

## **TAIWAN COUNTRY CHICKEN: A SLOW GROWTH BREED FOR EATING QUALITY**

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### **ABSTRACT**

The Country chicken is not the pure native chicken, and is defined as the locally developed slow growth type of chicken. In Taiwan, Country chickens dominate meat type chicken market for decades. The native chickens in Taiwan have blue or black shank and tightly fitted feather covering. They are descendants of Chinese, Japanese, American and possible some European breeds. Because the imported commercial white broiler does not fit to the traditional cooking, consumers look for native chickens. Although farmers had introduced foreign breeds to improve the production efficiency, Taiwan Country chickens possess certain unique characteristics, such as a large and erected comb and heavy fleshy legs. Compared with the commercial broiler and White Leghorn, the Country chicken have better resistance against heat stress and many diseases, and their eggs and meat possess better eating qualities. Growth performance of Taiwan Country Chicken has been greatly improved in the past two decades, but their frame size increased and reproduction deteriorated. Studies showed that both genetics and management are responsible to the poor egg production. Under the pressure of World Trade Organization and the public's concern of food safety and animal welfare, the Country chicken will become more important in many countries. However, modern marketing system with reliable traceability, such as Label Rouge in France, is desperately needed for the future development.

**KEY WORDS:** Genetic conservation, Native chicken, Taiwan Country chicken.

### **PRODUCTION AND CONSUMPTION OF CHICKEN**

Because of religious and cultural reasons, pork is the main source of meat in Taiwan (Fig. 1). Most chicken were raised in backyards before 1963 when modern broiler chicken was introduced. Since then, production of chicken increased linearly and reached a plateau in 1997 (Fig. 2). According to the Council of Agriculture (2006), Taiwan produced 601 thousand tons of chicken meat and 7.0 billion chicken eggs in 2004. Combined with 55 thousand tons of the imported frozen chicken, the consumption was 27 kg chicken meat and 315 chicken eggs per capita.

Different from other countries, Taiwan poultry industry heavily relies on native genetic resources. Tsaiya, a traditional native duck breed, is a small excellent layer producing more than 300 large eggs (@ 65 g) annually. Before 1965, they supplied more than half of the eggs consumed in Taiwan. The white variety of Tsaiya is also crossed with Peiking drake to produce Kaiya, the breeder for meat ducklings. Kaiya is then crossed with White Muscovy drake to produce the mule duck for meat production. Although almost all the commercial chicken egg layers are imported exotic breeds, half of the meat-type chickens are domestically developed (Fig.3). The broilers, the imported breed, are mainly used as processed meat

products, such as fried chicken, nuggets and chicken burgers. Commercial lunch box also uses broiler leg as the main entree. However, most chicken purchased by the household and those used in the traditional cooking is the slow-growth ‘native’ breed, so-called ‘tu-ji’<sup>1</sup>. Since 1999, Taiwan gradually abolished tariff rate quotas restrictions on imported chicken meat and offal, and completely opened the market in 2005. Thus, in 2003, due to the imported chicken legs, the broiler consumption overtook the ‘tu-ji’ for the first time in 30 years (Fig. 2).

