Performance of 0-14 weeks-aged super free-range hens that are fed by fermented coconut pulp flour-contained ration

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Abstract. The research was carried out at the Basic Laboratory of the Faculty of Agriculture, Warmadewa University with a level of use of fermented coconut pulp, namely R0 (ration that contains no fermented coconut pulp, R1 (ration containing 5% fermented coconut pulp flour), R2 (ration containing 10% fermented coconut pulp) and R3 (rations containing 15% fermented coconut pulp). Each combination of treatments was repeated three (3) times, and each replication consisted of 4 super female free-range chickens. Variables observed included: 1) Age of chicken growth includes the weight gain and final weight of super free-range chicken, 2) Percentage of carcass and non-carcasses for super free-range chicken, 3) Feed Conversion Ratio (FCR, and 4) Feed consumption. From this study it was found that the giving of coconut pulp flour was fermented up to 10% (R2) significantly (P<0.05) could increase weight gain and final weight and flour dregs fermented coconut to the level of 10% also decreases ration consumption and the conversion of ration for super female chicken 14 weeks old.

1. Introduction
Free-range chicken is one type of local poultry that has the potential to produce eggs and meat so it is widely cultivated by people, especially those who live in rural areas. This is because native chickens have good adaptations to the environment. Consumer demand for chicken meat is increasing every year. Based on data from Direktorat Jenderal Peternakan, the total production of native chicken meat from 2007 to 2014 was 332,095 tons [1]. Seeing this, farmers must pay attention to the age of harvest from native chickens in order to meet the demand needed by the market by paying attention to the ration coefficient used to produce high body weight gain. Therefore, in discussing the new millennium era, where the market competition will be open, the development of free-range chicken is an alternative to its existence. Especially in the area of Bali where native chicken is needed both as a typical Balinese culinary namely Betutu which is preferred by tourists and is required for ceremonies.

Super native chicken is very potential to be developed because a super native chicken has faster growth compared to local free-range chicken where the maintenance period to harvest takes 55-60 days and is efficient in using rations. Super free-range chicken is the result of cross-breeding male chickens that have large postures with female laying hens [2]. Super chicken in its maintenance requires quality feed for nutritional fulfilment because the perfect feed with balanced nutrient content gives optimal results [3]. The fact is that the price of commercial feed in the market price is felt by farmers to be very expensive while feed is the largest component in poultry farming business, where the cost of feed can reach 60-70% of total production costs [4], so it is important to find alternatives namely utilizing...
agricultural and industrial waste that can be the best solution at this time. One of the agricultural/industrial wastes that has not been utilized so far is coconut pulp. Most coconut waste is thrown away so it pollutes the environment and its economic value is also low. By utilizing coconut pulp for feed, it can be expected to replace some of the use of imported feed ingredients with high prices so as to reduce production costs while increasing profits [5].

Coconut pulp is industrial waste or household waste which is very potential to be used as chicken feed ingredients because coconut pulp is still easily obtained from the rest of the manufacture of coconut oil traditionally and from the waste of making virgin coconut oil (VCO). However, coconut pulp has an obstacle to be given to livestock because the crude protein content is low while the crude fiber is high. Buckle et al stated that the content of coconut pulp consisted of 13.35% moisture content, crude protein 5.09%, crude fat 19.44%, ash 3.42% and crude fiber 30.4% [6]. To overcome the problem of coconut pulp can be done through a fermentation technology approach. In the fermentation process, a reaction occurs where complex compounds are transformed into simpler ones by cleaning up the molten water. Fermentation by using molds enables the change of components of materials that are difficult to digest to be more easily digested so that it is expected to improve nutrition [7] and added by Kartasudjana and Suprijatna [8], kapang and Khamir. The fermentation process will change the quality of food ingredients to be better than the original ingredients both from the aspects of nutrition, digestibility and increase storage power. The purpose of this research is interested the provision of fermented coconut pulp in super female native chickens aged 4-14 weeks against its growth.

2. Research methods

2.1. Location and duration of research
This research will be divided into 2, namely: 1) Preparing alternative feed ingredients namely fermented coconut pulp flour, 2) Research on super chicken raising which will be carried out at the Basic Science Laboratory of the Faculty of Agriculture, Warmadewa University for three months.

2.2. Research methods
The study was carried out using the 4 x 3 Complete Random Design method with 4 levels of use of fermented coconut pulp flour with three replications. The treatment is Fermented Coconut Pulp Flour (Control) (R0), Containing Ration 5% fermented coconut pulp flour (R1), Containing Ration 10% fermented coconut pulp flour (R2), Containing Ration 15% fermented coconut pulp flour (R3).

