

## The efficiency of Leguminosae Production Grains Plus Maize as A Feeding on Growth Phase of Local Swine (*Potamochoerus porcus*) in Timor-Leste

### *Efisiensi Produksi Biji Kacang-Kacangan Plus Jagung sebagai Pakan Ternak terhadap Tahap Pertumbuhan Babi Lokal (*Potamochoerus porcus*) di Timor-Leste*

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#### ABSTRACT

In Timor Leste, swine Farmers did not yet use legume production grains to maintain feed swine performance and respond to market demand. The research aims to evaluate the Efficiency of Leguminosae Production grains Plus Maize in feeding on the Growth Phase of Local Swine in Timor Leste. This research used Latin Square Design with four rows and four columns employed. The swine feeding has 4 treatments such as R1 (corn 50% + mungbean 15% + soybean 20% + common bean 15%), R2 (corn 40% + mungbean 20% + soybean 15% + common bean 25%), R3 (corn 40% + mungbean 20% + soybean 20% + common bean 20%), R4 (corn 50% + mungbean 10% + soybean 15% + common bean 25%). This research showed that Swine that consumed R2 rates were very good compared to other feedings for Swine. Look at the performance of the Swine with an increase in body weight of 31.16kg and body length of 72.75cm in the grower phase. All data were analyzed by ANOVA Latin Square Design, and Least Significance Difference (LSD) was conducted when the means were significantly different ( $p < 0.05$ ).

Keywords: efficiency of legume, grains, maize, local Swine (*Potamochoerus porcus*)

#### ABSTRAK

Di Timor Leste, Peternak babi belum menggunakan produksi biji kacang-kacangan untuk memelihara babi dan sebagai pakan ternak untuk melengkapi kinerja permintaan pasar. Penelitian ini bertujuan untuk mengevaluasi Efisiensi Produksi Biji Kacang-Kacangan Plus Jagung Sebagai Pakan Ternak Terhadap Tahap Pertumbuhan Babi Lokal (*Potamochoerus porcus*) di Timor Leste. Penelitian ini menggunakan Rancangan Bujur Sangkar Latin (RBSL) dengan empat baris dan empat kolom yang digunakan. Pemberian ransum babi memiliki 4 perlakuan, yakni R1 (jagung 50% + kacang hijau 15% + kedelai 20% + kacang merah 15%), R2 (jagung 40% + kacang hijau 20% + kedelai 15% + kacang merah 25%), R3 (jagung 40% + kacang hijau 20% + kedelai 20% + kacang merah 20%), R4 (jagung 50% + kacang hijau 10% + kedelai 15% + kacang merah 25%). Hasil penelitian menunjukkan bahwa Babi yang mengkonsumsi ransum R2 sangat baik dibandingkan dengan pemberian ransum babi yang lain. Dilihat dari tingka laku babi dengan peningkatan berat badan sebesar 31.16kg dan panjang badan 72.75 cm pada tahap pertumbuhan. Semua data dianalisis dengan ANOVA Rancangan Bujur Sangkar Latin (RBSL), dan Beda Nyata Terkecil (BNT) dilakukan ketika adanya saling berpengaruh nyata ( $p < 0,05$ ).

Kata kunci: efisiensi kacang-kacangan, biji-bijian, jagung, babi lokal (*Potamochoerus porcus*)

## INTRODUCTION

Livestock plays a significant role in Timorese society. According to the 2015 population and Housing Census, 87% of households in Timor-Leste own livestock. Ownership of Swine and Chickens were the highest at 71.5% for both animals, an increase of 4.5% from 2010. In contrast, ownership of goats and cattle had increased from below 10% in 2010 to 22.5% and 26%, respectively, in 2015. The main reason for owning livestock in Timorese society is to fulfill social obligations and provide a source of income. Swine is an, along with goats, cattle, and buffalo, are required for ceremonial occasions such as weddings, funerals, and other important events. A secondary reason for animal production is to provide meat for human consumption. However, it is not an essential part of the average human diet, with 7% never eating meat and only around half the population (54%) eating meat once per week. The pig is continuously similar to having money in an account at the local bank but not as secure. In a survey of three administrative posts, it was found that 31.3% of households (range 3.4 to 55.6) reared pigs for self-consumption and 52% of households (range 34 to 77) reared pigs for sale (Smith *et al.*, 2017); In occasions that by the support of author of TOMAK studied on a total number of pigs in Timor-Leste increased from 330,435 in 2010 to 419,169 in 2015, and increase of more than 25%.

