Performance of the F1 Chicken (CAMSU White):
Upgrading the Philippine Colored Chicken with White Leghorn

Policarpio V. Dingal
Elenita C. Gay

A study on the F1 Performance of the Philippine Colored Chicken ("*Bisaya*" or "Native") crossed with the White Leghorn of United States of America, was conducted in the Poultry Project of the College of Agriculture, Mindanao State University, Marawi City campus (CAMSU). The study was funded through the Office of the Vice Chancellor for Research and Extension (OVCRE) research fund. The research grant was made possible by virtue of Special Order No. 689, series of 2001, issued by the Office of the President.

The data and the implications are limited only to the matings of the *Bisaya* and the U.S. White Leghorn.

The study was prompted by a continuing argument that the Philippine Colored Chicken (PCC) strain is less productive and, therefore, cannot be recommended for commercial raising.

The following assumption were established: first, that the Philippine Colored Chicken used in the breeding were more or less of the homozygous *Bisaya*, and these were mated to a homozygous U.S. White Leghorn (WL). Secondly, there have been arguments advanced that some hereditary traits may show a heterosis or over-dominance in some matings, complete dominance and/or an intermediate dominance in others. This question may be answered in the first filial (F1) offsprings of the matings. Thirdly, there is also an argument advanced that reciprocal matings of these two poultry breeds may yield more distinct and different results.

Duration of the Study

The study started on December 1, 2001 in the CAMSU Poultry Project and was completed on February 28, 2002.

The results of the study were found "impressive" by the researchers, and some of the specimens were kept for continuance of observations for a longer period. In this way, gene reversion or gene splicing, should there be any, could be observed during the second filial generation (F2). The specimens could also be observed for a confirmatory study should the need arise.

The Pedigree of the Breeding Stocks

Ready-to-breed White Leghorn layers were purchased from the Sarmiento Poultry Farm in Davao City. Per declaration of lineage by the Farm, the parental stock was imported from the United States of America. The informant assured the researchers that the birds were pure White Leghorn of U.S.A. origin. The White Leghorn layers and the two roosters in a single batch were of single-toothed comb.

The parental stocks of the *Bisaya* were purchased from the remote barangays of Lugait, Misamis Oriental and Linamon, Lanao del Norte. The selection of the Philippine Colored Chicken was based on body constitution and body formation. These body characteristics of the birds, which folks use to tell that these are native birds or *Bisaya*, were the first group of criteria used in the selection. With this body conformation, the folks, particularly the cockers, call the birds *Bisaya* or "native" chicken. The body of the *Bisaya* is slanted less than 45 degrees angle or nearly horizontal in arrangement. This was the primary consideration used by the researchers.

In an article entitled, "Raising Philippine Native Chickens for Fun and Profit," (*Mindanao Journal*, XXIV, 2001), Dingal generalized that importation of fighting cock strains from Europe and the United States of America has altered genetically the Philippine native chicken. Dingal recorded and tentatively listed 16 strains among the Philippine Colored Chickens. Among the 16 strains, the *Bisaya* is the most symbolic native chicken strain with characteristics such as a smaller body, shorter wings, no crest, no beard, single or rose comb, the tail rectrices not erect, and the birds are little bit wild, but can be tamed.

These characteristics also formed the other set of criteria in the selection of the parental stocks of the PCC breeders used in this study. The female, red in color, was of a single-toothed comb, while the male (also red, *boyugen*), was of a pea comb and was wild. The pair was tamed and confined in a broodyard of 6 feet X 6 feet and 8 feet high and was provided with a nest. The first seven-days eggs were discarded to avoid any pre-mating accident of the female specimen. Eggs layed after seven days were collected. The hen was allowed to sit on 14 eggs and the chicks were artificially brooded. Ten (10) chicks survived to pubertal age. Four (4) were males (cocks) and were used to mate with the U.S. White Leghorn layers. The five (5) females (hens) were mated to US White Leghorn cock for the reciprocal matings. Seven out of 10 (70%) of the parental *Bisaya* were pea comb.

The Breeding Compartments

Five uniformly-built breeding compartments were used. These were constructed in the CAMSU Poultry Project. Each breeding compartment was 6 feet by 6 feet and 8 feet in height. An approximately 36 square feet floor area was provided per compartment and common to all the treatments. Ordinary nests (no trapnest at all) were provided in each compartment and the eggs were collected daily. Similarly, the first seven-day (7-day) egg collections were discarded to prevent genetic contamination in all the treatments.

Rice hull used as litter material to make the breeding compartments always dry and sanitary. The use of the rice hull was prompted by the fact that this material can be taken free of charge from various Rice Mills in Marawi City, about 4 kilometers from the CAMSU research area.

