Evaluation of Pig Slaughtering at Tuke Slaughterhouse (RPH) on Carcass and Physical Meat Quality

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Abstract. This study aims to evaluate the effect of pig slaughtering processes at the Tuke Slaughterhouse on carcass yield and meat quality. The main focus of the study is to understand how pre- and during-slaughter treatments affect meat quality, taking into account the variables of pig age and sex. The parameters observed include slaughter weight, carcass weight, carcass percentage, carcass length, fat thickness and physical meat quality such as moisture content and pH. The methods used include direct observation and laboratory measurements. The research process involved quarantine, ante-mortem and post-mortem examinations, slaughter and collection of muscle samples for laboratory analysis, namely the back muscle (*Longissimus dorsi*), thigh muscle (*Biceps femoris*) and abdominal muscle (*M. rectus abdominis*). The instruments used included pH meter, analytical scales, drying oven and thermometer. The data were analyzed using simple linear regression. The results showed that male pigs had higher slaughter weight (113,50 kg) and carcass weight (96,25 kg) than females (99,56 kg and 81,67 kg). The carcass percentage of males was 85%, while that of females was 80%. The length of the female carcass (105,17 cm) was greater than that of the male (84,5 cm) with a relatively similar backfat thickness of around 6 cm. The pH value of male meat (5,75) was higher than that of female meat (5,17) while the moisture content ranged from 7,5 to 7,67%. Statistical analysis showed a positive relationship between slaughter weight and carcass weight, carcass percentage, carcass length and meat pH. These findings provide important insights into the factors that affect carcass quality and the physical quality of pork at slaughterhouses.

Keywords: Pig, Slaughterhouse, Slaughtering, Carcass, physical meat quality

1 Introduction

Pigs are one of the main commodities in the livestock sector and play an important role as a source of animal protein. This species is known to have a number of advantages, such as high birth rates in a single reproductive period (*prolific)*, the ability to efficiently convert feed into meat, and the production of carcasses with a large proportion, namely around 65%

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to 80% (Wibawa et al., 2019). In addition to its role in food supply, pig farming also contributes significantly to meeting domestic meat demand. According to data from the Central Statistics Agency (BPS) of the Ministry of Agriculture in 2024, the six regions with the highest pork production in Indonesia are Bali, North Sumatra, East Nusa Tenggara, East Java, South Sulawesi, and Central Papua. Based on records from the Central Statistics Agency (BPS) of East Nusa Tenggara Province, the pig population in Manggarai Regency was recorded at 56,779 in 2020, 43,427 in 2021, 44,847 in 2022, 61,276 in 2023, and 63,190 in 2024. Pigs also have a strong symbolic function in various cultural traditions. To support the sustainability and safety of livestock meat consumption, especially pork, the existence of slaughterhouses that meet health and slaughtering standards is a very important requirement.

Slaughterhouses (RPH) are public service facilities that play a vital role in providing safe, healthy, intact, and halal meat. As a center for livestock slaughtering activities, RPH ensures that all processes are carried out in accordance with veterinary public health standards, animal welfare principles, and Islamic sharia provisions. Within the facility, ante-mortem (checking the health of livestock before slaughter) and post-mortem (examination of carcasses and offal) inspections are carried out to prevent the transmission of zoonotic diseases to humans. The main product of pig slaughtering at slaughterhouses is meat. Meat is a highly nutritious food source that can meet human nutritional needs. Therefore, it is important to ensure the availability of meat that is safe, healthy, and of high quality so that it can be something that is very important for every consumer in the market. Meat quality can be assessed based on physical and chemical aspects. Physical quality assessment of meat includes parameters such as pH and moisture content (Sangkek et al., 2021)

