Assessment of maize-peanut intercropping and its potential waste usage for cattle feed in dry land

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Abstract. Intercropping planting system is one of methods to enhance the land productivity. The maize and peanut crops waste has high beneficial to farmers for cattle feed. The study of maize and peanut crops intercropping has been conducted in May-August 2020. Study was arranged by using Randomized Complete Block Design with 5 treatments and replicated for 8 times. Treatments examined were P1: Srikandi Kuning maize variety cultivated by monoculture planting system; P2: Nasa 29 maize variety cultivated by monoculture; P3: Peanut crop cultivated by monoculture; P4: Srikandi Kuning and peanut crop cultivated by intercropping; P5: Nasa 29 and peanut crop cultivated by intercropping. Variables observed were growth and yield components and analysed by analysis of variance and advanced tested by LSD at 5%. To know the land productivity, the calculation of Land Equivalent Ratio (LER) was done meanwhile the Index of Plant Competition (IPC) also was calculated to know the plant competition level. Results showed that the peanut crop productivity by intercropping was decrease about 37.50%-38.79% compared to monoculture. Meanwhile, the productivity of Srikandi Kuning maize variety was also decrease due to the reducing of plant population. The intercropping of Srikandi Kuning and Nasa 29 variety with peanut crop enhance the LER became 1.02 and 1.03. The utilization of Nasa 29 maize variety by intercropping with peanut crop was better than Srikandi Kuning with the lower IPC namely 0.8932 meanwhile the IPC of Srikandi Kuning was 0.9270. The potential waste for cattle feed at maize crop plantation by monoculture was higher than intercropping with peanut crop and peanut crops by monoculture namely P3: 572 head/ha; P1: 500 head/ha; P5: 484 head/ha; P4: 454 head/day; P3: 288 head/day.

1. Introduction
Gerokgak District, Buleleng Regency is dry land area with main commodity cultivated were maize and peanut crops also has been declared as the centre for cattle development area. The implementation of maize dan peanut farming system in this area has not optimum yet. The maize and peanut crops productivity in Buleleng Regency was still low namely 44.10 quintal per hectare and 15.47 quintal per hectare [1]. The implementation of un-optimum cultivation technique such as the utilization of local variety, fertilization, crops management and cultivation by monoculture planting system were predicted as causative factors therefore the innovation of cultivation technique was necessary to increase the land productivity.

Intercropping planting system has many beneficials namely the increasing of efficiency such as labour, land utilization and sunlight absorption, the plant population can be managed as desired, can obtain the crops harvest more than one commodity, the combination of some crops can create the
biological stabilization therefore it can assist to suppress the plant pest and disease and can maintain the sustainability of land resource particularly the soil fertilization [2]. Intercropping planting system can be applied to utilize the environmental as well as possible (soil nutrient, water and sunlight) to reach optimum productivity [3]. Intercropping planting system can be implemented between two types of annual crops which are mutually beneficial such as peanut crop with maize crop. Maize crop required the high nitrogen nutrient meanwhile the peanut crop capable to fixation the nitrogen from free air therefore the maize crop’s nitrogen need can be fulfilled by the nitrogen excess from peanut crop. The growth of peanut crop will not be disturbed due to it get protection from maize crops.

Intercropping planting system is one of methods to enhance the land productivity. The increasing of land productivity is characterized by the increasing of Land Equivalent Ratio (LER). LER is total yield ratio between crops cultivated by intercropping planting system to crops cultivated by monoculture planting system in the equal crops management level [4]. LER is one of methods to calculate the land productivity which cultivated by two or more crops types by intercropping planting system. Intercropping planting system will be more beneficial if LER value is more than 1.

Apart from economical yield in form of main product harvested, the maize and peanut crops waste also has high beneficial for farmers in this area. Maize and peanut crops waste was utilized for cattle feed by farmers because farmers only rely on feed availability from nature therefore farmers always face feed deficiency during dry season. Based on these conditions, the study of intercropping planting system between maize and peanut crops was necessary to be conducted.

