INTENSIVE INTEGRATION OF DAIRY GOAT IN OIL PALM CULTIVATION

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MPOB INFORMATION SERIES • ISSN 1511-7871 • JULY 2018 MPOB TT No. 635

Small land holding is one of the factors limiting the independent oil palm growers to increase the production of fresh fruit bunches and income. Therefore, a good land use strategy is needed to fully utilise the farm to ensure it remain sustainable in the future. Intensive integration of dairy goat is a value farming through diversification of economic activity in oil palm area. The technology uses oil palm fronds as main green roughage for feeding the goats, making the grazing area is not required. Dairy goat farming produces various products including milk, breeder goats, slaughter goats and bio-fertiliser.

GOOD ANIMAL HUSBANDRY

Goat Breed

The Anglo Nubian breed is recommended in the intensive farming of goats in oil palm area (*Figure 1*). This breed is a prolific goat breed, non-seasonal breeding and dual-purpose breed (milk and meat). Breeder goats should have good pedigree record and must free from diseases especially *Brucella*, *Caprine Arthritis Encephalitis* and *Caesous lymphadenitis*. Recommended age for breeder goats is 12 to 24 months old. The production model started with 20 does and one buck. Newly arrived goats should be treated from any stress problem. Familiarisation with local environment and management should be carried out about 3 to 4 months.

Housing

A good goat house is highly required because the goats will be kept intensively in the house. The goat house is recommended to be built using hard wood. The size of goat house for this production model is 15 m length x 6 m width (> 4 m^2 per head). A raised floor using wooden slatted should be built at 1.5 m high minimum. The house also should be equipped with a good feeding trough, water supply, milking house, compost barn and perimeter fencing.

Feeding Management

Feed is the most important inputs especially for quantity and quality of milk production. In this production model, pruned oil palm fronds (OPF) that abundantly available in oil palm plantation are used as main green roughage for goats. Goats were fed by hanging the fresh OPF cuts in the goat house or chopping for trough feeding (*Figure 2*). This OPF should be offered *ad libitum* on daily basis and supplemented with goat pellet at 30% of total goat's requirement. The goats are normally fed three times a day.

For milking does, concentrate feed is given during milking activity in the morning and evening. Dairy goat pellet with palm kernel based formulation is offered at 1.0 kg per head. Additional feed used is soya bean hull pellet offered at 0.5 kg per head. Vitamin powder supplement also used at 0.02 kg

Figure 1. Anglo Nubian does (left) and a buck (right).

ISSN 1511-7871
9 771511 787001

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per head. *Table 1* shows laboratory result from sampling of goat feeds used in this technology. Clean water is supplied through automatic drinker pipe. Mineral block is supplied for free lick at any time in the house.

Figure 2. Goats feeding on chopped oil palm frond.

Breeding Management

This technology practiced natural breeding with one buck for 20 does. A sire buck should have good body conformation and active. Before joining for breeding, the buck and does should be flushed by feeding high energy feed to stimulate fertility, ovulation and conception. This practice should be carried out two to three weeks prior to a joining. Pregnancy diagnosis is carried out by ultrasound or physical evaluation (ballottement or sticky milk appearance). It should be carried out on does that were mated three months before. Any none pregnant does will be allowed to back on heat for re-mating. Two year old does that never pregnant should be culled. Replacement does are selected from doeling goats that reached at least one year age or reached 65% of mature body weight. Potential doeling and buckling goats are used as replacements for older or unproductive breeder goats. Any excess goats should be sold as breeder or slaughter goats.

Milking Management

Heavy pregnant does must be separated from a big group to avoid abortion caused by horning. After giving a birth, each doe is kept with its kids until seven days after parturition. After that, the kids are moved to the kid's pen and the mother joins a milkier group for milking. Milking is carried out twice daily on early morning and late afternoon. Milking can be performed using machine or hand milking. Always practice hygiene before, during and after milking. Disinfect the teats using iodine after each milking as preventative again *Mastitis*. Collected milk must be processed immediately. It must be pasteurised and bottled before cooling in temperature under 4°C or frozen below 0°C (*Figure 3*). After 5-6 months of peak milking (estimated milk production reducing below 400 g per day), a doe will be placed with a buck for mating. During pregnancy, milking still can be continued but need to dry-off about one to two months before a next kidding.

