

INDONESIA AUSTRALIA
RED MEAT & CATTLE
PARTNERSHIP



Commercial Cattle Breeding in Integrated Cattle - Oil Palm Systems

FINDINGS AND LESSONS

INDONESIA-AUSTRALIA COMMERCIAL CATTLE BREEDING PROGRAM

OCTOBER 2020



IACCB

Indonesia-Australia Commercial Cattle Breeding Program

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01 OVERVIEW OF THE SSKA MODEL – INTEGRATED CATTLE AND OIL PALM SYSTEM

1.1. The SSKA model

1.2. Variations of the model





Commercial cattle breeding in an oil palm plantation with Brahman Cross cattle accessing additional feed

1. Overview of the SISKa model – Integrated cattle and oil palm system

1.1. The SISKa model

SISKa is the acronym for *Sistem Integrasi Sapi dan Kelapa Sawit*, the cattle - oil palm integration system. SISKa generally involves cattle directly grazing the native pastures and cover crops that exist under established oil palms. In commercial SISKa enterprises cattle remain permanently in the oil palm plantations, rotating from one block to another and only returning to the cattle yard every three months. Additional concentrate feeds or forages are required because the understory forage resource is of low quality and density. This is particularly important for lactating and recovering cows and all classes of growers, as the under-story pastures are of inadequate quality for their needs. If land is available, small areas of open improved pastures can be developed to augment the under-story pastures and reduce the cost of more expensive concentrates, typically oil-palm by-products such as palm kernel cake (PKC) or solids (mill sludge).

1.2. Variations of the model

The most common variations of the SISKa model are commercial SISKa and smallholder SISKa.

Commercial SISKa: In commercial SISKa, mobs of 300 head or more Brahman-cross (BX) cattle intensively graze 30 ha blocks in a short-term rotational system – usually for half or a full day before being moved to the next block. Blocks are grazed in a 70 to 90-day rotation, depending on regrowth. Stocking rates generally range from 4 to 6 ha per breeder. Cattle are provided with water and supplements each day. Portable electric fencing is used to contain cattle within the blocks. Commercial SISKa herds generally need to be in excess of 500 breeders to be sufficiently profitable to justify the investment and effort.

Smallholder SISKa: Smallholder SISKa is much less structured than commercial SISKa. Small herds of five to 50 Bali, Ongole or other local cattle randomly graze understory forages in easy reach of their barns (*kandang*s) to which they return each evening. There are no fences in the understory grazing areas. Cattle are either tethered or graze freely under the supervision of a shepherd. Cattle are fed cut-and-carry forages in the barn each night, before being returned to the understory pastures each morning. It is very common to see the understory forages close to the barns become progressively over-grazed and weed-infested. These areas are also subjected to high animal traffic, possibly leading to soil compaction. It is common for several herds belonging to different farmers or farmer groups to utilise the same grazing resources, so there is little incentive to eradicate weeds or other forms of pasture maintenance.

Incorporating open pastures: A significant limitation of the SISKa model is the quality of understory pastures. Shade grown pastures are lower in soluble carbohydrates and protein and are significantly less dense than those grown in full sun. Supplementation will be necessary to assist breeders to maintain their body condition and achieve reasonable growth rates of weaners and growers. One option to support higher growth rates is to allocate open blocks to planting with improved pastures. Improved pastures grown in the full sun can provide large amounts of feed at relatively low cost, particularly when directly grazed. Such blocks can be especially useful to assist cows to recover condition immediately prior to and following calving. The improved pastures can also be harvested for cut-and-carry feeding.

Incorporating a breedlot: A further variation of the commercial SISKa model involves cattle spending some part of the production cycle in a breedlot. Breeders are removed from the mob one month prior to calving and placed in pens so that the calving process can be better supervised. Cows and calves then remain in the breedlot for approximately 2 months until the cow has recovered and the calf is robust enough to join the grazing herd in the plantation. They rotationally graze understory forages for the rest of the year.