Methodology and Research Layout

Twenty ready-to-breed White Leghorn of U.S.A. origin were grouped into four (4) of five (5) layers per group. These four (4) groups were labeled T1, T2, T3, and T4. These were mated to four (4) Philippine Colored Chicken (*Bisaya)* roosters coming from the single hatch of a hen purchased from Lugait, Misamis Oriental and a rooster secured from Linamon, Lanao del Norte. The sources (Lugait and Linamon) are about 18 kilometers northwestern and about 18 kilometers southeastern sides of Iligan City, respectively, or about 36 kilometers apart to avoid the chance of inbreeding accident among the parent stocks of said breeders used in the research study. Both towns are 57 kilometers away from CAMSU Research Area by land transportation.

For a reciprocal mating, five (5) Philippine Colored hens (from the same hatch), were mated to a White Leghorn rooster. This rooster is of the same hatch of the White Leghorn layers. The reciprocal matings were labeled T5. The low female ratio was made to ensure high fertility. The 1:5 ratio was adopted as a matter of study prerogative.

The purpose of reciprocal matings was to find the mutual responses of the observable hereditary traits, knowing that the native chickens (4 roosters and 5 hens) came from a single hatch. Further, it was estimated that the U.S. White Leghorn layers would yield bigger eggs, therefore, bigger chicks than the native hens.

The White Leghorn layers and the White Leghorn roosters were also presumed to have come from a single stock obtained from a single purchase from the Sarmiento Farm in Davao City. The rooster was, perhaps, an error of the sexer – hence, the assumption that these birds (the layers and the cock) have descended from a single mating.

The four (4) groups were labeled T1, T2, T3, T4, and the reciprocal matings, the T5. These treatments were assigned to five different mating compartments at random.

Eggs were collected and numbered according to the mating numbers T1-T5 boldly written at every door of the mating compartments. Selected eggs from a 15-days egg collections were hatched by batches of 15 eggs per compartment, using a home-made incubator. The incubation started in June 2001 and a total of ten (10) hatches were made from the F1 Performance study.

Results and Discussion

The species of the *Gallus gallus*, namely *Gallus gallus, Gallus lafayetti, Gallus sonneratti,* and *Gallus varius* and their subspecies come from various body constitution or conformation, plumage pattern, color of the shank, body weight, egg shell color, egg weight, egg production per year, and other characteristics such as their being sitters or non-sitters, (mother characteristics) and fighting ability in the bladeless or in a bladed cockfight.

A. The Body Constitution and Body Conformation

The body of the birds includes various conformations. In totality, these are termed body constitution. These include the fleshiness

and muscle fill-ups of the edible parts, the symmetrical arrangement of the parts, structure, shape, or contours of the birds. The body conformation is an obvious characteristic of the avian species, including both the U.S. White Leghorn and the Philippine Colored Chicken.

The body conformation of some of the genus *Gallus* (chicken group), shows upright body arrangement. The body, as well as the neck, are more or less slanted to about 45 degrees angle. This is the typical body form of the Bisaya, a 45 degree-slanted body conformation. The U.S. White Leghorn stands more horizontal than the Bisaya or slanted to more or less 35 degrees angle. (Figure 1) The body conformation of the F1 (CAMSU White) chickens shows an intermediate inheritance. The conformation is not so much upright and not so much horizontal as compared to pure White Leghorn layers.

The fleshiness of the White Leghorn is inferior. This is true, because the breed is not a meat type. Therefore, the White Leghorn is less fleshy than the Philippine Colored Chicken. Further, the breast muscle of the White Leghorn breed is almost a V-shaped compared to the Philippine Colored Chickens. The breast filling of the Philippine Colored Chicken is almost U-shaped or rounded based. With this arrangement, the White Leghorn is less muscled than the Philippine Colored Chicken. This explains why the White Leghorn is not a meat chicken, but the Philippine Colored Chicken is of a meat type. (Figure 2).

In this study, the F1 (CAMSU White) is more fleshy and the body is more or less rounded than the pure White Leghorn breed. Therefore, it can be concluded that meatiness is a complete dominant characteristic of the PCC parents. In view of this fact, the CAMSU White birds are more fleshy or meaty than the parental White Leghorn. This implies that it got more of the meatiness characteristic from the Philippine Colored Chicken and, therefore, the CAMSU White can be classified as a dual-purpose bird. Though small-bodied, it has good fleshing or meatiness characteristic and, as a dual-purpose chicken, it has good laying capacity, too. These characteristics can qualify CAMSU White for raising into commercial scale. For sure, the culls

of the CAMSU White can still get higher demand than the parental White Leghorn.

B. The Plumage Pattern

The parental White Leghorn is an all-white feathered bird and not even a slightest streak can be seen. On the other hand, the Philippine Colored Chickens comes in many colors – hence, the name Philippine Colored Chicken or PCC. The cocks, as well as the hens used in the study were all dark red (*boyugen*) in color, except for one hen which was almost black.

The results of the study show that the White Leghorn white plumage was a dominant character trait over the other colors. It was estimated that the CAMSU White offsprings from a PCC male to White Leghorn hen resulted in a streak ranging from 15% to 20% of varied colors.