2. Materials and Methods

Study was done at Subak Musi, Musi Village, Gerokgak District, Buleleng Regency, Bali Province in May to August 2020. Study was built by using Randomized Complete Block Design and replicated for 8 times. Treatments examined consisted of monoculture and intercropping planting system of maize and peanut crops with using two maize varieties namely Srikandi Kuning and Nasa 29. There were 5 group treatments namely P1: Srikandi Kuning maize variety cultivated by monoculture planting system; P2: Nasa 29 maize variety cultivated by monoculture planting system; P3: Peanut crop cultivated by monoculture planting system; P4: Srikandi Kuning maize variety and peanut crop cultivated by intercropping planting system; P5: Nasa 29 maize variety and peanut crop cultivated by intercropping planting system. Peanut crop variety used was local variety. Each treatment was cultivated in 500 m² land area therefore total of area land used in this study was 2 Ha.

Maize crop cultivated by monoculture planting system with using spacing plant was 100 cm x 50 cm x 40 cm (66.600 crops/Ha) and cultivated by intercropping planting system with using spacing plant was 200 cm x 40 cm x 50 cm (26.240 crops/Ha). The spacing plant used for peanut crops was 40 cm x 20 cm (250.000 crops/Ha by monoculture planting system and 208.300 crops/Ha by intercropping planting system).

Variables observed consisted of the growth performance and yield. The observation of growth performance was conducted to plant samples and the yield was measured from samples plots. Based on the data of yield from each crop types in monoculture and intercropping planting system both maize and peanut crops can be measured the Land Equivalent Ratio (LER) and the Index of Plant Competition (IPC). The equation of LER namely:

\[ LER = \sum_{i=1,2,3}^{n} \frac{h_i}{H_i} \]

Note:
- \(h_i\) = yield of crop types by intercropping planting system
- \(H_i\) = yield of crop types by monoculture planting system
- \(i\) = 1, 2, 3, 4, ....
- \(n\) = crop types in intercropping planting system

Data of growth performance and yield were analysed by using analysis of variance (ANOVA) and advanced test by LSD at 5% significance level if treatments applied showed the significantly
different (P value < 0.005). The *Index of Plant Competition* (IPC) was calculated by using the equation as shown below:

\[
IPC = \frac{(N'A - NA)(N'B - NB)}{NA \times NB}
\]

Note:

NA and NB = The comparison of crop A’s and crop B’s population intercropped
N’A and N’B = Number of crop A and crop B required to reach equal yield with one unit of crop A and crop B in intercropping planting system

To calculate the carrying capacity of maize and peanut crops waste both by monoculture and intercropping planting system for cattle feed, it was done by dividing the weight of stover produced with forage consumption per cattle/day as shown below:

\[
X = \frac{A}{B}
\]

Note:

X = The carrying capacity of waste for cattle feed potential (head)
A = The stover weight per Ha (kg)
B = The cattle feed requirement/day (kg/head)

3. Results and Discussion

3.1 The Growth Performance and Yield of Peanut Crops

The monoculture and intercropping planting system significantly affected to the growth performance of peanut crops. The peanut crops’s plant height cultivated by intercropping planting system with maize crops was higher than cultivated by monoculture planting system, however peanut crops’s branches number and leaves number significantly lower (Table 1). Number of leaves is one of the growth variables describe the capability of crops to conduct the photosynthesis [5]. The higher number of leaves, the leaf area index will be higher therefore it will initiate the photosynthesis rate will be higher. The increasing of plant height occurred due to elongation of stem segments. The stem segments elongation is one of efforts to prevent the sunlight deficiency therefore it provided the more opportunities for crops to obtain more sunlight in shaded conditions [6]. The shade cause sunlight intensity absorbed by crops was reduce therefore etiolation was occurred [7]. Etiolation was caused by the increasing of auxin hormone which promote and regulate the stem elongation, inhibit growth of lateral buds and maintains apical dominance [8]. It accelerated the crops to grow to up in order to obtain the more sunlight to conduct the optimum photosynthesis [9].