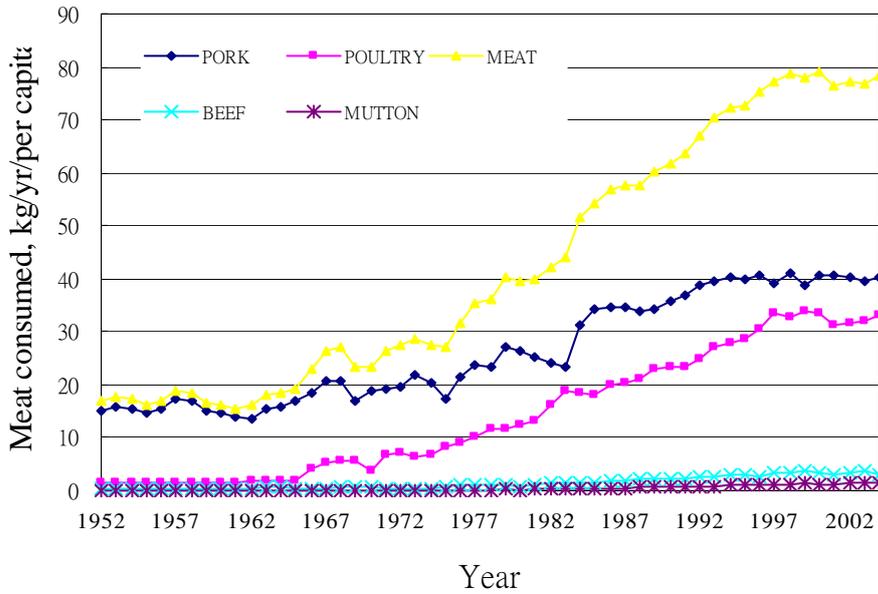


Figure 1. Consumption of meat in Taiwan from 1952 to 2004. (Source: COA, 2006).

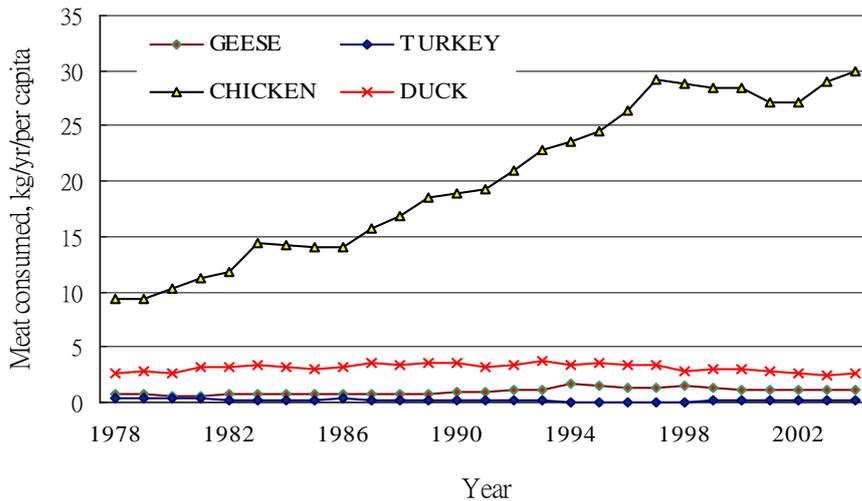


Figure 2. Consumption of poultry meat from 1978 to 2004. (Source: COA, 2006).

<sup>1</sup> Different names are used to call ‘pure’ native chicken. It is called as ‘tu-ji’ in Taiwan, ‘chou ji’ in China and ‘zhi-tori’ in Japan.

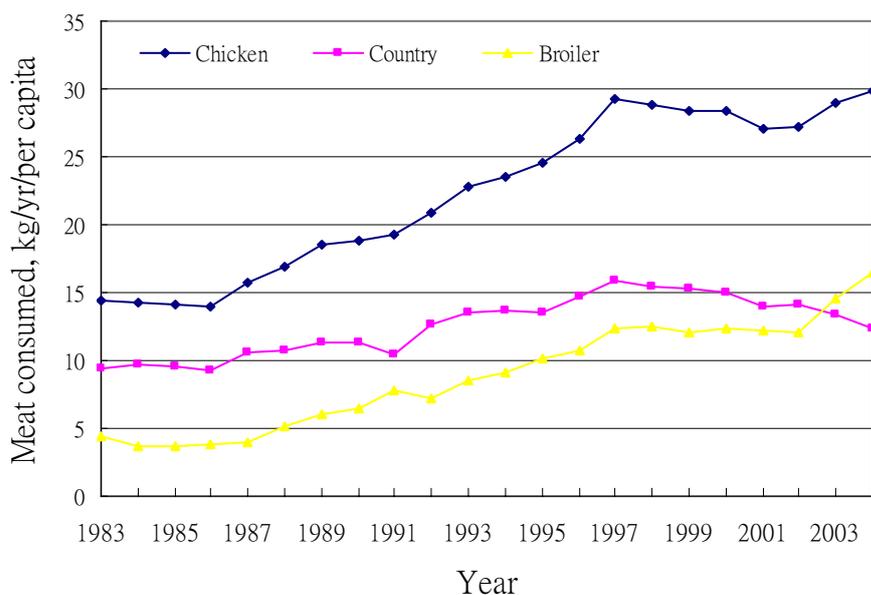


Figure 3. Consumption of chicken in Taiwan from 1983 to 2004. (Source: COA, 2006)

