

## Strategic Planing to Develop Good Dairy Farming Practices in Smallholder Dairy Farms in Batu City, East Java

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### Abstract

Some of the objectives to be achieved in this research is to describe the attack profile of subclinical mastitis on Etawah Crossbreed Goats (ECG) in some smallholder farms, to identify risk factors that contribute to subclinical mastitis attacks and to compile a strategic plan to develop Good Dairy Farming Practices (GDFP) in Batu. The data were gathered by interviewing smallholder farmer and direct observation in the three farms goats in Batu (Bumiaji, Pesanggrahan, Temas and Beji village). California Mastitis Test (CMT) is used to detect subclinical mastitis on 51 ECG lactation belonging to farmer. Risk factors Identification of subclinical mastitis conducted by Spearman correlation analysis. All of smallholder compared with GDFP concept using gap analysis. Meanwhile, the strategic development plan of GDFP in Batu was done by the *Root Caused* analysis. The results showed that 100% subclinical mastitis attacks occurred on three dairy goats farms in Batu City with the level 31-80% percentage of attacks. This subclinical mastitis attacks positively correlated with milk production ( $p < 0.01$ ). The risk factors of subclinical mastitis partly because of the environment ( $p < 0.01$ ), milking procedure ( $p < 0.01$ ) and health management ( $p < 0.01$ ) were not right. The strategic plan to develop GDFP in Batu City are Increase knowledge and awareness of farmers about how to implement good dairy farming practices on Etawah Crossbreed farm, particularly in the benefits of clean environmental, handling and using goat manure, the benefits of sanitation and disinfection of udder, the effect of milking frequency on udder health and the urgency of separation between healthy and sick goats.

**Keywords:** good dairy farming practices, risk factors, subclinical mastitis

### INTRODUCTION

According to the data from Statistics Animal Husbandry and Animal Health Ministry of Agriculture in 2013, East Java Province is the largest producer of fresh milk in Indonesia from 2009 to 2012 [1]. One of the cities in East Java, which is a milk production center, is Batu City. In 2013, milk production in Batu City was 416,418,654 kg and goats milk as much as 4,573,135 kg. Goat milk production in Batu during the year showed an increase from the previous year. In 2012, the goat milk production was 392,184 kg [2]. This is because the public is increasingly aware that goat milk has many benefits, especially for human health and have better nutritional content than cow's milk, so the market demand for goat's milk increased [3,4,5,6].

However, market demand is not matched by the number of the existing milk production. Domestic milk production can only be accounted

for as much as 30% of the national milk requirement, while the rest rely on imports [4]. One of the factors that lead to low domestic milk production is subclinical mastitis disease [7,8,9]. Goats were attacked subclinical mastitis do not exhibit any symptoms of illness so that farmers are often not aware of and tend to ignore, that is why the incidence rate of subclinical mastitis disease in Indonesia is still quite high. In the end of 2006, there were approximately 75-83% [10]. Milk production will decline 10-25% in the stricken goat subclinical mastitis [8,9]. High cases of subclinical mastitis are often associated with risk factors, including livestock conditions, environmental and health management [11,13,14]. The high incidence of subclinical mastitis indicates that there needs to be improvement in animal husbandry management. Dairy goats farming practices that conducted by smallholder farmers especially in Batu is still very simple and usually as a sideline business. Therefore, aims of this research were to determine the profile attacks of subclinical mastitis in Etawah goats on some smallholder farms in Batu City, to determine the effect of subclinical mastitis attacks on goat milk

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production, to identify risk factors that contribute to subclinical mastitis attacks, to know famers weakness in dairy farming practices and compile a strategic plan to develop Good Dairy Farming Practices (GDFP) on smallholder dairy farms in Batu City.

## MATERIALS AND METHODS

This research was carried out on three goat dairy farms scattered in three places in Batu, East Java, Indonesia, namely Bumiaji, Pesanggrahan, Temas and Beji village (Fig. 1.). The study was conducted in December 2014 to May 2015 using 51 Etawah Crossbreed Goats (ECG) those are being lactation as sample. A total of 35 goats belonging to farmers in Bumiaji village, 6 goats belonging to farmers in Pesanggrahan village, 5 goats belonging to farmers in Temas village and 5 goats belonging to farmers in Beji village.

