Deutscher Tropentag 2003
Göttingen, October 8-10, 2003
Conference on International Agricultural Research for Development

Options for Native Chicken (*Gallus domesticus*) Production in Northeastern Thailand

Theerachai Haitook[a], Ezzat Tawfik[b] and Michael Zöbisch[a]

[a] Asian Institute of Technology, School of Environment, Development and Resources, Pathumthani, Thailand. Email: Theerachai@ait.ac.th
[b] University of Kassel, Department of International Animal Husbandry, Witzenhausen, Germany

Abstract
Over the last decades, poultry-production technology in Asia has improved significantly, with rapidly increasing production. During the past 30 years, poultry egg production has increased six times and chicken meat supply has increased 14 times. Thailand is one of the world's leading countries for poultry egg and meat production, and worldwide, it is the 5th largest exporter of poultry meat. Also, the local per capita consumption of poultry meat is high, i.e.,, about 13.5 kg per year. Most of the meat is produced by high-performance races and hybrids; only 13% of the meat comes from native chicken. The growth of the poultry industry in Thailand is dominated by large-scale producers and their contract farmers. Due to the high cost of production inputs, such as feed and drugs, and the control of the market by the contract companies, many individual farmers could not compete with the companies and had to give up chicken-meat production. For these individual farmers, a streamlined production of native chicken could be an option for alternative income generation and for the diversification of the agricultural production base. Native chicken meat is generally considered to be of high quality, and in the larger cities in the region there is a growing market for this type of meat. However, no reliable raising systems have been developed for native chicken, which ensure a regular supply of high-quality meat to the market.
The study aims to develop options for the improvement of indigenous chicken raising systems, based on an evaluation of the agricultural production systems of small-scale farmers and a detailed investigation of the performance of native chicken in comparison to commercial breeds and hybrids.
Keywords: *native chicken, Thailand*

Introduction

In Southeast Asia, local –or native– chicken meat is preferred by most consumers (Choprakarn *et al*., 2000). In Thailand, about 80% of the rural households in the country raise indigenous poultry, mainly for home consumption but also for sale (Chopakarn *et al.*, 2000; Kajaroen *et al*., 1989). Native chicken are an important part of traditional rural living. Typically, a farm household keeps around 10-20 birds (Wuthipranee, 2000). There is a growing domestic market for native chicken, especially in the large urban centres, with consumers who are increasingly willing to pay higher prices for special-quality meat (Choprakarn *et al.*, 2000). However, market demands cannot be met by supplies at present. Annually, about 90-120 million indigenous chicken are produced with a value of approximately 5.4-7.2 billion Baht (1 Euro = 40 Baht). This is estimated to be only about 25-30 % of the potential in the Region (Choprakarn *et al.*, 2000). Improving the efficiency of local chicken production would, therefore, benefit large numbers of farmers in the country.

Over three decades, native chicken raising has been investigated in Thailand, targeting mainly the increase of survival rates and the improvement of carcass quality, but also feed and feeding techniques, disease prevention, breeding and marketing. However, the adoption of improved technologies has generally been inadequate, mainly because of limitations set by the socioeconomic environment of the farmers.

Most farmers raise poultry semi-intensively. Poultry flocks are usually of mixed species and ages. The animals are allowed to scavenge during the day; only at night they are confined, usually under the farm house or in simple sheds. The feed consists of local materials, such as rice, bran, fruits, kitchen leftovers, grasses, weeds and occasionally insects, earthworms, aquatic snails, crabs and small fish.

Indigenous chicken are well-adapted to the conditions of typical resource-poor small-scale farmers. Their resistance to hot climate and to diseases is considerable higher than high-performance breeds or hybrids. It is therefore widely accepted that indigenous chicken raising has a high potential for rural areas with untapped local feed resources (Kajaroen *et al.*, 1989)

Many attempts have been made to improve the performance of native chicken by introducing exotic breeds for cross-breeding and to produce hybrids with high production performance. However, these animals were not accepted by a part of the consumers, because they did not meet their expectations for meat quality, mainly taste. The native chicken continues to be the most preferred type, with firm and low-fat meat, and free of drug residues (Choprakarn *et al.*, 2000)

Performance of commercial breeds and native chicken

Strategies to improve meat quality and the growth of native chicken have been based on selection, cross-breeding (4 lines and 5 lines) and hybridization with local and exotic races, e.g., Rode Island Red, (Laopaiboon, 1990). Although these cross-breeds and hybrids had initially been adopted well by the big farmers, they did not find wide acceptance by a part of the consumers; also these breeds did not respond well to the rather simple husbandry practices on small-scale farms and the available local feed resources.