The F1 offsprings, (CAMSU White) came streaky with either red, blue, orange, gray and black or as barred feathers. However, phenotypically speaking, the female CAMSU Whites are white and more of a White Leghorn white – hence, the name CAMSU White is fitting.

However, maximum streaks recorded were about 20% golden-red that came out with some males F1. (Plate 1) The colored feathers mostly of the secondary dorsal wing coverts come as golden bars. However, these become a light-orange shade of the saddle feathers. This plumage patterns also occur in the hackle feathers, but rectrices were all white with few color streaks. Filipino cockers classify this F1 plumage pattern of CAMSU White as *banugon* or *tuba-on*. The female CAMSU White has a maximum colored streak of 5.5% and mostly coming from the mating of White Leghorn male to Philippine colored hens. These estimates were based on an actual count of dressed birds where colored feathers were divided by the total number of feathers multiplied by 100 and made an average of 5.5% plumage inheritance.

Seen at a distance, however, the CAMSU White strain birds are still white, especially the females.

C. The Color of the Shank

The 22 heads of U.S. White Leghorn layers were all yellow shanked. The eight (8) Philippine native chickens have the following shank colors: three (3) of the males and two (2) of females were black-shanked or 62.5%, and one (1) male and two (2) of the females were dark to yellowish green (greenish) or 37.5%. These birds were recorded to have greenish shanks, which make most cockers call them "green-legged chicken."

However, in the F1 (CAMSU White), the following results were obtained. Twenty-seven (27) out of 32 males have yellow shanks or 22.991% and five (5) males have yellow-green shanks. Eighty (80) out of 88 females were yellow-shanked or 67.797%, five (5) of the females were light-black shanked or 4.237%, the three (3) females out of 88 were of greenish shanks or 2.542%.

In the overall assessment of shank heritability, the black and green colors are only 11.017% while the yellow color of the U.S. White Leghorn is 88.983% heritable character. This implies that the yellow shank color is not easily maneuverable by breeders, because it is not a complete dominant trait. It is a sort of a slightly intermediate dominant trait. It is so, because the black and green colors were carried down to the offsprings.

D. Body Weight

Weights of the chicks are shown as follows: T1, T2, T3 and T4 averaged to 35.072, 34.503, 33.961 and 33.756 grams, respectively, at day-old. However, T5 (reciprocal mating) averaged to 33.067 grams at day old. This implies that native hens produced smaller eggs and therefore smaller chicks. This infers further that hens have more hereditary influences on offsprings, particularly, of the body weight, at hatching time.

In a similar research, F1 chicks from a cross between Kabir (meat type chicken) and Basilan strain (a game cock of Malay origin) weighed an average of 40.5 grams. Pure White Leghorn average is 38.52 grams. The Philippine Colored Chicken (native) averaged at 32.351 grams. The F1 (CAMSU White) chicks are smaller chicks compared to White Leghorn but bigger than the native chicks. Weight at day-old seemed to be an intermediate dominant character.

The average daily weight gains are not taken, because the birds were not intended for meat production but rather for egg production only.

Adult weights were taken at 4.5 months old when 50% of the female birds have layed eggs. T1 got the heaviest weight of 1901.314 grams (1.9 kgs), followed by T4 which was 1823.305 grams (1.8 kgs), then T2 at 1798.932 grams (1.79 kgs), and T3 averaged 1797.632 grams (1.79 kgs), respectively. In the case of the reciprocal matings (T5), the average weight was lower than T1, T2, T3 and T4. The average weight was only 1725.504 grams or (1.72 kgs).

Among the males, T4 yielded the heaviest cocks with an average of 2700.0561 grams (2.70 kgs), T1 average of 2690.001 grams (2.69 kgs), T2 with an average of 2687.003 grams (2.69 kgs) and T3 had still the lowest of 2679.013 grams (2.67 kgs). Even in the case of the reciprocal males, the average was lower. It averaged only to 2653.067 grams or 2.65 kgs. This implies that mothers had shown greater effects on the body weights of F1 (CAMSU0 White). Female native parent stocks were smaller than the White Leghorn female parent stocks.

E. Egg Number and Weight

According to James R. Carson of the School of Agriculture of Purdue University, a good egg-producing hen (U.S. White Leghorn), will lay 270 to 280 eggs per year. The good egg-type hen weighs 4 pounds (1.8 kgs) and uses 4 pounds of feed to produce a dozen large eggs.

In this study, WL parents produced an average of 137.5 eggs in a six (6) month-laying period, while the PCC parents produced an average of 83.2 eggs in the same laying period. The F1 or CAMSU White averaged 132.78 eggs in a six-month laying period.

T-test on the Number of eggs between parent WL and F1 (CAMSU White) resulted in 11.6766 with probability equal to 1.538E-04 or 0.0001538. This implies that Number of Eggs of parent WL is significantly higher than those of F1 breeds (since probability is less than 0.05).

