PN-ABS-563

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Evelyn Mathias-Mundy, Sri Wahyuni, Tri Budhi Murdiati,
Agus Suparyanto, Dwi Priyanto, Isbandi, Beriajaya, and
Harini Sangat Roemantyo

Small Ruminant-Collaborative Research Support Program
Balai Penelitian Ternak
Pusat Penelitian dan Pengembangan Peternakan
Bogor 1992

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Working Paper No. 139, September 1992

UNIVERSITY OF MISSOURI, COLUMBIA, USA

Acknowledgments

The studies were supported by the Sociology Project of the Small Ruminant-Collaborative Research Support Program under grant no. DAN 1328-G-SS-4093-00.

We would like to thank Michael Nolan for moral and financial support for this project, Luiz Iniguez and Josephine Wie for logistic support, Andy Djajanegara for suggestions, Zaenal Kosasih for analyzing the fecal samples, and Paul Mundy for comments and editing.

Our studies would not have been possible without the cooperation of the Bogor District Livestock Services and the openness and patience of the farmers and village administrations in Cinangka, Pasir Gaok and Ngagrak.

Background

Traditional animal health care combines prevention and treatment. Preventive measures include management and feeding practices, as well as the application of drenches, smoke to repel insects, and other practices. If an animal gets sick, farmers know and use a wide spectrum of internal and external medicines and manipulative techniques. So far publications on traditional veterinary medicine in Indonesia have focused on plants and formulae rather than on the system of traditional animal health care as a whole (e.g., Adjid 1990, FAO 1991).

In 1991, a multidisciplinary team representing the fields of sociology, toxicology, botany, and veterinary medicine studied ethnoveterinary practices of small ruminant holders in three villages (Cinangka, Pasir Gaok and Ngagrak) around Bogor, West Java. The objectives were to find out how farmers prevent and treat livestock diseases, who holds the information on animal health care, who treats the animals, and which remedies are used. Findings were reported for Cinangka by Sri Wahyuni *et al.* (1991) in English and for Pasir Gaok and Ngagrak by Priyanto *et al.* (1991) in Indonesian.

This report summarizes some of the findings and describes differences and similarities among the villages. It discusses the efficacy of local animal health care and suggests improvements. The appendix lists medicinal plants used by farmers in all three villages and their application.

Methodology

The Setting

Between May and November 1991, ethnoveterinary studies were done in three villages in Bogor District, West Java. First, an in-depth survey was conducted in Cinangka, situated some 15 km west of Bogor. To test the validity of the Cinangka data for comparable areas in West Java, the villages Pasir Gaok (about 13 km north of Bogor) and Ngagrak (some 15 km to the southeast), were studied using rural rapid appraisal (RRA). These villages were selected because they had sufficiently high small ruminant numbers and management conditions on initial inspection appeared similar to those in Cinangka. Table 1 shows household and small ruminant numbers and areas of the three villages.

About 70% of Cinangka's area was used for rice production, and some 13% for growing a variety of other crops including papaya, cassava and vegetables. In Pasir Gaok, the southern one-third of the village was covered by rice fields, while some 50% of the village area or most of the northern part belonged to a rubber factory and was planted with rubber trees. Houses in northern neighborhoods (RT) seemed to be spaced wider than in the southern

part of the village, and a great number of fruit trees grew between them. One-third of the area of Ngagrak belonged to a golf course, some 10% to a clove plantation, and roughly one-third was utilized for agricultural purposes, with cassava, papaya and fruit trees dominating and rice production playing only a minor role. As with the northern part of Pasir Gaok, numerous fruit trees grew between houses in most parts of Ngagrak.

In all three villages, small ruminant production was not a main occupation but commonly supplemented a family's income from farming, paid labor or trading. Farmers kept far more sheep than goats; in Cinangka, goats made up about one quarter of the small ruminant population; in Pasir Gaok, their proportion was probably somewhat higher, while in Ngagrak their share was much smaller and, according to villagers, steadily decreasing. Farmers said they preferred sheep because these were easier to feed and were less damaging than goats, and unlike goats, did not suffer from scabies.

Further information about the villages and their small ruminant population and production is provided in Sri Wahyuni *et al.* (1991) and Priyanto *et al.* (1991).

Table 1. Village characteristics and small ruminant (SR) numbers in Cinangka, Pasir Gaok and Ngagrak.