The quality and quantity of meat are greatly influenced by the treatment pigs receive prior to slaughter. Stress in these animals can reduce the quality of the meat produced. One cause of this is the process of transporting them from the farm to the slaughterhouse. During the journey, pigs can face various stresses, such as unfavorable microenvironmental conditions during transport, including the use of unsuitable vehicles, high ambient temperatures, lack of drinking water, and cramped or uncomfortable living quarters. In addition to causing stress, these conditions can also lead to fatigue, which ultimately has a negative impact on meat quality (Sosiawan et al., 2021). Carcass is the part of livestock that does not contain blood, including the head, legs, hair, and all contents of the abdominal cavity, except for the liver and heart. The carcass inspection process in slaughtered livestock, especially pigs, is carried out to evaluate carcass quality. This includes measuring carcass weight, carcass length, and carcass percentage (Gerungan et al., 2017) Carcass quality can be assessed using several parameters, including live weight, carcass weight, carcass percentage, carcass length, fat cover, muscle tone, grading results, and muscle percentage. High-quality carcasses generally have a higher proportion of meat than bone and fat. Carcass is a key indicator of broiler productivity because it is the main product produced. Its composition includes bones, muscles, fat, and other tissues that grow as body weight increases. Carcass percentage is directly proportional to body weight and is greatly influenced by feed quality and quantity. Its growth is determined by internal factors, such as genetics, age, and sex, as well as external factors, such as temperature, humidity, and feed availability (Mukhlas et al., 2016) Based on the background description explained above, the researcher considers it important to further examine pig slaughtering at the Mena Slaughterhouse, particularly in relation to the carcasses and physical quality of the meat produced.

2 Research Method

Research Location And Time

This study was conducted over a period of two months in the form of field and laboratory experiments at two locations, namely the Mena Slaughterhouse located in Langke Rembong District, Manggarai, East Nusa Tenggara, and the Agricultural Study Program Laboratory, Faculty of Agriculture (FPP). These locations were chosen because RPH Mena is one of the main slaughterhouses in the region and routinely processes pigs, while the laboratory was used to analyze samples related to carcass quality and the physical quality of pork.

Population And Sample

The population in this study included all pigs slaughtered at the Tuke slaughterhouse during the study period. Samples were taken using purposive sampling techniques, with selection criteria based on age, weight, and health condition of the pigs prior to slaughter. The number of samples 10 pigs, the sample used consisted of 4 males and 6 females. which was considered representative for describing carcass quality and physical meat quality.

Data Collection Metodh

In this study, data was obtained through several methods, one of which was through direct observation in the field, physical measurements of carcasses and meat, and documentation. Direct observations were conducted in the morning, between 05:00 and 08:00 WITA, to observe all stages of the pig slaughtering process, including quarantine, ante-mortem inspection, slaughtering, post-mortem inspection, stamping, and cleaning of the slaughterhouse (RPH). Before measuring the carcass, ensure that all necessary tools are properly prepared. The tools needed include scales to measure the weight of the carcass and a measuring tape to measure the length and width of the carcass. Before slaughter, the pigs will be rested in an adaptation pen and fasted for 12 hours. Physical measurements of carcasses and meat were carried out using laboratory equipment such as pH meters, analytical balances, drying ovens, and thermometers to analyze the physical quality of the meat. The samples analyzed included back muscle (*Longissimus dorsi*), thigh muscle

(Semimembranosus or Biceps femoris), and meat muscle (M. Rectus abdominis or M. Trapezius), with each sample weighing 50-100 grams. In addition, documentation was used to collect secondary data in the form of slaughterhouse activity reports and slaughtering processes.

Reserach Variabel

Carcass Quality

The samples were then analyzed by measuring several parameters, including carcass weight, carcass length, and carcass percentage.

Slaughter Weight

Slaughter weight is measured after livestock have fasted for approximately 12 hours, but are still given access to drinking water to prevent dehydration. The weighing process uses digital scales with the appropriate capacity, so that the results obtained are accurate.

Carcass Weight

Carcass weight measurement is carried out immediately after the cutting and cleaning process is complete. This weight includes all parts of the carcass, consisting of meat, bones and fat, but does not include the head, feet, offal, or skin, if the skin is not counted as part of the carcass. Weight measurement is carried out before the carcass undergoes the cooling process, so that the results obtained reflect the actual condition after cutting.

Carcass Percentage

The carcass percentage is obtained by comparing the carcass weight to the slaughter weight, then multiplying the result by 100%.

$$\% \text{ Carcass} = (\text{Carcass weight}) / (\text{Slaughter weight}) \times 100\%$$

Carcass Leght

The measurement process is carried out using a measuring tape, starting from the base of the atlas bone (base of the skull) to the tip of the ischium bone (base of the tailbone).

Fat Thickness

Back fat thickness is measured at three points: above the first rib, above the last rib, and above the last hip bone (lumbar vertebra).

pH Test

A 10-gram sample of meat was ground, then mixed with 10 ml of distilled water until homogeneous. The mixture was measured using a pH meter, with the electrode cleaned using distilled water and dried with tissue before measurement. Each sample was measured three times, then the results were averaged to obtain the pH value.