Smallholder SISKa: Female farmer herding her Bali cattle herd in oil palm plantation (Indobeef picture)



Cattle breedlot

Breedlot feeds generally comprise low cost agro-industrial by-products such as palm kernel cake, mill sludge (solids) and cassava by-products as *onggok*¹, chopped forages such as king grass, and oil palm fronds. If located close to a feedlot reject feedlot rations can be used. It is important that the rations provided in the kandang are of better quality of and quantity than the grazed feed resource so that cattle benefit from their time in the breedlot.

Incorporating a feedlot : IACCB's modelling shows that the most profitable component of the cattle production process can be the growing and fattening process. Feeder cattle enter the feedlot at around 320kg liveweight and are fed a combination of agricultural by-products and other rations. Cattle grow rapidly, gaining between 1.0 and 1.6kg per day depending on the quality of the feed. Feedlots are generally located within easy access to low-cost feed sources and markets to minimise logistical costs.

This document is focussed on the commercial SSKA model. Information on smallholder SSKA systems is available from numerous other sources both government pilots e.g. BPPT or donor supported projects e.g. Indobeef.

¹ Waste product after expulsion of starch, generally used in dried form but can be fed wet

02 CONSIDERATIONS BEFORE INVESTING IN SISKI

- 2.1. Is your plantation suited to cattle integration?
- 2.2. Financial considerations
- 2.3. Impacts of integrating cattle into the plantation
- 2.4. Human resource considerations



2. Considerations before investing in SSKA

2.1. Is your plantation suited to cattle integration?

The SSKA model can be implemented in most locations where oil palm is grown – most commonly Kalimantan and Sumatra. Limitations occur where palms are excessively dense or weed-infested, or the environment is unsuitable due to flooding and very high rainfall, and excessively steep topography. Social factors and level of system integration also impact success of a SSKA operation.

Light penetration: Sunlight is the driver of growth for green plants. Oil palms create a dense shade from years 8 to 20, leaving a relatively small number of years for grazing of productive understory pastures before the canopy becomes too dense. Where a large percentage of the plantation is 8 to 20 years old and / or where the understory herbage is dominated by unpalatable species, cattle will struggle to maintain their weight due to the limited quantity and quality of feed, but cattle will remain productive with a small amount of supplementary feed. From IACCB's experience, a presentation yield of 500kg dry matter (DM) per ha of palatable herbage is required to support grazing cattle. Replanting of oil palms offers an opportunity to integrate pastures and cattle.

Open pastures: Is the plantation prepared to allocate a minimum of 1.0% of the overall area under grazing for open, improved pastures? This small amount of the overall land area can greatly assist the cattle operation by providing good quality feed for recovering cows and weaners. SSKA operations will struggle to become financially viable unless palm kernel cake (PKC) is available to grazing breeders on a daily basis and small areas of improved, open pastures are available for weaners. Ultimately, the availability of small areas of cleared land for open pastures is a definite advantage to productivity and profitability but not essential.

Social licence with local communities: Cattle graze across extensive plantation areas. In some locations they will interact with local communities and possibly local cattle herds. This can lead to competition for the grazing resource as well as the potential introduction of pests and diseases – cattle ticks and brucellosis for example. Local dogs may kill calves if left uncontrolled. IACCB partners have experienced calf mortality rates of up to 4.6% due to dogs alone (see Table 5). IACCB strongly recommends that agreements are developed with local communities grazing their cattle in the plantation to minimise impacts on the enterprise herd and retain workable relations.

Topography and environment: Oil palm requires continuously high heat and rainfall to achieve maximum production, creating a challenging environment for cattle. The challenges can become excessive where rainfall is extremely high over several months as this increases the likelihood of bogging, elevated screw fly prevalence and scours and pneumonia in calves. The quality of understory forages is also typically low. Experience suggests that problems due to excessive rainfall are likely to occur once it exceeds 1,500mm over a 3-month period. It may be possible to control mating to avoid calving during the peak wet season.