	Area (ha)	Households (n)	Households keeping SR n	Households keeping SR %	No. of SR	SR per household
Cinangka	345[1]	1400[1]	190	14	981	5.1
Pasir Gaok	659	1687	379	22	1990	5.2
Ngagrak	766	1451	488	34	2166	4.4

[1] Figures from Sri Wahyuni *et al.* 1990

Research Methods

Survey in Cinangka. Between May and July 1991, a research team consisting of four sociologists, a toxicologist, an ethnobotanist, a veterinary parasitologist, and a veterinarian with some anthropological training visited Cinangka once or twice per week, altogether on 11 days. Research methods included a census of all sheep and goats in the village, in which the animals' age, sex, and condition were recorded; scoring the type and condition of the

Management around Birth and Care of Newborns

Pregnant animals did not receive any extra care or fodder. Animals that were going to give birth were taken out of the barn and kept on the ground up to two months afterwards. Some farmers in Ngagrak had special barns on the ground for this purpose, but the majority kept the dam and newborns either in the kitchen or close to the house or barn. Farmers worried that otherwise newborns would be hurt by other animals in the herd or would catch their feet in the slatted floor. Another way of preventing such injuries was to cover the slatted floor with old cloths or grass during birthing, but this seemed rare.

To prevent infestation with maggots, smallholders put kitchen ash in and around the dam's vulva and on the newborn's navel. For several days after birth, dams commonly received pure water, cooked vegetables, or the cooking water from vegetables. Some farmers in Ngagrak warned against feeding cassava peel for several months after birth because it would cause bleeding from the reproductive tract and would not be good for the offspring. Newborns were allowed to suckle immediately and seemed to get milk supplements only in exceptional cases. Farmers mentioned lack of milk, diarrhea, and accidents as reasons for deaths of newborn and young sheep and goats.

Differences in our questioning between Pasir Gaok and Ngagrak on one hand and Cinangka on the other mean we cannot compare mortality figures of newborns between villages. In Cinangka, we asked farmers to recall births in the previous two to three years and how many of the newborns had died. This yielded a figure of 30% mortality during the first two weeks after birth -- an unusually high rate that contradicted our field observations (see Sri Wahyuni *et al.* 1991). It is likely that our question formulation prompted farmers to recall more births where offspring had died than where all survived.

To overcome this problem, in Pasir Gaok and Ngagrak we asked farmers with barns containing animals under three months of age whether these animals stemmed from triplets, twins or were singles, whether some of the newborns had died, or whether a dam had given birth during the previous months where all of her offspring had died. This gave a mortality rate of about 8% within the first month after birth (Table 2). However, this figure is probably an underestimate for two reasons: (1) the data are drawn from a convenience sample collected during the RRA; and (2) it was based mainly on lambs and kids present in the barn during our visit, so recent births where all offspring had died may have remained unrecorded.

Estimates of neonatal mortality rates of village sheep and goats vary in the literature. According to Bell and Inounu (1982), lamb mortality figures in several surveys in West Java range

between 4 and 22%. Adjid *et al*. (1989) monitored 22 farms in Bogor District and found that of 175 lambs born within one year, 9% died within the first week and 2% were stillborn. Subandriyo (1985) calculated a range of 11 to 33% for newborn mortality within the first 30 days in three villages in West Java.

In Ngagrak and Pasir Gaok, single births made up some 40% of all births (Table 3), but as with the mortality rate, the figures in Table 3 should be understood as trend indicators rather than exact percentages.

Table 2. Mortality of lambs and kids within the first month after birth in Pasir Gaok and Ngagrak, West Java (figures include still births)

		Number of animals born						Mortality
		single	twin	triplet	4plet	5plet	Total	%
Pasir Gaok	live	14	30	15	4	0	63	7.9
	dead	1	1	2	1	-	5	
Ngagrak	live	24	52	9	8	5	98	8.1
	dead	1	1	1	1	4	8	

Table 3. Proportion of multiple births of sheep and goats in Pasir Gaok and Ngagrak, West Java

		single	twin	triplet	4plet	5plet	Total
Pasir Gaok	n	14	15	5	1	-	35[1]
	%	40	43	14	3	-	
Ngagrak	n	24	26	3	2	1	56
	%	43	46.5	5.5	3.5	1.5	

[1] Total number of births in Pasir Gaok is smaller than in Ngagrak because the method of recording these data was developed after the Pasir Gaok study had begun.