Moisture Content Test

moisture content is calculated using a specific formula to determine the percentage. Each sample is tested twice to ensure the accuracy of the moisture content measurement. Moisture content is calculated using the formula:

Moisture Content (%): $(W2-W3)/(W2-W1) \times 100$ (%)

Data Analysis Techniques

The collected data were analyzed using simple linear regression with the equation $Y = a + bX$. In this equation, X represents the cut weight, while Y includes the carcass weight, carcass percentage, and backfat thickness (Sangkek et al., 2021).

3 Result And Discussion

Table 1. Average slaughter weight, carcass weight, carcass percentage, carcass length, and fat thickness based on age and sex differences.

Gender	Age (month)	Slaughter Weight (kg)	Carcass Weight (kg)	Carcass Percentage (%)	Carcass Leght (cm)	Fat Thickness (cm)
Male	11	95	75	79%	96	6
		136	114	84%	106	5
	14	116	96	90%	70	6
	17	107	100	86%	66	8
Total		**454**	**385**	**339%**	**338**	**25**
Average		**113,50±17,29**	**96,25±16,13**	**85±5**	**84,50±19,55**	**6±1,26**
Female	9	73	50	90%	104	7
	10	89	70	83%	93	7
		84	64	81%	97	7
		122	108	89%	116	5
	11	130	82	89%	116	5
	13	100	116	82%	105	6
Total		**598**	**490**	**514%**	**631**	**37**

Average	**99,66±3,38**	**81,67±25,78**	**80±8**	**105,17±9,50**	**6,17±0,98**

Slaughter Weight

The results showed that the average weight of male pigs at slaughter was 113.50 kg, which exceeded the ideal slaughter weight standard. The ideal slaughter weight for local pigs (Bali/Timor) ranges from 60 to 80 kg, which is generally achieved at 6 to 7 months of age (Sangkek et al., 2021) However, in this study, the weight of the pigs obtained exceeded the ideal range because slaughtering was carried out at an older age. This finding is in line with the study by (Aritonang et al, 2011) which reported that the carcass weight of Duroc male pigs tends to increase with age. At the age range of 331–360 days, the highest carcass weight was recorded, with an average of 112.18 kg. The increase in carcass weight at this stage is related to increased metabolic activity and organ development as the livestock ages. This condition opens up opportunities to improve production efficiency by adjusting the slaughter time so that the livestock weight meets the standard. Slaughtering at the ideal weight has the potential to produce carcasses with better quality, optimal meat proportions, and higher selling value.

The results of the study show that the average slaughter weight of female livestock is 99.56 kg, while the average slaughter weight of male livestock is 113.50 kg. Thus, the slaughter weight of female livestock is slightly lower than that of male livestock. This difference is in line with what has been explained by (Sangkek et al., 2021) that sex steroid hormones, especially androgens, play an important role in regulating growth and influencing differences in body composition between male and female livestock. At the same age, male livestock usually have a larger body weight than females due to the influence of these hormones. Additionally, according to (Bee, 2004), steroid hormones work by increasing protein synthesis in muscles, thereby accelerating muscle growth in pigs. These hormones also reduce protein breakdown, resulting in an increase in lean body mass. Furthermore, steroid hormones can stimulate appetite, causing pigs to consume more feed.

Carcass Weight And Percentage

The results of the study show that the average weight and percentage of carcasses of each animal slaughtered at the Tuke Slaughterhouse is 96.26 kg for male animals and 81.67 kg for female animals (Table 1). The carcass weight of both male and female pigs generally increases with age. However, at 9-17 months of age, which is the finishing or adult phase, carcass weight may decrease, possibly due to a decline in the livestock's endurance and productivity. For example, at the Tuke Slaughterhouse, the carcass weight of male pigs at 14 months of age was slightly higher than at 17 months of age, with the highest average carcass weight reaching 96.25 kg. A similar phenomenon occurs in female pigs, where carcass weight at 11 months of age is higher than at 13 months of age, with the highest average carcass weight of 81.67 kg, reflecting that early age increases weight, but at a more advanced age, decreased productivity can cause weight to decline. This is in line with the opinion (Goniwala et al., 2016) that carcass weight tends to increase with the age of livestock during a certain period. This increase occurs due to the growth and development of the livestock's organs.