In the T-test of the Number of Eggs between PCC and the F1, results show that T=122.65337 at probability of 1.325E-08 or 1.325 x 10^{-8}. This implies that Number of Eggs of parent PCC (allowed to sit) is significantly lower than those of the F1 birds (since probability is less than 0.05).

Another T-test on the Number of Eggs between PCC (when not allowed to sit) resulted to 240.1617 at probability = 9.017E-10 or 9.017 X 10^{-10}. The Number of Eggs of parent PCC (when not allowed to sit) is significantly lower than those of the F1 layers (since probability is less than 0.05).

F. Egg Sitting or Mother Instinct Characteristics

The White Leghorn used in the study were 100% non-sitters. The native used were 100% sitters.

All the Philippine Colored hens, whether there were eggs or no egg at all in the nest were really sitters to incubate. Poultry scientists call this breed characteristic "mother instinct." The Philippine Colored Chicken shows this mother instinct characteristic. These birds sit on the nest even without the egg.

The F1 (CAMSU White) layers were mostly non-sitters. Only two out of 88 layers showed the mother instinct characteristic. The two hens (2.272%) were made to sit on 14 eggs each and were able to

incubate the eggs successfully. Hen 1 hatched 12 eggs out of 14 (85.714%), while the second hen (Hen 2) hatched 9 eggs out of 14 or 64.285%.

Of course, poultry experts are unified at saying that some White Leghorn layers have been observed to show mother instinct characteristic. Records of White Leghorn showing mother instinct was estimated at 0.7%. In the case of CAMSU White, hens showing the mother instinct is high. The 2.272% is very high number of culls when in a largescale poultry farm.

G. Cockfighting Ability

The White Leghorn cock does not fight hard with other cocks. Obviously, the White Leghorn cock does not attempt to pick on any of the Philippine Colored cocks. It just refuses to fight.

On the other hand, the Philippine Colored cock fights the White Leghorn rooster, picks on it and, in fact, is willing to continuously pick on all other cocks to death. This fighting ability has been observed by the researchers enough for them to conclude that the PCC is of a fighting cock strain.

The F1 roosters were all cockfighters. All F1 roosters fight, but only 16 out of 27 or 59.259% fight with one another and with any cock for a longer time. This was proven by having all of them go through a 15-minute fight per pair and changing partners thereafter. Fighting test was extended to all other roosters in the neighborhood. Though none of the cocks were tested in the cockpit for a bladed or bladeless fight, majority of the cocks show fighting ability. Fighting ability of the Philippine Colored Chicken was a sort of dominant character trait. This even gives the researchers the impression that the White Cuban, the Zamboanga White and other White feathered fighting cocks in the cockpit may have some White Leghorn genes.

H. Feed Consumption to Produce 1 Dozen Eggs

Results show that the T4 consumed the greatest amount of feed to produce 1 dozen eggs which was 1.79 kilograms. This is followed by T2 which averages at 1.72 kilograms per dozen eggs, trailed by T3 – 1.68 kilograms, followed by T1 which is 1.67 and lastly by T5 (reciprocal matings) which has an average of 1.66 kilograms per dozen eggs.

However, these results still show lower feed consumption compared to the White Leghorn parent stocks which recorded 1.8 kgs of feed needed to produce 1 dozen eggs (Carson, 1996). Much more, the PCC parental birds consumed 2.53 kilograms of feed to produce 1 dozen eggs.

The consumption of the PCC was arrived at giving the number of lost-days accruing to incubation and brooding period of chicks. Incubation requires 21 days and a brooding period of about a month. However, brooding under good management can be shortened to 15 days, using the cold brooding technique.

Cold brooding simply means, the hens are removed from the brooder at 15 days old, leaving the chicks to heat themselves. Cold brooding is heaterless brooding. Efficient cold brooding requires the use of litter such as paper strips, rice hulls, milled peanut hull, chopped cogon grass leaves and other litter materials.

T-test on layer feed consumption between parent WL and F! (CAMSU White) shows significant difference between the two groups. Layer feed consumption per dozen egg of parent White Leghorn (WL) is significantly higher than those of F1 breeds at probability level of 0.05.

Another T-test on kilogram layer feed consumption per dozen egg between Philippine Colored Chicken (PCC) and F1 (CAMSU White) also reveals a significant difference between the groups. Layer

feed consumption to produce per dozen egg of parent PCC is significantly higher than those of F1 birds (since probability < 0.05). These results of the T-tests show that it would be allowable to raise the F1 birds even to a commercial scale.

I. Color of the Earlobe

The color of the earlobe is a character trait of the White Leghorn which is a complete dominance. This conclusion was reached because when the all-white earlobed White Leghorn chickens were mated with the all-red earlobed Philippine Colored Chicken, the F1 offsprings (males and females) were phenotipically all white-earlobed. This implies that the white-earlobed character is a completely dominant one.