**Table 1.** The growth performance of peanut crops cultivated by monoculture and intercropping planting system with maize crops at Musi Village, Gerokgak District, Buleleng Regency in 2020.

| Treatments | Plant height (cm) | Number of leaves per plant | Number of branches per plant | Stover fresh weight per plant (gram) |
|------------|-------------------|-----------------------------|-------------------------------|--------------------------------------|
| P3         | 46.50 c           | 65.20 a                     | 4.80 a                        | 123.30 a                             |
| P4         | 55.90 b           | 57.30 b                     | 3.40 b                        | 125.90 a                             |
| P5         | 59.20 a           | 56.60 b                     | 3.50 b                        | 125.00 a                             |

Noted: Numbers followed by the same letters in same column were not significantly different at LSD 5%.

The peanut crops cultivated by the monoculture and intercropping planting system with maize crops produce the pod’s number equally each other, meanwhile the filled pod’s number, empty pod’s number, filled pod’s weight and empty pod’s weight showed the significance difference (Table 2). Effect of shade in intercropping planting system reduce the sunlight intensity absorbed by peanut crops which impacted on filling pods. The reducing of sunlight absorption up to 50% cause the reducing of filled pods number was 17 pods approximately [10]. This result was suitable to the
statement [11] that plant spacing in intercropping planting system related to plant competition. One of factors influenced was sunlight. Sunlight was utilized by crops for their photosynthesis. The closer plant spacing, the sunlight absorbed by crops will be more reduce therefore the photosynthesis will be disturbed and cannot be conducted optimally. Furthermore, it will initiate the reducing of photosynthate supplies which caused the crops productivity reducing such as the number of filled pods and seed weight per plant will be reduce. The higher shade crops intercropped with peanut crop reduce the photosynthesis rate of peanut crops because the leaf area be lower and not all leaves are equally efficient in absorbing sunlight [12].

Table 2. The yield component of peanut crops cultivated by monoculture and intercropping planting system with maize crops at Musi Village, Gerokgak District, Buleleng Regency in 2020.

| Treatments | Number of filled pods per plant | Number of empty pods per plant | Fresh filled pods weight per plant (gram) | Fresh empty pods weight per plant (gram) |
|------------|---------------------------------|--------------------------------|------------------------------------------|------------------------------------------|
| P3         | 15.84 a                         | 5.00 b                         | 24.65 a                                  | 3.81 b                                   |
| P4         | 11.90 b                         | 8.80 a                         | 19.04 b                                  | 9.00 a                                   |
| P5         | 12.00 b                         | 9.30 a                         | 19.20 b                                  | 8.50 a                                   |

Noted: Numbers followed by the same letters in same column were not significantly different at LSD 5%.

The reducing of peanut crops productivity in intercropping planting system were caused not only by the plant population reducing up to 16.67 % compared to plant population in monoculture planting system, but also caused by the reducing of yield component crops. The sunlight intensity absorbed by the shaded plant was lower therefore the photosynthesis was carried out un-optimally which affected to number of photosynthate production [13]. If the number of photosynthate required was not fulfilled optimally, it will impact on productivity.

The intercropping planting system also reduce the harvest index of peanut crops. It showed that the photosynthate translocated to the seed was lower compared to monoculture planting system and more focus to translocate to vegetative organ. It caused by the reducing of sunlight intensity absorbed by peanut crops. It resulted in the reducing of photosynthate numbers supply and causing in crops productivity reducing which characterized by the reducing of yield components crop such as filled pods weight and seed weight produced. This result in line with study by [14] which obtained the reducing of peanut crop’s yield was 38.88% in intercropping planting system with maize crops compared to the peanut crops cultivated by monoculture. Meanwhile, study by [2] showed the reducing of peanut crop’s yield was 21.07% when it cultivated by intercropping planting with maize crops.