Carcass percentage is the ratio of carcass weight to slaughter weight and is an indicator of carcass production efficiency. The carcass percentage in male pigs has an average value of 85 ± 5%, while in females it is 80 ± 8%. This value shows that male pigs are more efficient at producing carcasses than females. This efficiency may be due to the lower proportion of fat and internal organs in males compared to females, which allows more parts of the body to be included in the carcass. According to Sinaga 2012 in Andika et al, (2015), pig carcasses generally reach 60–75% of their live weight. This percentage is relatively high and greater than the carcass percentage of other livestock, such as sheep and cattle. In pigs, stress is one of the factors that can affect carcass percentage. One cause of stress is an environmental temperature that exceeds the thermoneutral zone, which is above 27°C, especially in pigs and sows that are about to be slaughtered. This condition can cause a significant decline in growth performance and reproductive efficiency. These losses can occur even without changes in feed intake, as heat stress causes direct metabolic disturbances, including changes in nutrient distribution and a decrease in lean tissue formation.

Carcass Length

The average carcass length of female and male livestock is 105.17 cm and 84.50 cm, respectively, as shown in Table 1. The data shows that female pigs have a greater average carcass length than male pigs, namely 105.17 cm, compared to male pigs, which have an average of 84.50 cm. The standard deviation (SD) value for female pigs is smaller, namely 9.50 cm, compared to male pigs at 19.55 cm, which shows that the variation in carcass length in female pigs is smaller. This difference is likely due to female pigs generally being younger, ranging from 9 to 13 months old, while male pigs are older, ranging from 11 to 17 months old, with only 4 males in the sample, resulting in greater variation affecting the SD value for male pigs. As explained by (Wibawa et al., 2019) carcass size is one of the important parameters in evaluating the quality of pig carcasses. Carcass size has a strong relationship with slaughter weight; pigs with higher slaughter weights usually have longer carcasses, and vice versa. The findings of (Sangkek et al., 2021) show that, in general, female pig carcasses are larger than male pigs. Research on slaughter age also indicates that female pigs are usually slaughtered at a younger age, around 9 to 17 months, while male pigs tend to be slaughtered at an older age, namely under 11-14 months. According to Reiland (2020), the growth and development of domestic pigs (native Swedish and Yorkshire breeds) were reported, and weight curves for male pigs from birth to adulthood were included. Other parameters are tooth development and the growth of certain bones. It is concluded that daily weight gain increases rapidly until around 5 months of age. Sexual maturity is reached by male and female pigs at around 5-6 months of age. At this point, there is a turning point in the weight curve. The period from 5-6 months to around 18 months of age. Conclusion Skeletal growth in pigs occurs rapidly until around 5 months of age, with a significant increase in daily weight gain. After reaching sexual maturity at 5–6 months of age, growth enters an adolescent phase that lasts until around 18 months. During this phase, growth still occurs, but at a slower rate compared to the previous phase.

Fat Thickness

Pigs that are raised for longer periods tend to show a significant increase in backfat thickness. Equally important, physical activity levels and housing systems (intensive and semi-intensive) can affect fat distribution; pigs that are confined with limited space are more prone to subcutaneous fat accumulation. Thus, the thickness of backfat in pigs is influenced by a complex interaction between genetic, physiological, nutritional, and management factors (Kim et al. 2017) The average backfat thickness in male and female pigs is 6 cm and 6.17 cm, respectively, as shown in Table 1. Based on the data in the table, there is a difference in backfat thickness between male and female pigs, both in terms of average values and data distribution. In male pigs, the average backfat thickness was recorded at 6 cm with a standard deviation (SD) of 1.26 cm. This shows that there is quite a noticeable variation between individuals, with the lowest backfat thickness being 5 cm and the maximum being 8 cm. Meanwhile, female pigs had an average backfat thickness of 6.17 cm, slightly higher than males. The standard deviation in the female group was smaller, at 0.98 cm, indicating that backfat thickness in female pigs tended to be more uniform and stable. These findings are in line with the statements by (Mukhlas et al., 2016.) that thin backfat can increase meat percentage, while excessively thick fat has the potential to reduce meat yield.

Table 2. The relationship between factors affecting slaughter weight and carcass weight, carcass percentage, carcass length, and backfat thickness.

