

Cattle Production on Small Holder Farms in East Java, Indonesia: I. Household and Farming Characteristics

P. S. Winarto¹, P. H. Leegwater, G. Zemmeling and M. N. M. Ibrahim*

Animal Production Systems Group, Wageningen Institute of Animal Sciences (WIAS)
Wageningen Agricultural University, P.O. Box 338, 6700 AH Wageningen, The Netherlands

ABSTRACT : A general household survey was carried out in the village of Sonoageng in East Java, Indonesia with the aim to assess their socio-economic status, and the crop and livestock production system prevailing in the area. Of the households interviewed (164), 52% are landless, 35% own land or have a combination of own and shared land, and 12% do not own land but have access to land by sharing. Nearly two thirds (65%) of the households raise cattle; most of them own animals, 8% reared shared animals only. The dominant crop was rice; other crops grown were soya bean, groundnut, maize and sugar cane. Nearly half (47%) the household income was derived from off-farm work (non-agricultural activities), 33% from crops, 13% from livestock (mainly cattle), and 7% from agricultural labour. Most households kept 1 to 2 animals and only 21 out of 164 households earned more than Rp. 500,000 (~250 US\$) per annum from livestock. The most prevalent type of livestock production in the area could be characterized as small-scale cow/calf operation, either by landless households or those with <0.4 ha of land. (*Asian-Aus. J. Anim. Sci.* 2000, Vol. 13, No. 2 : 220-225)

Key Words : Cattle, Household, Farming Characteristics, Indonesia

INTRODUCTION

The island of Java, Indonesia, is one of the most densely populated areas in the world with a population density of 799/km² (Kepas, 1985). Java is well known for its many volcanoes and large areas of fertile lowland. Extended irrigation systems have been developed to create large areas of sawah (irrigated fields) for rice cultivation. Due to the high population pressure, there is virtually no grazing land. Nevertheless the livestock population is high. Buffaloes and cattle are extensively used as draft animals and, together with sheep and goats, these animals are an important asset, providing additional income and economic security for smallholder farmers as well as landless households. Feed resources for ruminants differ according to the area and cropping pattern (Ifar, 1996). In the mountainous regions, more green feeds from hillsides are available. In the lowland areas, crop residues are the major feed resource and rice straw constitutes a large part of that. This gives rise to a difficult situation, because the straw is generally of such low quality, that it does not even cover the maintenance requirements of animals (Bruchem and Zemmeling, 1994). A vast amount of research has been conducted concerning the pre-treatment of straw and feed supplementation (Doyle et al., 1986; Schiere

and Ibrahim, 1989). However, practical application of this technology has been limited (Ibrahim, 1994). One possible reason is, that most of the research conducted by animal scientists was of a very technical nature. In laboratory studies on intake and digestibility of straw the feeds tested are separated from other feed resources available to the farmers, as well as the socio-economic context of the animal production system.

The present study was part of a project on "Increasing productivity of tropical crop-livestock systems by optimal utilization of crop residues and supplementary feeds" financed by the European Union under its Science and Development programme. At the onset of the project, it was decided that studies on the technical aspects of feed utilization should be preceded by an analysis of the feed resource base for livestock production systems in India, Sri Lanka and Indonesia. The study in Indonesia was in the village of Sonoageng in the irrigated lowland of East Java. The village of Sonoageng was selected based on the recommendation of the Government Livestock Services (Dinas Peternakan), and it was said that this village is a promising village for intensive beef cattle production, but very little is known on the production system itself. Moreover, Sonoageng is representative for the lower Brantas river area where we find the combination of animal production and intensive irrigated agriculture.

Most livestock in this area is kept by small holder farmers. Feeds are collected on the own farm, but (especially in the case of landless livestock keepers) also from the crop fields of others and communal areas such as road sides, forests, etc. (Ifar, 1996).

* Address reprint request to M. N. M. Ibrahim. Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka. Fax: +94-8-388041, E-mail: mibrahim@slt.lk.

¹ Faculty of Animal Husbandry, University of Brawijaya, Malang, East Java, Indonesia.

