

## POTENTIAL OF SHEEP FARMING DEVELOPMENT THROUGH AGRO-ECOSYSTEM ANALYSIS APPROACH IN SITE SELECTION. (Case study in Tegalsari Village, Purwakarta Regency)

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### Abstract

Study on “Sustainable of parasite infection control in small ruminants” was conducted using participative approach. This study was conducted as research collaboration between ILRI (International Livestock Research Institute and CRIAS (Centre Research Institute for Animal Production). In selecting location for research, the selection was conducted using agro-ecosystem analysis approach. The selection of the location was conducted in 4 Regencies, and from those regencies then selected 2 sites (villages) with different agro-ecosystem. One of the sites is Tegalsari village, Regency (*Kabupaten*) Purwakarta. From field observation Tegalsari has potential resource for sheep farming development, because this village is located in adjacent to rubber plantation that is used by sheep farmer for grazing area. Moreover, village communities in this village is very responsive, beside that the evident of worm infection is very dominant on the hand, there was no governments programs on handling parasite infection was done in Tegalsari. Based those reasons, therefore Tegalsari was selected as location for conducting research.

### Introduction

Parasite infection is one of serious cases that hampering livestock productivity in the smallholder sheep farming. To improve sheep productivity in smallholder farm, the study on “Control of parasite infection in small ruminants through participative approach” was conducted. The research was conducted in the village, therefore site selection was done to select appropriate that meet the research objective. The objective of the study is to implement control parasite infection programs through sheep farmer group guidance (activities), so that in the long term this program will be sustainable and able to improve sheep productivity in turn will also increase farmer income through sheep farming. Criteria’s in site selection are: has potential resource to support sheep farming development in the area, sheep population, farmers willingness to improve sheep production, and the prevalence of parasite infection. Farmers willingness is a critical factor due to this factor close related to farmers participation in adopting technology on parasite control that will be

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introduced. The agro-ecosystem analysis approach is thought to be the appropriate method in selecting location for conducting research.

## Material and Methods

Site selection was conducted through 2 steps; the steps are review from secondary data and agro-ecosystem analysis. Review from secondary data was done before conducting agro-ecosystem analysis. Secondary data was collected from the institutions, which have related to sheep farming such as livestock service, statistical bureau and food crop service. From review secondary, it was selected 4 villages from 3 Regencies (*Kabupaten*). The agro-ecosystem approach was conducted in those 4 villages. There are four patterns in agro-ecosystem analysis, namely: space pattern, time pattern, flow pattern and decision pattern analysis. Using those analyses, it is hoped that the recommended site can fully meet the research objective. Data was collected using method rapid rural appraisal (RRA) from Gibbs (1985). This method is generally suitable to gather up date information in the village. While data on prevalence of worm infection in sheep population was obtained by analysing the e.p.g (egg per gram) of worm in the faecal sample that randomly collected from population of sheep in those villages.

## Results and Discussions

### General Description of Tegalsari Village

Tegalsari village (*Desa Tegalsari*) is one of the villages in Tegalwaru District (Kecamatan Tegalwaru), Purwakarta Regencies (*Kabupaten Purwakarta*). This village located in the altitude between 350 m – 500 m above the sea. In the north of the village is adjacent to Rubber plantation area, as grazing area. Population in Tegalsari village is 1993 people; with 579 houses hold (HH). The total area of state rubber plantation is 2000 ha, and the area adjacent to hamlet Batutumpang is 80 ha, where native grasses abundantly are available under the tree that can be used for forage resource and for grazing area. Beside as farmer some people in this village also work as labour in rubber plantation, or work in building construction, brick or tile roof factory or working in the city as labour. Farm labour activities only done in rainy season. While in dry season most people live on in brick/roof factory. Some of them also work in the city such as in Bandung or Jakarta.

