

PRODUCTION SYSTEMS AND STRATEGIES FOR IMPROVEMENT OF VILLAGE CHICKEN IN EAST NUSA TENGGARA, INDONESIA

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ABSTRACT

In the Eastern part of Indonesia, the majority of village chicken, so called "kampungchicken" is commonly reared by small farmers which is practicing free-ranging to semi-intensive production systems with very limited input. Most of the meat and eggs produced are consumed by household members with small, mostly seasonal, surpluses being sold at village markets.

This study was designed to evaluate the characteristics of village poultry production, aiming at having clear understanding on chicken husbandry. One hundred and twenty farmers, were chosen from 3 locations, representing 3 types of agro-ecosystem in Kupang districts. They were interviewed, focusing on the chicken rearing, including direct observations on animals and their housing. Detailed observations on 33 selected farms was made at 2 monthly intervals, with 5 sequential records of chicken management and productivity.

The results indicate that keeping the 'kampung' chickens is most preference to exotic breeds, because they were easy to raise, required very low cost and provided quick returns. Housewives were responsible for the chicken rearing activities and had important roles in decision making, including animal sales. The numbers of chicken owned by each farmers in the three villages was small, averaged 18.5, 17.7 and 13.3 birds, respectively.

The majority of farmers left their birds unconfined during the day, but provided houses, pens or some kind of shelter for safe-keeping and shelter of their chickens at night and/or during the wet seasons. Birds regularly received supplementary feeding in the form of scraps from the family meal or from low-cost products, such as palm pith of *Coryphagebanga* and rice bran. Maize was occasionally given, on the average of about 25 gram/mature bird/day. Reproductive performance was low, sex ratio of 1:3 was close, and hatchability was high (87%). Chick mortality across the 3 villages averaged (24% from the survey and 15% from monitoring study), caused great losses due to infectious diseases, accidents and predators. Newcastle Disease (ND), is recognized as the most destructive, causing the highest economic losses in village chickens.

Growth pattern of birds changes due to seasonal effects indicated by a considerable differences in the liveweights over the range of 20 to 48 weeks of age, between the 3 villages during the wet season, but was similar in the dry season. When the rainy season limits free scavenging activities of birds, the types and amount of supplementary feed is likely to have a profound effect on the different liveweight and gains of birds between sites, at different ages.

Chicken and eggs were sold on individual basis or unit, at the local markets or to brokers, at lower prices, but were higher at town markets. Their economic contribution was important, for which eggs accounted for less than 10% to the total income received by farmers. Strategies for improving productivity through a better and inexpensive management, covering feeding, breeding and appropriate health management should be of importance.

Keywords: village chicken, production systems, strategy

INTRODUCTION

Large commercial chicken enterprises have contributed substantially to the national meat and egg consumption, with the present population of broilers in Indonesia, of about 1 billions. The number of exotic chickens increased 23.45% per year, from 798 millions in 2006 to 1.042 millions by 2011 and layers of only 1% per year. (Livestock Statistics and Animal Health, 2011).

East Nusa Tenggara (NTT) province, is characterized by its dry-climate with harsh environment, comprised of many islands, in where native chickens are spread widely throughout villages in the region. Population of village chicken in Kupang district counted 19.3% to the total population in

NTT province. Kept in small numbers of less than 20 birds/household, they were raised close to the household, where the main feed is determined by the types of staple food consumed by farmers (Fuah *et al.*, 1992). Economically, Kingston and Creswell, (1982), reported that indigenous chickens gave a considerable contribution to family income of more than about 10%. Village chicken provides eggs and meat in rural areas, it is simple to manage, and requires very low inputs. Small unit size and low capital value, and reared as integrated species in agricultural system (Smith, 1992), make farmers can turn-over stock rapidly without upsetting their capital base. This types of management, according to Tadele *et al.* (2003), and Muchadeyi *et al.* (2004), has been practiced in many developing countries, simply

because of low cost and chicken was raised for quick cash income.

Very little research and development work has been done to characterize, understand and develop the system in NTT regions. This study was aiming at evaluating production systems and characteristics of the native chicken, identifying factors influencing productivity and, then formulating some key strategies for improvement.

MATERIAL AND METHODS

Three village sites were chosen representing 3 main land-use types in the Kupang district, i.e.: Naibonat for Rice-field and mixed garden areas (RMG); Camplong 1 for Mixed garden and grazing areas (GG); Camplong 2 for Dryfield, grazing and forest areas (DGF); The 3 villages were situated adjacent to one another on an altitudinal and rainfall gradient, which was associated with differences in soils, vegetation and land-use types. A year-long study of village small livestock rearing conducted, commenced with a relatively formal survey. One hundred and twenty farmers were chosen randomly within the 3 locations, (42 from RMG, 31 from GG and 47 from DGF) sites. They were interviewed, based on written questionnaires, which focused on chicken husbandry. Direct observations made on the numbers and condition of birds and their housing, liveweights were measured and information about chicken holdings were observed.