Kids Management

Newly born kids should be treated with iodine on its navel. Kids must suckling colostrums milk on their mum within two hours after birth. Kids are allowed to stay with their mothers for only seven days. Then, the kids should be separated and bottle fed with a goat milk twice a day in the

Figure 3. Process flow for milk processing.

TABLE 1. NUTRITIONAL CONTENT OF GOAT FEEDS

Nutritional content	Oil palm frond	Dairy goat pellet	Soya hull pellet
Dry matter (%)	28.9	91.2	91.4
Crude protein (%)	7.2	17.6	25.1
Crude fat (%)	1.3	7.4	7.5
Crude fibre (%)	37.0	11.0	24.3
Total digestible nutrient (%)	52.3	74.2	68.2
Metabolism energy (Mj kg^{-1})	7.7	11.3	10.3

TABLE 2. PERFORMANCE OF ANGLO NUBIAN GOATS UNDER INTENSIVE PRODUCTION SYSTEM AT MPOB RESEARCH STATION IN KLUANG, JOHOR

Year	2015	2016	2017	Average
Kidding rate (%)	113.3	85.7	114.3	104.4
Twinning rate (%)	58.8	33.3	75.0	55.7
Male to female kid ratio	2.4:1	1.4:1	1.3:1	1.7:1
Male average birth weight (kg)	2.2	4.2	4.5	3.6
Female average birth weight (kg)	2.1	3.9	3.7	3.2

Figure 4. Weaned kids (left) and yearling female goats (right).

morning and late afternoon. Within two weeks, kids should be de-wormed using *Ivermectin* at 1% or *Albendazole*. Creep feed with high energy and protein content should be offered to goat kids for rumen development. Otherwise, high quality green grass can also be used. At four months old, young goat kids are weaned and transferred to a weaned pen. Again, the kids should be treated with de-worming and de-ticking medication. Goat kids are also fed with OPF as green roughage on a daily basis *ad libitum*. Concentrate pellet for growing also offered at 30% of its total feed requirement.

Disease Control Management

A good herd health programme should be formed to avoid goats from disease infections. Main disease controls are de-worming and de-ticking, conducted regularly at an interval of three to four months, or earlier if the goats showing symptoms of infestation. Floor flaming is also a good practice for controlling *Cocidiosis* infestation on goat kids. Additionally, a Bio-safety measure is also quite important to be practiced in the project's area. The goats must be monitored daily for any casualty, sickness or injury. Any suspected sick goats must be separated and treated by trained staffs.

TECHNICAL PERFORMANCE

Breeding Performance

Based on three years data, the average kidding rate was 104.4% per year (*Table* 2). Twinning rate was quite high with an average of 55.7% compared to our study on Saanen goat with only 38.5% (Zainal *et al*., 2014). The average birth weight was 3.6 kg for male kids and 3.2 kg for female kids. Kidding rate was slightly decreased in the second year caused by high mortality of does due to heavy worm burden.

Kid Growth Performance

The average body weight of weaned kids at four months old was 11.3 kg for male and 13.2 kg for female. At 12 month old average body weight was 24.0 kg for yearling male kids and 26.5 kg for yearling female kids (*Figure* 4). Average weight of female goat was higher than male goat for the first 1.5 years probably due to most of female goats were born single. On the other hand, male goats grew faster compared to female goats (*Figure* 5).