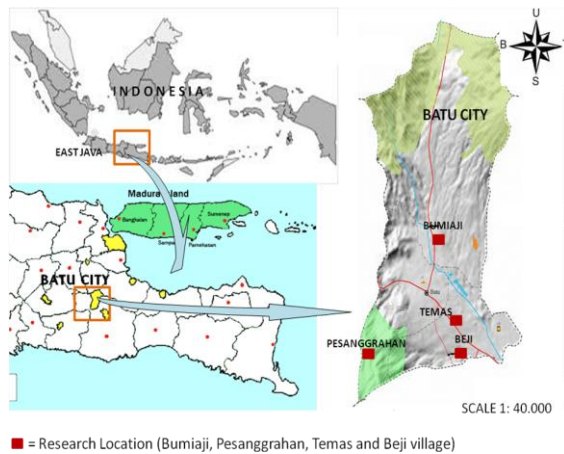


Figure 1. Map of study sites in Batu City

Recording of milk production conducted for 14 days. To determine subclinical mastitis status, goats were tested by California Mastitis Test (CMT) [5]. CMT test conducted by mixing CMT reagents and goat milk samples with a ratio of 1:1, and then shake it slowly for  $\pm 10$  seconds. The interpretation of CMT test results are as follows: positive one (+1) is characterized by a slightly thickened mass, positive two (+2) is characterized by a more viscous consistency mass of positive one (+1) and positive three (+3) is characterized by a mass that resembles gelatin and difficult to move, goats tested positive for subclinical mastitis if the test results showed positive CMT 2 (+2) [11,15].

Risk factors identification is done by direct observation to the farm and famer interview using a semi-structured questionnaire. The data

are gathered include : environmental (pen sanitation, animal waste handling and air circulation), milking procedures (milking frequency, udder hygiene and milking sanitation) and health management (separation between sick and livestock healthy animals, dry period and antibiotics treatment during the dry period).

All data were tabulated in *Microsoft Excel* 2007, descriptively analyze. Spearman correlation analysis was performed to identify risk factors for subclinical mastitis attacks in the three smallholder farms. Gap analysis used to indentify the weaknesses in goat dairy farming practices, by comparing four dairy goat farms profile with Good Dairy Farming Practices concept according to some standard references and FAO ( Food and Agriculture Organization). Furthermore, root cause analysis used to develop some strategic planing of GDFP on smallholder farmers in Batu City.

## RESULTS AND DISCUSSION

Subclinical mastitis test on 51 Etawah crosbreed goats using California Mastitis Test (CMT) is presented in Fig. 2A. and Fig. 2B. From these data, it appears that subclinical mastitis attacks occurred on three farms in Batu City. Goat dairy farm in Temas and Beji village has the largest percentage of subclinical mastitis incidence (80%), meanwhile Pesanggrahan village & Bumiaji village as much as 50% and 34%, respectively. Subclinical mastitis cases in Indonesia were reported in 2006 is still quite high, around 75-83% [10]. This is because the symptoms of subclinical mastitis attacks do not realize its presence by farmers, so farmers tend to ignore [12].

Differences in the incidence rate of subclinical mastitis in four goat farms can be due to differences in maintenance management, including environmental factors (air circulation, pen sanitation, animal waste handling), milking procedures (milking frequency, udder hygiene and milking sanitation) and livestock health management (separation between sick and healthy animals, dry period and antibiotics treatment during the dry period) [11,13,14,15]. Etawah crossbreed goat farm profiles of four goat farms as presented in Table 1. Air circulation systems of the dairy goat pen in Bumiaji village are good, which is very optimal ventilation enclosure for the exchange of air and morning sunlight freely into the enclosure area. Good lighting causes the pen dry and not humid, humid enclosure is a good environment for the

proliferation of bacteria [16,17,18], while the air circulation in Pesanggrahan and Beji village have adequate ventilation, but not quite optimal sunlight into the pen area. On the other hand,

goat pen belonging to farmers in Temas village, less air circulation for ventilation enclosure partially closed plastic and paper so that sunlight is not free to enter into the pen area (Fig. 3.).