Variable	TH	Equation	coefficient	Std. Error	Pro
Carcass Weight	+	BK=-26,382+1,082 BP	1,082 -26,382	0,059	0,003*
			98% 97%		
Carcass Percentage	+	%K=52,994+0,277 BP	0,277 52,994	0,066	0,003*
			69% 65%		
Carcass Leght	+	PK=74,674+0,357 BP	0,357	0,035	0,087ts

			74,674		
			11% 0%		
Fat Thickness	-	TLP=8,672+-0,02 BP	-0,02 8,672	0,015	0,001*
			22% 12%		

*Desription: * = Significant, ts=not significant, TH=no hope*

Relationship Between Slaughter Weight And Carcass Weight

Based on the regression analysis results presented in the table, there is a very strong and significant relationship between Slaughter Weight (SW) and Carcass Weight (CW). The regression equation obtained is CW = -26.382 + 1.082 SW, which indicates that every 1 kilogram increase in slaughter weight will increase carcass weight by 1.082 kilograms. This positive regression coefficient indicates a positive linear relationship between the two variables. The R-squared value of 98% indicates that 98% of the variation in carcass weight can be explained by the variation in slaughter weight, while the Adjusted R-squared value of 97% reinforces that this regression model is very good at explaining the relationship between variables. In addition, the probability value ($P<0.05$) of 0.003, which is much smaller than the significance threshold of 0.05, indicates that this relationship is statistically significant. According to (Rizki et al., 2025), the positive regression coefficient value between cut weight and carcass weight also means that an increase in both variables will be followed by an increase in muscle area. One of the most important factors affecting muscle area is the type and quality of feed given. In addition, muscle size is also influenced by carcass weight and meat yield.

Relationship Between Carcass Weight and Carcass Percentage

The regression analysis results show that there is a positive relationship between Carcass Weight (CW) and Carcass Percentage (%CP). The regression equation obtained is %CP = 52.994 + 0.277 CW. This means that every 1 kilogram increase in carcass weight will increase the carcass percentage by 0.277%. This relationship is positively linear, which means that the greater the carcass weight, the higher the carcass percentage tends to be. The R-squared value of 69% indicates that approximately 69% of the variation in carcass percentage can be explained by the variation in slaughter weight. Meanwhile, the Adjusted R-squared value of 65% indicates that the model is quite good at explaining this relationship, although it is not as strong as the direct relationship between BP and carcass weight. The coefficient value of 0.277 has a standard error of 0.066, and a $P<0.05$ value of 7.128, which indicates that this relationship is also statistically significant because $P<0.05$ is still within an acceptable range when interpreted from the t value, not p directly—the probability of P is very small considering the large t value. Thus, it can be concluded that Slaughter Weight has a positive effect on Carcass Percentage, although its effect is not as strong as its effect on Carcass Weight directly.

The relationship between carcass weight and carcass percentage can occur because both describe the composition of livestock, especially how much of the body can be used as meat after slaughter. Carcass percentage itself is calculated from the ratio between carcass weight and slaughter weight, so any change in slaughter weight will affect this percentage. When slaughter weight increases, it is usually because the livestock has experienced muscle growth and fat accumulation, especially during the fattening period. This increase will add to the parts of the body that are included in the carcass, such as muscle and subcutaneous fat, so that the carcass weight also increases. If the weight gain occurs more in the parts of the body that are components of the carcass (not the parts that are discarded, such as the entrails or head), then the carcass percentage will also increase.

Relationship Between Carcass Weight and Carcass Length

Based on the regression analysis results, the relationship between Carcass Weight (CW) and Carcass Length (CL) is formulated in the regression equation CL = 74.674 + 0.357 CW. This indicates that every 1 kilogram increase in carcass weight will contribute to a 0.357 cm increase in carcass length. This relationship is positively linear, indicating that the greater the slaughter weight, the greater the carcass length tends to be. However, the coefficient of determination (R-squared) value only reaches 11%, while the Adjusted R-squared is even 0%, which means that only a small portion of the variation in carcass length can be explained by slaughter weight. This shows that slaughter weight is not a strong predictor of carcass length, suggesting that other factors may play a more significant role in influencing carcass length. In addition, the P-value of 0.087 indicates that this relationship is not statistically significant at the 5% significance level (because it is greater than 0.05). Thus, it can be concluded that although mathematically there is a positive relationship between slaughter weight and carcass length, this relationship is relatively weak and not statistically significant. (Sari., 2021.) stated that an increase in body weight is generally followed by an increase in the size of other body parts. Meanwhile, grouping based on age shows a highly significant relationship between slaughter weight and carcass length. One of the main factors is genetics or livestock breed, as each breed has different body growth characteristics. Certain breeds, such as Landrace pigs, are known to have longer bodies than other breeds of the same weight. In addition, the age of the livestock also plays an important role because body length growth tends to occur in the early stages of growth, while in the later stages, weight gain comes more from fat. Another influential factor is linear body size, such as body length, shoulder height, and chest circumference, which directly reflects body dimensions and is usually more strongly correlated with carcass length than total weight.