Despite these conditions, Leotarakul and Pimkamlai (1999) identified a rising trend of hybrid native chicken. These chicken grow faster than the pure native chicken. Native hybrid chicken can reach a marketable live weight of 1.2-1.4 kg after 8-12 weeks while pure native chicken reach the same weight only at 16 weeks, with the same feed (layer feed) (Leotarakul and Pimkamlai, 1999)

Generally, native chicken grow significantly slower than all cross-breeds and hybrids (Table 1). Table 1 shows that the average daily weight gain of cross-breeds and hybrids is about twice as high as that of pure native chicken. From the table it is also evident that feed quality influences growth. Even with commercial feed, native chicken show significantly lower weight gains than improved breeds. The table also shows that, with local feeds, high-performance breeds lose their advantage over native chicken in terms of weight gains. Also, the reproductive performance of pure native chicken is much lower than that of cross-breeds and hybrids (Table 2). For native chicken production on small farms, egg-laying performance is crucial to secure a sufficient number of chicks for fattening.

The hybrid native chicken market price is 5-15 Baht/kg lower than that for Thai native chicken. Also there is very limited market available (Kasibut, 2000). The marketable live weight for chicken is around 1300g; this is considered a suitable size for the popular traditional dishes grilled chicken (*Kai Yang*) and spicy-soup (*Tom Yam*) (Cheenduang *et al*., 2001). Consumers prefer to buy the whole carcass, which ensures them of the quality of the meat. Particularly long legs are considered a sign of good quality. The market price of chicken with short legs is about 10% lower than the price of chicken with long legs.

The highest investment return from native chicken is at the age of 16 weeks, whereas for hybrid chicken it is at 12 weeks (Leotarakul, 1997). Five-lines cross-breeds are also suitable for commercial production. A study by Thamabutr (2000) showed that, in terms of growth, five-line cross breeds are close to the commercial hybrid chicken, with a carcass ratio of 76 % of live weight. Meat quality, especially flavour, is comparable to the native chicken. It is also low in fat. Five-line cross breeds reach about 1.8 kg in 12 weeks with a Feed Conversion Ratio (FCR) of 2.5.

Table 1: Growth performance of native chicken and different improved breeds.

Breed	Average Body weight (g)	Average daily weight gain (g day^{-1})	Feed and feeding	Growing period	Reference Sources
Native Chicken	935	7	Supplementary with by-products and natural feed from the village	16 weeks	Choprakarn, (1988)
	910	-	Village system*	16 weeks	Leotarakul and Pimkamlai (1999)
	1360	-	Commercial feed**		
	1009	9	12-10-8 % CP†	16 weeks	Choprakarn, (1988)
	1136	10	14-12-10 % CP		
	1140.	10	16-14-12 %CP		
	1350 1440 1520	12	Commercial feed (for layer chicken feed, 15-21% CP)	16 weeks	Leotarakul *et. al* (1997)
Native Chicken x Rhode Island Red	1810	16	Commercial feed (for layer chicken, 13-19% CP)	16 weeks	Cheenduang *et. al* (2001)
Native Chicken x Rhode Island Red	1895	16.	Commercial feed (for broilers)	16 weeks	Leotarakul and Pimkamlai (1999)
	831	7	Maize + rice bran		
Native Chicken x Rhode Island Red x Barred Plymouth Rock	1600	14	Commercial feed (for layer chicken, 13-19% CP)	16 weeks	Cheenduang *et. a*, (2001)
Native Chicken x Rhode Island Red x Barred Plymouth Rock x Siang Hai x Commercial hybrid chicken	1820	-	Commercial feed (15-22 %CP)	12 weeks	Thammabutr (2002)