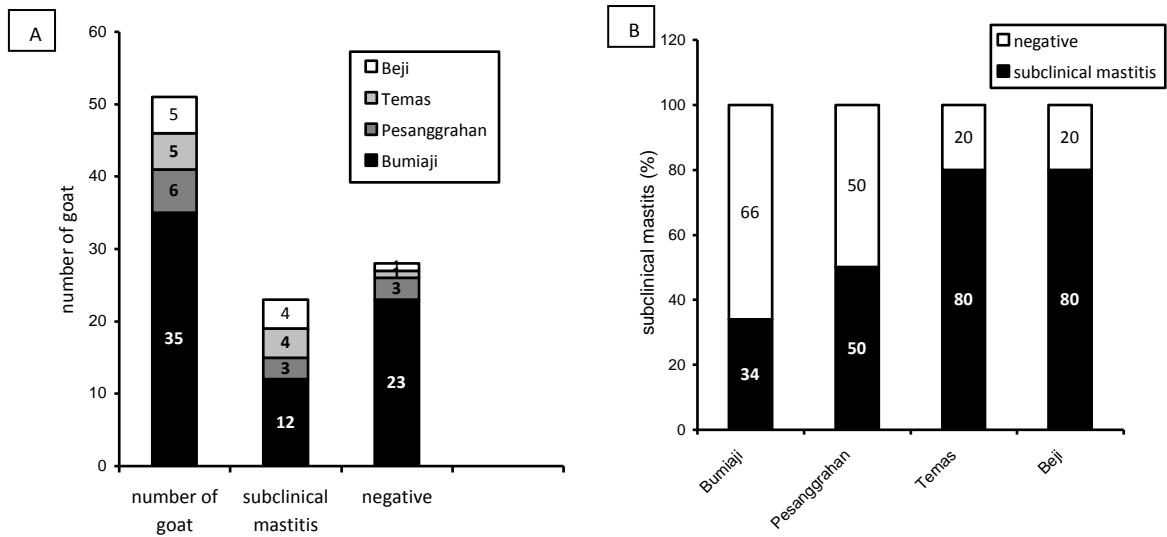


Figure 2. Profile of subclinical mastitis attacks on four dairy goat farms in Batu City : A. Variation of goat population which are attacked subclinical mastitis, B. Goat percentage which are attacked subclinical mastitis



Figure 3. Goats pen Profile of three goat farms in Batu City: a-b) goat farm in Bumiaji Village; c-d) goat farm in Pesanggrahan Village; e-f) goat farm in Temas Village; g-h) goat farm in Beji Village. (the red arrow indicates the location of feces disposal)

Table 1. Etawah Crossbreed Goats farm profiles in Batu City

Variables	Farm location			
	Bumiaji	Pesanggrahan	Temas	Beji
<b>Environment:</b>				
1. Air circulation	good	quite good	poorly	quite good
2. Frequency of cleaning the pen (per day)	twice	once	Less than once	once
3. How to handle livestock manure	accommodated in the sack	open dumping	open dumping	open dumping
4. Location of animal manure disposal	close to the pen (<10m)	close to the pen (<10m)	close to the pen (<10m)	close to the pen (<10m)
<b>Milking Procedures :</b>				
1. Milking frequency (per day)	twice	once	Not fixed, twice or once	once
2. Clean the udder before milking	yes	nothing	nothing	yes
3. Udder disinfection	before and after milking	After milking but inconsistent	No disinfection	No disinfection
<b>Health Management :</b>				
1. Separation between sick and health animal	Not separated	Not separated	Not separated	Not separated
2. Applying dry period	yes	sometimes	nothing	sometimes
3. Antibiotics treatment during dry period	nothing	nothing	nothing	nothing
<b>The incidence of subclinical mastitis (%)</b>	31	50	80	80
<b>Average of milk production per day (liter)</b>	1,4±0,06	0,9±0,05	0,6±0,09	0,6±0,05

Environmental filthy pens have a greater risk of developing mastitis than clean environment [18,19,20]. The milk procedures that are done by farmers in Bumiaji village is better than the other farmers, namely consistency of the milking time, frequent in the milking frequency and do sanitation and disinfection before and after milking. Livestock are frequently milked and carried udder disinfection during milking will reduce the risk of subclinical mastitis [21,22,24,25]. Teat disinfection at the time before and after milking can reduce somatic cell counts and also the level of new intramammary infections [23,26].

In animal health management, all of farmers were not doing the separation between sick and healthy animals. The separation between sick and healthy animals will reduce the spread of disease in farm environment. The application of dry period consistently performed by farmers in Bumiaji village, while farmers in Pesanggrahan and Beji village were not consistently applies it. On the other hand, farmers in Temas village was not apply dry periode at all times. Dry period is done by cessation of milking frequency gradually through setting up milk secretion stops. Some benefits of the dry period are allowing time for rest and restore the function of mammary gland,

optimally. In early and late phase of dry period is the vulnerable time to mastitis attack. As many as 50-60% of all new infections during lactation are caused by environmental pathogens acquired during the dry period [23]. To minimize the risk of subclinical mastitis, we need the application of dry period and intramammary antibiotics during the dry period. All of farmers in Batu City did not give the intramammary antibiotics during the dry period, so it could be risk factor for subclinical mastitis attacks. The result of Spearman correlation analysis showed that the CMT test results positively correlated with milk production ( $p < 0.01$ ). It means that the lower the value of CMT test, the average of milk production is also lower, vice versa. Meanwhile, the relationship between risk factors (environment, milking procedures and health management) with CMT test results production are positively correlated ( $p < 0.01$ ) (Table 2.). It means that the better environmental conditions, milking procedures and health management, the number of subclinical mastitis on goats affected lower. The Environment, milking procedures and health management on goat farm in Bumiaji village is the best among the other goat farms, so the incidence of subclinical mastitis is smallest among the other goat farms.