Health and Diseases

The most important diseases observed during our fieldwork and reported by farmers were diarrhea, scabies, eye disease, food and pesticide poisoning, thinness, abortion, milk fever, wounds infested with maggots, and broken legs. Farmers generally viewed their animals as healthy, and the team encountered few disease cases in Cinangka and Ngagrak, while the prevalence was higher in Pasir Gaok. The relative importance of diseases differed among villages and sometimes even neighborhoods (RTs) within a village. In Pasir Gaok, for example, we observed more cases of diarrhea in RTs where animals were regularly grazed than in those where the animals were mostly confined. In the latter locations, eye disease seemed to be more prevalent than elsewhere. Scabies was a problem in some parts of Cinangka, where the goat population was comparatively high, but not in Ngagrak, where few goats were kept.

Our findings suggest that disease problems were often related to management and feeding practices. In Cinangka, where sheep and goats were rarely allowed to graze, most were in sufficient to good condition, and we observed few cases of diarrhea. Most farmers regarded diarrhea not as a disease but attributed it to feeding too many sweet potato leaves. Our analysis of fecal samples supported our observations. Most animals (71%) were only lightly infected, with Haemonchus being the dominant strongyle. Liver fluke eggs were found in only three animals.

On the other hand, in Pasir Gaok -- where grazing was common -- we encountered 16 diarrhea cases within four days, and animals there generally seemed to be in worse condition than in Cinangka. Because we did not take fecal samples in this village, we cannot say whether this was because of parasites or the late stage in the dry season.

We mentioned already above that in some parts of Ngagrak farmers fed their small ruminants with fresh cassava leaves and peelings. They commonly regarded both as poisonous. But they insisted that the toxicity was reduced if the cassava products were given together with or after grass had been fed, and that animals would get used to them. It was in this village that we observed the fewest disease cases and encountered the best and fattest animals -- although we visited Ngagrak at the end of the dry season, later than the other two villages. And the condition of animals in those parts of Ngagrak where little or no cassava leaves or peels were fed was not as good. On the other hand, nearly every household we asked had encountered cases of food poisoning, and farmers reported six deaths caused by this. Although we cannot exclude other death causes, the disease signs the farmers described to us seemed to confirm their diagnosis.

In Pasir Gaok, farmers regarded pesticide poisoning as a bigger problem than food poisoning, because animals often grazed in

rubber plantations that were regularly sprayed with pesticides.

Healers

In all three villages, there were no special healers for animal diseases; livestock holders themselves treated their animals. The necessary know-how was usually acquired from parents, other relatives, or neighbors. Both men and women were involved in animal health care, although our data indicate that in Cinangka men had more information on animal diseases and remedies than did women. In each village, a few farmers seemed to be far more knowledgeable than others, but they said that they were not or only very seldom consulted by other smallholders.

An exception was a specialist for goat castration in Ngagrak, who reputedly also castrated bucks in neighboring villages. He had died two months before our survey. His son had not learned father's skills, but was able to roughly describe his method. Bucks were castrated so they would become bigger and healthier. The operation was usually performed with a knife using open surgery. The wound was treated with *jawer kotok* [Coleus atropurpureus(?)] and coconut oil that his father had made himself. The son explained that his grandfather had been a *dukun sunat* (circumcision specialist) and that his father very likely had learned some of his methods from his grandfather. A farmer mentioned that castrated goats recovered fast, but that sheep did not; sheep were therefore not castrated. Goats did not seem to be castrated in the other two villages.

Disease Classification

Farmers distinguished at least 20 different disease conditions, with disease names reflecting symptoms, affected body parts or disease causes. The classification systems were similar in all three villages. Disease conditions sharing the same signs but having different causes were in most cases not further differentiated. Diarrhea, for example, was called *mencret* whether it was attributed to nutritional factors or other causes.

Most local terms could be easily matched with diseases as defined by Western science. An exception was *lumpuh* 'paralyzed.' Cinangka farmers used this to refer to animals paralyzed because of either milk fever or snake bite. In Pasir Gaok, in addition to milk fever, *lumpuh* seemed to mean also a condition occurring independent of pregnancy; it was unclear which Western disease was meant.