Received December 8, 1998; Accepted April 30, 1999

Thus, the access to feed resources could not only related to the size of the own farm, but also to the availability of household labour in combination with other employment opportunities. In addition the role of livestock for the household economy differs according the income derived from land and outside employment opportunities. Studies conducted in Sri Lanka demonstrates this relationship (Zemmelink, 1996). The study on availability of feed resources and characteristics of the production system in Sonoageng was therefore divided in two parts: a general household survey and an in depth survey on feeding practices. The general household survey served as a basis for distinguishing household types according to the structure of their income and availability of resources. These criteria were later used for the selection of households participating in the in-depth feed survey. This paper reports the results of the general household survey. Results of the feed survey are reported in the second paper of this series.

The objective of the general household survey was to determine subjects and designs for in-depth surveys on major aspects of livestock production systems.

MATERIALS AND METHODS

Sonoageng is situated about 48 m above sea level, in the fertile plains of the Brantas river, to the west of Surabaya. This densely populated area is characterized by small-scale intensive crop farming. Many households rear livestock, especially cattle. The climate in this area is hot and humid with an average annual rainfall of 2,000 mm which falls mainly in the period November-March. The government supports agricultural production in the village, amongst others, through the irrigation board, the veterinary service, and artificial insemination. Fertilizers and chemicals are available through the government rice intensification programme. For Sonoageng, seeds, fertilizer, and pesticides are channelled through the village cooperative which operates from the capital of the district (Prambon). Farmers can also purchase these materials at the agricultural kiosk close to the market of Warujayeng (6 km East of Sonoageng).

The household survey comprised two phases: a rapid appraisal in April/May 1993, and the actual household survey in November 1993. The rapid appraisal served to establish contact with the village authorities and with personnel from the livestock services (key informants). Partly based on the information obtained in the rapid appraisal, a questionnaire for the household survey was developed, pre-tested in August-September 1993 and, where required, revised. The questionnaire included sections on the households (size, demographic composition, economic activities and income), land, crops, and

livestock.

There were 1,533 households in Sonoageng, divided over 52 RT's (Rukun Tetangga, the smallest administrative unit). The number of households included in the survey was 164 (11% of the total number), divided over all RT's. The households were selected at random, and the single-visit interviews were conducted in November 1993. The data were entered in Dbase and analyzed using Dbstat software program (Brouwer, 1992).

RESULTS

Demographic characteristics of the population

The village covers an area of 529 hectares and is sub-divided in 5 hamlets: Sonoageng, Sumber, Gading, Waung, and Banyurip. The total population was about 6,800, representing a population density of nearly 1,300 persons/km². Nearly all (99%) of the villagers of Sonoageng are Muslim. The average number of persons per household was 4.5 of which 3.0 were in the age class 18-65 years. This included all persons who lived in the same house and ate food prepared in the same kitchen, as well as persons related to the head of the household (usually unmarried children) who worked and lived outside, but returned home regularly and sent (part of) their earnings home. These non-resident members of the households were all of the age class 18-30 years, and included women (13 out of 101 in that age class) as well as men (15 out of 86). Most of them worked in Surabaya (various industries), or in a large cigarette factory in Kediri (about 10 km from Sonoageng). Apart from the regular wages, the extra allowance paid at the end of the Muslim fasting period ('Idul Fitr or Lebaran) is highly valued.

About 1 in 6 (15.9%) of the Heads of Household and their wives (15.5%) did not have any formal education. Two-thirds (69.5 and 67.6%, respectively) had completed primary school, and about one in six (14.6 and 16.9%, respectively) secondary school or high school. In the 1970's, the Indonesian government initiated the so-called 'Program WAJAR DIKDAS 6 TAHUN', to provide basic education for all children in the age class 6-12 years. Recently, the obligatory schooling programme has been expanded to 9 years (6 years primary school, and 3 years secondary school). As a result, the education level of the younger generation (boys as well as girls) is better than that of the older generation. In principle, all children go to primary school and a large part continues to secondary school or high school.