The peanut crop’s harvest index cultivated by intercropping planting system was clearly lower than cultivated by monoculture planting system. The harvest index described the proportion of photosynthate translocated into the food storage part of the plant [15]. The photosynthate of maize crops produced was translocated into the store food in forms of seed.

Table 3. The yield components, yield and harvest index of peanut crops cultivated by monoculture and intercropping planting system with maize crops at Musi Village, Gerokgak District, Buleleng Regency in 2020.

| Treatments | Dry pods weight per plant (gram) | Seed weight per plant (gram) | Seed weight per Ha (ton) | Harvest index (%) |
|------------|---------------------------------|------------------------------|--------------------------|-------------------|
| P3         | 15.04 a                         | 11.58 a                      | 2.33 a                   | 24.31a            |
| P4         | 11.61 b                         | 8.33 a                       | 1.42 b                   | 18.44 b           |
| P5         | 11.71 b                         | 8.53 a                       | 1.45 b                   | 18.53 b           |

Noted: Numbers followed by the same letters in same column were not significantly different at LSD 5%.
3.2 The Growth Performance and Yield of Maize Crops

The growth components per plant (plant height, number of leaves, stem diameter and stover weight) of maize crops cultivated by monoculture planting system and intercropping planting system showed not significance difference. The significancy difference due to variety utilization was shown on plant height and stover weight per plant variables (Table 4). Srikandi Kuning variety showed their plant height was greatly higher meanwhile the Nasa 29 variety produce the stover weight per plant was clearly higher.

Table 4. The growth performance of maize crops cultivated by monoculture and intercropping planting system with peanut crops at Musi Village, Gerokgak District, Buleleng Regency in 2020.

| Treatments | Plant height (cm) | Number of leaves per plant | Stem diameter | Fresh stover weight per plant (gram) | Fresh stover weight per Ha (ton) | Dry stover weight per Ha (ton) |
|------------|------------------|----------------------------|--------------|-------------------------------------|---------------------------------|-------------------------------|
| P1         | 255.00 a         | 13.80 a                    | 4.55 b       | 475.50 c                            | 24.11 b                         | 12.50 b                        |
| P2         | 244.50 b         | 13.75 a                    | 4.60 b       | 510.80 b                            | 26.50 a                         | 14.30 a                        |
| P4         | 251.50 a         | 13.70 a                    | 4.60 b       | 480.30 c                            | 10.30 c                         | 5.10 c                         |
| P5         | 239.90 b         | 13.80 a                    | 4.75 a       | 525.00 a                            | 11.40 c                         | 5.70 c                         |

Noted: Numbers followed by the same letters in same column were not significantly different at BNT 5%.

As same as the growth performance of maize crops, the yield components of maize crops cultivated by monoculture and intercropping planting system showed tend to equal in terms of the same variety used, however the yield components of Nasa 29 variety were significantly higher than Srikandi Kuning variety. It caused by the difference of genetic properties and adaptation ability of both varieties. Srikandi Kuning maize variety is composite maize variety with yield potential was 7.92 ton/ha and yield average were 5.40 ton/ha [16]. The Nasa 29 maize variety is hybrid maize with higher yield potential was 13.70 ton/ha [17].

The dry shelled yield per Ha showed that Nasa 29 variety cultivated by monoculture planting system produce the highest yield namely 7.80 ton/ha and clearly higher than Srikandi Kuning variety cultivated by monoculture planting system (6.96 ton/ha). The seed yield per Ha cultivated by intercropping planting also showed the same pattern namely Nasa 29 variety (3.15 ton/ha) produce the yield was higher compared to Srikandi Kuning variet (2.85 ton/ha). The low of maize crops productivity in intercropping planting system was caused by the reducing of crop’s population. Compared to the plant’s population in monoculture planting system, the population in intercropping planting system examined was only 40%. The growth and productivity of maize crops was highly affected by plant spacing and variety [18].