2.3. Ration used
In this study used rations consisting of corn, fish meal, bran, soybean meal, fermented coconut pulp flour, coconut oil, and minerals. The diet was prepared iso calories and isoprotein to see the effect of fermented coconut pulp.

2.4. Chicken used
In this study 144 super male chickens were used. DOC super chicken is purchased at 300 Tohpati Poultry Shop. From the age of 0 - 4 weeks the chickens are fed BR I and are kept in a postal cage equipped with warmers. After the chicken is 4 weeks old, the chicken is transferred to the battery cage and fed with the treatment ration.
Table 1. Composition of ingredients for the composition of rations of super-village chickens and their respective nutritional content of rations.

| Feed ingredients used          | R0  | R1  | R2  | R3  |
|-------------------------------|-----|-----|-----|-----|
| Corn                          | 42  | 43  | 43  | 40.5|
| Fermented coconut pulp flour  | 0   | 5   | 10  | 15  |
| Rice Bran                     | 37  | 30  | 25  | 21  |
| Fish meal                     | 10  | 10  | 7.5 | 10  |
| Soybean meal                  | 9   | 10  | 12  | 10  |
| Coconut oil                   | 1   | 1   | 1.5 | 2.5 |
| MINERAL                       | 1   | 1   | 1   | 1   |
| **Total**                     | 100 | 100 | 100 | 100 |

| Nutrient                      | R0  | R1  | R2  | R3  |
|-------------------------------|-----|-----|-----|-----|
| Crude Protein                 | 17.72 | 17.89 | 17.6 | 17.56 |
| Energy Metabolism             | 2,773 | 2,739 | 2,713 | 2,711 |
| Crude Fiber                   | 6,027 | 6,054 | 6,327 | 6,444 |

2.5. Variables observed
In this study the observed variables were Age of chicken growth includes weight gain and final weight of super chicken, percentage of super chicken carcasses, Feed Conversion Ratio (FCR) and Consumption of rations.

3. Results and discussion

3.1. Research result

The effect of fermented coconut pulp flour on the performance of super female native chickens aged 14 weeks.

Table 2. Effect of fermented coconut pulp flour on the performance of super female native chickens aged 14 weeks.

| Variable                        | Treatment | Average |
|---------------------------------|-----------|---------|
| Weight gain (g)                 | R0 628.82 b | R1 641.23 a | R2 646.82 a | R3 539.41 c | 614.07 |
| Final Weight (g)                | R0 810.45 a | R1 822.88 a | R2 828.96 a | R3 722.23 b | 796.13 |
| Ration Consumption (g)          | R0 3,878.42 a | R1 3,918.12 a | R2 3,612.56 b | R3 3,504.30 b | 3,728.35 |
| FCR                            | R0 5.33 a | R1 5.07 a | R2 4.62 a | R3 5.48 a | 5.12 |
| Carcass Percentage (%)          | R0 60.00 a | R1 61.00 a | R2 60.00 a | R3 59.00 a | 60.25 |

Note: Different letters towards the line show significantly different (P<0.05).

The effect of treatment on chicken weight gain showed significantly different results (P <0.05) (Table 2). The use of fermented coconut pulp as much as 10% (R2) in the ration was able to increase the highest weight gain of 646.82 g, followed by R1 (5%) of 641.23 g, R0 (0%) of 628.82 g and R3 (15%) of 539.41 g. The final body weight of 14-week-old female chickens treated with the highest fermented coconut pulp was obtained by R2 (10%), which was 828.86 g, followed by R1 (5%) of 822.88 g, R0 (0%) amounting to 810.45 g and finally on treatment R3 (15%) of 722.23 g. These results statistically showed a significant effect (P <0.05). The effect of treatment on the consumption of ration for 14-week-old female chickens showed significantly different results (P <0.05). The highest ration consumption was obtained in treatment R1 (5%), which amounted to 3918.12 g followed by R0 (0%) of 3878.42 g, R2 (10% of 3612.56 g and R3 (15% of 3564.3 g). The ration conversion obtained in this study obtained the highest value in the R3 treatment (15% 0 which is equal to 5.48 and the lowest was obtained in R2 (10%) which was 4.62, but statistically showed a non-significant effect (P> 0.05). In this study, the percentage of carcasses ranged from 59% - 61%. The effect of treatment showed results that were not significantly different (P> 0.05). The highest percentage was obtained in treatment R1 (5%) which was
61% and the lowest in R3 (15%) was 59%.