### Agro-Ecosystem Analysis

#### *Space Pattern Analysis*

**Biophysical Condition.** Tegalsari village elongate from North to South and has 5 hamlets. Three hamlet located in South edge side of the village, and 2 hamlet in

the North edge of the village. Topography of the village is 75% hilly area and 25% flat area. The slope from South to North is 20°, the area from east to west in the middle area is wider. Only in the west and east side area are planted with rice, while in the middle area are grown by scrubs and bushes. Land used in the housing area majority is used for dry land plantation combined with tree crop. Soil type is dominated by latosol and podsol yellow red soil, 60% of the land is dry land that is grown with bamboo and mixed timber tree. Some dry land is grown with shrub and bush and this area is used for grazing.

**Biophysical Transect.** Tegalsari village lengthens from North to South. From figure 1., it is shown that vegetation in the highest altitude 600m a.s.l (in the north side is planted with rubber plantation), this area belongs to government (state owned). Native grass grows abundantly under rubber tree and is available all year around, besides that, grown also *Centrocema* that is a good forage legume for ruminants feed. Usually the plantation area is used by sheep farmer for sheep grazing which is the only livestock allowed to graze in this area.

In the lower area (550 m a.s.l.) is utilized for housing where most people reside in this area, as well as the area where the livestock are. The vegetation grown in this area is an annual crop such as mango, coconut or timber tree such as, bamboo, and albizia. Wetland area is located in the altitude 525 m a.s.l. most of the wetland is rain fed which is planted with rice. There are also some dry lands in this altitude. The vegetation in the lower altitude (450 m a.s.l.) is usually perennial crop (such as, mango, albizia, and bamboo).

### *Time Pattern Analysis*

**Historical Calendar.** The historical calendar was shown in Table 1. It shows that before 1980. Tegalsari village was part of Tegalwaru village. At that time 75 % of the crop in state owned plantation was changed from rubber to cocoa. Then in 1981 Tegalwaru village was divided into two villages that are: Tegalwaru village and Citalang village, at that time Tegalsari village area was still part of Tegalwaru village. In 1988 Tegalwaru village was divided again into two villages (Tegalwaru and Tegalsari villages), and Tegalsari began with its own government with the area 226,60 ha. Tegalsari included in poor village (poverty status as set by government) (Table 1).

In 1989 there were grant programs from state owned forestry office which gave 4 head of sheep to increase farmers income by rearing sheep. In 1990 plantation was changed again into rubber crop. With changing from cocoa tree to rubber tree, the opportunity for grassing area was opened because of nature rubber tree is taller than cocoa tree and also the shading from rubber tree is not as dark as cocoa tree, as a result chance for grass to grow under rubber tree is better than under cocoa tree. This means that rubber plantation is a good area for grass to grow.



Table 1. Historical profile of Tegalsari village related to sheep development

Year	Event
Before 1980	Tegalsari village are included in Tegalwaru village 75% of rubber tree plantation is replaced with cacao
1981	Tegalwaru village divided into Tegalwaru and Citalang villages
1988	Tegalwaru divided again into Tegalwaru and Tegalsari villages
1989	PERHUTANI (forest state owned) granted 4 head sheep/farmer
1990	Cacao tree was replaced again with rubber tree plantation
1997	Programs of credit on food crop system (KUT) was began, 3 groups of farmer get credit 9 ton un-organic fertiliser.
2000	KUT was stopped Anthrax vaccination IB for cattle program from Regency livestock office
2001	Some farmers try to grow Ciherang rice variety..

In 1997 government gave credit scheme for food crop. The credit was given in the form of fertilizer, they went on up to 3 years, and finale in 2000. At the same time in year 2000 there was an outbreak of anthrax disease source from ostrich farming in *Kabupaten* Purwakarta. There fore to prevent the spread of anthrax, Regency livestock service office gave anthrax vaccination programs in all Purwakarta regency area, included in Tegalsari village. Therefore in 2001 some farmer tried to grow new varieties of rice that has better productivity than rice variety that usually grown in Tegalsari village. This indicates farmer willingness to try other technologies that able to increase their income is very high.