Treatments

Local treatment choices included the topical or oral application of remedies, dietary change, manipulative techniques, resting the animal and letting a disease heal alone, and selling or slaughtering the animal. Dietary changes were mostly confined to cases of diarrhea, although this disease was also treated with herbal drenches or allowed to heal alone. The latter treatment was also reported for several other conditions, but seemed to be especially frequent for eye disease. In cases of bloat and poisoning, i.e., in acute, life-threatening conditions, farmers sometimes slaughtered the animal on the spot, but otherwise our data and field observations indicated that smallholders often tried to treat sick animals before taking other measures.

Villagers used a wide range of drenches, ointments and other medications to treat their small ruminants. The remedies were made from the fruits, roots, leaves or stems of at least 48 plants (Appendix) including trees, vegetables and grasses as well as several other ingredients such as sweet soy sauce, shrimp paste, cooking oil and kerosene. Farmers considered some but not all traditional remedies as efficient.

There was considerable overlap between the remedies of the three villages. Nine plants were used in all villages, and 11 others were used in at least two. The appendix lists more plants for Cinangka than for Pasir Gaok and Ngagrak; this is probably because the team spent more time in Cinangka and interviewed more people there.

On the other hand, some plants used in one village were not used elsewhere. *Tongtolan nangka*, the very young fruit of the jackfruit tree, for example, was extensively used in Cinangka to treat pinkeye, but a farmer in Pasir Gaok said that in his village it wasn't used and no other respondent mentioned it. Sometimes there were differences even between parts of the same village. For instance, in Cinangka we studied three neighborhoods intensively, but farmers in only one gave *pisang batu*, a banana variety, as an appetizer or to treat problems of the digestive tract.

About half of the plants were used for single purposes, while the remainder had multiple uses and were applied to different health problems. Tamarind (*asam*), *dadap* (Erythrina subumbrans), *huni* (Antidesma bunius), arecanut (*jambe*), coconut (*kelapa*) and *lempuyang* (Zingiber aromaticum) had the most applications. Plant parts that were used for the same disease in all three villages included tamarind fruit pulp for poisoning, *huni* leaves as appetizer and against diarrhea, arecanut leaves against scabies, and *lempuyang* rhizome as appetizer (Appendix).

Plant mixtures also were sometimes applied to treat different problems or, more often, remedies for different diseases contained

similar ingredients. For example, many remedies against diarrhea, worms, reduced appetite and thinness were based on *deduitan* (Cyclophorus nummularifolius) leaves, *huni* leaves, *lempuyang* rhizome, and shrimp paste. This multiple use of remedies is probably because the local definition of these diseases is based on symptoms rather than on causes. Remedies used for fattening may in fact have some antiparasitic effect and therefore improve the general condition of the animal by reducing its parasitic load. A second reason could be that farmers do not have a specific cure for a certain disease and therefore use a general remedy which they know to improve the general condition. This is probably true for *pilek* 'flu': of three farmers in Cinangka who said something about this disease, two said that they did not have a remedy. The third used a prescription that he gave his animals also to increase appetite.

Compared to other societies (for examples see Mathias-Mundy and McCorkle 1989), farmers in West Java rarely used manipulative techniques. In all three villages, smallholders said they inserted the stalk of a papaya leaf into the anus of animals suffering from bloat to stimulate flatulence. In Ngagrak, village administration staff mentioned ear-slitting, and in Pasir Gaok we saw one goat which had been treated for poisoning by the farmer's cutting off the lower half of the ear to bleed it. An especially knowledgeable farmer in Ngagrak reported that as a last attempt after other treatments had failed, he had twice successfully punctured the stomachs of animals suffering from bloat.

Treatments that had obvious magico-religious components were rare. In Ngagrak, farmers said that poisoned animals might be drenched with charcoal and salt mixed with water in which a *peci*, a traditional Muslim hat, had been soaked. The son of the goat castrator mentioned above that his father sometimes used magic. That we encountered so few magico-religious practices does not exclude the possibility that such beliefs are behind the use of certain plants and remedies.

The three villages had little access to veterinary services. Few farmers gave commercial drugs to their animals, and in all cases these drugs had been originally intended for humans. Examples included eye drops, ointments for skin diseases, and medicines against intestinal parasites.

Epidemiological Knowledge and Disposal of Carcasses

Farmers were aware that certain diseases can be transmitted from animal to animal or from animal to humans. Some, but not all, of their assumptions were correct. However, respondents who recognized a disease as transmissible did not always think it necessary to separate infected animals from the rest of the herd. Some said that they could not split the herd for space reasons.