### NATIVE CHICKENS IN TAIWAN

Before the Chinese immigrants brought in chickens from the southeastern China about 400 years ago, the aborigines in the island had domesticated some jungle fowls. About 300 years ago, both the Dutch and the Spanish had lived in Taiwan for decades, and some European chickens might have been brought into Taiwan. During the Japanese ruling period, 1895 to 1945, Rhode Island Red and White Leghorn were the earliest exotic breeds introduced to Taiwan in 1918. Some Japanese breeds, such as Nagoya and Mikawa, and American breeds, such as Barred Plymouth Rock, were also brought in by the Japanese before 1925 (Lee, 1952). Before the introduction of modern white broilers, most chickens raised in Taiwan were the descendants of these chickens. They have inhabited in Taiwan for several generations, adapted to the local environment and have also been selected by the local people, and finally are recognized as the native chicken in Taiwan.

Preservation of native chickens in Taiwan started from 1982, when we began to collect and preserve native chickens around the island (Chen *et al.*, 1994). Although, blue or black shank, tightly fitted feather covering, active and agile are common characteristics, Taiwan native chickens at different area, due to geographical and cultural diversities, do have their distinct outlooks. Hakka people prefer large chicken, therefore, their chickens, such as Erh-Mei<sup>2</sup>, have matured body weight over 3.5 kg. Hua-Tung is a small fighting game with pea comb, black feather and black shank found at the east coast. Ju-Chi is a small and active chicken roaming at mountainside orchards. It was said that before 1960's chickens living in the west flat area generally had shorter shanks. Unfortunately, we could not find any pure native chickens in the densely populated flat area in the west coast.

Before the collection of native chickens, we assumed that the pure native chicken might

<sup>2</sup> Native chickens are named after their geographic location. Erh-Mei is located at Miao-Li county in the northern mountainous area. Hua-Tung is the chicken found in Hualien and Taitung counties at the east coast. Ju-Chi is located at Chia-Yi county in southern Taiwan.

be found only in the remote high mountain area where the aboriginal people reside. However, the aborigines do not reproduce their own chicks, but purchase large and sturdy chicks from hatchery or salesman. None pure breed chicken could be found in the tribes. However, the conservative Hakka people keep pure native chickens. They believe that only the pure native chicken cooked with Chinese herb has medical effect on patients after surgery or parturition. Therefore, the chickens we collected in 1982 at the aboriginal tribe (Hsin-Yi) might be the popular backyard chickens in 1970's.

Recently, in cooperated with INRA, we used microsatellite markers to compare genetic diversity of six breeds of native chickens (Chen *et al.*, 2004) from Taiwan (Quemoy, Ju-Chi, Hsin-Yi, Hua-Tung), China (Shek-Ki<sup>3</sup>) and Japan (Nagoya). Quemoy is a small island near the southern Fu-Jian Province of China where the majority of Chinese immigrants came from. Geographically, the southern Fu-Jian, surrounded by mountains, is very isolated to other parts of China. Even the dialect in this region is so much different from the adjacent northern Fu-Jian and Canton province. In the 16-17<sup>th</sup> centuries, this area was the gate of ocean-going route to Europe, India and other countries. Thus, European chickens might have some influence on the chickens living in the southern Fu-Jian and Taiwan. Although very closed to China, Quemoy is controlled by the Taiwan government. Due to the war between China and Taiwan, this island was substantially isolated since 1950 until the late 1980's. Thus, Quemoy can represent the local chicken in that island before 1950. Ju-Chi and Hsin-Yi chickens respectively are backyard chickens in the 1960 and 1970's. Analyzed results of the correspondence among six breeds (Fig. 4) were as expected that genetic background of Quemoy is very different from Shek-Ki and Nagoya, and similar to Ju-Chi and Hsin-Yi. Although Nagoya has blue shank and had been introduced to Taiwan, the above result as well as different eye shape (triangle *vs.* round) and egg shell color (purplish *vs.* tinted), suggest that this breed might have little influence on Taiwan native chickens.