Economic activities

The main occupation of most men (age \geq 18 years) of Sonoageng was in agriculture (see table 1).

However, a large proportion mentioned agricultural labourer and not farmer as their first occupation. For an equally large number, 'kerja serabutan' (undefined) was recorded. In many cases, this implies that the person concerned earned his main income from a combination of small jobs (e.g., fixing the neighbour's roof, cleaning somebody's home-yard, painting the house of a village officer, helping with transplanting rice, and so on). The majority of the women mentioned "house-wife" or "helping my husband" (both recorded as undefined) as their main occupation. For those women who stated a specific activity, the picture is similar to that for men: mostly farmer or agricultural labourer. Only 2 out of 164 heads of household stated that rearing livestock was their main occupation.

Table 1. Main occupation of men and women (>18 years of age) in Sonoageng (Number of persons)

	Men	Women
Farmer	77 (34.5)	37 (16.2)
Agricultural labourer	58 (26.0)	31 (13.5)
Local trader	12 (5.5)	14 (6.1)
Government officer	7 (3.2)	9 (3.9)
Factory labourer	5 (2.2)	2 (0.9)
Food vendor	3 (1.3)	6 (2.6)
Carpenter/brick layer	3 (1.3)	0
Retired	3 (1.3)	0
Rearing cattle	2 (0.9)	0
Others (undefined)	53 (23.8)	130 (56.8)
Total	223	229

Figures in parentheses are percentage of the total.

The dominant non-agricultural activities were local trading of vegetables and fruits, and running small shops which provide the daily needs of the community, including household utensils and food. The revenue obtained from this activity varied widely between households. One specific activity is the production of tofu (soybean curd). The by-product of this (ampas tahu or entheg: tofu waste) is used as a supplementary feed for cattle. Thirty (30) households, all in the hamlet of Gading, were involved in this.

Land resources and crop cultivation

According to information obtained from village authorities, 162 ha of land is occupied by buildings (mainly houses) and the surrounding home garden, leaving 367 ha for crop land. Slightly more than 80% (299 ha) of this is described as sawah, and the remainder as tegal (non-irrigated land). About one-third (120 ha) of the arable land was used to grow sugar cane. As in other villages, farmers are obliged by government rule to take turns in leasing their land to

sugar companies for the production of sugar. The duration of the lease period is 3-4 years. The cane is planted and harvested by the sugar companies. It is mainly harvested in the dry season. The cropping intensity on irrigated land not occupied with sugar cane is high: 3 to 4 crops per year. During the rainy and early dry season (7-8 months per year: December/January-July/August) nearly all fields (247 ha) are planted with rice (two crops). Due to high quality irrigation facilities, about two-thirds of the area can also be planted with rice during the other 4-5 months (dry season). The main harvest periods for rice are February-March and July. The third major crop is maize, and is mostly planted during the late dry or early wet season. The main harvest period is in October-December. Soybean and groundnut are minor crops, they are mostly grown after the second rice crop.

The estimated average input-output data for 4 crops are given in table 2. Ground-nuts and soybean appear to be more profitable than rice and maize. In contrast with what was said above, some farmers grow two crops of soya after one crop of rice, but the risk of losing the first soya crop (grown in the wet season) is high. Rice is the preferred crop, because of its role as staple food and the greater risks of crop failure with groundnut and soya bean. There are 3 rice mills in Sonoageng. Crop residues and by-products from the food processing industry are used for feeding livestock. However, much of the rice bran is sold on a tender basis to middle men, and subsequently via traders to feed mills and/or exporters in Surabaya.

Table 2. Input-output profile of crops (Rp. 1000/ha)

Crop	Costs		Receipts		Margin	
	OL	RL	OL	RL	OL	RL
Rice (n=188)	596	1,007	1,742	1,590	1,146	583
Soybean (n=93)	471	854	2,506	2,624	2,035	1,770
Maize (n=110)	517	865	810	1,129	293	264
Groundnut (n=4)	482	n.i.	3,329	n.i.	2,847	n.i.

Notes: Rp. 2000=1 US\$ approximately.