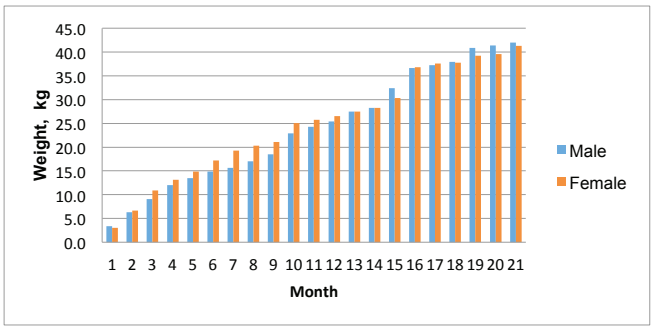

Figure 5. Growth pattern of Anglo Nubian goat kids.

Milk Production

Figure 6 shows the average daily milk production recorded for 180 milking days. The milk production increased in the second parity compared to the first parity. Average daily milk production was 1230 g per head for the first parity and 2280 g per head for the second parity. The highest milk recorded was

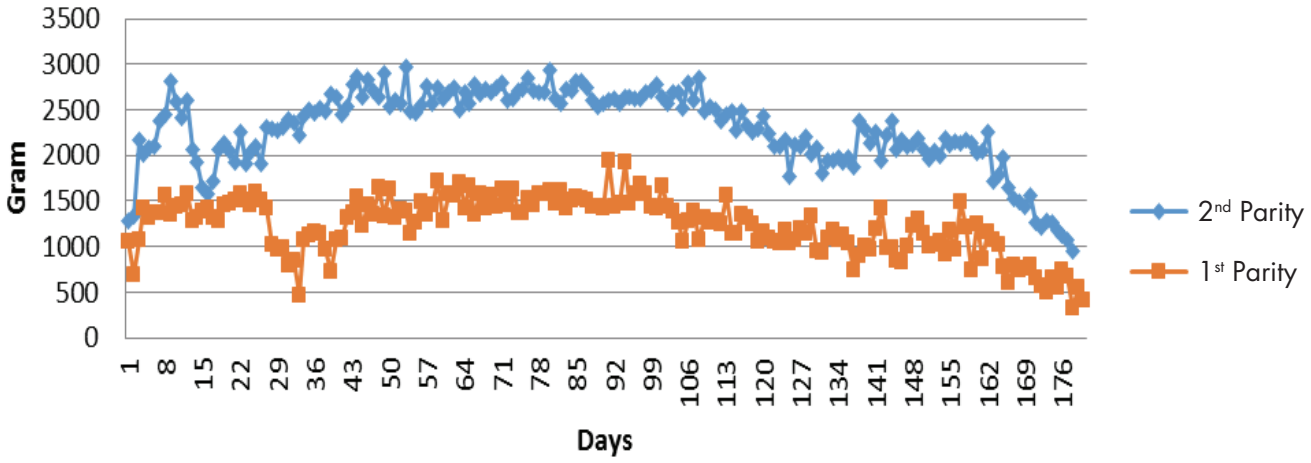

Figure 6. Average daily milk production for Anglo Nubian does under intensive production system.

3300 g per day on the second parity. There were three months of peak production days and milk volume started to decrease after three months of milking for both the first and second parity. Period of milking ranged from 6 to 10 months. Normally, the doe will be dropped in milk production at less than 400 g per day prior to a new birth. The does are ready to be dry-off for one to two months before delivery of new kids.

ECONOMIC FEASIBILITY

An initial cost of RM 170 000 is required to start this project with herd size of 20 does and one buck. Apart from buying breeder goats, the cost is for building a goat house, purchasing of chopper machine, milking machine and other equipments. The operational cost is calculated at RM 2.07 day per head for pellet, drug, supplements and maintenances. Daily income generated from milk sales. Other income is from selling of cull breeder, male and female kids that suited for breeding and meat market. Feasibility analysis estimated that the net present value (NPV) at 10% discounted rate was RM 76 784.51. The internal rate of return (IRR) was 30%, with the payback period of four years.

CONCLUSION

Intensive integration of Anglo Nubian dairy goat in oil palm is technically and economical feasible. The Anglo Nubian dairy goats has high milk production, fast growing rate and highly prolific. Oil palm pruned fronds can be used as a green feed source for raising the dairy goats. Implementation of intensive dairy goat farming by cut and carry system could generate additional income to small oil palm growers.

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