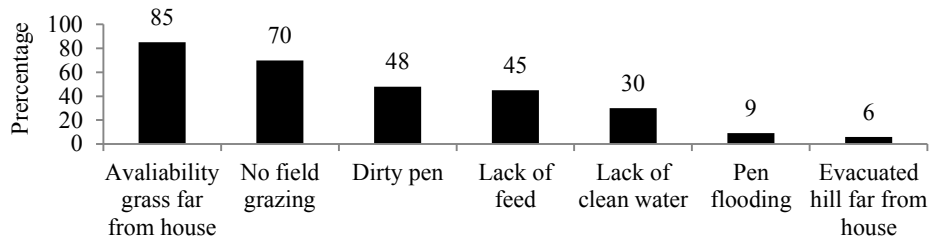


Fig. 2 Percentage of farmers faced by feed and pen problems in cattle rising during flooding

The survey result presented in Fig. 2 shows that 85% of farmers reported grass availability was far from household with the distance between 3 and 15 kilometers. Farmers (75%) said that there was no field grazing for cattle because grass field was flooded and 45% of farmers were lack of feed for cattle, a part of cattle lack of water grass due to no boat and destroyed grass. Pasture was also a major challenge to limit cattle productivity after flood because water grass was no longer grow or flower and that was not a suitable feed for cattle.

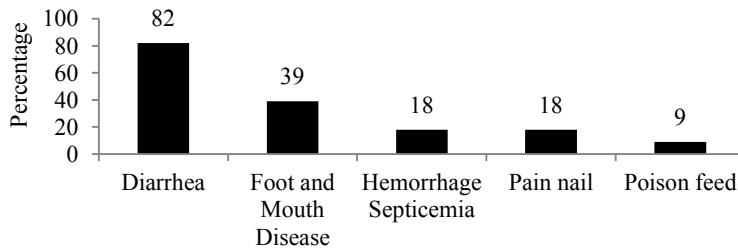


Fig. 3 Percentage of farmers noted disease in cattle during flood

Observation of farmers on disease in cattle during flood is shown in Fig. 3. There are 82% of farmers who found that their cattle had diarrhea during and after flood season. There were 39% of farmers who observed that cattle had Foot and Mouth disease, Hemorrhage septicemia (18%) and pain nail (18%). Lastly 9% of farmers reported poisoning cases on cattle. Those could be the result from flood related issues and evacuating conditions were susceptible to infectious diseases. Flood water was only a drinking source during flood duration and cut and carry moss grass were the main feed for cattle.

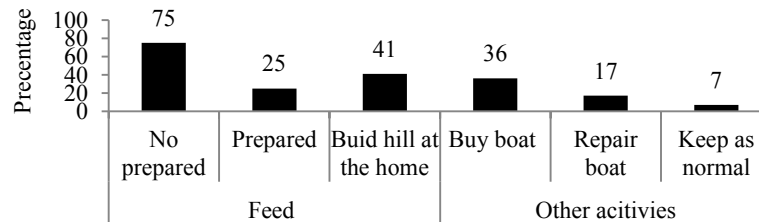


Fig. 4 Percentage of farmer adapted in cattle production

Adaptation of farmers keeping cattle in study site is illustrated in Fig. 4. Farmers were asked to share their experience of dealing with flood and to describe existing ways to adapt to flood. Up to 75% of cattle owners did not make any feed preparation while there was 25% prepared rice straw. Traditional adaptation of villagers, including 41% of farmers built an evacuated site for cattle at home, 36% bought a boat, and 17% repaired their boats before flood event because preparing boat was very

important to transport water grass. However, at least 7% absence of any adaptation means the farmers kept and did everything as normal due to living conditions.