**Farmers Calendar Activities.** The activities of farmers in Tegalsari village closely related to season (Figure 2), this due to their planting activities depend on rainfall, because all farm land are rainfall watering. Food crop planted is rice, which is planted in wetland rain fed. Rice production in Tegalsari village mostly for family consumption. Cropping pattern is adjusted to the availability of rain water. Planting activity begin on October when the rainfall higher, at this time the activities begin with ploughing rice field. Rice planting activity continue up to July, when the rainfall is decreased and dry season begin, planting activities still continue they grow soy bean (*palawija*) which was done after the rice are harvested. The planting system is this village is monoculture, which means that all land only grown by one type of food crop. Some of rice field left fallow in peak of dry season (July-Sept). This fallow rice field is utilising for sheep grazing.

### **Flow Pattern Analysis**

Rice cultivation and only for family consumption, however they also cultivate others food crop such as soybean, corn and cassava which are sold in the market (Figure 3). From the market farmers bought agricultural input. Farmers who raised livestock also get income from selling livestock. Beside that sheep farmer also get



other products from livestock in the form organic fertilizer origin from manure. This fertilizer is use to fertilize farm land/rice field. Livestock was sold through middleman, never sold directly to the market. Beside from rubber plantation, farmers also get livestock feed from fallow rice field in dry season or from un-utilise land.

Rubber plantation has important role in raising sheep because this area provide forage feed all year round freely. Beside as farmer, some of the people in this village also work as labour, in rubber plantation, building construction, brick or tile roof factory or working in the city as labour. Farm labour only work in rainy season and for men they are paid Rp.10,000/day and for women only Rp 5000/day. In the dry season men work in brick/tile roof factory, and they are paid Rp 4000/100 brick made. Some of them also work in the city such as in Bandung or Jakarta. Rubber plantation labours are paid Rp 7000/day. They highest salary was obtained by labour building construction, their salary is Rp 20,000/day.

### ***Decision Pattern Analysis***

With the limitation of the resource availability and their capital, farmers have to decide type of farming enterprise activity. From diagram decision pattern (Figure 4) can be seen that the factors affect farmers decision are: labour, land and capital. There are many alternatives activity can be taken by farmer in deciding which work can be done base on capital and resources availability. When farmer have enough land, labour and capital they will keep sheep, cattle, growing rice and soybean. However when the land and labour available, but they do not have capital they will grow rice with monoculture system, rearing sheep or become caretaker with share benefit (*maro/menggaduh*).

When farmers have land but they do not have sufficient labour but they capital they will diversify growing food crop, rearing cattle, and let some body else to look after their sheep for sharing profit (*menggaduhkan*). On the other hand, if the farmer only have land, they do not have sufficient labour and capital they will grow monoculture rice, rearing sheep and do non farm job, such as become labour in the city. The poor farmer, who do not have land but they have labour they will become care taker or tenant. When farmer do not have land and labour as well capital, they will rearing sheep, become farm labour, care taker or do non farm work. From this decision tree diagram, it can be seen that rearing sheep is a flexible work that can be done by anyone, even though they do not have capital, or land. In the case of Tegalsari village usually women or old people who take care sheep in grazing area.

### ***Stakeholder Relation In The Village***

Experience shows the availability organizational in the village will make easy to pass on the information especially for agriculture technology to the farmers. Formal organisational in the village is LKMD (*Lembaga Ketahanan Masyarakat Desa*),

which run by village officer, they deal mostly with village development. While informal organization has not developed yet. The only informal organization available is middleman, which has important role in selling livestock. Farmers never sell livestock to market directly, beside the location is very far they also do not have capability to bargain in market price (Figure 5). In this case relation sheep farmer with middleman is very close, because farmer can sell sheep any time they need money, otherwise the middle man everyday always go around village to get farmer who want to sell sheep/livestock. When the farmers need capital they will come rich farmer to borrow money. At present time there is no formal institutional (such as banking or village cooperative unit/KUD) that can lend money to farmer. In the past from 1997-1999 farmers got credit loan in the form of credit in kind, the program was distributing of agricultural input to farmer by loan from government through bank. At this time 3 groups of farmer got credit fertilizer 9 ton, this credit scheme was finalized year 2000. On the other hand Municipal/District Livestock office also have activity in Tegalsari, however no special development program to improve sheep productivity.