Following the survey, detailed observations were initiated at two monthly intervals, on a sub-sample of 33 farms from the survey, involving cooperative farmers, 11 from RMG, 11 from GG, and 11 from DGF. This gave five sequential records of management and productivity of the birds during study period. The number of animals were recorded, liveweights measured, data recorded on reproduction, mortality, sales, feed given, health problems and management practices, including the extraction rates occurred in each flock. Population change during the study period was recorded and estimated from the breeding females inside and those entering the flock and off take rates over the period. Reproductive performance was recorded in terms of sex ratio of breeding males and females, age of females at first lay, the number of eggs produced per clutch cycle, the number of eggs set, the weight of eggs, hatchability, mortality of young birds and the number of clutches produced by each hen per year. Descriptive Statistics and Two-Way Least Square Analysis with Interaction (SAS, 1985) was used in the data analysis.

RESULTS AND DISCUSSIONS

Chicken Rearing, housing and feeding management

Most of village farmers had been raising kampung chickens for more than 8 years, in small flocks, (18.5 ; 17.7 and 13.3 birds in RMG, GG and DGF respectively). The reasons were that the birds were easy to raise, required very low cost to maintain and provided quick returns, as also stated by Darmawan *et al.* (1987). Eggs were rarely consumed by householders since most of the eggs laid (approximately 90%) were set under the hens for hatching. Only about 2% of eggs produced were consumed by the family while 8% were sold, which was similar to the finding of Kingston and Creswell, (1982). Chicken meat was rarely consumed by

farmers because the birds were sold to meet the immediate needs of households. Changes in the structure of chicken population in the three villages (RMG, GG, DGF) were significant. The total number of chickens including young growing chickens, increased at the final monitoring by a factor of three, compared to the first monitoring, whereas the number of hens and roosters increased by about 50 percent. These figures indicating the potential breeding of village chicken under limited input and resources. The role of women in raising chickens was much greater, on 97% of the chicken farms, housewives were responsible for chicken rearing and had important role in decision making. The scavenging birds were given limited input, but, provision of additional feed at certain times of the day and continuous bird supervision by family members, were stated to be important factors in the success of the chicken enterprise.

The majority of farmers left their birds unconfined during the day, but provided houses, pens or some kind of shelter for safe-keeping and shelter of their chickens at night and/or during the wet seasons, for keeping their birds from predators or theft. Housing was quite simple, constructed mainly from local materials, eg. palm leaves, sawn wood or bamboo. Birds regularly received supplementary feeding in the form of scraps from the family meal or from low-cost products, such as palm pith and rice bran. When grain products were in surplus, maize was occasionally given to birds, in small amount of about 25 gram/mature bird/day, particularly in the morning and afternoon. The available feed for chickens at the three villages were maize, rice bran and pith of *Coryphagebanga*. Muchadeyi *et al.* (2004) stated that the main components of chicken feed (maize, soybeans and fish) were staple foods in the human diet and expensive. Maize, was rarely given to birds, and resulted in low chicken production. Other studies on village chicken production suggested that the main problem causing low productivity is the inadequate supply of nutrients (Zainuddin, 2005). Approximately 44% of chicken owners kept water containers in accessible areas around households, allowing drinking water for birds during the day.

Breeding and reproduction

The native chickens were well adapted to the free range method of management in which, males and females typically ran together all year. The average ratio between breeding males and females in each flock of approximately 1:3, was similar in the three villages, indicates ample opportunity for mating between males and females all year round. These resulted in uncontrolled breeding among chicken flocks. Reproductive performance of village chickens in the three villages during the study period (Table 1) gave the average figure of eggs production of 9-11 eggs/hen/clutch cycle, hatchability of 87%, with 4.1 clutches/hen/year, with an average of 45 eggs produced by each hen per year. The egg production was lower than the reports from other studies (Supriadi *et al.* 2001; Gunawan *et al.* 2003; Zainuddin, 2005), the results was may be due to the traditional way of breeding management Tadele *et al.* (2003), and less feed availability to afford optimal production. According to Zainuddin (2005), variation in egg production was associated with genetic, feed quality, diseases and management of village chicken.

Table 1. Mean reproductive performance of village chickens in RMG, GG and DGF during monitoring period.