The harvest index value of maize crops both Srikandi Kuning and Nasa 29 varieties were not affected by planting system applicated. Harvest index value is the ratio of grain yield and biomass yield [19]. A higher harvest index indicates superior dry matter conversion to grain yield. The optimum harvest index value was various from 15% up to 52% [20], therefore it can be said that the maize crops cultivated in this study with various treatments produce the optimum harvest index value.
Table 5. The yield components, yield and harvest index of maize crops cultivated by monoculture and intercropping planting system with peanut crops at Musi Village, Gerokgak District, Buleleng Regency in 2020.

| Treatments | The maize cob with its husk weight per plant (gram) | Number of maize cobs per plant | Peeled maize cob weight per plant (gram) | Dry shelled seed weight per plant (gram) | Dry shelled seed weight per plant per Ha (ton) | Harvest index (%) |
|------------|-----------------------------------------------|-------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------------|------------------|
| P1         | 320.00 b                                      | 1.00 a                        | 270.30 b                               | 130.20 b                               | 6.96 b                                        | 35.77 a          |
| P2         | 345.90 a                                      | 1.00 a                        | 296.50 a                               | 145.90 a                               | 7.80 a                                        | 35.29 a          |
| P4         | 325.50 b                                      | 1.00 a                        | 275.30 b                               | 132.00 b                               | 2.85 d                                        | 35.85 a          |
| P5         | 351.20 a                                      | 1.00 a                        | 299.50 a                               | 149.70 a                               | 3.15 c                                        | 35.59 a          |

Noted: Numbers followed by the same letters in same column were not significantly different at BNT 5%.

3.3 The Land Equivalent Ratio (LER) and Index of Plant Competition (IPC)

The agronomy beneficial of intercropping planting system implementation can be evaluated by calculating the Land Equivalent Ratio (LER) [12]. Intercropping planting system of maize crops with peanut crops capable to enhance the land productivity compared to monoculture planting system. The intercropping planting system of Srikandi Kuning and Nasa 29 maize variety with peanut crops create the LER value were 1.02 and 1.03 respectively. It indicated that the land efficiency was occurred namely 2-3% in intercropping planting system implemented proven by the increasing of LER value compared to monoculture planting system. This LER value obtained was lower than study by [21] which obtained the highest LER value of intercropping planting system between maize crops and soybean crops reached up to 1.57. Land Equivalent Ratio (LER) was total yield ratio between crops cultivated by intercropping planting system to crops cultivated by monoculture planting system in the equal crops management level [4]. LER is one of method to investigate and calculate the land productivity which cultivated by two or more crops types which intercropped and it can be said profitable if the LER value > 1 [22]. The maize crops cultivated by intercropping system and used double row plant spacing greatly affected on the efficiency of land utilization characterized by the LER value reached 1.76 when the maize crops were intercropped with peanut crops [23]. Study in China also showed that intercropping planting system between maize crops and peanut crops created the LER value was 1.14 [24]. Therefore, it can be concluded that intercropping system of maize crops with peanut crops able to utilize the land more efficiently rather than monoculture planting system.

The index of plant competition (IPC) of intercropping planting system between Nasa 29 maize variety crops and peanut crops (P5 was 0.89) were lower than intercropping planting system between Srikandi Kuning maize variety and peanut crops (P4 was 0.93). If the IPC value of intercropping planting system was lower than 1 (< 1), it indicated that the intercropping of plant competition was lower than plant competition in monoculture planting system [25]. If there were two crop types have the small competition and synergic each other, it will create the small IPC value [4]. If the interspecific competition was lower than intraspecific competition, the IPC value will be low. Therefore, it suggested that maize crops and peanut crops can be intercropped due to maize crops has the high stem, growing up fast, and unique anatomical leaves characteristic therefore maize crops still provide or can forward the sunlight to the ground then it can be absorbed by peanut crops.
Table 6. The land equivalent ratio (LER) and index of plant competition (IPC) of intercropping planting system between maize crops and peanut crops.