OL: own land; RL: rented land; n=number of plots; n.i.=no information.

Access to land and land ownership

The distribution of households according to type of land ownership is presented in table 3. About 50 % of the households were landless. Share-holding is common, but 3/4 of the households with access to land had their own land or rented land. Share-holding was only practiced for rice, and contracts were for one season (3-4 months) only. After each harvest, the arrangement of share-cropping is re-negotiated between the two parties. Usually, the shareholder has to pay all inputs (seed; fertilizer; pesticides; irrigation fee; labour

for land-preparation, planting and transplanting, weeding, fertilizing, spraying, harvesting, threshing and transporting the produce from the field). After the rice has been harvested and threshed, 10% of the yield is given to the labourers who helped with transplanting and harvesting. The remainder is divided between the share-cropper and the land owner. There was hardly any difference in average land size between households cultivating only their own land (0.31 ha), and those who only had access to shared land (0.33 ha).

Table 3. Distribution (N) of households (HH) by type of land ownership and by type of cattle ownership

	Type of ownership				Total
	None	Own	Own + shared	Shared	
Type of land ownership:					
Number of HH	86	55	3	20	164
Land area (ha):					
Total	0	17.0	2.7	6.6	26.3
Average per HH	0	0.31	0.90	0.33	0.16
Type of cattle ownership:					
Number of HH	58	89	4	13	164
Number of CU*:					
Total	0	148	13	17	178
Average per HH	0	1.6	3.4	1.3	1.1

* Number of Cattle Units=(cows×1+bulls>12 months×1+heifers×0.75 + calves 12 months×0.5)

Livestock

Animal draft power has largely been replaced by hand tractors in Sonoageng. Nevertheless, there is a large animal population. According to village records, there were about 1,800 cattle and 800 sheep in the village. Table 3 shows the distribution of households by type of cattle ownership. Almost two-thirds (65%) of the households reared cattle. In addition, 4 of 164 households owned cattle, but had shared them out to other farms. Usually, the share-holders are close

friends or relatives of the owner. The number of cattle units on farms that raised only cattle in shareholding was slightly lower than on farms with only their own cattle. However, the number of households raising only shared animals was small (8%).

Table 4 shows the subdivision of households included in the survey, according to (1) farm size, (2) income from agricultural labour, and (3) the type and number of cattle kept. As one of the objectives of the general household survey was describe the livestock production system in the village, as influenced by cattle type and numbers, data regarding age distribution of cattle, reproduction and production performance were not gathered. For farm size, three classes were distinguished: <0.1 ha (essentially landless: not enough fodder (crop residues) to provide feed for 1 animal), 0.1-0.4 ha (probably sufficient fodder from own land to raise 1-2 animals), and >0.4 ha (larger farms). An important observation is that very few households had only calves or bulls. Most (84 out of 106 households who reared cattle), had 1-2 cows and heifers (plus accompanying calves) in combination with <0.1 ha land (46) or 0.1-0.4 ha (38).

Household income

Table 5 presents data on sources of household income and the distribution of households according to the amount earned from different activities. The average yearly income per household was Rp. 1,882,000 (~US\$ 950 in 1996). The most important source of income was off-farm work (non-agricultural activities) which contributed 47% to the total. Of all the households in the survey, 108 (66%), derived income from this source. Crops contributed 33% of the total income and livestock (mainly cattle, and a small number of sheep) 13%. Thus, when measured this way, the contribution of livestock, was relatively small. For most households, the number of animals kept was also small (1-2 animals) and only 21 out of 164 households earned more than Rp. 500,000 from livestock. In this respect, earnings from livestock were similar to those from farm labour. On the other hand,

Table 4. Distribution of households (N) by farm size, income from farm labour, and type and number of cattle

Farm size (ha)	Income from farm labour	Number and type of cattle					Total
		None	Calves only	Bulls only	1-2 Cows & heifers	>2 Cows & heifers	
<0.1	no	25	1	1	17	-	44
	yes	15	-	1	29	2	47
0.1-0.4	no	10	3	-	31	3	47
	yes	1	1	-	7	-	9
>0.4	no	7	-	1	9	-	17
	yes	-	-	-	-	-	-
Total		58	5	3	93	5	164

the number of households obtaining income from rearing animals was nearly twice (70%) as large (114 out of 164), as the number involved in farm labour (59). Thus, the income of livestock was divided over many households, including a significant number of landless and nearly landless households. For the latter, the economic importance of livestock may be much larger than expressed by the average contribution of 13% to the total income.