* Village system: Extensive system with local feed

** Commercial feed: Intensive system with exclusive use of commercial feeds

† CP: Crude protein

Table 2 Egg-laying performance of native chicken and different improved breeds

Breed	Annual number of eggs per hen*	Reference Sources
Native Chicken	30-40	Ratanawaraha (1997)
	92	Chotesangasa *et.al* (1994)
Rhode Island Red	241	Leotarakul *et.al*, (2001)
	199	Gongrattananun *et.al*., 1993
Rhode Island Red x Barred Plymouth Rock x Siang Hai x Commercial meat type	240	Thammabutr (2002)
(Rhode Island Red x Barred Plymouth Rock x Siang Hai x Commercial hybrid chicken) x Native Chicken	100-130	
Commercial laying hen (AA-Brown)	243	Chotesangasa *et.al* (1994)

* rounded figures

Characteristics and requirements of small-farm chicken raising

Thai native chicken are well adapted to the simple rural environment. They require space for scavenging, hiding and reproduction. They do not respond well to highly confined environments predominant in commercial hybrid chicken production, despite adequate feeding and vaccination. The raising environment of native chicken must therefore be similar to the unconfined conditions found on smallholder farms. Commonly, the chickens are confined only at night. During the day they move freely and they receive supplementary feed. Vaccines are available but often not applied at the village level. (Laopaiboon and Jitrpraneechai, 1999).

The introduction of hybrid native chicken at the village level has generally not been successful. Because the farmers could not afford to buy commercial feeds, they used locally available feeds, such as broken rice and rice bran. Laying, growth and survival rates were lower than of the native chicken (Namkhun *et al.*, 2001). The market was also a major problem, with low demand and generally unattractive prices for such hybrid chicken (Palarak, 1985).

In areas with cereal-based cropping systems, feed is usually abundant. Losses of flocks due to local and seasonal disease outbreaks happen commonly, with the chicken moving around freely. Suitable confinement systems will help control the spread of parasites and diseases, and contribute to the success of native chicken raising at the small farm level.

Options for improvement of small-scale raising conditions

Although considerable research has been conducted over the past three decades, no significant improvement in local chicken raising has been achieved at the farm level. Even with a lot of efforts by development and extension agencies and initial subsidies, there have been no long-term sustainable economic benefits for the farmers. This has led to a general negative attitude of small-scale farmers towards a commercialization of native chicken enterprises. Despite an obvious demand for native chicken meat, especially in the urban centres, the supply has always been limited. This clearly implies the need for research into alternative production strategies.

Profitable commercialization of native chicken requires a reliable and large enough supply of marketable meat. For the chicken raiser, a major bottleneck is the availability of chicks for fattening. As day-old chicks are not readily available from breeders, the farmers need to produce their own supply of chicks from fertilized eggs. Hatchability is not a problem, but the limited number of eggs per hen is rather low. Efficient flock management needs to ensure a consistent reproduction of a sufficiently large number of chickens. The most limiting factor appears to be the number of egg available for hatching. Also, native chicken do not lay eggs continuously but tend to produce eggs in clutches, typically 2 to 4 per year with a total number of eggs between 30 and 92 (see Table 2).

This requires that a large enough number of hens –and cocks- are kept as reproductive stock to supply chicks for fattening. It also requires the introduction of simple incubators to reduce losses incurring with natural hatching and to ensure that a sufficiently large number of chicks hatch simultaneously. In a typical small-scale farm scenario, however, individual farmers will most likely not be able to ensure a continuous production of a sufficiently large number of chicks at predetermined times. This implies that farmers need to join hands. Thus, improved native chicken production as a small-scale commercial enterprise requires a cooperative-type cooperation –or network– of several farmers, who are prepared to share resources and to supply each other with fertilized eggs from their breeding stock. Also, it requires that production scales and schedules are coordinated within the group. Such a network will also be a strong farmer representative for the intermediate suppliers, or middlemen, who have ready access to the urban markets. A reliable supplying of native chicken to the market is a key to strengthening the position of small-scale producers.