### Health Status

Health status of the sheep were not very good, it is indicated by the wool covering anus were dirty, with wet faeces stick on it. The sheep were also thin. Other clinical symptoms were diarrhoea (especially in rainy season) and bloat. Mortality frequently occurred in pre weaning lamb (2 – 3 month old. The real condition of intestinal infection of sheep and goat was obtained from faecal sample analysis. The result of the analysis is shown in Table 2.

This table shows that in general intestinal parasite infection (nematode intestinal infection) for sheep was very high (close to 100%). However the seriousness of infections (as expressed in EPG>1000) is differed in different group. In younger group sheep infection is heavier than the adult. Base on EPG>1000, it shows that infection in young group of sheep much higher (78.9%) than adult (average 45%). This data indicate that the sensitivity of intestinal parasite infection in young animal is higher than the adult. From interviewed with farmers, it indicated that mortality

Table. 2. The prevalence of nematode worm infection in Purwakarta Regency 22-24 August 2001

	Group of age			Total Animals
	Lamb/kids (<8 months old)	Ewes	Ram	
No of sheep	19	30	6	55
Prevalence of Infection (%)	100	96.7	100	
Average EPG	2933	1516	1913	
EPG>1000 (%)	78.9	40	50	

EPG=egg count per gram feces

rate of younger group (pre-weaning lamb or kid) is higher especially in rainy season than the older group.

Usually the sick livestock is treated with traditional medicine (*jamu*) bought from market aimed to increase appetite. Problems in sheep production mostly related to health. Health condition of sheep usually was not very good, even though sheep was house in the slatted floor barn, intestinal infection still occurred. The infection could be acquired from grazing area. None of good feeding management and health management is applied in the village, this might be due to none extension programs on sheep management given to farmer in Tegalsari village. Therefore the main reason of bad condition of sheep might be caused by lack of information. Therefore, it is expected with application of health technology, health status and production will be increased.

### Conclusions

Result from analysis agro-ecosystem in Tegalsari village, which aimed to identify potential and problem, related to carrying capacity in order to develop sustainable control intestinal-parasite in sheep, it is concluded that

1. From space pattern analysis it shows that grazing area is abundantly available from rubber plantation. This area supply native grass as forage feed year round. In dry season grazing area is wider due to fallow rice field, also can be used for grazing area
2. Opportunity of man power distribution in rainy season could not be a problem, since take care of sheep with grazing management can be done by any body. In dry season the availability of man power for caring sheep is abundant due to minimum activity on food crop cultivation, this condition have good prospect in development sheep farming.
3. Prevalence of parasites infection is high almost 100% at all ages, it is showed from faecal analysis, and meanwhile lambs have higher risk to infection than adults.
4. Due to availability of feed resources all year around, the willingness of sheep farmer to improve sheep productivity and dominant case of parasite infections, Tegalsari village is appropriate site as location for conducting research on "Sustainable Parasite Control on Small Ruminant".

### References

- Chambers, R. 1986. "Shortcut Methods in Social Information Gathering for Rural Development Projects". In Putting People First, Editor Carne.
- Conway, G. R. 1986. Agro-ecosystem, Analysis for Research and Development. Winrock International. Bangkok. Thailand.



Gibbs. C. 1985. "Rapid Rural Appraisal". San Overview of Concepts and Application. Paper Presented in The International Conferences on Rapid Rural Appraisal (September 2-5). Khon-Kaen. Thailand.