The farmers use fed feeding likely cassava, coconut, taro, residues of horticulture plants, and rumbia (sago) for mixing to become swine feeding in traditional fed. The fed feeding mentioned above that Farmers never used and became a useless tradition increase and promoting swine performance, and do not have time management for feeding caused decreasing in swine growth every year.

Legume proteins as animal nutrition. It is used as a protein supplement and diet for Swine's performance in second phases such as starter and grower. Some essential amino

acids are "locked-in" inhibitors present in the bean and are made unavailable (Naawu *et al.* in Liener, 1979). Legume grain is one of the food crops, and as an animal feeding, likely Swine is in our research site. Animal feeding by legume grains production for pigs in actual become increasing pigs growth until finishing phases in every period. Legume grains production as the feeding of Swine, and become a new technology package to solve and less demand immediately in Timor Leste.

The protein of soybean, mung bean, and common beans are contained a considerable quantity of lysine (6.2g/16gN), but the value of protein is limited by methionine and cysteine content (2.9g/16gN). Concerning high protein content, the soybean meal is mainly used in poultry and pig nutrition. In mixtures for poultry content of soybean meal can approximate 40%. Generally, soybean seed's content of 5,6-11.5% of water ranges for crude protein is from 32 to 43,6%, for fat from 15.5 to 24.7%, for crude ash from 4.5 to 6.4%, for neutral detergent fiber (NDF) from 10 to 14,9%, Acid Detergent Fiber (ADF) from 9 to 11,1%, carbohydrates content from 31.7 to 31.85% on a dry matter basis (Banaszkiewicz, 2011).

Legume grains were a source of proteins for animal feed, and also their product can provide a range of benefits to both farms and feeding manufacturers. Explaining legume grains is a classic example of successful development and use. Mung bean, common bean, and soybean are exploited as grain crops in temperate farming systems, and their production for homegrown protein supply is encouraged in the Timor Leste to reduce dependency on imported proteins (Siriwan, 2012).

The protein of grains is due to food security, sustainability, environmental concerns, nitrogen (N) retention, and the growth performance quality of the grower (Whitea, 2015). In Timor Leste, farmers do not use legumes feed for swine maintenance.

The importance of an appropriate

available energy supply in a balanced diet for efficient protein use by livestock was stressed, high energy to protein ratio being needed to optimize the use of the protein.

Feeding pigs in Timor-Leste is still a traditional method of boiling mixed materials. In our study cases with legume grains such soybean, mung bean, and common beans. In the study we conducted, all materials from the bean grains were grinded and mixed based on the treatment designed, then boiled to feed the Swine. The Swine fed feedings contain protein content such as maize 9.8%, mung bean 7.4%, soybean 40%, and common bean 25%.

## METHODS

This research was used Latin Square Design with 4 rows, and 4 columns. The swine feeding has 4 treatments such as R1 (corn 50% + mung bean 15% + soy bean 20% + common bean 15%), R2 (corn 40% + mung bean 20% + soy bean 15% + common bean 25%), R3 (corn 40% + mung bean 20% + soy bean 20% + common bean 20%), R4 (corn 50% + mung bean 10% + soy bean 15% + common bean 25%).

Sampling is only used in site experiments of Swine. The six (6) variables observed have a different component of parameters such as body weight (kg), body length (cm), feed conversion ratio, a diameter of body (cm), adding of body weight (kg), and feed ratio consumption rates (kg) will be

measured and determined on a day 14 per two weeks during two months.