J. Egg Shell Color

In the same source, Carson generalized that the White Leghorn is the most popular egg type chicken in the world. This breed produces white-shelled eggs. As stated, the White Leghorn parents all laid white-shelled eggs.

Other strains produce brown-shelled eggs, including the PCC parents which were used in this study. Except for personal preference, Carson generalized that brown-shelled eggs are not more nutritious than white-shelled eggs. The color of the egg shell has nothing to do with the nutrient content of the egg, but the feeds of the hens do affect the nutritional value of the egg (Nesheim, et.al., 1979).

However, the F1 offsprings of the PCC male crossed with white leghorn female chickens produced 95.315% white-shelled egg layers and 4.685% brownish-shelled egg layers.

On the other hand, the reciprocal matings (White Leghorn male X native hens) produced 97.728 percent white-shelled egglayers and only 2.272% brownish-shelled egg layers.

In all matings, 96.522% of the F1 layers produced white-shelled eggs, while only 4.47% layed brownish-shelled eggs. However, when all the eggs were placed on an egg tray, these generally look like white-shelled eggs.

K. Type of Comb and Wattle

The comb and wattle of chicken come in various types. White Leghorn and some of the Philippine Colored Chicken have single-toothed combs and double wattles. Most of the Malay breeds, which include the Basilan strain are of rose and pea comb and are single-wattle chicken. However, there are some in the Bisaya strain which are of rose and pea comb. Incidentally, the ancestral rooster used to mate the parent Bisaya female used to produce the F1 chicken was a pea comb.

The results of the study show that the pea comb is 63.636% dominant over the White Leghorn single-toothed comb; 56 out of 88 layers or 63.636% were pea comb and 32 out of 88 or 36.364% were single-toothed comb. This confirms the studies of Malden C. Nesheim, Richard E. Austic, professors of Cornell University, and Leslie E. Card, professor of Poultry Science, University of Illinois when they studied Rose Comb and Single Comb chickens.

However, it was not studied whether the type of comb affects the production potential of the layers. It was expected that the egg producing genes are not in any way affected by the type of comb of the layers.

I. Implications

Based on the findings of the study, the F1 offsprings of the cross between the U.S. White Leghorn and the Philippine Colored Chicken (native) has shown a very promising egg production record. Though the average weight of egg from F1 hens were lower that that of the pure White Leghorn, the feed consumption is less compared to

the statistically recorded consumption of White Leghorn. Analysis of Variance (One-Way ANOVA) on egg weight in grams show an non-significance, with probability level of 0.05: All F1s cross layers and parental layers have statistically the same egg weights.

The difference in feed consumption and the average weight of egg is reasonably compensating. This confirms the scientific theory (Bell, 2000) that the chicken of the egg type must have a smaller body, but relatively lays bigger eggs. A smaller-bodied chicken consumes lesser feed to produce an egg. The objectives and direction of some poultry companies are to go specializing on genetic improvement of layer chicken which lays bigger and more eggs with less feed consumption.

The upgraded Philippine Colored Chicken can be raised in commercial scale. While the F1 hens produce smaller eggs, relatively, these consume lesser feed compared to either pure White Leghorn and the native parent stocks. This finding confirms the theory of Carson (1996). Breeders must breed male and female chickens that would produce small-bodied layers but lay more and relatively bigger eggs. The F1 offsprings are showing these important characteristics of the farmer's ideal layers.

Further, the F1 of the White Leghorn and native can be raised as fighting cocks. The fighting ability of the F1 males shows a very observable improvement. This gave the impression that the White Cuban, the Zamboanga White and other white-feathered fighting cocks might have White leghorn descendant or genes. These white-feathered cocks are winning in the cockpits not only on Mindanao but throughout the country. In this study, 59.259% of the cocks fight just like any other fighting cocks do. They fight up to 15 minutes without stop nor surrender. This fighting ability can still be improved by backcrossing or going into F2 production or criss-crossing techniques. The 15-minute fight was used as basis to indicate that the cock would not run away after a blade wound inside the cockpit arena.

M. Recommendations

The researchers wish to recommend the following:

1. Upgrading the Philippine Colored Chicken be expanded to include other egg and meat type breeds of chicken;

2. There should be further study on the heritability of cock-fighting ability of the White Leghorn and the Philippine Colored Chicken matings;

3. A study on the performance of F2 chicken be conducted to find out some peculiarities of gene reversion and other gene segregation or assortment;

4. A study on the effect of the type of comb can be explored further. There is a dearth of findings relating to this aspect of breeding.