Attribute	RMG		GG		DGF	
	Mean	SE	Mean	SE	Mean	SE
Cock number	11	-	10	-	10	-
Hen number	38	-	34	-	33	-
Eggs/hen/clutch	9.3	0.18	9.6	0.2	9.3	0.22
Eggs set/number laid (%)	90	0.8	87	2.32	87	2.2
Hatchability (%)	84	0.23	90	0.23	87	0.28
Egg weight (g)	40.2	0.6	41.5	0.7	35.7	0.5
Chick mortality (%)	19	1.90	17	1.60	10	1.1

The overall hatchability was relatively high, and was similar in the 3 villages. Chick mortality up to 6 weeks of age in the DGF site (10%) was markedly lower than that of the two other sites (approx. 18%). Most deaths (64%) occurred before 4 weeks of age with the majority were attributed to disease (82%), while the remainder (18%) were caused by accidents, predators and inadequate-imbalanced nutrient intake of the young birds. The mortality may reach 75% when there is an outbreak of Newcastle Disease (ND). The average egg weight (39 gram) was slightly lower than the what was reported by Zainuddin (2005), mainly, due to the low genetic resources of the indigenous breed.

Diseases and health control

Chick mortality across the three villages averaged 24% (survey results), and 15% from the monitoring study. Most chicken losses were related to infectious disease, accidents and predators. Mature bird mortality was 5.7%, 13.1% and 12.6% of the total number of birds in RMG, GG, and DGF, respectively, and these were caused mainly by Newcastle Disease (ND), which causing the highest economic losses in village chickens. The drop in chicken mortality during the monitoring compared to that derived from the survey, was probably due to vaccination treatments conducted in RMG and GG villages during the study. This suggests that a regular vaccination should be essential to maintain mortality levels in chicken flocks. The unconfined chicken manage-

ment means that systematic disease control measures are difficult to implement. Vaccination for ND were recommended vital for the improvement of village poultry production (Darmawanet al. 1987; Aini, 1990). The lack of vaccination means that outbreak of the disease are not contained and spread widely. Sixty percent of chicken owners treated their birds using home-made medicine. This types of treatment was stated by Muchadeyi (2004) as a common practice in developing countries.

Chicken liveweights and growth

Average liveweights of village chickens by sex and age (survey data) increased fairly rapidly up to about 24 weeks of age, averaged 84g/week, after which there was a gradual increase up to 90 weeks of age. Least Square Means of chicken liveweights in the 3 villages during monitoring period (Table. 2) indicate an increased liveweight at the rate of 84 g and 60 g per week for males and females, respectively, to 24 weeks of age.

Liveweight of birds up to 12 weeks of age at the DGF site was significantly ($P < 0.01$) higher than that at GG site, and higher ($P < 0.05$) than at both the RMG and GG sites between 12 and 24 months of age. On the other hand, the weights of birds during the productive period, between 24 and 72 weeks of age at the GG site, were significantly higher ($P < 0.01$) than those at the other sites. The alternating nature of these results indicate that differences between sites in the liveweights of birds at different ages may be influenced by different supplementary feed supplied by farmers, associated with differences in crop production. These figures were much lower than those of local breeds of chicken at the similar age, in West Java (Iskandar *et al.* 2000; Suparna 2005;

Table 2. Least Squares Means (LSM) of Chicken Liveweights (g/bird) at RMG, GG and DGF sites

Group	Age (weeks)	N	RMG		GG		DGF	
			LSM	SE	LSM	SE	LSM	SE
1	1-12	1261	323	5.5	303	5.7	337	6.6
2	12-24	651	1,068	23.8	1,099	20.7	1,205	24.1
3	24-48	426	1,836	41.3	2,189	36.6	1,937	52.6
4	48-72	209	1,965	66.2	2,478	67.0	1,996	84.1
5	72-96	97	2,14	122.5	2,355	128.6	2,162	155.7