Plantations that have been established in areas of steep slopes or where rivers and streams flood regularly are poorly suited to cattle grazing. Cattle can become isolated during excessively wet periods and access to the grazing herd for provision of feed supplements is also restricted, leading to a deterioration in condition. Heavy losses can occur if the isolation continues for several weeks, particularly of calves.

This occurred at one of IACCB's partner projects near Bengkulu and resulted in severe decline in the condition of cattle. All weather roads and year-round access to grazing blocks are essential.

The understory grazing resource is extremely important as it provides the low-cost basis for the operation's cost effectiveness. Where the understory is weed-infested, additional supplementation will be required. Unpalatable weeds should be eradicated prior to commencement of grazing. Some unpalatable weeds cannot be eradicated because they are valuable to the plantation – such as *Nephrolepis* fern (host for a beneficial insect), or too difficult and costly to eradicate – such as *Dicranopteris linearis* (pakis kawat) when it becomes dominant. The grazing resource will be compromised and financial viability difficult to achieve in these cases. One of IACCB's partners in Kalimantan was able to successfully control fern infestation, converting the understory into a valuable grazing resource. It is important to evaluate each case to determine costs and benefits.

Supportive management teams: Commercial oil palm plantations are sophisticated enterprises. Day to day operations are governed by well-developed standard operating procedures (SOPs) that dictate all aspects of production. Cattle do not readily integrate into plantations and efforts must be made to make the combined enterprise work. Whilst both components of Siska must adapt – oil palm and cattle- ultimately the enterprise is firstly an oil palm plantation, with cattle being a secondary component. Mutual respect from each one part of the combined operation for the other is needed to create the efficiencies required to operate profitably. This can only be achieved with a high level of commitment and support from all tiers of management, commencing with the owner and CEO.

Cattle as plantation guests

One of IACCB's most successful partners suggests that *'The plantation is the host and livestock are the guests. A good host should be able to serve his guests conveniently and a good guest does not disturb the host'*.

2.2. Financial considerations

2.2.1. Start-up Costs

Table 1 provides typical start-up costs for operational and capital expenditure. Major capital costs include the cost of cattle and the stockyard. It is assumed that land is provided at no cost – a major benefit of the Siska approach. Various partnership models incorporating cattle have been adopted by oil palm companies and some models may include a capital expense at start-up.

As with any long-term enterprise, the costs incurred at start-up and the time to becoming cash-flow positive have a major impact on profitability. Sometimes low-cost, temporary stockyards can be constructed as an interim measure, however eventually a permanent, efficient facility will be required. Alternatively, it may also be possible to scale up infrastructure progressively as needs arise and cash flow improves. Similarly, with cattle, it is important to purchase breeding stock of good temperament and fertility. These factors are generally and are most important to long-term success. Genetic quality can be improved over time, but the enterprise ideally needs a calf from every cow every year.

Table 1 : Capital and operational start-up costs for various starting herd sizes for Siska

Initial No. of Cows	Capital expenditure Year-1	Operational expenditure Year-1
100 hd	IDR 2,368,950,000	IDR 600,415,000
300 hd	IDR 6,787,800,000	IDR 1,289,100,000
600 hd	IDR 13,315,600,000	IDR 2,278,125,000
900 hd	IDR 20,058,400,000	IDR 3,327,955,000
1,200 hd	IDR 26,906,200,000	IDR 4,407,030,000
1,500 hd	IDR 33,764,000,000	IDR 5,486,835,000
2,000 hd	IDR 45,034,700,000	IDR 7,593,545,000

2.2.2. Expectations – Cash-flow, IRR, NPV

The early generation of positive cash-flow is important for the financial viability of most business and cattle breeding is no exception. If dry heifers are purchased it is unlikely that the enterprise will generate an income until late in year 3 and more generally in year 4. Heifers purchased from Australia will take 2 to 3 months to become acclimatised and recover from their travel before they can be joined. Calves born in year 2 should be retained until they are at least 300kg in liveweight to achieve good returns to the enterprise.