Infection Fasciolosis in Cattle

Out of the total cattle examined, an overall prevalence of 28 (16.4%) were recorded in the present study. The prevalence rate at Robaoh Reang and Sdock Khlouk villages were 1.6% and 25%, respectively (Table 1). Prevalence of fasciolosis was higher in cattle at non-flood areas than in cattle at flood areas. The study revealed a significant difference ($p < 0.001$) of fasciolosis prevalence in the two study villages. Sdock Khlouk was higher than Robaoh Reang as it may be defined by the presence of more lowland or lake, which was the maintenance of flood prone areas. The mollusk dispersion and maintenance of the life cycle of fasciola are suited for those areas (Lima et al., 2009). High prevalence was observed in flood areas as it was supported by the model, which indicated that the area of high and moderate risk of fasciolosis in the closed distance river and lake (Tum et al., 2004). Moreover, cattle feeding method in Sdock Khlouk was mainly free grazing at bank of natural lake and the margin of flooded areas as water receded. This inundated area was a suitably permanent habitat for aquatic snails that were the intermediate hosts of *F. gigantica* (Tum et al., 2004). The higher in area surrounding large natural lake or pond was the location where *Lymnaea* snail was seen by villagers. The overall prevalence of liver fluke infection (13.4%) is supported by the finding of Dorny et al. (2011) which the result varied from 5%-20%. On the other hand, this result is higher than the earlier report of Tum et al. (2007) who found 6.2% prevalence of *F. gigantica* in cattle for Pursat province and concluded that there is a moderate predicted risk of information. The variation in the findings with the early reports may be due to the difference in sample size, place of study site, period of infection, time of collecting fecal sample, and availability of infected intermediate hosts (*Lymnaea* snail). The present finding was gradually increased year over year and it might be closely associated to the presence of chronic cattle infection due to no deworming.

Table 1 Prevalence of fasciolosi base on site

Site	N examined	N infected	Prevalence %	χ^2	P
None-flood	63	1	1.6	15.92	0.001
Flood	108	27	25		
Total	171	28	16.4		

As shown in Table 2, there was significant in variation of fasciolosis in male and female cattle ($\chi^2 = 5.59$, $p = 0.018$). The infection rate in female was higher (19.7%) than male (2.9%). This finding was similar to the observation of Ardo (2014). Impact to the infection rate could not be explained, but these infections in female were higher than in male which could also be attributed to the proportion of more female samples (Table 2). The prevalence of fasciolosis was higher (23.2%) in old cattle while lowest prevalence in young cattle was up to three years old (7.9%). It showed a significant difference among age group ($\chi^2 = 7.18$, $p = 0.007$). The lower prevalence rate in young cattle might be due to short time exposure to disease than old cattle. On the other hand, the old cattle were free grazing from near submerged area from morning to evening (Table 2). Base on body condition, it was significantly difference ($\chi^2 = 18.81$, $p = 0.000$) of prevalence *F. gagantica* among emaciated, thin, medium, and fat body conditions of cattle. 40% was observed in cattle with emaciated body condition, while the lowest infection prevalence (1.6%) was observed among cattle with fat body condition which was consistent with the finding of Rast et al. (2013).

Table 2 Prevalence of fasciolosis base on sex, age and body condition of cattle

Factors		N examined	N infected	Prevalence %	χ^2	P
Sex	Female	137	27	19.7	5.59	0.018
	Male	34	1	2.9		
Age(years)	≥ 3	95	22	23.2	7.18	0.007
	< 3	76	6	7.9		
Body condition	Emaciated	10	4	40	18.81	.000
	Thin	38	11	29		
	Medium	61	12	19.7		
	Fat	62	1	1.6		

Risk Factors for Fasciolosis in Cattle

Fourteen univariates were analyzed for association with the presence of fasciolosis reported by cattle owners. Of these 10 ($p \leq 0.25$) showed significant association risk variables of fasciolosis including cut grass from flood plain, natural lake, cut stubble, free grazing around Tonle Sap, free grazing around lake, drink water from lake, canal, dung well, use cattle for ploughing in rice field, and use cattle fecal for fertilizer. This was eligible for the inclusion of the multivariable logistic regression. The results from this analysis revealed that cattle that were fed by cut and carry water grass from natural lake were more likely to have fasciolosis than cattle that were not fed by cut and carry grass from natural lake. There was a significant association ($OR=0.61$, $P < 0.01$) with prevalence of fasciolosis in cattle (Table 3).

Table 3 Result of a multivariable logistic regression analysis of risk factors for fasciolosis

Risk factor	β	Association with Fasciolosis			P
		OR	95 CI for OR		
			Lower	Upper	
Constant	-1.193				0.000
Cut and carry grass from natural lake	-2.796	0.061	0.008	0.462	0.007

CONCLUSION

The cattle productions of small-holder farmers were in the limit productivity in terms of feeding and occurrence of diseases resulted by flooding. Traditional adaption may be neglected to improve cattle productivity, hence adaptation capturing good practice to enhance community resilience to flood should be introduced to farmers. Prevalence *Fasciola gigantica* was found in cattle and feed management in the areas that seemed to be exposure to fasciolosis infection. Accordingly, a disease prevention program and a control program are required. Inundated areas may be associated with habitat of intermediate hosts that contribute to higher prevalence of fasciolosis in flooded areas. It would also be a role as baseline data in the future study or for the relevant field.