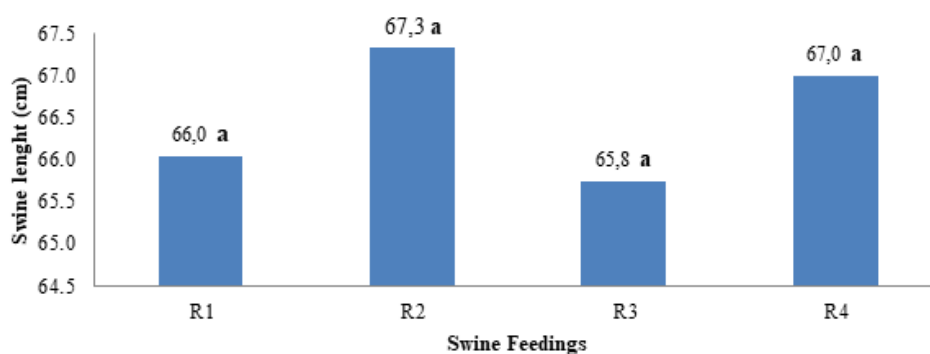
All data was collected from the field, managed in an MS Excel spreadsheet database being transferred for further analysis to Genstat and ANOVA of Latin Square Design with Genstat software 18<sup>th</sup> edition and also continuing analysis of the significant difference between treatments were continued analysis by Least Significance Difference test (LSD,  $p < 0.05$  and  $0.01$ ).

## RESULT AND DISCUSSION

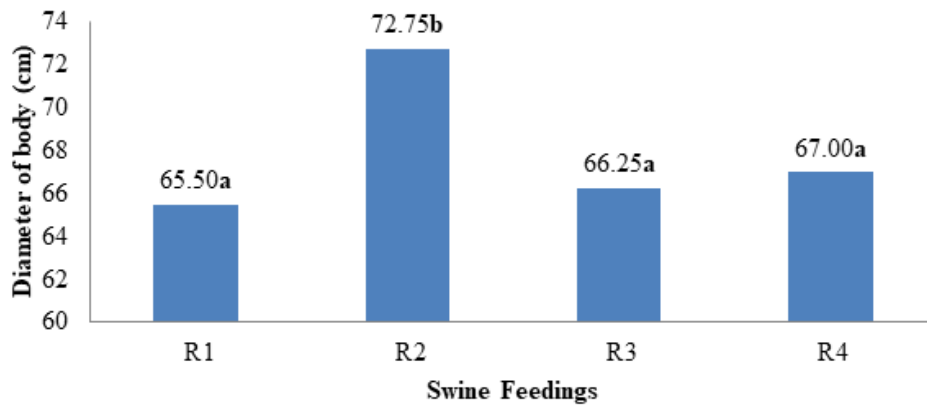
### Swine Length

Probability is not significant by swine feeding of legumes on body length. The variable of swine body length had gotten legume feedings showed no significant difference between treatments (Graph 1).

The variation of the feeding of legumes such as soybean, mung bean, and common beans, were combined with maize become a diet feedings and well on swine growth in body length by targets of protein percentage per legume feedings and approved with least significant difference (LSD) 5% in similarly variation periods. The visualization performance in the reality of field experiment showed that have confirmed, according to legume feeding proteins into the content of legumes and original percentage of protein is consistence in actual. The performance and growth of Swine's body length of based on



Graph 1. Swine length (cm)



Graph 2. Diameter of the body (cm)