Cash flow can be generated in late in the second year of operations by starting the enterprise with pregnant heifers. Cash flow in Year 2 would require the sale of weaners or yearlings but is not advised as they only provide a small profit margin. There are significant risks associated with purchasing pregnant heifers that need to be considered by companies with limited prior experience in cattle breeding (refer to Section 3.1 Acquiring and Transporting Heifers).

IACCB’s modelling suggests that a business strategy based on the sale of yearlings is only likely to be effective for operations achieving very high weaning rates – 90% or better. These weaning rates can only be achieved in intensive breeding systems, such as breedlots. SISKA enterprises will typically achieve weaning rates of 50%

to 65% over the first few years of operation. With these outcomes it will not be profitable to sell weaners.

Analysis of herd size on financial metrics using IACCB’s financial spreadsheet CALFIN revealed that herd size had little impact on years to positive cash flow or pay-back period. Positive cash flow was able to be achieved after three years with good management, whereas the payback period was nine years. In contrast, herd size had a dramatic impact on the internal rate of return and net present value at year 10.

The analysis indicated that the internal rate of return (IRR) rose sharply from 4% to 12% as herd size increased from 100 to 600 breeders and then remained flat until herd size approached 2,000 breeders when a further modest increase occurred to reach 13% (Figure 1). The net present value (NPV) of the investment at year 10 increased in a linear fashion from 100 breeders to 1,500 breeders, but then kicked quite sharply, giving a much better result for 2,000 head.

Figure 1: Internal rate of return (IRR) and net present value (NPV) for various SISKA

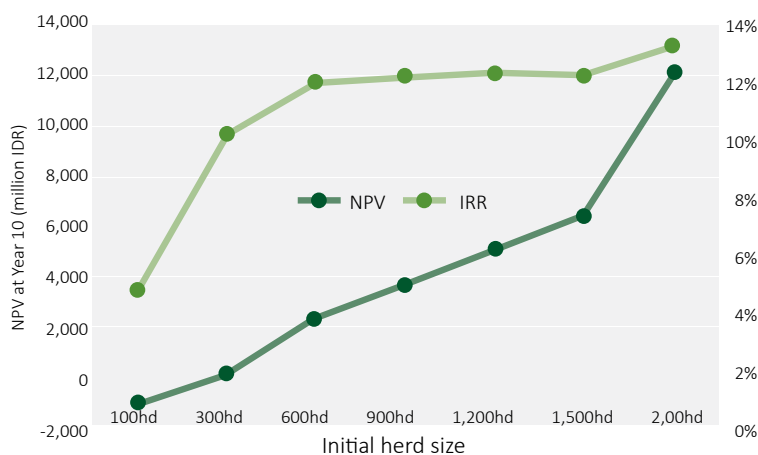


Table 2: Financial metrics for various starting herd sizes for SISKA

Initial No. of Cows	Positive Cash Flow	IRR at Year-10	NPV at Year-10	Pay Back Period
100 hd	Year-3	4.81%	-IDR 1,040,297,223	Year-9
300 hd	Year-3	10.22%	IDR 127,329,657	Year-9
600 hd	Year-3	12.08%	IDR 2,311,546,581	Year-9
900 hd	Year-3	12.24%	IDR 3,719,986,728	Year-9
1,200 hd	Year-3	12.30%	IDR 5,092,874,785	Year-9
1,500 hd	Year-3	12.31%	IDR 6,420,257,967	Year-9
2,000 hd	Year-3	13.33%	IDR 12,228,437,700	Year-9

The efficiency gains that are achieved by larger herds particularly impact NPV, a major factor to be considered by a company committing significant management resources to a cattle breeding enterprise. In Australia, commercial herds are generally over 5,000 head in size in order to provide reasonable returns on investment.

With these herd size considerations in mind, SSKA operations generally need to run a minimum of 500 breeders to be viable. IACCB recommends commencing with a herd of 300 breeders and growing the herd to at least 600 breeders either by organic growth, by additional procurement of heifers, or by a combination of the two. An organic herd growth approach will take longer, whereas with additional purchases the herd should reach 600 breeders by year 4.