Relationship Between Carcass Weight and Backfat Thickness

The regression analysis results show that the relationship between Carcass Weight (CW) and Backfat Thickness (BFT) is expressed through the regression equation BFT = 8.672 + (-0.02) CW. This means that every 1 kilogram increase in carcass weight causes a 0.02 mm decrease in backfat thickness. This negative regression coefficient indicates a negative linear relationship between the two variables. However, the R-squared value is only 22%, and the Adjusted R-squared is 12%, indicating that only a small portion of the variation in backfat thickness can be explained by carcass weight. Nevertheless, the P-value of 0.001 indicates that this relationship is statistically significant. This is interesting because even though the contribution of carcass weight to the variation in fat thickness is relatively small, the relationship is statistically significant. In other words, there is a significant negative relationship between carcass weight and backfat thickness, but its predictive power is weak, as seen from the low R^2 value. This indicates that there are other more dominant factors that affect fat thickness, such as genetic factors, feed type, or livestock activity levels. This contrasts with the results of the study by (Aritonang, 2011), which described a very strong relationship between age and carcass weight, carcass percentage, and backfat thickness, with correlation values of 0.989, 0.891, and 0.957, respectively. The process of fat accumulation occurs at various stages of life when energy intake exceeds the basic requirements for maintenance and growth. As age and body weight increase, fat tends to accumulate more in the back, causing a significant increase in back fat thickness. According to (Bee, 2004) the main parts of the body that undergo development include bones, muscles, and fatty tissue. In the early stages, the fastest growth rate generally occurs in the skeletal bones, followed by muscle development, while fat accumulation occurs in the final stage of growth.

Table 3. The Effect of Age and Gender on Average pH and Water Content

Gender	Age (month)	pH	Moisture Content (%)
Male	11	5	48,55
		6	47,37
	14	6	46,64
	17	6	46,67
Total		**23**	**189,03**
Average		**5,75±0,5**	**47,26±0,95**
Female	9	5	46,70
	10	6	48,28
		5	47,38
		5	45,86
	11	5	46,69
	13	5	48,35
Total		**31**	**283,26**
Average		**5,17±0,41**	**47,21±0,98**

pH

Based on the results of observations, male pork has a pH value ranging from 5.00 to 6.00, with an average of 5.75 ± 0.50. This value indicates that the pH of male pork tends to be close to neutral, with a fairly high level of variation between individuals. In contrast, female pork has an average pH of 5.17 ± 0.41, which indicates that female pork tends to be more acidic and has a more stable pH variation than male pork. This difference indicates that gender has an effect on the pH value of meat. Factors that may cause lower pH values in female pigs are higher muscle glycogen levels. After slaughter, this glycogen is converted into lactic acid, which ultimately lowers muscle pH. Therefore, female meat shows lower pH due to greater lactic acid accumulation, as a result of more active postmortem metabolism. Overall, it can be concluded that sex is one of the physiological factors that affect meat pH values. Female pork tends to have a lower and more consistent pH, while male pork shows a tendency for higher and more variable pH. Understanding these differences is important in controlling meat quality and determining the appropriate post-harvest handling to maintain the quality of pork products. In this study, pH measurements were taken one hour after slaughter and continued at several-hour intervals thereafter. These findings are consistent with the opinion of (Sangkek et al., 2021) which states that in some livestock, the pH decreases very rapidly in the first hour after slaughter, then stabilizes at a high range of around 6.5–6.8. Conversely, there are also livestock that experience a sharp decrease in pH to 5.4–5.5 in the first hour, then remain in the range of 5.3–5.6.