Outline of a small chicken production network

The setting up of producer networks requires careful planning. The two main determinants for such networks are the production targets (i.e., the number of slaughter chicken to be sold) –which are dependent on both market demand and farmers' capacities– and the capacity to produce the day-old chicks for fattening. Figure 1 depicts the main functions of chicken production network.

Each participating farmer will need to maintain his own breeding stock. A common incubator needs to be operated by a member of the network, who will play a major role as a hatchery centre for the network. The network members will deliver the fertilized eggs from their reproduction flocks to the hatchery centre. The hatchery centre will pool the eggs, and produce and distribute the chicks to the network members according to an agreed production schedule. Overall, each member will have to supply a sufficient number of eggs to the hatchery –including expected losses– to satisfy his own demand for chicks. However, due to the rotational nature of chick allocation to the members, the members will normally not receive chicks hatched from their own supply of eggs.
Because of the irregular egg-laying habits of native chicken (i.e., laying the eggs in 3-4 clutches over the year) the network farmers need to pool the eggs from their breeding flocks in order to obtain batches of eggs that are sufficient to supply chicks for the fattening flocks. If this aim cannot be achieved, a reliable and supply of slaughter chicken to the market cannot be maintained. Due to the relatively slow weight gain (growth) of native chicken –compared to commercial hybrids– the rotation scheme is more elastic. If need arises, the chicken can be either sold earlier or their sale can be delayed by a few days or even weeks. With commercial hybrids, strict adherence to pre-determined production schedules is more critical than with native chicken.

Simulation network and future development plan
A small prototype network for the simulation and adaptation of improved small-scale native chicken production is being developed at the Asian Institute of Technology (AIT) in Pathumthani, Thailand. The main aim of the prototype network is to establish the key determinants for the systematic production of native chicken and to identify bottlenecks in the daily running and management of such a system likely to occur at the farm level. The system, thus, will be modified over time.

The eggs are produced by 5 flocks of breeder chicken (each 10 females and 1 male), which are kept in simple shaded pens with resting sticks and laying nests. Hatching is done with a simple standard incubator with a capacity of 200 eggs. The temperature in the incubator is generated by a simple electric coil, which is controlled by a thermostat. The eggs are collected daily and are stored for hatching. Hatching is done in batches of when

The prototype simulation network has been inspired by ongoing farmer participatory research and development in the Lam Phra Phloeng Watershed, northeastern Thailand. Since 2001 there has been a continuous exchange with farmers on various aspects of smallholder agriculture in the area. Native chicken had been identified by the farmers as an untapped niche market, where they felt they could benefit. A first group of farmers, with a strong interest to set up a small network in their village has formed. These farmers will be involved in the simulation network for some time, until they feel comfortable with the system and are prepared to try it on their farms. The detailed modalities of the management of such a system cannot be prescribed, but will still have to be worked out with the farmers.

In order to function, the network builds on strong cooperation between the farmers. It will also create interdependencies. Therefore there has to be a high degree of mutual trust between the farmers. It cannot be predicted how farmers will actually work together in such a system. This stresses the role of the simulation network to identify potential bottlenecks in the system and to develop solutions for these. There is also a need of close monitoring and extension once the farmers have embarked on a network in their village. This will require a longer-term involvement of agencies, such as AIT and an extension service that is present in the village.

Also, housing characteristics and the confinement systems are being studied. The chicken are confined in a ground-pen with *ad libitum* feeding. Feed and feeding options are also tested. The aim is to maximise the use on on-farm feed resources, such as maize, rice, mungbean and their by-products.

Conclusions and recommendations
There is a growing –yet relatively limited– market for high-quality-meet native chicken in Thailand. But because of their slow growth and low final weight, these chicken are not attractive to large-scale producers