2.3. Impacts of integrating cattle into the plantation

The oil palm enterprise will be impacted by the introduction of cattle. Frond pruning, fertiliser application, weed control and bunch harvesting all need to be timed to fit the grazing cycle. Without synchronisation, access to blocks for palm management operations may be restricted by fencing for cattle. Cattle may be impacted by poorly timed fertiliser and herbicide application. Cattle may also miss out on the opportunity to graze freshly pruned palm fronds. Provided there is a willingness to collaborate the changes to the oil palm operation need not be dramatic. Experience with IACCB's partner projects has shown that relatively seamless integration is very possible as long as there is goodwill from all parts of the enterprise. It is essential for the owner, the managing director and the general managers of the company to be committed to the successful integration of the cattle operation.

How much land under palms will the cattle need? Each breeder will require a considerable area of palm block to graze depending on the understory grazing resource. In general, 4 to 6 ha well-managed understory pasture will be sufficient for each breeder. Feed shortages can occur during intense dry seasons if insufficient land area is allocated. Therefore, a herd of 300 breeders will require around 1,500 ha of understory area. By year 3, a further 1,500 ha will be required for the weaners and growers produced by these breeders. If available, the allocation of 30 ha for open, improved pastures should be included to achieve better rates of growth from weaners and growers. This allocation amounts to only 1.0% of the overall land area under grazing (30 ha of a total 3,000 ha) but will greatly enhance the productivity and profitability of the cattle operation. A further 30 ha of land could be allocated to birthing / lactating cows if available. This would allow for close supervision of birthing cows and can reduce calf and cow mortality. This is less essential than the pastures for weaners, which are an important inclusion to achieve optimal financial outcomes.

Who bears the costs and who benefits from the gains: There are cost savings to the oil palm unit in terms of reduced weed control and fertiliser costs (see Table 3). There may also be an increase in the yield of fresh fruit bunches (FFBs) due to improved mineralisation and distribution of nutrients. Several companies have reported an increase in fresh fruit bunch (FFB) production following the introduction of commercial cattle grazing, presumably due to improved nutrient cycling. One of IACCB's partners recorded an increase in fresh fruit bunch yield of

Table 3: Cattle grazing benefits to oil palm enterprise

Benefit	Annual value of benefit
Reduced weed control costs	IDR70,000 per ha
Increase in FFB yield of 4% after 3 years of grazing	IDR5,000,000 per ha

4% after 3 years of grazing based on an assessment of yield history of grazed and ungrazed blocks. The response is difficult to prove in controlled experiments due to the large number of uncontrollable factors that impact yield – age of palms, soil type, micro-environment, uniformity of grazing, fertiliser management and weed control. A 4% productivity gain would be valued at approximately US\$400 per ha per year at 2020 prices.

The cattle unit will need to use tractors, vehicles and other plant owned by the oil palm company. The oil palm company will also provide PKC as a feed. The manner in which costs and benefits are allocated among the cattle and oil palm units should be determined prior to commencement of integration and be reviewed regularly, especially if the SSKA is a joint-venture between different companies.

Do grazing cattle spread *Ganoderma*? IACCB's collaborative research with the Indonesian Agency for the Assessment and Application of Technology (*Badan Pengkajian dan Penerapan Teknologi -BPPT*) has shown that the commercial SSKA system is unlikely to increase the incidence or spread of *Ganoderma* in oil palm plantations. *Ganoderma* spores do not survive the acidic environment of the rumen and are therefore not spread in cow dung. In addition, spores will not develop in the presence of cow dung on the soil surface. Whilst minor pugging of soil may occur under wet conditions, the short duration of grazing mitigates soil compaction impacts. Each block is subjected to a single day of grazing, followed by a 2 to 3-month recovery period during which the soil fully recovers. In summary, BPPT's research was unable to identify any link between grazing cattle and the spread of *Ganoderma*. The experience of IACCB's partner companies supports this finding – no spread occurred. However, as a precaution, cattle grazing should be avoided in palm blocks with high levels of endemic *Ganoderma*.