Table 5. Distribution (N) of households (HH) according to level of income (from 4 sources and total) and average income per HH from these sources

Level of income (Rp. 1000)	Source of income				Total
	Crops	Livestock	Off-farm work	Farm labour	
None (0)	52	50	56	105	-
1-499	63	93	35	42	10
500-999	23	19	25	15	53
1000-1499	13	2	17	2	35
1500-1999	3	-	12	-	23
2000-2499	3	-	4	-	8
2500-2999	2	-	4	-	9
3000-3499	1	-	2	-	7
3500-3999	-	-	4	-	5
4000-4499	-	-	1	-	2
4500-4999	1	-	1	-	3
5000-5499	1	-	2	-	3
5500	2	-	1	-	6
Average income/HH					
Rp. 1,000	618	238	885	144	1,882
% of total	33	13	47	7	100

Naturally, not all households were involved in all four economic activities mentioned in table 5. As was to be expected, the proportion of households with income from farm labour was larger amongst households without income from crops (25 out of 52; 48%), than amongst households with income from crops (34 out of 112; 30%). The reverse was true for livestock: amongst the 52 households without income from crops, again 25 (48%) had income from livestock, while amongst the households with income from crops this was 89 (79%). This suggests a close association between crop farming (availability of crop residues), and rearing of livestock at the household level. Of these 89, however, there were 22 who obtained their income from crops entirely from the home garden, i.e. had no income from crop fields. This, added to the fact that there were 25 households with income from livestock but no income from crops at all, implies that 47 (29% of all 164 households) derived income from livestock, even though their feed

resources in terms of their own crop residues, must be have been minimal.

DISCUSSION

We chose to put our efforts on one village and not to take a few households in each of several villages. The reason is that the interaction between (or the combination of) crops and livestock becomes only apparent at the village level and not at the level of individual households: one household may have the land (crops) while another household has access to the crop residues, either as part-pay for labour or otherwise. This exchange of resources between households makes the village operate as a crop-livestock system, even though at the level of the individual household this cannot be always recognized. Sonoageng is often referred to as a cattle-fattening centre. However, farmers who are mainly engaged in fattening are a small minority, and usually these are bigger operations. Possibly because of their size and prosperity, they tend to attract a lot of attention in public relations. They are not however, representative of the general village population. Unlike in the more familiar production systems where the main purpose of rearing cattle is for milk, meat or draft, the most prevalent type of livestock production (table 4) in Sonoageng could be characterized as small-scale cow/calf operations, either by essentially landless households, or farmers with <0.4 ha of land. In other words these farmers involved in the cow/calf operation are intermediaries of a cattle fattening systems which takes place outside the village of Sonoageng. On such systems, data is not available in Java and other areas in the region for a direct comparison. As such, information presented in this paper is rather new.

Based on table 4, the following major groups of livestock rearers could be distinguished: (a) landless without income from farm labour, (b) landless with income from farm labour, and (c) farmers with 0.1-0.4 ha of land, without income from farm labour. There is still a considerable variation within each group, e.g. in the size and demographic composition of the household (all groups), and time spent on non-agricultural activities (group b). Both influence the availability of labour for rearing of livestock. For group (c), the variation in farm size and cropping pattern will affect the amount and kind of crop residues available for livestock feeding. Nevertheless, it is to be expected that access to feed differs between the landless and farmers with crop fields. It is customary in Indonesia, that farm labourers who help with weeding and harvesting of crops are allowed to take home grass, weeds, and crop residues, to feed their own animals. Thus, it can be expected that landless households deriving income from farm labour