The effect of fermented coconut pulp flour on body weight gain and final body weight showed significantly different results (P <0.05) (Table 2). Giving fermented coconut pulp up to the level of 10% (R2) can increase the final body weight and weight gain of super female chicken age 14 weeks, while the provision of fermented coconut pulp at the level of 15% (R3) can reduce weight gain and final body weight super chicken aged 14 weeks (P <0.05). This is due to the fact that up to the level of giving 10%, the extracted coconut pulp is able to provide and provide balanced food substances so that it can sustain the growth of the livestock juice, but when given to the level of 15% the nutrient content in the ration is less balanced for example the crude fiber content increases up to 6.3%.

In Table 1, It can be seen that in R3 treatment (15%) gave the lowest weight gain compared to other treatments, while treatments R0 (0%), R1 (5%) and R1 (10%) gave almost the same results. This is due to the addition of fermented coconut pulp at the level of 15%, resulting in a decrease in the amount of ration consumption and the lower nutrient content of the ration resulting in decreased digestibility and palatability. Poultry does not have cellullatic enzymes in the digestive tract so that the feed cannot be digested properly, and will accelerate the rate of digestion. Supriyati and Kompiang stated that the negative effect of adding fiber is an increase in the production of endogenous materials, reducing the influence of other nutrients, and holding back the penetration of digestive enzymes [9]. Tillman et al stated that low food digestibility showed that the food substances consumed by livestock were not widely used in the body, but many were excreted through feces, thereby increasing growth in body weight [4].

In addition, the fermentation process can increase protein content and metabolic energy. Wiguna state that the fermentation process can increase the digestibility of organic matter as an ingredient feed [10]. Widodo stated that body weight gain was influenced by livestock type, environmental temperature, sex and nutrition in the ration [3]. According to Yamin, food experienced the fermentation process has a better nutritional value than the original ingredient, where microorganisms that are catabolic will break down complex components into simpler substances [11]. In addition, through fermentation, food ingredients will experience beneficial physical and chemical changes such as flavour, texture, digestibility and shelf life [12]. Growth of body weight is one indicator of the growth achieved in the research period. This growth will later have a direct effect on the final weight. This is clearly seen in Table 2, where the treatment pad R3 (15%) gives the lowest final body weight, while in R2 (10%) gives the highest yield. Factors that influence body weight gain are genetic, health, the nutritional value of rations, food substance balance, stress, and the environment [13]. According to Rasyaf, genetic and environmental factors affect the growth rate of chicken body weight [12]. Body weight gain is strongly influenced by ration consumption, so indirectly the consumption of ration during the study greatly influences the weight of life produced [14].

The giving of extracted coconut pulp has a significant effect (P <0.05) on the consumption of super chicken rations. Feed consumption increases to a level of 5%, which in turn decreases with the increasing rate of fermented coconut pulp. This is caused by the administration of R1 (5%) the crude fiber content of feed is still the same as R0 (0%), which is 6%, while the administration of R2 (10%) and R3 (15%) the crude fiber content of feed increases to 6.3% and 6.4%. Giving fermented coconut pulp in the ration will increase ration consumption (R1). This is due to the specific aromas produced by fermented coconut pulp, which adds to the palatability of the ration, while the addition of fermented coconut pulp levels 10-15% results in reduced ration consumption. Palatability is one of the factors that affect the consumption of rations. Palatability depends on the appearance and shape of the feed, smell of taste, texture and ambient temperature. In treatment R1 (5%), because fermented coconut pulp has a fragrant taste and aroma that is favoured by livestock which results in the highest consumption of rations, which is 3918.12 g. In R2 (10%) because the fiber content is increasing, it results in decreased ration consumption but is able to provide the highest increase and final body weight, but on R3 (15%), along with the increase in crude fiber content of feed it decreases the consumption of ration so heavy end body and the lowest weight gain.

This is because a lot of coconut pulp will increase the crude fiber content of a feed. Crude fiber
consists of cellulose, hemicellulose, and lignin, which are mostly not digested by poultry and are either bulky or bulky [15]. Digestion of crude fiber in poultry occurs in the cecum with the help of microorganisms, because poultry does not have cellulase enzymes that can break down crude fiber. The crude fiber content in the crossbred native chickens is 6 - 12% [16]. Consumption as an illustration of nutrient intake eaten by livestock for the process of increasing body weight. Then the ration content must be balanced and in accordance with the needs of poultry, besides that, the needs of vitamins and minerals must also be fulfilled. The increasing amount of coconut pulp will result in high crude fiber content, so that it will cause more important nutrients released through feces before experiencing more perfect absorbs resulting in stunted growth [15]. Crude fiber in a certain amount is needed to expedite the removal of food waste which is not digested, but if it exceeds the maximum limit it will reduce the nutrition of the ration.