Performance of F1 Chicken: A Comparative Study

B – Plumage Color and Pattern

Plumage color and pattern -	Phenotype	(% of color streaking)	Average (%) Color Streaking
A. T1 to T4 – (Colored Male X WL hens)	All white	20.0	
B. T5 (WL Male X Colored hens)	All white	5.50	12.75

C – Color of the Shank

	Shank Color	Percentage (%)
White Leghorn parent stock (22 heads)	Yellow	100
Philippine Colored Chicken (8 heads from single hatch)		
a. Five (5) males	Black	62.5
b. Three (2 males & 1 female)	Greenish	37.5
F1 or CAMSU White (32 males, 88 females)		
a. Males (27)	Yellow	22.881
b. Males (5)	Dull-green	4.237
c. Females (80)	Yellow	67.797
d. Females (5)	Light black	4.237
e. Females (3)	Greenish	2.542

D – Body Weight

	At Average Day-old (Weight in grams)	4.5 Mos. Old Average (Weight in Kilograms)	
		Female	Male
U.S. White Leghorn parent stock	38.521	1752	2.98
Philippine Colored Stock	32.351	1463	2.35
F1 (CAMSU White Hens)		Female	Male
a. T1 (Colored male X WL hens)	69.732	1.617	2.69
b. T2 -do-	70.013	1.593	2.69
c. T3 -do-	69.815	1.589	2.67
d. T4 -do-	69.831	1.621	2.70
e. T5 (WL male X colored hens)	67.815	1.491	2.65

E – Number of Eggs and Egg Weights (Averages)

	First 3 Months	2nd 3 months	No. of Eggs (6 months)
Parents (WL)	56.325 grams	69.527 grams	137.5
Parents (PCC)			
a. Not allowed to sit	38.132 grams	45.328 grams	83.2
b. When allowed to sit			35.7
F1 (CAMSU White)			
T1 (Colored male X WL hens)	43.725 grams	63.466 grams	133.6
T2 (Colored male X WL hens)	44.351 grams	64.781 grams	132.9
T3 (Colored male X WL hens)	43.832 grams	64.881grams	131.9*
T4 (Colored male X WL hens)	44.253 grams	63.887 grams	133.7
T5 (Reciprocal matings)	43.863 grams	64.533 grams	131.8

* One layer showed mother instinct. It did sit and hatched 9 chicks

F – Mother Instict Characteristic or Sitter Bird

PARTICULAR	Sitter	Non-sitter	% of Sitter	Total
WL parents Stock	0	20	0	20
Philippine colored chicken	5	0	100	5
CAMSU White	2	86	2.272	88

G – Cockfighting Ability

PARTICULAR	Short-time Fight	(%)	15 minutes fight	% of Fighter
WL parent cock	0	0	0	0
PCC parent cocks	5	100	5	100
F1 (CAMSU White)	27	100	16	59.259

H – Feed Consumption to Produce 1 Dozen Eggs

Feed Consumption of layers to produce 1 dozen eggs	Layer Feed (Kilograms)
WL parent stocks	1.80
PCC	2.53
F1 (CAMSU White)	
T1 (Colored male X WL hens)	1.67
T2 (Colored male X WL hens)	1.72
T3 (Colored male X WL hens)	1.68
T4 (Colored male X WL hens)	1.79
T5 (Reciprocal matings)	1.66

I – Color of Earlobe

	Color	%
U.S. WL Parent Stock	White	100
PCC Parent Stock	Red	100
F1 (CAMSU White)	White	100

J – Egg Shell Color

Egg Shell Color	White-Shelled (%)	Brownish-Shelled (%)
A. T1 to T4 (Colored Male X WL Hens)	95.315	4.685
B. T5 (Wl male X Colored hens)	97.728	2.272

K – Type of Comb and Wattle (88 Layers)

Type of Comb	No. of Heads	Heritability %
Single-toothed Comb	56	63.636
Pea Comb	32	36.364

L – Hypothesis Tests for Means

Header Data for: Dingal, label: No. of eggs
Number of Cases: 5 Number of Variables: 1
Means vs. Hypothesized Value

L.1. **T-test** on number of eggs between Parent (WL) and F1 (CAMSU White)

HYPOTHESIZED VALUE	=	137.5000
MEANS	=	132.7800
STD. DEV.	=	.9039
STD. ERROR	=	.4042
N	=	5 (CASES = 1 TO 5)
T	=	-11.6766 (D.F. = 4)
PROB.	=	1.5383E-05 = 0.0001538

REMARK: Number of eggs of parent White Leghorn is significantly higher than those of the F1 breed (since probability <0.05).

L.2. **T-test** on No. of eggs between PCC (Allowed to sit) and F1 (CAMSU White)

HYPOTHESIZED VALUE	=	83.2000
MEANS	=	132.7800
STD. DEV.	=	.9039
STD. ERROR	=	.4042
N	=	5 (CASES = 1 TO 5)
T	=	122.6537 (D.F. = 4)
PROB.	=	1.325E-08 = 1.325 X 10^{-8}

REMARK: Number of eggs of parent Philippine Colored Chicken (allowed to sit) is significantly lower than those of F1 (CAMSU White) breed (since probability < 0.05).