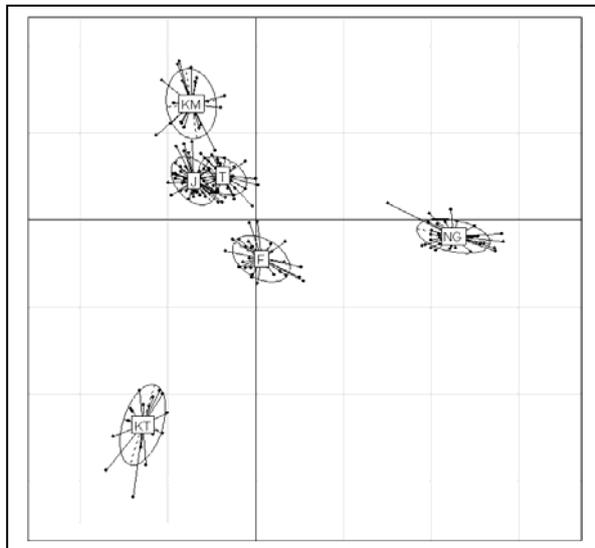


Figure 4. The correspondence analysis result of the six breeds of native chickens from Taiwan (KM, J, T and F), China (KT) and Japan (NG). The factorial analysis of individual multilocus genotypes placed the Hua-Tung (F) breed at a central position. The Quemoy (KM), Ju-Chi (J) and Hsin-Yi (T) breeds seemed to be very close, whereas Nagoya (NG) and Shek-ki (KT) breeds were found to be well isolated from the others (KM: Quemoy, J: Ju-Chi; T: Hsin-Yi; F: Hua-Tung; KT: Shek-Ki; NG: Nagoya; where points are individuals and ellipses represent confidence area). Source: Chen *et al.* (2004).

<sup>3</sup> Shek-Ki is a village in Chung Shang County, Canton Province. The former British Fishery and Agriculture department at Hong-Kong imported it in the 1970's and preserved at the Ching Shang experimental station. After systematic inbreeding, they were distributed to the farmer as the sire line to cross with exotic breed to produce the famous Shek-Ki hybrid for the consumers in Hong Kong and Canton. Shek-Ki hybrid, at present, is the most popular 'Three-Yellow chicken' in the southern China. The pure breed was brought to NCHU in 1987 from the Ching Shang experimental station.

## **EVOLUTION OF MEAT-TYPE CHICKEN**

Before the introduction of broiler in 1963, most chickens raised in Taiwan were backyard chickens (tu ji). However, due to the relatively poor production efficiency, they were replaced by the imported broiler. Around 1970, more than 90% of chickens in the market in Taiwan were broilers, only a few years after their introduction. However, consumers prefer backyard chicken and would pay more for them, and hence, varieties of fast-growth foreign chickens were then imported to crossbreed with the local chicken to produce the so-called 'fan tu ji' (simulated native chicken). Compared to 'tu-ji', 'fan tu ji' were larger and grew faster, but the consumer can distinguish them by their larger frame size, smaller comb and/or yellow shank. These chickens were reared by the same intensive system used in white broiler. Large flock of several thousand birds reared in a crowded house, and fed on nutritionally complete balanced commercial ration. The meat quality as well as the price, of course, was not so good. Therefore, some farmers developed smaller chickens. These chickens had a single comb, red feather and blue shank. They were externally very similar to the original backyard chicken, and probably also possessed greater proportion of native genetic resources. Thus, they were called as 'tu-ji' in the market. Contrary to the broiler, both 'tu ji' and 'fan tu ji' had color feather, and are thus classified as 'colored or colorful chicken' in the industry (Lee, 1990). Genetically, they are not native at all, but have been crossed with foreign breeds, notably French chickens around 1980. In additions, they are not what consumers recognized as foraging in backyard or open pasture. Therefore, in the English context, I prefer to use 'Country' chicken to refer these types of chickens, because the word 'Country' can imply: 1) it is locally developed to adapt to the local market, 2) it can adapt to more extensive production system, and 3) it is a slow growth breed, contrary to the fast growth industrial chicken.