In Cinangka most farmers we asked about this topic said they would bury animals that had died of a disease; only two said that they ate or sold the flesh of such animals. A farmer in Pasir Gaok mentioned that villagers would eat animals that had died from bloat and poisoning but not of scabies and *lumpuh* (translation unclear, see above). A farmer in Ngagrak regarded the meat of animals slaughtered because of poisoning as less tasty. Since sick animals are often sold if local treatments fail, we can assume that some will be slaughtered outside the village and enter the meat market.

Traditional Animal Health Care: What Works and What can be Improved?

Most farmers we talked to regarded their small ruminants as healthy and believed that the animals would do well with regular feed and good care. Several said that finding green fodder during the dry season was a bigger problem than disease. Western science shares the smallholders' view that management and feeding are important aspects of disease prevention. Our findings suggest that farmers in all three villages were reasonably successful in keeping their animals healthy, although differences between villages and some disease problems existed (i.e., scabies in goats and diarrhea in Pasir Gaok).

Parts of Ngagrak clearly had the fattest and healthiest animals, followed by Cinangka, with most parts of Pasir Gaok coming last. It is likely that management and feeding accounted for the differences in the animals' condition and health.

The most obvious difference among locations was whether animals were grazed or not. The fecal examinations from Cinangka show that animals totally confined in barns built on stilts have low parasitic loads. The feces drop through the slatted floor of the barn, reducing the possibility of an animal ingesting larvae of fecal parasites. Since the animals never or rarely graze outside, it is unlikely that the grass and fodder the farmers cut and carry is extensively infested with parasites dangerous for sheep and goats. Although we did not do parasitological investigations in the other two villages, it was remarkable that grazed animals were thinner and had more diarrhea than those under total confinement. Gatenby *et al.'s* (1985) study of sheep and goat housing in West Java supports these findings.

Other management factors that likely accounted for differences in the animals' condition and health were the small distance between barns (more eye disease in southern Pasir Gaok than in the northern part), fodder types (fatter animals in some Ngagrak neighborhoods than in Cinangka, although in both places the animals were totally confined in stilted barns), and possibly animal movements (the small ruminant population in Ngagrak seemed more secluded than in Cinangka, though our observations on this are very

limited).

It was difficult to assess the role played in each village by preventive herbal drenches and special feeds such as cucumber and soy sauce. It seems that farmers in Cinangka used them more than farmers in Ngagrak, with Pasir Gaok probably in the middle. However, such medicines and feeds are given infrequently, and they are therefore not as visible as other management practices. In addition, farmers were sometimes rather vague about how often they used them. Several other preventive measures, such as sprinkling salty water on dry fodder or if animals had reduced appetite, and rubbing kitchen ash around a dam's vulva or on a newborn's navel to prevent maggot infestation, seemed to be done by most smallholders.

Curative practices were similar in all three villages. Farmers used various herbal drenches and other medicines, while manipulative techniques were rare. The spectrum of medicinal plants overlapped in the three villages, although there were some differences as to the plant parts used and the conditions they were applied for.

As a whole, however, the use of medicines seemed to be moderate. There may be several reasons for this. We mentioned above that farmers perceive their animals as very healthy. Furthermore, farmers have a lot to lose if an animal dies of disease. Kenyon and Kenyon (1991) point out that most of a family's wealth may be tied up in a few animals, and an animal's death may mean financial ruin. Smallholders will therefore immediately slaughter an animal that has a directly life-threatening condition, or sell or slaughter rather than try a second remedy it the first fails. The number of treatments tried probably depends on the time a disease allows for treatment (e.g., several farmers said they had tried several remedies against scabies), the farmer's experience with a remedy (i.e., whether it has worked in the past) and whether he or she knows of an alternative if the first treatment fails.

It is beyond the scope of this report to discuss the efficacy of the remedies used in Cinangka. Many of the plants identified are applied also in human ethnomedicine, and we may expect that at least some are effective. Several plants such as *huni* (PROSEA 1991) are known to contain an alkaloid and to be poisonous. For snakebite, villagers purposely use the sap of the *picung* tree (Pangium edule), which they regard as toxic, because they hope that the toxin will combat the venom of the snake. They use leaf and bark of the same plant to treat myiasis and scabies. According to Burkill (1966), leaves, bark and other parts of *picung* contain hydrocyanic acid.