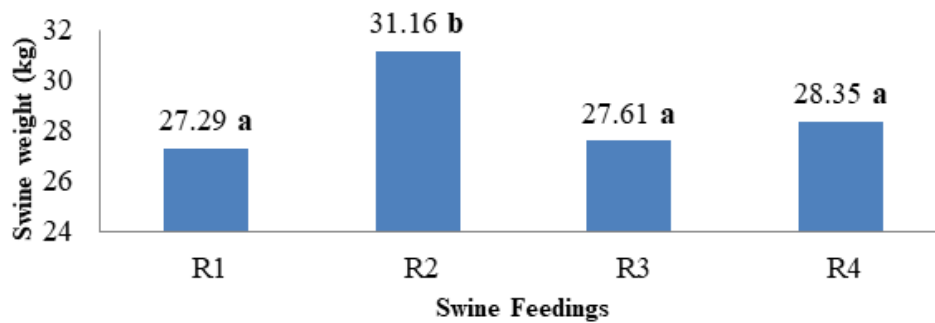
feeding resources, whereas in quadratic on the base by effective studied maintenance on protein efficiency, in the occasion of normal condition with the scale on growth phase increasing swine body length, also adapted of environment climate identic for local Swine during a time. The local feeding resources of legumes potential area of tropics superior compared to middle tropics, and also non-conventional resources of swine feeding legumes, would be able and prepared in every site could become swine feedings (Whitea *et al.*, 2015).

#### Diameter of The Body (cm)

The treatment of corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2) showed a significant difference compared to other feeding treatments, but R1, R3, and R4 feedings did not show a significant difference between them on the diameter of the body (Graph 2). On occasion, the body diameter is highest in treatment corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2) with a value of 72.75cm compared to other feeding treatments. In the statistical analysis, that diameter of body category included in quantitative data of descriptive, because by the observation visualized method that utilization equipment of roll meter becomes a one-off measurement for getting primarily data's in experiment sites, and in observation were done by periods with data tabulation based on Genstat application

software for Latin Square Design (LSD). The diameter of body swine methods is units experiment that showed in Graph 2. Based on quantitative data with values of 72.75 cm got in treatment corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2) compared to other feeding treatments because each period adds diameter of the body formed growth by bone, meat, lipids become a one of the potential growth for rising meat in relation of diameter of the body (Budaarsa, 2012). The experimental analysis of ANOVA showed that legume feedings nutrition content with different percentages could stimulate adding growth for swine body and body width by anatomy and physiology. They were increasing the body swine growth link for economic growth, though in some expectations is not permitted yet. However, all of the conditions for other indications showing with legume feeding treatment such as corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2) can increase the performance of Swine. The field experiment is visualized by ANOVA analysis per each treatment have variation directly by adding Swine's' body performance (Pasaribu *et al.*, 2015). On the occasion that can see in photographs of swine body growth in the attachment.

Anatomy has seen that swine body had progress based on variation by legume feeding effect can increase by the diameter of body observation indirectly.



Graph 3. Total Body Weight Gain (kg)

### Swine Weight (kg)

Treatment corn 40% + mung bean 20% + soybean 15% + common bean 25% (R2) significant difference of swine weight result with other feeding treatments, but among three feeding treatments such as R1, R3, and R4 did not show impact on swine weight. In occasion that highest swine weight in corn 40% + mung bean 20% + soybean 15% + common bean 25% (R2) treatment with value 31.16 kg, and lowest swine weight in corn 50% + mung bean 15% + soybean 20% + common bean 15% (R1) with values 27.29 kg (Graph 3). The differential response of the Swine at increasing legume feeding of R2 treatment code may be levels of supplemental lysine replacement with explained by the fact that Swine in the fast growth line ate more feed than Swine in the slow growth line ( $p < .02$ ). Thus fast growth was exposed to larger amounts of inhibitors. Average daily feed intake and feed efficiency were significantly different within each growth line.