Introducing cattle into young oil palm: Estate managers will generally allow cattle to graze oil palm blocks once they reach 3 to 5 years of age. By this time the young palms will have attained sufficient leaf area as to be unaffected by grazing cattle. It is recommended that weaners, rather than mature cattle, be integrated into young palm blocks as they are less likely to damage the palms and will benefit from the better-quality forages in the relatively open areas between the palms. Mature cattle may browse the lower, older oil palm fronds. From IACCB's experience, cattle plantations managers readily accepted the inclusion of weaner cattle in young palm blocks.

2.4. Human resource considerations

There is a general lack of labour skilled in cattle breeding in Indonesia. This can be a particular constraint in remote locations, such as the SSKA plantations in Kalimantan and Sumatra. Good livestock staff are attentive to issues arising in the herd, addressing them before they become problematic. This is particularly important around calving and weaning. Human resources are also required for administration, record-keeping and security. Casual labour is required for weed control, feed mixing and feeding, cleaning yards, etc.

Benchmarks from active cattle breeding enterprises in Indonesia suggest that a ratio of one staff member to 100 cows should be achievable in efficiently managed, extensive systems. Higher labour inputs will be needed for intensive production systems. For example, a stockman may be able to look after 200 cattle in a herd but supporting staff will be required for feed and water distribution, animal health and security. Table 4 lists the factors that commonly reduce the efficiency of labour in cattle operations.

There is an assumption that once a breeding enterprise has been operating for 3–5 years the staff will have been “trained” – able to operate at an effective level. Experience suggests that this is not always the case. Staff require structured training on top of their on-the-job training and need to be supported to apply their learning. Only then will staff function effectively to support profitability of the enterprise.

One of IACCB’s key partners insists that the capacity building of stockmen must occur continuously. Cattle production requires a different work culture to normal plantation work culture. Only staff who have a genuine empathy for cattle should be selected to manage cattle. Senior managers can encourage this empathy for cattle but not all staff will develop it.

Table 4: Factors that reduce labour efficiency

Infrastructure factors	<ul style="list-style-type: none"> • Inefficient systems for provision of water and feed supplementation. Efficient mobile systems are required in plantations. • Poor fencing and poorly designed yards result in higher labour costs and reduced herd performance. It is essential to be able to control the herd at all times without stressing cattle. • Long distances between paddocks, poor road infrastructure and poorly located stockyards increase labour use.
Cattle factors	<ul style="list-style-type: none"> • Cattle with bad temperament require higher inputs Never purchase aggressive cattle and always cull aggressive cattle including bulls, cows, weaners and heifers from the herd. • Too many small groups of cattle, each of which requires supervision.
Management & labour factors	<ul style="list-style-type: none"> • Stockmen without experience in handling cattle – an experienced stockman with designed and maintained will move cattle efficiently • Staff who are not fully committed will increase labour requirements-untimely attention to sick cattle, declining BCS, etc. • Inefficient administration systems that delay procurement.

03

PRACTICAL ASPECTS OF CATTLE BREEDING

- 3.1. Acquiring and transporting the breeders
- 3.2. Breeding Management
- 3.3. Forages and pastures
- 3.4. Supplementary feeding



3. Practical aspects of cattle breeding

This section summarises much of the existing information to highlight what needs to be known or considered as a starting point to commencing a commercial SSKA operation in Indonesia. There are several comprehensive texts covering commercial cattle breeding in Indonesia, including the IACCB's manual², that should be referred to for more detailed information.

3.1. Acquiring and transporting the breeders

It is a logistical challenge to purchase large numbers of good quality breeders within Indonesia. Assuming that *Bos indicus* cattle are preferred, Ongole cattle tend to be highly variable in their genetic performance and are rarely available in significant numbers. Numerous feedlot operators in Indonesia have reported Ongole feeder cattle achieving a wide range of growth rate options, from 0.4 to 1.5 kg per head per day liveweight gain on feed. With a rigorous selection program it would be possible to develop a relatively high quality Ongole herd, but this would take several years at best. It is currently possible to purchase moderate numbers of Brahman cross (BX) breeders from many Indonesian feedlots. This option should be considered for small herds and for scale up.