Although farmers said they would apply remedies for long enough until recovery, our observations from Cinangka suggest that dosages and treatment schedules are weak points of the local

ethnoveterinary system (for examples see Wahyuni *et al.* 1991). If a remedy (local or Western) is introduced, for example against scabies (see below), farmers should learn that -- depending on the remedy -- regular and frequent application is necessary for successful treatment.

Another drawback of the local system is the lack of special care for pregnant ewes and does. Improved feeding and the regular provision of sufficient water during pregnancy is likely to reduce the incidence of milk fever.

Another problem that could be solved through management changes is poisoning. Pesticide poisoning could be avoided by keeping animals away from rubber leaves and grass from newly sprayed plantations (farmers may not always be aware when spraying is done). Food poisoning could be reduced by feeding other fodder types instead of cassava leaves and peels. This, however, may not be in the interest of the farmers, who seemed consciously to choose the risk of losing some animals: cassava leaves and peels were easily available and the surviving animals made up for the losses through their especially good condition.

Scabies in goats is a problem in West Java. Although we did not see many cases (remembering that the proportion of goats in the three villages is comparatively small), respondents in Cinangka identified it as one of the most important disease problems, and several farmers in the other villages indicated that scabies was one reason they had switched from goats to sheep. Some farmers knew treatments for scabies but not all were convinced that the treatments worked.

A common traditional remedy for scabies is used engine oil. It is used not only in our villages but also in other parts of Indonesia (Adjid 1990, FAO 1991, Gatenby *et al.* 1985, Mathias-Mundy and Murdiati 1991) and elsewhere (Mathias-Mundy and McCorkle 1989). This may indicate that it has at least some efficacy. Gatenby *et al.* (1985) found that this treatment seemed reasonably successful with smallholder goats in Cirebon, West Java, but did not eradicate the disease. Our observations in Cinangka suggest that this failure may be because farmers did not repeat the application after one or two weeks or left too much time between applications.

It might be that other types of oils or mixtures of oil and medicinal plants are more effective. Scientists in the Andes tested the efficacy of *muña* (Minthostachys andina) oil and diesel oil against sarcoptic and psoroptic mange in alpacas. They found that topically applied *muña* oil was more effective than diesel oil (Caballero Osorio 1984). Indonesian farmers frequently use coconut oil either alone or mixed with sulfur or medicinal plants (data from our studies, Adjid 1990, FAO 1991, Gultom *et al.* 1991). Since coconut oil is widely available in the tropics, and in remote areas may be easier to get than engine oil, it would be a useful remedy

if indeed it works. It should therefore be tested scientifically, possibly also in combination with other medicinal plants. One such plant is *ketepeng* (Cassia alata), for example, a traditional Indonesian remedy against scabies in goats (Gultom *et al*. 1991, FAO 1991), although it was not mentioned by respondents in our study villages. According to Murdiati and Manurung (forthcoming), *ketepeng* significantly reduced the number of live psoroptic mites in rabbits. Its efficacy against sarcoptic mites remains to be proven.

Most Cinangka farmers experienced with scabies or who had seen cases in a neighbor's flock were aware that the disease could be transmitted to other goats. However, they did not always act accordingly. And as many respondents said that people could contract scabies from animals as thought the opposite. Since scabies can be transmitted to humans (in fact, we learned about one case in Cinangka where a whole family had to be treated at a nearby health center), farmers should be informed about the dangers of this disease.

In areas where grazing is common, sheep and goats would benefit from the introduction of a regular deworming scheme, preferably based on cheap, locally available remedies. The leaf of *huni* seems to be a potential candidate and should be tested scientifically. Although we have no proof that the thin condition and diarrhea of animals in Pasir Gaok was caused by intestinal parasites, studies have shown that infestation with intestinal worms is common in small ruminants in West Java and that infestation is higher in regions where animals are grazed than under zero-grazing (Ronohardjo and Wilson 1986). Handayani and Gatenby (1988) suggest that high death tolls from worms in grazed sheep were probably one of the reasons for the unconscious evolution of the stall-feeding system in Java.

Implications for Development Projects

This study led to some observations of general importance for the implementation of development projects. These should be taken into account when planning and designing any interventions in animal health care, whether the interventions are based on traditional or modern veterinary medicine:

(1) Although all three study villages were located not far from each other, management practices and disease problems varied, requiring different approaches in each village.