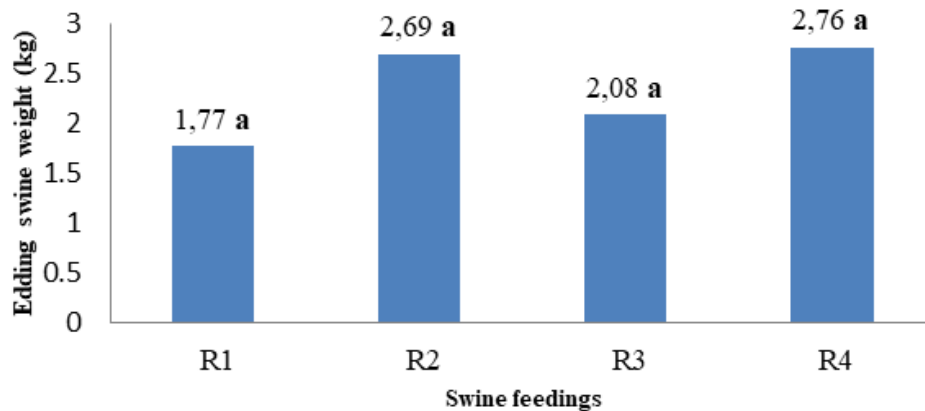
In an earlier trial (Maxwell *et al.*, 1983), a 25% level of the supplemental lysine replacement (7.5% mung beans in diet) did not cause any decrease in feed efficiency in the growing phase of production. However there was a trend of reduced feed efficiency with mung bean, soybean, and common beans replacement of supplemental lysine from other feedings cannot arrange when compared to the feeding percentage has not served (Naawu *et al.*, 1979 in Liener, 1979). The physical experiment of the Swine is in the field is very important on utilization of treatment

maintenance used swine feedings efficient and appropriately, in term of local feeding of legumes from agricultural-based for festering economic growing by legumes production grains for Swine's feeding for all household quantitative data is on swine weight.

Legumes local feeding the combination of the percentage for four levels legumes types feeding best is corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2), when compared to the other treatment of feedings were added swine weight as a growth growing early on the application significantly. It will be the same level of Swine feeding with the utilization of corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2). Based on the swine performance needs to attention feeding of crude protein is a necessity for stimulating efficiency of progress. In general, increasable in swine growth for weight each period that is added weight per day and per week (Tillman *et al.*, 1998). The performance of Swine by the effect of feeding corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2) immediately that per day Swine should be eaten, have not to rest, it is mean that adding swine weight for meat, and also as proteins necessary into swine body, so that saw by the quantitative database on Swine growing body.

The growing process involves adding swine growth part of body components such as heart, bones, and other components, except lipids (Anggorodi, 1994). Observation made by Maxwell *et al.* (1983) in Naawu, 1979 that backfat thickness was not affected by dietary





Graph 4. Adding Swine Weight (kg)

treatment since mung bean substitution did not produce any significant changes in the energy content of experimental diets compared to the gain and backfat thickness than gilts <.02 and when compared to research result earlier done.

Utilization of Swine feeding from legumes with difference percentage conversion ratio produced adding swine weight did not same and less based on crude proteins content 14.48% -18%. Swine feeding for the starter phase indicated that crude protein had a direct percentage of 18%. Although, has data's periods have a progressing for adding swine weight on period 3 and 4 adapted in environment preliminary by crude proteins experimented for Swine's performing, (Pasaribu *et al.*, 2015).

The result of swine feeding, usually from same sources of difference legume production types such soybean, mung bean, common bean, and maize combined by its' percentages conversion ratio related on swine weight starter phase for getting initial. On the occasion that adding's swine performance weight per day per period usually about 197.14gr per a head per day, when compared to research result by Pasaribu *et al.* (2015) that adding swine weight per ahead got 200g – 700g. This condition permitted Swine growing to respond to feeding treatment by swine grower phase is good, served and adapted effect of corn 40% + mung bean