| Treatments | LER value | IPC value |
|------------|-----------|-----------|
| P1         | 1         |           |
| P2         | 1         |           |
| P3         | 1.02      | 0.93      |
| P4         | 1.03      | 0.89      |

The competition occurred in plants which growing close together is predicted happened into three stages, however if the plant spacing is wide enough, there will be no overlap in absorption area of the roots and there will be no competition for both nutrients and water uptake [14]. The plant competition was also depended on the characteristic of crops population and plant spacing management. The crops population density has wide effect to crops productivity.

3.4 The Waste Potential for Cattle Feed

The waste potential of maize crops and peanut crops which transplanted by monoculture and intercropping planting system with the assumption that the feed requirement for cattle (250 kg body weight) was 10% from their body weight namely 25 kg/head showed that the maize crops which transplanted by monoculture planting system has the highest waste carrying capacity for cattle feed namely 572 head (Nasa 29 maize crop variety) and 500 head (Srikandi Kuning maize crop variety) followed by intercropping planting system of Nasa 29 maize variety and peanut crops (483 head) and Srikandi Kuning maize variety with peanut crops (454 head). The lowest waste carrying capacity for cattle feed was produced by peanut crops cultivated by monoculture planting system (288 head). It caused by the low waste produced by peanut crops.

Table 7. The waste carrying capacity of maize crops and peanut crops cultivated by monoculture and intercropping planting system for cattle feed at Musi Village, Gerokgak District, Buleleng Regency, Bali Province in 2020.

| No | Description | Treatments |
|----|-------------|------------|
|    |             | P1 | P2 | P3 | P4 | P5 |
| 1  | The waste potential per Ha (kg) | 12500 | 14300 | 7210 | 5100 + 6260 = 11360 | 5700+6370 = 12070 |
| 2  | The waste carrying capacity: - 100% as cattle feed (head) | 500 | 572 | 288 | 454 | 483 |
|    | - as 50% forage substitution (head) | 1000 | 1144 | 576 | 908 | 966 |

Note: The assumption of cattle feed forage requirement (250 kg body weight) was 10% from cattle’s body weight namely 25 kg/head/day.

The maize crop’s waste has the weakness as cattle feed because of having the high crude fibre containing. It highly suggested to be well preserved first as preserved feed before feeding to the cattle. Table 8 showed that the maize crop’s waste which been processed as silage, it contained the higher protein nutrient rather than waste unprocessed. In order to optimize the cattle growth, it was required the combination of maize crop’s waste, forage and feed concentrate to be implemented to the cattle. Chemical properties, consumption and feed types play role to influence the cattle growth therefore it was necessary to be combined [26].
Table 8. The chemical properties and waste nutrient of maize crop’s waste.

| Waste types                  | FM | TDN | CP | UIP | CF | ADF | NDF | CFat | Abu | Ca | P |
|------------------------------|----|-----|----|-----|----|-----|-----|------|-----|----|---|
| 1. Maize straw               | 80 | 67  | 9  | 45  | 25 | 29  | 48  | 2.4  | 7   | 0.50| 0.25|
| 2. Maize stover/stalk,       | 80 | 59  | 5  | 30  | 35 | 44  | 70  | 1.3  | 7   | 0.35| 0.19|
| mature                       |    |     |    |     |    |     |     |      |     |     |   |
| 3. Maize silage, immature    | 26 | 65  | 8  | 18  | 26 | 32  | 54  | 2.8  | 6   | 0.40| 0.27|
| fruit                        |    |     |    |     |    |     |     |      |     |     |   |
| 4. Maize silage, mature      | 34 | 72  | 8  | 28  | 21 | 27  | 46  | 3.1  | 5   | 0.28| 0.23|
| well fruit                   |    |     |    |     |    |     |     |      |     |     |   |
| 5. Sweet maize silage        | 24 | 65  | 11 | Tad | 20 | 32  | 57  | 5.0  | 5   | 0.24| 0.26|
| 6. Maize cobs                | 90 | 48  | 3  | 70  | 36 | 39  | 88  | 0.5  | 2   | 0.12| 0.04|