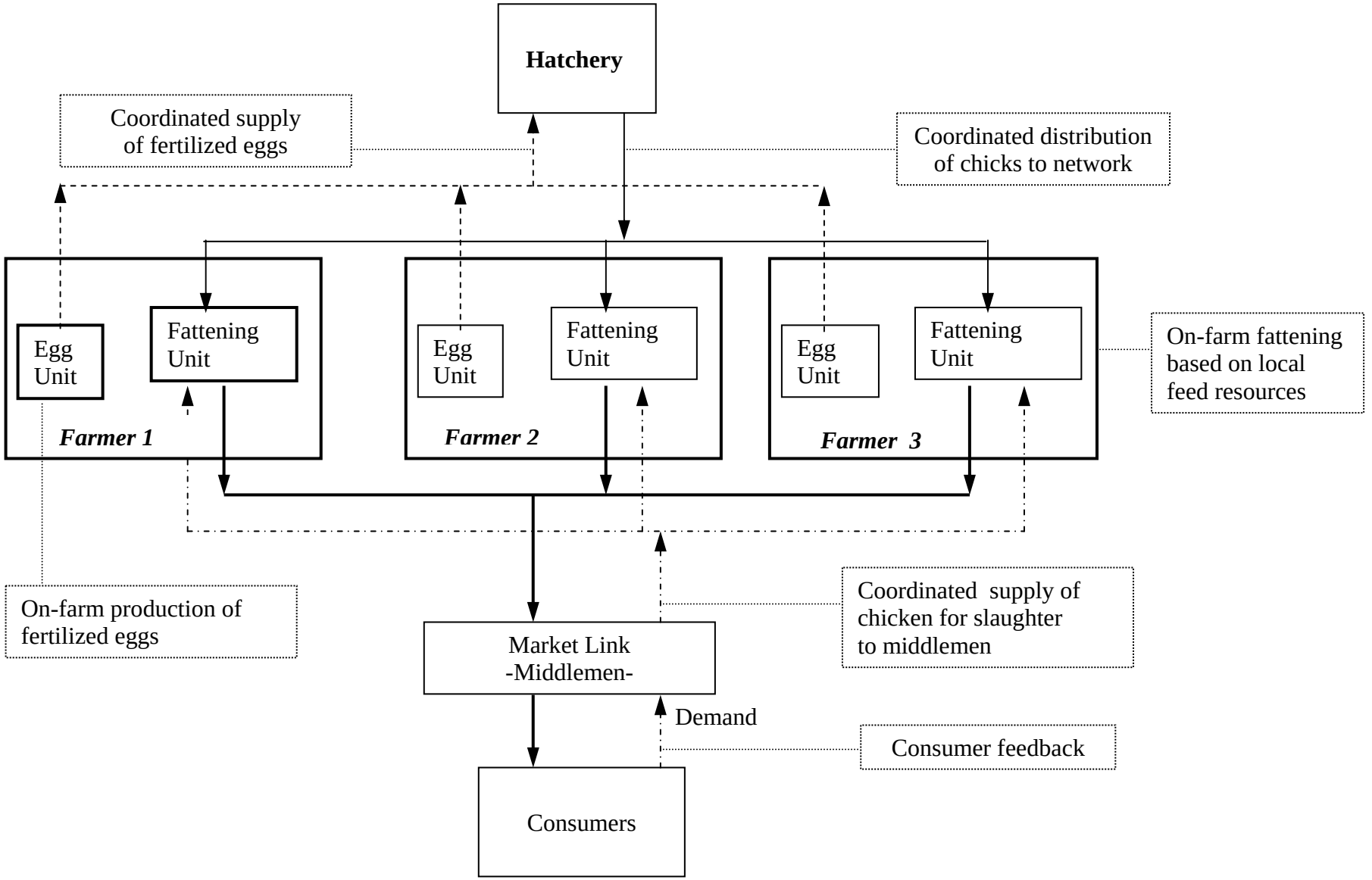

Figure 1 Simplified functional chart of a prototype chicken-production network

who prefer to target the mass consumer market. These conditions destine native chicken production to the small-scale producer.

Native chicken are well-suited to small-farm conditions; they have good resistance to diseases and they tolerate a large variety of locally available feeds. However, they have a low egg-laying performance and tend to lay eggs in clutches rather than evenly distributed over the year, leading to irregular production of chicks for fattening. But the market requires a reliable and regular supply of market-size chicken. Considerable improvements in bird husbandry have been made over the last decades, except for the management of a regular and reliable production of chicks. This has been the major constraint to the development of native chicken raising as a profitable enterprise for small-scale farmers in Thailand.