(2) In all three villages, farmers had little contact with veterinary services and relied on traditional methods for the health care of their small ruminants. This demonstrates that traditional animal health care is important not only in remote areas, but also in villages close to cities. And it implies that farmers possess skills on which animal health care

interventions can build.

(3) Improvements should consider existing conditions. About a year before our survey, work-study (*kuliah kerja nyata*) students had tried to convince Ngagrak farmers to grow elephant grass and gliricidia bushes as livestock feed. The students did not recognize that the village already had a very specific feeding system that took advantage of and optimally utilized available fodder resources. During our survey, hardly any traces were left from the students' efforts. Only one farmer who lived close to the main road grew elephant grass for sale.

(4) Farmers may actively choose health risks to their animals, weighing the risk against advantages such as convenient fodder collection and good animal condition.

(5) In all three villages, customs and beliefs influenced management and curative practices (e.g., treatments logically resulted from beliefs about disease causes, and farmers believed that females could become sterile from feeding too much salt). To be successful, any interventions have strongly to consider such local beliefs and practices.

(6) The Cinangka study showed that women participate actively in animal health care. Although we did not especially investigate this subject in the other two villages, we saw that women were involved here too. This implies that animal health care projects should target both men and women.

Outlook

The studies in Cinangka, Pasir Gaok and Ngagrak were a first step in the research and application of traditional animal health care in West Java. They characterized the health care system and described specific remedies and practices. The next step would be the identification and testing of remedies against scabies and intestinal parasites and their promotion in the study villages. Some possible candidates are coconut oil and *ketepeng* against scabies and *huni* against intestinal worms.

A database should be compiled of all plants used in the three villages and named in other publications on Indonesia (Adjid 1990, FAO 1991, Mathias-Mundy and Murdiati 1991) and published and unpublished information on the biochemistry, pharmacology, medical efficacy and other aspects of these plants. Since many of them are also used in human ethnomedicine, it is quite likely that at least some have been studied and tested. The database should be the basis for identifying effective remedies against disease conditions that can be successfully treated by owners or personnel with some basic training in veterinary medicine. Examples include wounds, myiasis, skin diseases, and intestinal parasites. The target would be to develop an "ethnoveterinary kit" containing key remedies

suitable for different regions of Indonesia.

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Appendix
Application of Medicinal Plants

Plant name Local	Plant name Latin	Plant part	Disease	Village[1]		
Amis mata	unidentified	Sap	Pink eye			N
Asam	Tamarindus indica L.	Fruit	Coughing	C		
			bloat	C		
			insufficient milk	C		
			poisoning	C	P	N
			appetizer		P	N
Bambu	Bambusa spec.	Leaf	Poisoning		p	
Bawang merah	Allium cepa L.	Bulb	Thinness	C		
			appetizer			N
Berenuk	Crescentia cujete L.	Leaf	Scabies	C		
Blendung (dadap batang berduri)	Erythrina orientalis (L.) Murr.	Leaf	Scabies	C		
Bonteng (timun)	Cucumis sativus L.	Fruit	Appetizer	C	P	
			diarrhea	C		
Dadap	Erythrina subumbrans (Hassk.) Merr	Leaf	Coughing	C	P	
			flu		P	
			bloat	C		
			appetizer	C	P	
			thinness	C		
			insufficient milk	C		
			poisoning		P	
			diarrhea		P	
Deduitan	Cyclophorus nummularifolius C. Chr	Leaf	Worms	C		
			rumen fluke	C		
			appetizer	C		
			thinness	C		
			diarrhea	C		
Duren	Durio zibethinus Murr.	Leaf	Thinness	C		
			appetizer		P	
			poisoning		P	
			scabies			N
Huni	Antidesma bunius (L.) Spreng	Leaf	Worms	C		
			rumen fluke	C		