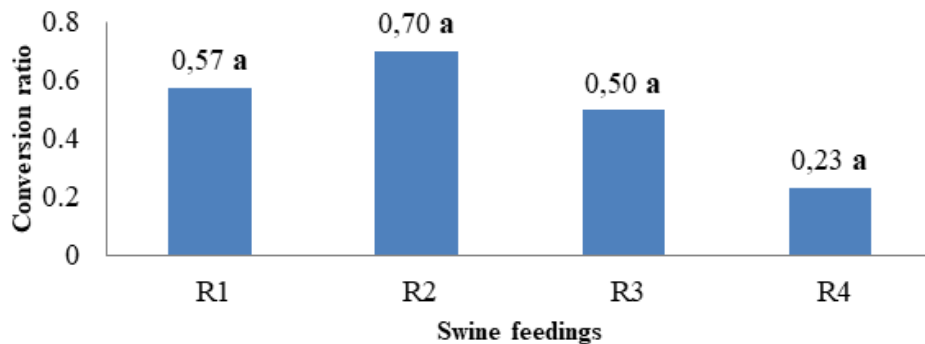
20% + soybean 15% + common beans 25% (R2). Continued Pasaribu *et al.* (2015) that adding swine weight able to 0.1 kg per a head per day, when compared to research result early from UNITAL Agriculture Faculty of livestock Department with weight 0.2kg per a head per day by the effect of combination feeding of conversion rates. That is an effect of environmental factors, and swine feeding (quantity and quality) influenced growth in the field experiment.

**Adding Swine Weight (kg)**

Graph 4 showed that swine weight from the first period got conversion ratio of feeding and ending of research was uniformed with the extra percentage of 5% for initial weight in total quadratics consumption by getting of swine experiment. Swine feeding was 18% quadratically with several combination crude proteins by feeding types and accumulated for all percentages estimation into stimulation for formulating on the form growing in adding swine weight per period (Sola *et al.*, 2011).

Normally, Swine grow day to day needs, how much weight Swine add progress by time and ages, though did not follow by treatment, still causes late swine growth, when did not attention maximum with fed feeding treatment intensive, semi-modern, and will be indicated that exchanged time per period information for progressing of swine weight adding (Wea, 2010).

In processing adding of swine weight,



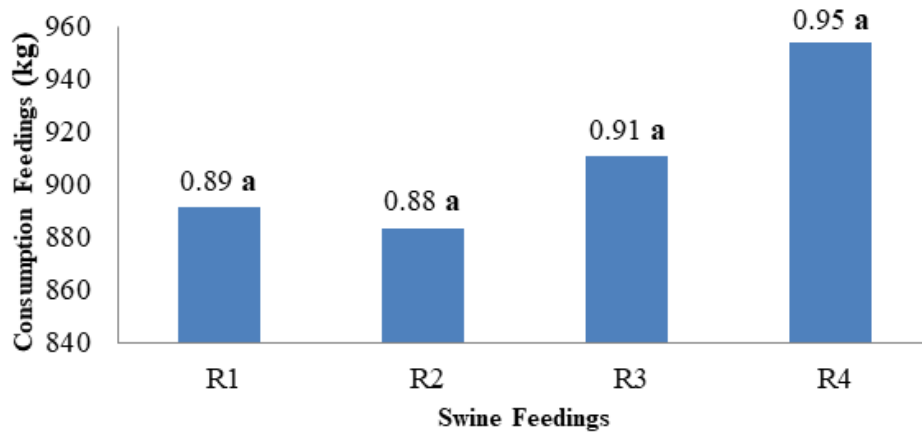
Graph 5. Conversion Ratio

Swine's necessity for feeding consumption is applicable, efficient, and suitable. It is formatted of large anatomy by the metabolism and palatability swine of feeding combination percentage as a feeding treatment of legumes production grains. In the occasion that by the feedings efficient of nutrients that contain calcium, phosphor for vital energy, it will be viabilities of Swine for recuperated weight each period for quickly adding progress by swine weight per day, and also absorption by feeding proteins content, Tiro, no Fernandes (2007). This indication showed that other variables like the faces linking to the quadratics faster of formation process on swine growth by this study, but did not implement by using faces variable viability. Additional dietary treatment in the starter phase was incorporated into swine weight per period. Accordingly, five growers' dietary treatments were evaluated by ANOVA Latin Square Design (LSD) by the effect of legume production grains for swine feeding. The four rows and four columns of the entire female Swine (initial weight 17.24). Animals were transferred onto grower treatments at 17.24, and the trial continued until animals weighed 31.16. The starter swine were transferred onto the identical legume-based diets for the grower period (thus, for example, Swine's feeding the legumes production diet during the starter phase was transferred to swine feeding of legumes production grower, Whitea, (2015). An add (R2) adds Swine's starter 17.24 and grower 31.16 phases of the study, Whitea,

(2015).