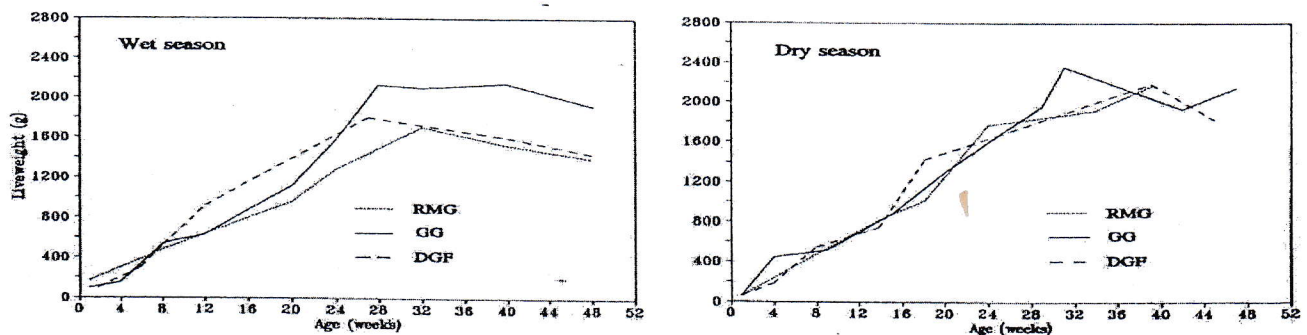


Figure 1. Liveweight of village chicken in RMG, GG and DGF villages during the wet (February) and dry (October) seasons in West Timor

Mansjoer *et al.* 2004), depending upon the types of local birds and varied management applied by farmers.

The average liveweights were markedly different between seasons (Figure 1), of which, birds over 12 weeks of age during the wet season was significantly lower ($P < 0.01$) than that in dry season, probably associated with the inadequate supply of available feed during this period. In contrast, liveweights of young birds during the peak of the dry season, particularly between July and October, were markedly lighter ($P < 0.01$) than those in the wet season. Very high temperatures (averaged 35°C) during the study, may have caused slow growth of young birds, and might be associated with relatively low feed intake during the dry period. This finding as was stated by Aini (1990), indicating the common characteristics of chicken performance in the villages of Asian countries.

A highly significant interaction between villages (land-use types) and season on the productivity of chickens (Figure 1), suggest that the growth pattern of birds changes due to seasonal effects. There were considerable differences in the liveweights of birds over the range of 20 to 48 weeks of ages, between villages during the wet season. However, the average liveweights during dry season was similar in the 3 villages, suggested that when the rainy season limits free scavenging activities of birds, the types and amount of supplementary feed is likely to have a profound effect on the different liveweight of chickens and gains between sites. According to Argono and Iskandar (2005), native chicken given low feed protein and energy still showed good performance as compared to exotic breeds, however, an appropriate and sufficient nutrient content would give better performance.

Marketing System

Indigenous (kampung) chickens were usually sold by farmers at the local markets, or to brokers, at lower prices than broilers produced from semi-intensive management systems. The prices were higher if sold at town markets, where preference for this indigenous breed was high. Chickens were sold on an individual basis, prices determined by the size and their estimated weight, no significance price distinction between males and females. Contribution to farmers income was important, eggs contributed less than 10% to the total income from chickens. This finding is similar to the report of Kingston and Creswell (1982), that native chicken provided significance contribution to farmers daily income.

Constraints and Strategies for the Improvement of Village Chicken

Major constraints that limit the benefits to farmers from rearing 'kampung' chickens are listed: Environmental factors, i.e., inadequate feed availability and disease problems; Biological, i.e., limited genetic potential of native birds to respond to improved management; Management, i.e., inefficient use of local feed resources, high mortality of young birds; ineffective vaccination programs; low chicken productivity and egg production; inefficient marketing strategies; poor water supply; Social: less capital of farmers for setting large scale of chicken enterprises; lack skill of farmers on chick-

en health, feeding and breeding management; inefficiency in marketing systems. Strategies for improving benefit for farmers and village chicken production, including the provision of: effective training in improved feeding (particularly for egg production; Zainuddin, 2005), water supply, breeding and health management; well-organized demonstration/trials of chicken management, mainly with women, inexpensive methods for utilizing locally-available feeds; credit facilities to purchase improved breeds, improvement of efficient veterinary services; Adejoro (1991), recommended the implementation of regular vaccinations need to be conducted through government services which should be available to local farmers at the village level.

CONCLUSIONS

Most of the indigenous chickens found throughout villages of East Nusa Tenggara region, was reared close to the household with very limited input given and poor management practiced by farmers. The role of women in chicken raising was predominant, including in the decision making. Insufficiency in feed provision became the major constraints responsible for low productivity, high mortality of young birds, and inefficiency in disease control. The risk of losing stock from diseases and lack of capital were the major reasons that farmers did not invest more money in chicken enterprise. Organized vaccination programs by involving trained farmers, and also woman, is needed. The number of eggs and birds available for sale can be increased by reducing mortality rate of young birds through better management.

Strategies for improving production levels and the benefit to farmers, require active support from all parties and commitment of government agencies. There is greater scope for individual farmers with knowledge and skills adopting improved management and technology to suit large scale of chicken enterprise. Programs aimed at fully intensifying chicken production in villages might be more appropriate by setting a long term goal to improve the productivity of village chickens, through an effective crossbreeding programs.

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