[1] C = Cinangka, P = Pasir Gaok, N = Ngagrak

Plant name Local	Plant name Latin	Plant part	Disease	Village		
Huni (ctd.)		Leaf	appetizer	C	P	N
			thinness	C		
			diarrhea	C	P	N
			poisoning		P	
			scabies			N
Jahe	Zingiber officinale Roxb.	Rhizome	Poisoning			N
Jambe (pinang)	Areca catechu L.	Leaf	Scabies	C	P	N
			lice	C		
		Root	Thinness	C		
			diarrhea		P	
		?	Milk fever	C		
			paralysis	C		
Jambu biji	Psidium guajava L.	Leaf	Diarrhea		P	
Jawer kotok	Coleus atropurpureus Bth. (?)	Leaf	Thinness	C		
Jengjing	Albizia falcataria (L.) Fosberg	Leaf	Diarrhea	C		
Kangkung	Ipomoea aquatica Forsk.	Leaf	Insufficient milk	C		
Katuk	Sauropus androgynous (L.) Merr.	Leaf	Insufficient milk	C		
Kecebong	unidentified	Leaf	Bloat	C		
Keci beling	Strobilanthus crispus (L.) Bremek	Leaf	Diarrhea	C		
Kekentutan (sembukan)	Paederia foetida L.	Leaf	Bloat	C		
Kelapa	Cocos nucifera L.	Oil	Scabies	C	P	
			pink eye	C		
			milk fever	C		
			paralysis	C		
			poisoning			N
		Fiber of shell	Scabies		P	
		Water	Pink eye		P	
			coughing		P	

Plant name Local	Latin	Plant part	Disease	Village		
Kelapa (ctd.)		Water	flu			P
			poisoning			N
Ketepeng	Cassia alata L.	Leaf	Scabies	C		
Kihujan	Gliricidia maculata	Leaf	Scabies	C		
Kipahit	Pierasma javanica BL.	Leaf	Scabies	C		
Kunyit	Curcuma domestica Val.	Rhizome	Scabies	C		
			appetizer	C		
			wounds			N
Lada	Piper nigrum L.	Seed	Bloat	C		
			appetizer			N
Langkuas	Languas galanga (L.) Stuntz	Rhizome	Appetizer		P	
Lamtoro	Leucena leucocephala (Lmk.) de Wit.	Leaf	Poisoning			N
Lempuyang	Zingiber aromaticum Val.	Leaf	Coughing	C		
			rumen fluke	C		
			diarrhea	C		
		Rhizome	Appetizer	C	P	N
			thinness	C		
			diarrhea	C	P	
			scabies			N
Nangka	Artocarpus heterophyllus Lmk.	Leaf	Bloat	C		
			diarrhea	C	P	
		Fruit	Pink eye	C		
Nenangkaan (gendong anak)	Euphorbia hirta L.	Sap	Pink eye	C		N
Paci-paci	Leucas lavandulaefolia J.E. Smith.	Leaf	Scabies	C		
Padi	Oryza sativa L.					
merang		Straw	Scabies	C	P	
alu		Pestle	Bloat		P	
beras		Fruit	Insufficient milk			N
Pecah beling	unidentified	Leaf	Diarrhea		P	

Plant name Local	Plant name Latin	Plant part	Disease	Village		
Pepaya	Carica papaya L.	Leaf	Bloat	C	P	
			insufficient milk	C		
		Fruit	Insufficient milk	C		N
Petai	Parkia speciosa Hassk.	Leaf	Scabies	C		
Picung	Pangium edule Reinw.	Leaf	Scabies			N
			myiasis			N
		Bark	Myiasis	C		
			scabies	C		
		Sap	Snake bite	C		
Pisang	Musa paradisiaca L.	Stem	Poisoning			N
			diarrhea			N
Pisang batu	Musa balbisiana Colla	Fruit	Rumen fluke	C		
			bloat	C		
			appetizer	C		
			diarrhea	C		
			flu	C		
Sembung	Blumea balsamifera (L.) DC.	Leaf	Rumen fluke	C		
			diarrhea	C		
			thinness	C		
			scabies			N
Sereh	Cymbopogon nardus (L.) Rendle	Leaf	Broken leg	C		
			lice	C		
		?	Lameness		P	
Singkong	Manihot esculenta Crantz.	Root	Insufficient milk			N
		Fermented root	Scabies	C		
			diarrhea		P	
Tapak liman	Elephantopus scaber L.	Leaf	Thinness	C		
Teh	Camellia sinensis L.	Leaf	Pink eye	C	P	
Tembakau	Nicotiana tabacum L.	Leaf	Myiasis		P	N
			poisoning			N
Temu lawak	Curcuma xanthorrhiza Roxb.	Rhizome	Diarrhea	C		