Note: DM= dry matter; TDN= total digestible nutrient; CP= crude protein; UIP= Undegradable insoluble protein; CF= crude fibre; ADF= acid detergent fibre; NDF= neutral detergent fibre; CFat= crude fat; Ca= calcium; P= phosphorus [27].

According to the crude protein (CP) containing, the peanut crop’s straw had the great nutrient for cattle feed rather than the peanut hulls due to its CP containing was low (Table 9) therefore it was required to be fermented in order to increase its protein and reduce its crude fibre. Peanut crop’s waste fermented contain crude protein was 10.34% and its crude fibre can be reduced from 31.99% to 29.90% by fermentation [28]. The protein and energy containing of waste fermented was increase meanwhile the crude fibre containing was reduce [29]. The proximate analysis showed that the peanut hulls fermented by Trichoderma viridie able to increase the crude fibre became 7.35% and the crude protein was decrease became 55.74%. Cattle which given additional feed up to 75% peanut hulls as rice bran substitution produced the weight gaining was 0.39 kg/day-0.40 kg/day and feed converted was 9.06-10.45 approximately [30]. The high crude protein containing can increase the digestibility of feed resulted in the increasing of cattle growth [31]. Powder of fermented waste able to be given as rice bran substitute namely 0.70-1.00 % from cattle body weight [29].

Study of maize crops and peanut crops waste utilization showed that cattle which given 50% maize crop’s waste combined with the peanut crop’s waste produce the cattle body weight gaining was 0.50 kg/head/day with FCR 8.70 [32]. Cattle which given the 100% sweet maize crop’s waste and 1 kg pollard, also injected with growth promotor produce the growth rate was 9.92% higher than control [33]. The implementation of 50% sweet maize’s waste as grasses substitution for cattle fattening which combined with growth promotor application create the daily body weight gaining was 0.56 kg/head/day [34].

Table 9. The chemical properties and waste nutrient of peanut crop’s waste.

| Description           | DM (%)   | CP (%)   | CFat (%) | CF (%)  | TDN (%) |
|-----------------------|----------|----------|----------|---------|---------|
| Peanut straw          | 29.08    | 11.31    | 3.32     | 16.61   | 64.50   |
| Peanut hulls          | 87.36    | 5.77     | 2.51     | 73.37   | 31.70   |
| Peanut hulls fermented*| 90.75    | 7.38     | 0.74     | 55.74   | 38.83   |

Note: DM= dry matter; CF= crude protein; CFat= crude fat; TDN= total digestible nutrient (Wahyone and Hardianto 20014). *= proximate analysis result by Lolit Sapi Potong Grati (2019).
4. Conclusions
The reducing of peanut crops productivity cultivated by intercropping planting system was 37.50%-38.79% compared to cultivated by monoculture planting system. Meanwhile, the reducing of maize crops productivity was caused by the reducing of crops population. The intercropping planting system of Srikandi Kuning and Nasa 29 maize varieties crops with peanut crops increase the LER value be 1.02 and 1.03. The utilization of Nasa 29 maize variety crops cultivated by intercropping planting system with peanut crops was better than the Srikandi Kuning maize variety crops intercropped with peanut crops due to its IPC value was lower namely 0.89 meanwhile the Srikandi Kuning maize variety crops intercropping was 0.93. The waste potential for cattle feed by maize crops cultivated by monoculture planting system was higher than intercropping planting system of maize crops with peanut crops namely their waste carrying capacity per Ha were P2 was for 572 head, P1 was for 500 head, P5 was for 484 head, P4 was for 454 head and P3 was for 288 head.

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