L.3. **T-test** on No. of eggs between PCC (when allowed to sit) and F1 (CAMSU White)

HYPOTHESIZED VALUE	=	35.7000
MEANS	=	132.7800
STD. DEV.	=	.9039
STD. ERROR	=	.402
N	=	5 (CASES = 1 TO 5)
T	=	240.1617 (D.F. = 4)
PROB.	=	9.01 E – 10 = 9.017×10^{-10}

REMARK: Number of eggs of parent Phil. Colored Chicken (when not allowed to sit) is significantly lower than those of the F1 breed. Since probability <0.05.

L.4. **T-test** on layer feed consumption/dozen eggs, kg. Between WL & F1 (CAMSU White)

HYPOTHESIZED VALUE	=	1.9000
MEANS	=	1.7040
STD. DEV.	=	.0532
STD. ERROR	=	.0238
N	=	5 (CASES = 1 TO 5)
T	=	-4.0352 (D.F. = 4)
PROB.	=	7.833E = 0.007833

REMARK: Layer feed consumption per dozen egg of parent WL is significantly higher than those of F1 CAMSU White (since probability <0.05).

L.5. **T-test** on kg. Layer feed consumption per dozen egg between PCC & F1 CAMSU White

HYPOTHESIZED VALUE	=	2.5300
MEANS	=	1.7040
STD. DEV.	=	.0532
STD. ERROR	=	.0238
N	=	5 (CASES = 1 TO 5)
T	=	-34.7194 (D.F. = 4)
PROB.	=	2.5053E – 06=2.0533 x 10^{-6}

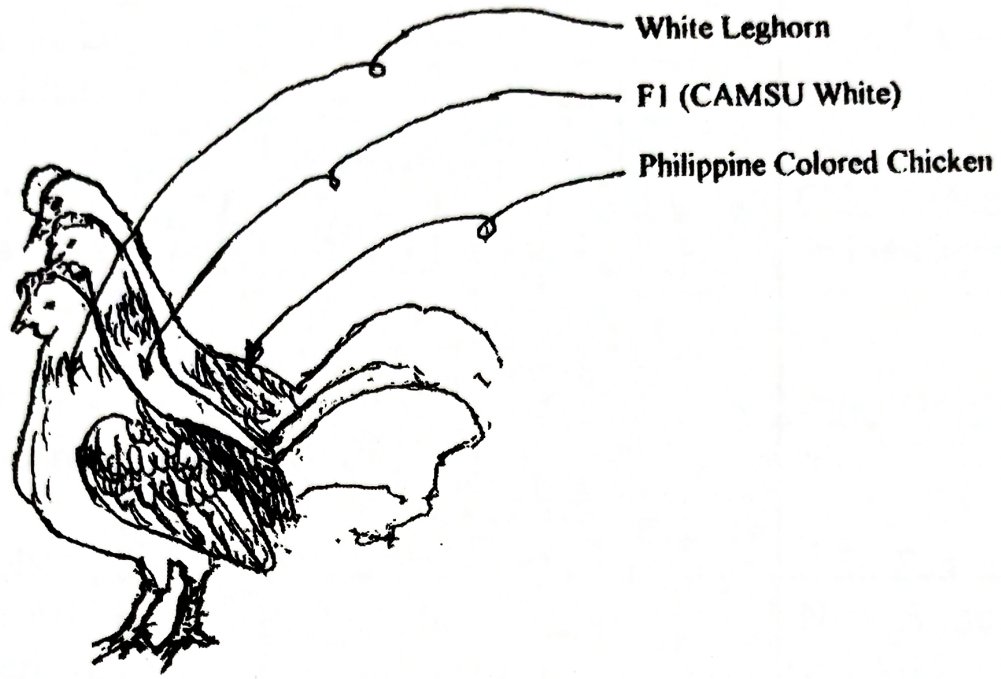
REMARK: Layer feed consumption per dozen egg of parent PCC is significantly higher than those of F1 CAMSU White (since probability <0.05).

M. ONE-WAY ANOVA
(ANOVA ON EGG WEIGHT)

	GROUP	MEAN	N
F1	T1	53.596	2
	T2	54.566	2
	T3	54.357	2
	T4	54.070	2
	T5	54.198	2
CONTROLS	WL	62.926	2
	PCC	41.730	2

SOURCE	SUM OF SQUARES	D.F.	MEAN SQUARE	F RATIO	PROB.
Treatment	459.894	6	76.649	0.469*	0.8126
Error	1144.485	7	163.498		
TOTAL	1604.379	13			

* Not significant (since probability >0.05). All F1 crosses and parent hens have statistically the same egg weights.