The effect of giving fermented coconut pulp to the conversion of super chicken rations showed results that were not significantly different (P> 0.05). The highest ration conversion was obtained at R3 treatment (15%) which was equal to 5.48. The smallest ration conversion is obtained in R2 treatment (10%) which is equal to 4.62. Ration conversion is a comparison between the amount of ration spent in a certain period of time and weight unit [14]. The lower the conversion rate obtained, the better because the ration used to produce one kg of meat is less [17]. The ration conversion value is influenced by several factors including genetic, ration type used, feed additives used in rations, maintenance management, and ambient temperature. The higher the value means the more wasteful rations used [18]. Feed conversion is influenced by protein and energy levels, metabolic ration, age, chicken nation. This proves that the use of fermented coconut pulp up to 10% is more efficient than the use of fermented coconut pulp at other levels and without the provision of fermented coconut pulp due to the amount of feed consumed in the control feed is not proportional to the increase in body weight gain. This shows that consuming 3612.56 g of feed can increase 646.82 g of body weight of native chickens. Coconut pulp fermentation can improve the quality of food ingredients and is easily digested by livestock. This is in accordance with the opinion of Yamin, which states that fermentation basically multiplies microorganisms and improves the quality of food substances after adding flavour [11]. In addition, after fermentation, food will experience beneficial physical and chemical changes such as flavour, texture, digestibility and storage power [2]. Feed conversion is influenced by energy and protein balance. The higher the balance of energy and protein, the ration conversion will be lower and vice versa. The efficiency of ration use is lower with decreasing energy content and protein ration. This can be seen from the significantly increasing conversion ration (FCR) with decreasing energy content and protein ration. The energy content and protein ration decreases causing lower digestible proteins and decreased protein retention which will reduce growth. According to [19] rations with high energy and protein tend to accelerate growth and improve feed conversion. The ration conversion value is related to production costs, especially ration costs, because the higher the conversion ration, the ration cost will increase because the amount of ration consumed to produce body weight in a certain period of time is higher. The high ration conversion value shows the amount of ration needed to increase body weight and lower ration efficiency [19]. Whether or not the quality of the ration is determined by the balance of nutrients in the ration with what is needed by the body of the native chicken. A diet that lacks one of the nutritional elements of a nutrient will cause chickens to consume excess rations to meet the body's lack of needed substances [2]. Super chicken (age 4-10 weeks) with ad-libitum ration has a ratio of 5.0 to 5.5 ration [16]. Conversion of domestic chicken ration maintained by intensive maintenance systems ranged from 4.9 - 6.4. Maintenance of chickens with a traditional, semi-intensive and intensive maintenance system resulted in different ration conversions. The smaller the conversion rate indicates that chicken is better at turning feed into meat and the ration can be said to be good. Factors that influence weight gain in poultry are species, strain, type of production, sex, environmental temperature, season, quality and number of rations, maintenance management, ration form, ration administration system, and initial weight [20]. The better the quality of the ration, the smaller the conversion value of the ration.

The results of the diversity analysis showed that the treatment of fermented coconut pulp showed no
significant difference (P>0.05) to the percentage of carcasses of super female chicken 14 weeks old. Treatment R1 produces the highest percentage of a carcass or the best result, even though statistically it shows differences that are not real. Dewanti et al states that the carcass component is relatively the same and is proportional to the body weight gain which will produce a carcass percentage that is not different [19]. From the results of this study, the average carcass percentage ranges from 59 - 61%, the percentage of carcass obtained from the comparison between carcass weight and cutting weight multiplied by 100%. According to Purawisiastra, factors that influence the percentage of a carcass, namely nation, sex, age, feed, physical condition, and abdominal fat [7]. The percentage of chicken carcasses increases with increasing cutting age. This is in line with the opinion of Iskandar that the percentage of a carcass is influenced by the weight of the slaughter [20]. The percentage of carcasses starting from the growth rate indicated by the increase in body weight will affect the weight of the slices produced. Cut weight will affect the percentage of carcass produced. The carcass weight is influenced by chicken type, ration, body weight, gender, and age [17]. When the chicken gets bigger then its growth slows down but the feed consumption increases, so the longer the ration conversion will be greater and it will cause the income over feed cost to decrease. The quantity and quality of rations given were related to the high and low production and the speed of growth that was growing [4]. The growth rate of body weight is influenced by age, environment, and genetics where the initial body weight of the surface phase is related to adult weight.