### Conversion Ratio

Graph 5 did not have significant influences between values indicated on swine feeding. It means that the capacity of Swine had done conversion rates for forming meat had not been the difference between the treatment of legumes feeding having "other namely" that adding swine weight for starter phases mentioned, thus for them are efficient for transforming immediately for meat onto Swine actual much consumption of feedings (Pasaribu *et al.*, 2015). Research results concluded that the value of conversion ratio of Swine by the legume feedings combined with maize, based on those percentages formulating have not uniformed and unbalanced percentages different too and continuing ideas from expert Wea (2010). It was reported that the conversion ratio is not yet efficient compared with legumes production of grains combination rates of 100%, such as soybean, mung bean, and common beans combining with maize. Expert Patience *et al.* (2015) that utilization of the energy of swine feeding is one of the based important for feeding efficiency, though other factors accompanied and intervention becomes an influenced. Conversion ration minus in R4, R3, and R1 did not directly affect by minus feeding energy. Although the treatment of legume feeding of Swine was not significantly different, the ability to partner with numerical value conversion rates is high, parallel to minus conversion feedings. The conversion



Graph 6. Consumption Feedings (Kg)

ratio is a significant variable for indicating, however, using legume feeding applicable, when recommended to husbandry in first for sharing information about legume feedings for substituted, other feedings such from agriculture residues. Also, other foods improve local Swine's performance to consumption feeding with food resting. On the occasion that by the performance swine weight for profit abilities feedings, and on processing by metabolism and palatability is for its energy of forming into the quadratic well, and firmly in one of expression performance result, its' meaning that swine meat adds equating and proven, Noblet and Perez (1993).

### Consumption Feedings (Kg)

The indication shows that per day into one period with total grams of feeding, based on formulation from legume feedings' combination though did not follow by usually, and minus mixing fed on treatment process have not a uniform of percentages. Application rates showed that in an initial swine performance before consumption, legume feedings can also respond by crude protein. An initial was supported. Levels of crude proteins can influence swine growth by the swine weight. The high coarse proteins caused minus palatability's feedings and could affect swine weight endings. Palatability is essential to determining consumption progress, though other researchers reported that in the long term, husbandry could solve

nutrition content by affecting feedings. Consumption of legume feedings necessity by Swine per ahead per day with weight 891.2g to 953.8g, in average is 922.5g per day a head of Swine. Legume feedings quantities for this research are supported by Maxwell *et al.* (1983) that 1.5kg to 2,75kg. Swine capacity for absorbing feeding as an efficient nutrition component will be relatively the same for altogether swine necessity ideal, and growing of Swine. Those factors are influenced by swine feeding of legume production grains are big body, swine weight, and age, thus caused by conditions of the environment such as temperature, humidity, and sunlight., The aspects are determinate is high, and minus of quality of legumes feedings. It was proteins, energy, vitamins, minerals, and other materials that would form Swine's growing and process for absorbing biology (Poluan *et al.*, 2017). That Swine for a starter of primarily on period until grower phases with weight are 17.24kg to 32.00kg fed feedings by ad-libitum that delivering water to Swine did not follow volumes. Generally, energy as legume feedings is still controlled with quantitative consumption, though influenced by highly energy into feedings; on the other hand, quantitative variance for consumption for day to day affects its self of Swine.



## CONCLUSIONS

According to the result by analysis of variance (ANOVA), we concluded that: 1) Legume feedings applicable for swine growth are combination rates of corn 40% + mung bean 20% + soybean 15% + common beans 25% (R2) with a value weight of 31.16kg, and the diameter of the body is 72.75 cm when compared to other result treatments on growth phases. 2) Application of legume feeding treatments was combined with maize grains to increase Swine's growth faster during two months (8 weeks) in an initial value of 17.24kg to 31.16kg, between starter and grower are able for adding swine weight 13.92kg, when compared to other feedings.

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