FIGURES 1. Artist's illustration on the body constitution of the parent stocks and F1 chickens

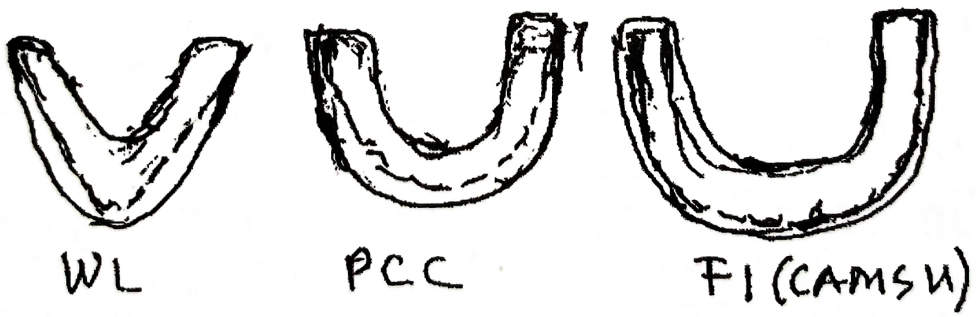


FIGURE 2. Artist's perception on the breast bones of the parental stocks and F1 chickens

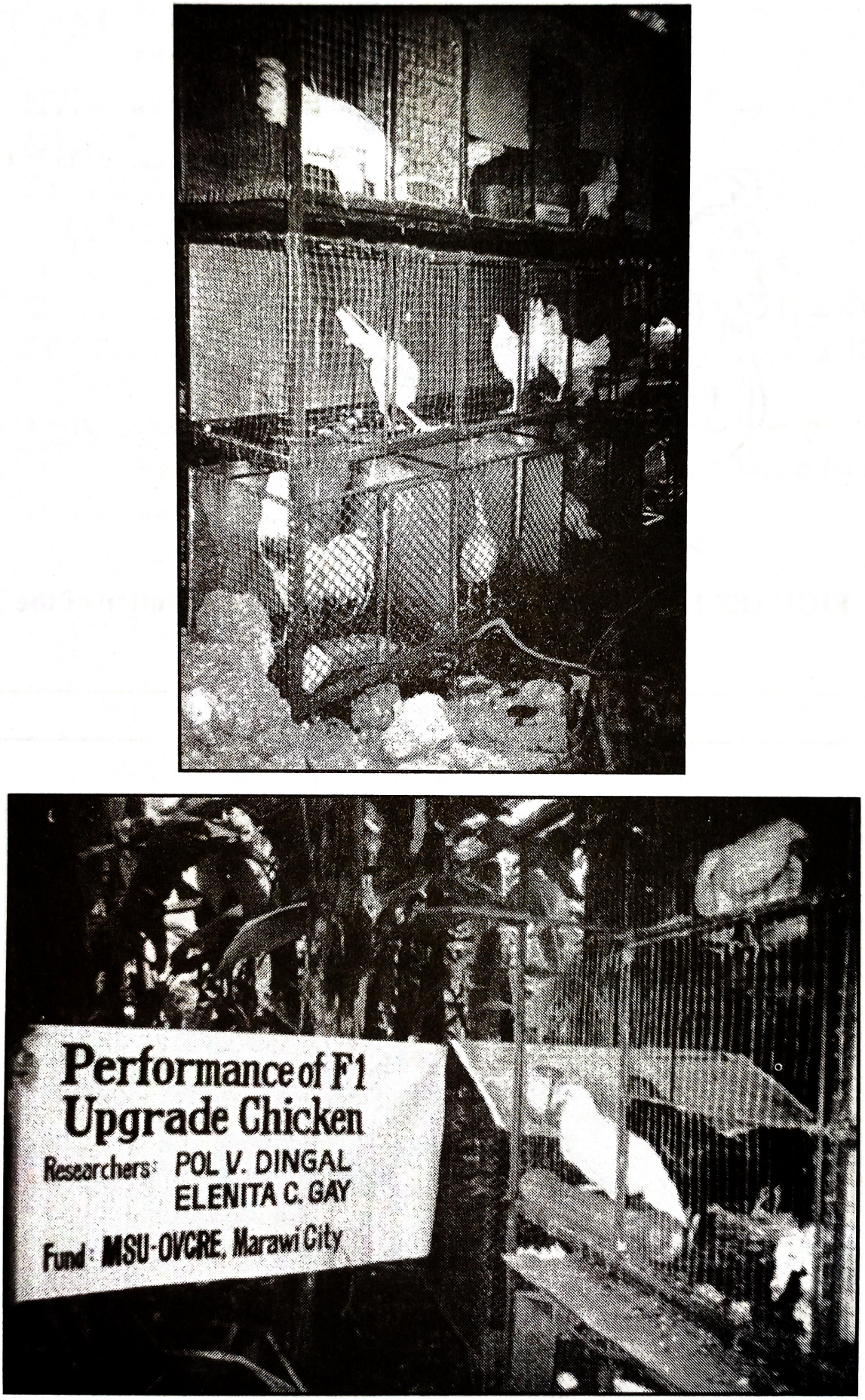


PLATE 1. Photos of some of the F1 chickens

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