From 1975 to the late 1980's, 70% of chickens consumed in Taiwan were Country chickens. In the earlier part of this period, the large and black-feathered 'fan tu ji' dominated the market. But due to large price difference, 'fan tu ji' gradually lost their market and vanished in the late 1980's. Meanwhile, the increased production in 'tu ji' forced farmers to improve production efficiency. However, their red feather color became lighter or even to buff/white, body size very large and no longer have the good meat quality as usual. They are a new type of 'fan tu ji' with an outlook of a 'tu ji'. Therefore, after the introduction of fast-food chain store, Taiwan Country chicken started to loss their market share to broilers. In the mean time, around 1990, a new type of high priced country chicken emerged in the market. They are called 'fang shan ji' (chickens foraging on mountain). In addition to having larger outdoor space for exercise, they have a small and compact body shape similar to the original 'tu ji'. The black feathers and white hackles enable consumers to easily differentiate them from low quality 'tu ji'. Because of the demand, this market grows very fast. At present, they are the two main varieties of Taiwan Country chicken. According to the feather color, the industry calls them 'red-feathered' and 'black-feathered' Taiwan Country chicken respectively.

## **CHARACTERISTICS OF TAIWAN COUNTRY CHICKEN**

In 1982, when we started research on Taiwan Country chicken, there was no scientific research on these birds, although they represented 70% of chickens in the market. Thus, the first approach was to understand their merits and problems. What merits can be utilized and

what problems need to be solved? Compared with the white broiler, Taiwan Country chickens grow slower and have poor feed efficiency. Recently, Fanatico *et al.* (2005) compared growth performance of slow, medium and fast growth genotypes also found the similar results. However, we found this slow growth is mainly due to eating less feed. The country chicken will adjust their feed intake by the nutrient density of diet. Thus, if the country chicken and the broiler are sold at the same age, both have similar feed conversion ratio. The poor feed efficiency, actually, is caused by longer rearing period, because the market demands chickens with sexually matured outlook (Fan and Lee, 1984; Lee and Huang, 1985). In additions, the flock uniformity of Taiwan Country chicken is another problem. Thus, all chickens in one flock are not likely to be sold at the same age and the processing plant has difficulty to automatically process the chickens.

Although the proportions of carcass parts and meat qualities are affected by feeding and management, there is a real genetic difference between Taiwan Country chicken and the white broiler. In general, the country chicken is a healthier bird and a nutritious food. It has less fat in meat and smaller abdominal fat pad (Lee and Chen, 1984; Lee and Lin, 1993<sup>b</sup>). Interestingly, our colleague found the special value of native chicken. They reported that the concentration of phosphoserine (with aphrodisiac effect) in the country chicken was 11 times as that of broilers (Lee *et al.*, 1993). It has larger thighs and legs, smaller feet and intestine (Lee and Chen, 1984). The eating quality is also better as shown by higher shear value, better cohesiveness, but tender meat, *i.e.*, lower in hardness (Lee and Lin, 1993<sup>a</sup>). In additions, egg laid by the country chicken is preferred by the consumer. Compared with White Leghorns, these eggs are smaller, but have a larger proportion of yolk, and better shell strength (Lee, 1988). A study of egg size laid by White Leghorn from 1950 to the present time revealed that there is a steady increase of egg weight, but the yolk size remains unchanged (Tharrington *et al.*, 1999). Thus, it is probably a result of genetic selection rather than the breed difference. Although most consumers believe that meat and egg from native or slow-growth breeds have better eating qualities, however, most studies using traditional methods could not have a very conclusive result. Developing more precise and accurate testing methods for eating qualities of meat and egg are urgently needed for future research for the utilization of native chickens.