Gap analysis carried out between dairy farming practices on four goat farms (Bumiaji, Pesanggrahan, Temas and Beji village) and good dairy farming practices concept, according to some references and FAO (Table 3.). There are three aspects that is not in accordance to Good Dairy Farming Practices (GDFP) in Batu City, an aspect environment (feces disposal close to the pen (<10m) dan two aspects health management (there is no separation between healthy and sick goats, antibiotics treatment during dry period). While, the aspects were not in accordance to GDFP standards varies on each farm. Famers in Pesanggrahan village, in addition to the three aspects as mention above, another aspect was not in accordance to GDFP standards, namely, milking frequency (once/day), meanwhile, three aspects were not in accordance to GDFP standards in Temas village, namely frequency of cleaning the pen (<once/day), udder disinfection was not done and there is no dry period, while goat farmers in Beji clean the pen once per day,

goats milked once per day and there is no teat disinfection in milking. The strategic planing to develop Good Dairy Farming Practive (GDFP) in three goat farmers, we performed root cause analysis of the farmers weakness in dairy goats farming parctices (Table 4.). Based on the results of root cause analysis, the strategies that are given to goat farm in Batu City are increase knowledge and awareness of farmers about how to implement Good Dairy Farming Practices on Etawah Crossbreed farm, particularly in : 1) The benefits of clean environmental for health and goat milk production, 2) Handling and using goat manure, 3) The benefits of sanitation and disinfection of udder before milking, 4) The effect of milking frequency on udder health and milk production, 5) The urgency of separation between health and sick goats, 6) The benefits of antibiotics treatment during dry period and increasing farmers knowledge about alternative antibiotic intramammary which is cheap and easily.

Table 2. Spearman correlation between CMT test results, milk production, environment, milking procedures and health management

		CMT		Production
Spearman's rho	Env.	Correlation Coefficient	.398**	.133
		Sig.(2-tailed)	.004	.351
		N	51	51
	MP	Correlation Coefficient	.387**	.101
		Sig.(2-tailed)	.005	.480
		N	51	51
	CMT	Correlation Coefficient	1	.707**
		Sig.(2-tailed)		.000
		N	51	51
	Production	Correlation Coefficient	.707**	1
		Sig.(2-tailed)	.000	
		N	51	51
	HM	Correlation Coefficient	.366**	.074
		Sig.(2-tailed)	.008	.607
		N	51	51

\*\* Correlation is significant at the 0.01 level (2-tailed)

Note : CMT = California Mastitis Test; Production = milk productin; Env.= environment; MP= milking procedures; HM= health management

Table 3. Dairy goats Farming Practices in Bumiaji Village based on gap analysis

No.	Var	Dairy goats farming practices				GDFF Standard*	Gap analysis			
		B	P	T	BJ		B	P	T	BJ
1.	Env.	Clean (frequency of cleanig the pen = twice/day)	Clean (frequency of cleaning the pen = once/day)	Dirty (frequency of cleaning the pen less than once/day)	Clean (frequency of cleaning the pen = once/day)	Providing an environment with good sanitary conditions	(+)	(+)	(-)	(-)
		Feces disposal close to the pen (<10 m)	Feces disposal close to the pen (<10 m)	Feces disposal close to the pen (<10 m)	Feces disposal close to the pen (<10 m)	Having good waste management system, e.g waste disposal away from the pen (>10 m)	(-)	(-)	(-)	(-)
2.	MP	Goats milked twice per day	Goats milked once per day	Goats milked twice per day but inconsistent	Goats milked once per day	Twice daily milking appears to be an optimum milking frequency for goats and frequent milking can reduce mastitis risk	(+)	(-)	(+)	(-)
		Udder was cleaned before milking	Udder was cleaned before milking	Udder was not cleaned before milking	Udder was cleaned before milking	milking routines do not introduce contaminants into milk	(+)	(+)	(-)	(+)
		Teats disinfection before and after milking	Teats disinfection after milking	There is no disinfection in milking	There is no disinfection in milking	milking is carried out under hygienic conditions	(+)	(+)	(-)	(-)
3.	HM	There is no separation between sick and healthy goats	There is no separation between sick and healthy goats	There is no separation between sick and healthy goats	There is no separation between sick and healthy goats	Goats are separated between sick and healthy	(-)	(-)	(-)	(-)
		Apply dry period	Apply dry period (sometimes)	Do not apply dry period	Apply dry period (sometimes)	Apply dry period for udder health	(+)	(+)	(-)	(+)
		There is no antibiotic treatment during dry period	There is no antibiotic treatment during dry period	There is no antibiotic treatment during dry period	There is no antibiotic treatment during dry period	Antibiotics treatment during dry period	(-)	(-)	(-)	(-)
<b>Number of aspects in accordance to GDFF standards</b>							<b>5</b>	<b>4</b>	<b>1</b>	<b>2</b>