have easier access to weeds and crop residues, than households not involved in agricultural labour. The latter may depend more on purchased feeds. Depending on the income from off-farm employment and cash flow, they may be in a better position to purchase rice bran and tofu waste. As reported above, about 30 households in Sonoageng produce tofu. Tofu waste is a watery by-product, but on a dry matter basis, fairly high in protein and quite popular as animal feed. The amount of tofu produced, and thus the amount of waste available, varies between seasons. It is highest in months with important festivities. Generally, however, the amount of waste available is quite limited. In April 1994, for instance, the total amount of fresh tofu waste available was about 800 kg/d (80 kg dry matter). Assuming that the amount of fresh tofu waste given to cattle is 10 kg per animal per day, only a small fraction of the 1,800 cattle in Sonoageng could receive this supplement, so competition for this resource is likely to be high. Thus, while access to feed resources may partly be related to farm size, other factors are also involved, and problems of livestock feeding may well differ for the groups identified above.

The random sample of 164 households (11% of the total number) selected revealed that only three owned bulls. In a cow/calf production system as in Sonoageng, breeding and access to studs/artificial insemination facilities is an important operation. Unfortunately, questions related to this aspect of livestock management was addressed. However, there is evidence to indicate that natural mating is the most preferred and commonly used method of breeding in Sonoageng (Zemmelink, 1996). There are specialised farmers who rear bulls and others have pay to obtain this facility. Future studies should address this aspect of production system in order to obtain the economics of the cow/calf operation system.

ACKNOWLEDGMENTS

The authors wish to thank the Commission of the European Communities for the financial assistance provided under contract no. TS3*CT92-0120. The fellowship provided by the Wageningen Institute of Animal Sciences (WIAS), Wageningen Agricultural

University, The Netherlands for one of authors (MNMD) to undertake this writing assignment is gratefully acknowledged.

REFERENCES

- Brouwer, B. O. 1992. *Dbstat user's guide*. Department of Animal Production Systems. Wageningen Agricultural University, The Netherlands.
- Bruchem, J. van and G. Zemmelink. 1994. Towards sustainable ruminant livestock in the tropics: opportunities and limitations of rice based systems. In: *Constraints and Opportunities for Increasing the Productivity of Cattle in Small Scale Crop-livestock Systems* (Ed. G. Zemmelink, P. H. Leegwater, M. N. M. Ibrahim and J. van Bruchem). Proceedings of a workshop held in November 1994 in Sri Lanka. Department of Animal Production Systems. Wageningen Agricultural University, Wageningen, The Netherlands. pp. 124-140.
- Doyle, P. T., C. Devendra and G. R. Pearce. 1986. *Rice straw as feed for ruminants*. IDP, Canberra, Australia.
- Ibrahim, M. N. M. 1994. Livestock development programmes and their impact on small scale dairy farming in Sri Lanka. In: *Constraints and Opportunities for Increasing the Productivity of Cattle in Small Scale Crop-livestock Systems* (Ed. G. Zemmelink, P. H. Leegwater, M. N. M. Ibrahim and J. van Bruchem). Proceedings of a workshop held in Sri Lanka. Department of Animal Production Systems, Wageningen Agricultural University, Wageningen, The Netherlands. pp. 146-152.
- Ifar, S. 1996. Relevance of ruminants in upland mixed-farming systems in East Java, Indonesia. Ph.D. Dissertation. Wageningen Agricultural University, Wageningen, The Netherlands. pp. 139.
- Kepas. 1985. *The critical uplands of eastern Java - An agro-ecosystems analysis*. FAO-AARD, Malang.
- Schiere, J. B. and M. N. M. Ibrahim. 1989. Feeding of urea-ammonia treated rice straw. Pudoc, Wageningen, The Netherlands. p. 125.
- Zemmelink, G. 1996. Increasing productivity of tropical crop-livestock systems by optimal utilisation of crop residues and supplementary feeds. In: *Final Scientific Report submitted to the Commission of the European Community, Brussels. (TS3*CT92-0120)*. Animal Production Systems, Wageningen Agricultural University, Wageningen, The Netherlands. p. 171.