Designed experimental studies in comparison with broiler and Single Comb White Leghorn (WL) proved the robustness of country chickens. Fan *et al.* (1988) challenged chicks at 12 days of age with *Eimeria tenella* oocysts to study the resistance to cecal coccidiosis. They found that Taiwan Country chicken tended to have a higher resistance than WL based on the results of body weight gain, haemoglobin, cecal lesion score and cecal oocyst number after challenge. Chao and Lee (1991) compared antibody responses to New Castle disease vaccine (B1 and Lasota strains and inactivated alumina-gel virus) and sheep red blood cells (SRBC) between Taiwan Country chicken and WL at 2, 15, 32, 61, 181 and 293 d in three trials. They found Taiwan Country chicken had higher antibody titer responses to both Lasota strain and inactivated alumina-gel Newcastle disease virus vaccines as well as SRBC than did WL. Cheng *et al.* (1990) conducted a survey on the susceptibility to Leucocytozoonosis, a prevail protozoa disease in Asian countries, in Taiwan Country chicken and WL. In an experimental flock naturally infected with leucocytozoon, serum antibodies to the leucocytozoon schizont were tested by agar gel immunodiffusion test. The positive antibody response rates among Taiwan Country chicken (9.3%) and WL (47.6%) were highly significantly different. After successful establishment of related techniques, such as rearing intermediate host-*Culicoide arakawae* in the lab, we inoculated

Leucocytozoon sporozoites into chickens in 14 trials to confirm the superiority of disease resistance of Taiwan Country chicken over WL and white broiler (Chen *et al.*, 1991). Taiwan Country chicken had the lowest mortality rate, the longest mean survival time and the lowest number of schizonts in internal organs after challenge. It has a better resistance against heat stress and many diseases, such as Marek's disease (Cheng, 1987), , etc.

Compared to broiler, the country chicken is a very active and aggressive bird (Lee, 1992). While both breeds spent about the same 10% of day time on feeding, broiler spent 60% on resting but the country chicken spent only 20%. Comparing the chickens at the same age, frequency of agonistic interactions between the country chicken was several times as much of that among broilers. Frequencies of aggression and sexual mounting increase dramatically while male chicken reaching sexual maturity. Since the country chicken has to be raised to maturity, injury and mortality caused by excessive aggression and sexual mounting become new problems (Lee, 1992).

## **MEAT PRODUCTION AND REPRODUCTION**

Although the farmers have been utilizing the native chicken genetic resources for decades, none of them could develop one strain prevail for years. Due to the small scale operation, rarely anyone could afford to maintain a pure strain. The breeder selects replacement parent breeders from commercial flocks. Some breeders import exotic chickens to improve production efficiency. When good breeders are found, their crossbreed offspring become very popular. However, due to the loss of heterosis, the chicken's performance deteriorates in a few generations. No one can maintain their chicken quality for years.

The small frame size native chicken has a very poor feed efficiency. Studies indicated the larger the chicken, the better the feed efficiency. As mentioned above, the length of rearing period appeared to be the main factor (Lee and Huang, 1985). Since the country chicken needs to be raised to sexual maturity, we suggested inducing them to mature earlier is the best way to improve feed efficiency. Our genetic studies also suggested that selection for larger comb size at appropriate age would be a convenient and efficient method to induce earlier sexual maturity (Lee, 1985). The breeders might have adopted this method, and in the last two decades, the rearing period has been reduced from 15-16 weeks to 12-13 weeks, but the chicken also adopted a rather large single comb.

In past few years, we had conducted a series of test to study the growth as well as reproduction performances of our commercial country chickens (Chao *et al.*, 2005a,b). In general, the commercial chickens had improved the growth performances as well as carcass proportion to consumer's demands. Compared with the earlier report (Fan and Lee, 1984; Lee and Huang, 1985), the red-feathered Country chicken has a body weight heavier than 'fan tu ji' in the 1980's, an erected comb larger than the earlier 'tu ji' (Table 1), and the feed conversion ratio improved from 3.0 to less than 2.5 (Chao *et al.*, 2005a). However, the improvement of growth and carcass traits seems to render the chicken to lose their egg production (Chao *et al.*, 2005b).