Note : \*GDFF = Good Dairy Farming Practices; Positive (+) = available and negative (-) = absence; Var=variables; B=farmers in Bumiaji; P=farmers in Pesanggrahan; T=farmers in Temas; BJ=farmers in Beji; Env.=Environment; MP=milking procedures; HM=Health Management

Table 4. GDFF development strategy in Batu based on Root Cause Analysis

Weakness	Farmers				Root Cause	Strategies
	B	P	T	BJ		
1. Filthy pens (pen cleaning frequency once/day)	-	-	√	√	Farmers have not realized the benefits of clean environment for health and goat production	Increase knowledge and awareness of farmers about how to implement good dairy farming practices on Etawah

2. The location of manure disposal close to the pen (<10m)	√	√	√	√	- Limited farm land - Farmers knowledge on handling and processing of goat manure is still lacking	Crossbreed farm, particularly in : - The benefits of clean environmental for health and goat milk production (Farmers in Temas and Beji village)
3. Udder is not cleaned before milking	-	-	√	-	Farmers knowledge about the benefit of udder health is still lacking	- Handling and using goat manure ( Farmer in Bumiaji, Pesanggrahan, Temas and Beji village)
4. Milking frequency that is not often (once/day)	-	√	-	√	farmers knowledge about the influence of milking frequency to subclinical mastitis and milk production is still lacking	- The benefits of sanitation and disinfection of udder before milking (Farmers in Temas and Beji village)
5. Not performed teat disinfection	-	-	√	√	Knowledge and awareness of farmers about the benefits of teat disinfection for udder health is still lacking	- The effect of milking frequency on udder health and milk production (Farmers in Pesanggrahan and Beji village)
6. There is no seperation between healthy and sick goats	√	√	√	√	Knowledge and awareness about the urgency of separation between healthy and sick goat is still lacking	- The urgency of separation between healthy and sick goats ( Farmers in Bumiaji, Pesanggrahan, Temas and Beji village)
7. There is no dry period	-	-	√	√	Farmers knowledge about the benefits of dry period for udder health is still lacking	- The benefits of antibiotics treatment during dry period and increasing farmers knowledge about alternative antibiotic intramammary which is cheap and easily obtainable (Farmers in Bumiaji, Pesanggrahan, Temas and Beji village)
8. No antibiotics during the dry period	√	√	√	√	- Farmers knowledge about the benefits of antibiotics treatment during dry period for udder health is still lacking - The price of antibiotic intramammary is expensive	

Note : Mark (√) indicates that the goats farm has these weakness, while the sign (-) indicates that the farm doesn't have these drawbacks; B=farmers in Bumiaji; P=farmers in Pesanggrahan; T=farmers in Temas; BJ=farmers in Beji

## CONCLUSION AND SUGGESTION

Subclinical mastitis attacks occurred on all of goats farm Batu City, with an incidence rate 31% on goats farm in Bumiaji village, 50% on goats farm in Pesanggrahan village, 80% on goats farm in Temas and 80% on goats farm in Beji village. There are three risk factors causing subclinical mastitis, namely environment, milking procedures and health management that is not right. Generally, the strategic plan to develop GDFP in Batu City are Increase knowledge and awareness of farmers about how to implement good dairy farming practices on Etawah Crossbreed farm, particularly in the benefits of clean environmental, handling and using goat manure, the benefits of sanitation and

disinfection of udder, the effect of milking frequency on udder health and the urgency of separation between healthy and sick goats. The strategic plan could be used as a basis for subclinical mastitis control program on Etawah crossbreed goats by local government, such as Department of Agricultural, Agricultural Extension Center and Animal Husbandry Training Center.

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