The alternative is to import BX heifers from northern Australia. Australian BX cattle are known for their hardiness but have lower fertility than *Bos taurus* breeds. That is, they fail to cycle and / or abort calves when their body condition is poor. Whilst this works well as a survival mechanism, it can also impact re-conception rates of breeders. There is an ongoing effort in Australia to select for breeders with higher fertility traits.

Beware buying pregnant heifers: The most efficient way to get started with a breeding operation is to buy pregnant heifers. By buying pregnant heifers it is assured that the breeders are fertile and the lag phase to first calf is greatly reduced. There are risks however. Pregnant heifers will be more susceptible to stress during transportation, sometimes resulting in abortion or death of the heifer. The risks can be minimised by ensuring that imported heifers are no more than 4 to 5 months pregnant and considerable care is taken during the transportation process. For land transport that means regular stops for feed and water, provision of serviceable loading ramps, use of trucks with non-slip flooring and high sides. Quarantine yards need to be strong and well-designed. Extensive information on transportation of cattle is available in the manual: Best Practice Guide for the Transport of Cattle in Indonesia³. IACCB's cattle breeding manual also provides additional information on cattle selection and management.

Avoid having breeders arrive in peak wet season: SSKA estates are necessarily located in high rainfall environments as this is where oil palm grows best. The peak wet season, which generally occurs from December through to March should be avoided as a time for the arrival of cattle. Cattle become stressed during periods of high humidity, heat and rainfall. Losses are more common, especially for pregnant heifers. Time the arrival of cattle to coincide with the driest months (preferably early dry season) and ensure that sufficient feed and water is available for best results.

² Commercial Cattle Breeding Manual. <http://iaccbp.org/files/15092019-manual-iaccb-eng.pdf>

³ <http://www.iaccbp.org/files/rpj31-best-practice-guide-for-the-transport-of-cattle-in-indonesia.PDF>

3.2. Breeding Management

The goal of a breeding operation is to produce a calf every 12 months – 9 months of gestation (mating to calving) followed by 3 months of lactation for the small calf and then re-conception. The reproductive process is highly demanding for breeders, which generally lose condition during lactation. To achieve a short inter-calving interval, the cow must be able to attain a Body Condition Score (BCS) of 3 to 3.5 before mating. BCS is a visual assessment of the amount of fat and muscle covering the bones of a cow, regardless of body size, rated on a scale of 1 to 5. It is not affected by gut fill or pregnancy. Stockmen should become experts in rapid assessment of BCS so that the herd can be continuously monitored and small changes in BCS identified and supplementary rations provided before problems become serious.

In a SSKA system it is difficult for cows to produce a calf every 12 months. Even the target of a calf every 15 months is challenging, but achievable in SSKA conditions. If every cow in the herd produced a calf every 15 months, that would equate to a calving rate of 80%, or four calves in five years. IACCB's partners have achieved calving rates of around 70% to 75% after three years of operations, with outcomes continuing to improve as management and skill levels improve.

Under the SSKA system, the breeding herd (cows and bulls) is moved daily to a new palm block for grazing. This gives the herdsman the opportunity to check the herd each day and to identify existing or potential problems with any bulls, cows or calves. Suspect animals may be treated and possibly drafted in a temporary set of moveable yards. Poor condition, lactating cows can be drafted out for additional supplementation or feeding on better pastures while their calves could be removed for weaning. Every 70–90 days, the whole herd is mustered into the central permanent yards where cattle can be drafted into secure pens or treated in a race.

Mating: Joining in grazing herds is generally only feasible using natural mating. Bulls are run with the cows and mature heifers at a ratio of about 5%- one bull to 20 females. Although 3% is a normal ratio for commercial beef production in Australia, the higher ratio is recommended under the SSKA system because of problems when new bulls are relocated into the more stressful plantation climate and because of poorer visibility of the cow herd under the oil palm plantation. Newly imported bulls and heifers need about 3 months to acclimatise to the local environment before being mated.