Table 1. Comparison of body weight and comb size at 14 weeks of age of Taiwan Country chickens reported at 1985 and 2005.

Year reported		1985 TCC <sup>1</sup>		2005 TCC <sup>2</sup>	
Trait	Sex	'tu ji'	'fan tu ji'	Black	Red
Body wt. (g)	Male	1817	3028	2071	3169
	Female	1469	2221	1711	2693
Comb area (cm <sup>2</sup> )	Male	44	34	44	87
	Female	10	9	12	37

<sup>1</sup> Source: Lee and Huang, 1985. <sup>2</sup> Source: Chao *et al.*, 2005a.

In a series of studies to analyze factors influencing egg production, we compared the commercial red-feathered and black-feathered Country chickens with a selected strain of Country chicken as well as White Leghorn layer (Yen, 2004). Results suggested that the poor egg production of the heavy Taiwan Country chicken was caused by genetic and management factors. The follicle in the ovary takes more days to form a yolk, the clutch length is shorter, the time interval between consecutive eggs in a clutch is longer, and the period of paused laying is longer (Table 2). Although selection only for meat production is an important factor, the production system may be the main cause of the problem (Chao *et al.*, 2005b). We have shown that either the restricted feeding commercial Country chicken during rearing period (Lin *et al.*, 2005) or crossing them with selected strain (Lee *et al.*, 2005) can have tremendous effect on egg production of breeders without any loss of meat production efficiency (Chao *et al.*, 2005c). However, due to the small scale operation, the Country chicken breeder usually selects chickens from commercial flocks around 9 to 13 weeks of age which is too late to start an appropriate restricted feeding program.

Table 2. Comparing egg production traits of different breeds/strains of Taiwan Country chickens with Single Comb White Leghorn (commercial layer).

Trait	Red <sup>1</sup>	Black	B	L2	WL
Eggs laid to 50 wks of age	119.38 <sup>c</sup>	119.64 <sup>c</sup>	130.29 <sup>b</sup>	161.43 <sup>a</sup>	172.59 <sup>a</sup>
Rate of lay, %	61.47 <sup>b</sup>	58.34 <sup>b</sup>	65.99 <sup>b</sup>	82.78 <sup>a</sup>	84.27 <sup>a</sup>
Average clutch length, d	3.39 <sup>c</sup>	3.04 <sup>c</sup>	3.15 <sup>c</sup>	7.19 <sup>b</sup>	9.63 <sup>a</sup>
Maximum clutch length, d	16.61 <sup>c</sup>	11.86 <sup>c</sup>	11.41 <sup>c</sup>	31.29 <sup>b</sup>	46.53 <sup>a</sup>
Follicle rapid growth period, d	9.47 <sup>c</sup>	9.32 <sup>c</sup>	8.81 <sup>b</sup>	8.42 <sup>b</sup>	7.28 <sup>a</sup>
Oviposition lapse w/n clutch, hr	25.17 <sup>b</sup>	25.98 <sup>a</sup>	25.97 <sup>a</sup>	24.66 <sup>bc</sup>	24.39 <sup>c</sup>

<sup>1</sup> Red: red-feathered commercial Country chicken; Black: black-feathered commercial Country chicken; B: Country chickens selected for body confirmation; L2: Country chickens selected for eggs laid to 40 weeks of age (Source: Yen, 2004; unpublished data).

## HOW TO PROMOTE COUNTRY CHICKENS?

Around the world, there are many types of slow growth local chickens similar to Taiwan

Country chicken, loved by local consumers. Since 1989, for every two to three years, scholars, experts and producers interested in the slow growth breed of chicken from China, Hong Kong and Taiwan will get together for a seminar. The so-called 'Quality Chicken Conference'. According to the attendants to the seminar from China, 85% of meat-type chickens raised in commercial farms in Guangdong province were 'three-yellow chickens'. In 1987, I visited Malaysia and found chicken farmers raised large flocks of slow growth type chickens in palm yards. They said these types of chicken had at least 10% of market share in Malaysia. A few years ago, CP group in Thailand announced a project to develop game birds for meat production to satisfy the consumer's demand. Spanish and Italian also love slow growth local chicken. Even in New York, there are more than 100 stores selling slow growth chickens. However, similar to Taiwan, none of these slow growth country chickens could be sold as carcass parts for high price in the modern supermarket. They are usually sold as live birds in the traditional wet market. The consumer does not trust the carcass because it may be a defrosted product or even from a low quality (not matured or sick) bird. However, under the threat of Avian Influenza and for sanitation reasons, live birds will not be allowed in the market in the near future.