ACKNOWLEDGEMENTS

The author would like to express his sincere thanks to the two-year scholarship from Climate Change and Water Governance project of the Cambodia's leading independent development policy research institute (CDRI) funded by IDRC. We would address our sincere thanks to classmates for their help and participation of farmers during the field survey.

REFERENCES

- Alves, D.P., Carneiro, M. B., Martins, I.V.F, Bernardo, C.C., Donatele, D.M., Pereira Júnior, O.S, Almeida, B.R., Avelar, B.R. and Leão, A.G.C. 2011. Distribution and factors associated with *Fasciola hepatica* infection in cattle in the south of Espírito Santo State, Brazil. *Journal of Venomous Animals and Toxins including Tropical Diseases*, 17, 271-276.
- Ardo, M.B., Aliyara, Y.H. and Lawal, H. 2014. Prevalence of bovine Fasciolosis in major abattoirs of Adamawa State, Nigeria. *Bayero Journal of Pure and Applied Sciences*, 6, 12-16.
- Coperman, D.B. and Suhardono. 2008. Epidemiology of *Fasciola gigantica* in cattle and buffalo. In: Gray, GD, Copland, R.S. and Copeman, D.B. (Ed.). *Overcoming liver fluke as a constraint to ruminant production in South-East Asia* (p. 39). Australian Center for International Research (ACIAR), Canberra, Australia.
- Dorny, P., Stolaroff, V., Charlier, J., Meas, S., Sorn, S., Chea, B., Holl, D., Aken, V.D. and Vercruyse, J. 2011. Infections with gastrointestinal nematodes, *Fasciola* and *Paramphistomum* in cattle in Cambodia and their association with morbidity parameters. *Veterinary parasitology*, 175, 293-299.
- Leng, H.A. 2014. Country Report of Cambodia disaster management. Asian Disaster Reduction Center, Cambodia.
- Lima, W. dos.S., Soares, L.R.M., Barçante, T.A., Guimaraes, M.P. and Barçante J.M. de P. 2009. Occurrence of *Fasciola hepatica* (Linnaeus, 1758) infection in Brazilian cattle of Minas Gerais, Brazil. *Revista Brasileira de Parasitologia Veterinária*, 18, 27-30.
- MAFF. 2014. Annual report total work of agriculture, forestry and fishery 2013-2014. Ministry of Agriculture Forestry and Fishery, Phnom Penh, Cambodia.
- MoE. 2014. Improvement of rural livelihoods through livestock management and preparedness and production technologies adapted to climate change in 4 communes of Pursat and Takeo province. Cambodia Climate Change Alliance Trust Report. Ministry of Environment, Phnom Penh, Cambodia.
- MoE and UNDP. 2011. Cambodia Human Development Report 2011. Building resilience: The further of rural livelihood in the face of climate change. Phnom Penh, Cambodia.
- NCDM. 2014. Country report of Cambodia disaster management. National Committee for Disaster Management, Phnom Penh, Cambodia.
- Phalla, C. and Sour, K. 2014. Climate change vulnerability, adaptive capacity and water governance in the Tonle Sap Basin. Annual development and development review 2013-2014: Development inclusiveness, sustainability and governance in Cambodia. CDRI. Phnom Penh, Cambodia.
- Rast, L., Nampanya, S., Khounsy, S., Toribio, J.A. and Windsor, P. 2013. Liver fluke in large ruminants in northern Lao PDR. *Cattle Health, Production and Trade in Cambodia*, 60.
- Sothoeun S. 2007. Fasciolosis of cattle and buffaloes and its control measures. Technical Implementation Procedure. Ministry of Agriculture, Forestry and Fisheries, Phnom Penh, Cambodia.
- Spithill, T.W., Smooker, P.M., and Copeman, D.B. 1999. *Fasciola gigantica*: Epidemiology, control, immunology and molecular biology. *Fasciolosis*, 465-525.
- Tum, S., Puotinen, M.L. and Copeman, D.B. 2004. A geographic information systems model for mapping risk of fasciolosis in cattle and buffaloes in Cambodia. *Veterinary parasitology*, 122, 141-149.
- Tum, S., Puotinen, M.L., Skerratt, L.F., Chan, B. and Sothoeun, S. 2007. Validation of a geographic information system model for mapping the risk of fasciolosis in cattle and buffaloes in Cambodia. *Veterinary parasitology*, 143, 364-367.