Strategies and management modes to improve the supply of chicks for fattening need to be developed, which are feasible for small farmers –without compromising the quality of the meat. A promising approach is to develop local networks of farmers who share their breeding stock in order to produce a regular flow of fertilized eggs for hatching and re-distribution within the network. This approach, however, requires a relatively high level of management skills, and mutual trust between the farmers because of the high degree of resource sharing required.

References

Cheenduang, T., A. Leotarakul and O. Leotarakul, 2001. Body weight, daily gain and body conformation of crossbred Native - Rode Island Red and crossbred Native - Rode Island Red - Barred Plymouth Rock Chicken. Livestock Magazine no 5. 3 (3):1-9. (in Thai)

Choprakarn, K.,1988. Study on a method to increase the productivity of native chicken. M.Sc. Thesis, Khon Kaen University, Khon Kaen, Thailand. (in Thai)

Choprakarn, K., V. Watanakul, K. Wongsvichet, V. Suriyachantrathong, 2000. Native and crossbreed chicken: Past and future. National Research Funding and Supporting Office. Bangkok. Thailand. (in Thai)

Chotesangasa, R., S. Isriyodom and N. Gongruttananun, 1994. Comparative Studies on Laying Performance and Egg Components of Native and Commercial Laying Hens. Agricultural Science no 28, 1 (Jan-March): 38-48. (in Thai)

Kajaroen, Y., S. Kajaraoen, S. Theerapuntuwat, A. Sivaprapakorn, P. Saki-ya, P. Sripra-ya,S. Chaiput and Y. sai-ngam., 1989. Poultry on-farm trial at the village level in Khon Kaen Province: Results. The development and improvement of small animal production for smallholders in the Northeast. Final report, Faculty of Agriculture, IRD Khon Kaen University and USAID: 125-151. (in Thai)

Kasibut, M., 2000. Factor affecting the production efficiency of raising Thai native chicken by farmers in the poultry dissemination project, Changwat Lop Buri. M.Sc. Thesis, Kasetsart University, Bangkok, Thailand (in Thai)

Gongrattananun, N., R. Chotesangasa and S. Isriyodom, 1993. Egg production and composition of Thai native chicken in comparison with some pure breeds. The 31st Kasetsat University Conference. Kasetsart University, Bangkok, Thailand, 161-171 (in Thai)

Laopaiboon, B., 1990. A comparative study of egg production performances of native and crossbred chicken. Department of Animal Science, Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand. (In Thai)

Laopaiboon, B. and S. Chitpraneechai, 1999. Study on native chicken production in the villages of Amphur Muang, Changwat, Khon Kaen. Technical Report. Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand. (in Thai)

Leotarakul, A., P. Sonthipairoj and S. Moratob, 1997. Production performance of native chicken raised in the livestock breed improvment station. Breeding and breed selection of native chicken, Livestock Breeding Station, Mahasarakam Province. Magazine 7 (37): 63-71 (in Thai)

Leotarakul, A. and O. Pimkamlai, 1999. Economic return of indigenous chicken and crossbred indigenous and Rhode Island Red. Livestock Magazine no 5. 3(1): 7-10 (in Thai)

Namkhun,S., T. Ob-aun and A. Leotarakul, 2001. Prediction of annual egg production from partial egg production in Rhode Island Red. Livestock Magazine no 5. 3(3): 11-19 (in Thai)

Palarak, K, 1985. The improvement of backyard poultry production on village level of the settlement in the Northeast. Final Report, Public Welfare Department and Faculty of Agriculture, Khon Kaen University, Khon Kaen, Thailand (in Thai)

Ratanawraha, A.1997. Native chicken: Economic animals at small-scale level. Matichon Publication, Bangkok (in Thai)

Thamabutr, S. 2002. Five-line crossbreed Thai native chicken raising – 60 years of memory: The Poultry Promotion Association of Thailand, 208-216 (in Thai)

Wuthipranee, P., 2000. Essential technologies for native chicken raising development of farmers: A case study in Pranakhon Sri Ayuttaya Province. M.Sc. Thesis. Kasetsat University, Bangkok, Thailand (in Thai)