Moisture Content Test

The moisture content in meat is an important indicator in determining freshness, texture, and shelf life. From the measurement results, the moisture content of male pork varied between 46% and 48% and an average of 47,26 ± 0,95. The relatively high standard deviation indicates that there are significant differences in water content between individual males. This condition may be caused by variations in muscle structure, fat content, and different metabolic activities between male livestock. Meanwhile, female pork showed more stable moisture content, with values ranging from 45% to 48%, and an average of 47,21 ± 0,98. Although the average moisture content in females was slightly higher than in males, the lower standard deviation indicates that the moisture content in this group was more uniform. This may reflect the more homogeneous characteristics of muscle tissue in females, as well as the possible influence of hormones on water retention in muscle tissue. Pork generally contains a significant amount of water, ranging from 68–75%. In addition, this meat is also rich in nitrogen compounds with varying levels of complexity, as well as minerals and various other important nutrients (Sosiawan et al., 2021) The water content in pork that has undergone the resting process tends to be maintained. This is in line with the results of research by (Hernando et al., 2015), which shows that resting, cutting, and proper carcass handling can help maintain the water content of meat within the normal range.

Table 4. The relationship between the factors causing cutting weight and each of the factors affecting pH and moisture content

Variable	TH	Equation	Coefficient	Std Error	Pro
pH		pH=5,777+(-0,003)	-0,003 5,777 14% 2%	0,935	0,000*

Moisture content	KA=0,040+0,000 BP	0,000 0,040 41% 17%	0,028	0,191ts

*Desription: * = Significant, ts=not significant, TH=no hope*

Relationship Between Cut Weight and pH

The regression equation obtained in this study for the relationship between cut weight and pork pH is pH = 5.777 + (-0.003 × CW). The regression coefficient of -0.003 indicates that every 1 kilogram increase in cut weight will decrease the pH value of the meat by 0.003 units. The p-value (Pro) of 0.001 indicates that this relationship is statistically significant (because it is less than 0.05). This means that there is a real effect of cut weight on the pH of pork. The initial pH value of 5.777 indicates the normal pH range for meat, and this small decrease is still within the safe range for meat quality. The high average pH in pork that has not been given time to rest is generally triggered by stress and fatigue experienced by livestock during the shipping or transportation process (Sosiawan et al., 2021) This condition causes a reduction in glycogen reserves in the muscles, which then affects the metabolic process after slaughter and causes the pH of the meat to rise above normal limits (Gerungan et al., 2017).(Rambu et al., 2016) also stated that in pigs experiencing stress and fatigue, the reduction in muscle glycogen stores makes lactic acid formation suboptimal for lowering the pH to the normal range. As a result, the meat tends to be darker in color, harder in texture, and dry in taste, a condition known as DFD (Dark, Firm, Dry).

Relationship Between Cutting Weight and Moisture Content

The regression equation obtained in this study for the relationship between cut weight and pork moisture content is KA = 0.040 + 0.001 × BP. The regression coefficient is 0.001, which means that mathematically, cut weight has no effect on pork moisture content. This is supported by a p-value (Pro) of 0.191, which is much greater than 0.05, so the relationship is not statistically significant. Thus, it can be concluded that in this study, the moisture content of pork is not affected by cut weight. The relative humidity of the air surrounding meat can affect the moisture content on the surface of the meat. If the moisture content of the meat is low while the humidity of the air is high, the meat will absorb water vapor from the air, making its surface more moist and increasing its moisture content. In addition, if the temperature of the meat is lower than the ambient temperature, water vapor in the air can condense on the surface of the meat. This condensation creates conditions that are more conducive to bacterial growth. In general, the moisture content in meat ranges from 68% to 80% (Sitompul et al., 2015) According to (Agustina et al., 2017) the water content in meat plays an important role in determining the level of damage during storage, especially due to microbial activity. High humidity and water content generally support the growth of microorganisms. Both bacteria and fungi generally require humidity above 85% to reproduce well.

3 Conclusion

In terms of carcass percentage, male pigs showed higher results with an average of 85 ± 5%, while females only 80 ± 8%. This shows that males are more efficient in producing carcass meat, which is related to their body composition—where males have more muscle tissue and less fat and non-carcass organs than females. Interestingly, the average carcass length of females (105.17 cm) is actually greater than that of males (84.50 cm), but statistically, slaughter weight has no significant relationship with carcass length. This indicates that factors such as age, genetics, and bone growth are more decisive in determining carcass length than slaughter weight itself.

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