4. Conclusions
Giving fermented coconut pulp flour up to the level of 10% can increase weight gain, and weight in the maintenance of super female chicken 14 weeks old. Provision of fermented coconut pulp flour to the level of 10% can significantly reduce feed consumption and Feed Competition Ratio in the maintenance of 14 weeks super female chicken.

It can be recommended to use fermented coconut pulp flour up to 10% level to get weight gain, final weight and feed consumption ratio. This will also reduce ration consumption and ration conversion in the maintenance of super female chicken.

References
[1] Direktorat Jenderal Peternakan 2014 Produksi Daging (ton), 2000-2014 [Online] Tersedia pada: http://www.bps.go.id/linkTabelstatis/view/id/1506 Diakses pada tanggal 8 september 2015
[2] Salim E 2013 Ayam Kampung Super (Lily Publisher Yogyakarta Teknologi peternakan dan Veteriner ITB Bandung)
[3] Widodo J 2014 Bibit ayam kampung Super [Online] Tersedia pada: http://jack.yogya.blogspot.com/ Diakses pada tanggal 10 Januari 2015
[4] Tillman A D, Hartabi H, Reksohadiprodjo S, Prawirokusumo S dan S Pekdosoekjo 1991 Ilmu Makanan Ternak Dasar (Yogyakarta: Gadjah Mada University Press)
[5] Puri E 2011 Pengaruh Penambahan Ampas Kelapa Hasil Fermentasi Aspergillus oryzae Dalam Pakan Komersil Terhadap PertumbuhanNila (Oriochromius niloticus) (Surakarta Jurusan Biologi, FMIPA Universitas Sebelas Maret)
[6] Buckle K A, Edward R A, Fleet G H and Wooton M 1985 Ilmu Pangan (Jakarta: Universitas Indonesia)
[7] Purawiskastra S 2001 Pengaruh isolat galaktomannan kelapa terhadap penurunan kadar kolesterol serum kelinci Warta litbang kesehatan 5 (3&4)
[8] Kartasudjana dan Suprijatna 2006 Manajemen Ternak Unggas (Jakarta: Penebar Swadaya)
[9] Supriyati dan Kompiang I P 2002 Perubahan komposisi nutrien dari kulit ubi kayu terfermentasi dan pemanfaatannya sebagai bahan baku pakan ayam pedaging JITV 7 150-154
[10] Wiguna I 2007 Emas yang tercecer [Online] Tersedia pada: http://www.trubusonline.com/mod.php?mod=Publisher&op=viewarticle&cid=7&artid=234
[11] Yamin M 2008 Pemanfaatan Ampas kelapa dan Ampas Kelapa Fermentasi Dalam Ransum Terhadap Efisiensi Ransum dan Income OferFed Cost Ayam pedaging J Agroland 15 (2) 135-139
[12] Rasyaf 2011 Panduan Beternak Ayam Pedaging (Jakarta: Penebar Swadaya)
[13] Miskiyah I, Muliyawati and Haliza W 2006 Pemanfaatan Ampas Kelapa Limbah Pengolahan Minyak Kelapa Murni Menjadi Pakan Seminar Nasional
[14] Wahyu 2004 Ilmu Nutrisi Unggas (Yogyakarta: Cetakan ke-V Gajah mada University Press)
[15] Ma’rifah B, Atmomarsono U and Suthama N 2013 Nitrogen retention and productive performance of crossbred native chicken due to feeding effect of Kayambang (Salvinia molesta) International Journal of Science and Engineering 5 (1) 19-24
[16] Fadilah R 2004 Panduan Mengelola Peternakan Ayam Broiler Komersial Cetakan 1 (Jakarta: Agromedia)
[17] Card L E and Nesheim M C 1972 Poultry Production 11th Ed (Philadelpia. California)
[18] Santosa K, Warsito S S T dan Andoko A 2012 Bisnis Penggemukan Sapi (Jakarta: Agromedia Pustaka)
[19] Dewanti R, Irham M dan Sudiyono 2013 Pengaruh Penggunaan Enceng Gondok (Eichornia crassipes) Terfermentasi dalam Ransum terhadap Persentase Karkas Non-Karkas dan Lemak Abdominal Itik Lokal Jantan Umur Delapan Minggu Buletin Peternakan 37 (1) 19-25
[20] Iskandar S 2005 Pertumbuhan dan perkembangan karkas ayam silangan Kedu x Arab pada dua sistem pemberian pakan Jurnal Ilmu Ternak dan Veteriner 10 (4) 253 – 259