Fortunately, France has established the 'Label Rouge' system for other countries to follow. The slow growth varieties in France are sold as fresh carcass in the supermarket as the white broiler. The price was more than twice of the white broiler and they represent about 40% of the chicken consumption in France in 2002. I visited France in 1999 and found that it is a very complicated system and requires the involvement of every sector from breeder, producer, processor, distributor to retailer as well as the strong government policy to support. Therefore, in 2001, we organized a group of experts to visit France for the promotion of the country chickens in Taiwan. (Later I found that there was also an American group from Illinois visited for the slow growth chicken in France in 2002). We concluded the following factors for the success of country chicken in France. 1. France has a reputed system for consumers to distinguish chicken products of different qualities, *i.e.* AOC, organic, Label Rouge, certified and standard chickens. 2. Label Rouge, or red-labeled, chickens are slow growth prime eating quality chickens. The minimum rearing period is over 81 days and the preferred body weight is below 2.2 kg. Thus, genetically, it should be a slow growth breed (SYNALAF, 2003). 3. No animal or fish source ingredient is allowed in the feed in order to avoid any doubt of BSE and fish odor contamination in the meat. 4. Animal friendly rearing and management. Chickens are raised in small flocks (max. 4,400 birds/flock) with plenty of living (chicken house, max. 11 birds/m<sup>2</sup>) and exercise space (pasture, min. 2 m<sup>2</sup>/bird). 5. To maintain meat quality, every chicken is kept under refrigerated condition. No frozen product is allowed.<sup>4</sup> 6. Reliable traceability. Every chicken has a unique identification number. Consumers can use it to trace detailed information of every chicken from hatch to the retailed stores. 7. Label Rouge started before 1970, but it remained insignificant for two decades until around 1990 after the outbreak of BSE.

Every chicken thrives in the local market is a success of evolution. They must adapt to the local climate and preferred by the local consumers. For example, Taiwan Country chicken has a large erected comb to acclimate the hot and humid environment, and a large leg to satisfy the consumer's demand. The firm and cohesive muscle make it suit for traditional

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<sup>4</sup> In Europe, chicken carcass is chilled by dry cold air and can have 12 to 14 days shelf-life under refrigeration. The problems with air-chilled are higher processing cost, wrinkled carcass and reduced carcass weight. In Taiwan, chicken carcass is chilled in cold water which is likely to contaminate the carcass with more microorganisms and shortening the self-life under refrigeration condition.

cooking recipes. It is not right to judge their value by the standards developed by other countries, such as the sensory test for white broiler meat. Therefore, in order to promote these slow growth country chickens, we need to understand, utilize and enhance their special merits. For example, the 'drunken' chicken cold plate is famous for the elasticity chicken skin of the red-feathered country chicken.

No doubt, maintaining genetic diversity of chicken is very important. However, cost to preserve genetic resources of native animals is rather high. Private farm and even the government could not afford to keep animals without economic value for a long time. Experience in Taiwan indicates that promoting the utilization of native chicken is the best way to preserve genome. However, it also showed that commercial activity, such as the selection and crossbreeding for production efficiency, has undoubtedly made some genetic varieties extinct. In recent years, the World Trade Organization had forced many countries to open their markets to other countries. It is beyond doubt that the impact on the agriculture industry of many countries is tremendous. Farmers in the less competitive countries should be aware of producing the same product as the imported one will be forced out the market. Native animals, if loved by the consumers, probably will not be directly influenced. However, almost all the production, processing and marketing techniques and/or systems established so far are tailor-made for the commercial broilers and layers bred by a few big international companies. To survive under the immense salesmanship of the imported products, the native animals need more works on every aspect of the production and marketing of their products.

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