Controlled mating is a standard practice in Australia and many other countries but is uncommon in Indonesia at present. Controlled mating can be practiced by removing bulls to prevent calving occurring during the wettest and hottest months – commonly December, January and February in Indonesia. Avoiding the wettest months for calving should reduce the risk of fly myiasis and pneumonia in newly born calves. Calves also struggle in boggy conditions. Peak rainfall months can shift from year to year⁴ so that the positive impacts of controlled mating may be reduced in less typical seasons.

⁴ See IACCB's paper from ICOP on impacts on rainfall on calf mortality: <http://iaccbp.org/files/VzDfV-prosiding-icop-conference-20191.pdf>

Where the herd is run on low-quality pastures under the palms, IACCB recommends weaning calves at about 100kg at 4 months of age. A previous recommendation to wean at 80kg liveweight resulted in severe post-weaning malaise for many weaners. Provision of creep feed for calves prior to weaning and good quality supplements for weaners post-weaning are important to achieving acceptable growth rates. See IACCB's Commercial Cattle Breeding Manual for more information on creep feeding.

Natural mating versus artificial insemination: For most commercial grazing enterprises, and more so the SSKA breeding model, natural mating will provide the most reliable and cost-effective form of mating. Bulls and cows will be grazing in the same plantation cells to ensure mating can occur anytime. Brahman Cross bulls tend to loosen condition and require a recovery period of 2-3 months per year to keep optimal condition.

Where the SSKA operation includes a breedlot, Artificial Insemination (AI) is more likely to be achievable as cows can be more carefully monitored and signs of heat need to be detected twice daily or the cow herd needs to be synchronized for oestrus. AI also requires highly skilled technicians who have daily access to the cows to achieve reasonable conception rates. Bulls should always be available to service cows that have failed to conceive after one or two AI procedures.

Calving and calf management: Calving is a crucial period for cows and calves and high rates of calf mortality can occur if management is not rigorous. Cows that are in good condition (BCS 3 or more) when they calve are less likely to experience calving problems – this is a crucial prerequisite to achieving successful calving and weaning rates. Calves can also succumb to various other factors, most of which can be controlled with careful management. Table 5 lists the percentages of calves that died due to various causes in IACCB partner operations. Many are linked to calving during periods of excessive rainfall.

Calves born during the peak of the rainy season commonly die from pneumonia, screw fly strike and other disorders that are promoted by wet, humid and occasionally cold conditions. Rainy season mortalities at the sites were between 11 and 18% in 2017 but more experienced stockmen and improved management of pregnant cows reduced this to less than 5%.

One strategy to overcome this is to control the mating season so that cows do not give birth in the peak of the wet season. Long-term rainfall data (> 10 years) is very important to determine

Table 5. Percentage of 1,196 calves born at three IACCB partner operations that died from a range of causes

Cause of calf mortality	Partner 1	Partner 2	Partner 3	Overall
Attacked by wild animals	0.0%	4.6%	0.0%	1.3%
Poor mothering ability	1.7%	0.3%	0.6%	1.0%
Cow malnutrition	0.0%	0.3%	0.3%	0.2%
Illness – pneumonia, scours, other	0.6%	3.6%	9.2%	3.9%
Injuries	1.7%	0.9%	1.7%	1.5%
Malnutrition	0.0%	0.9%	0.0%	0.3%
Abortion, prolapse, premature, dystocia	1.2%	0.9%	0.9%	1.0%
Still Birth	0.4%	0.0%	0.0%	0.2%
Unknown	0.0%	0.9%	3.5%	1.3%
Total	5.6%	12.5%	16.2%	10.5%

rainfall patterns so that a controlled mating strategy can be developed. Rainfall data collected shows that each project location has a different pattern, with rainfall ranging from 1500- 4500 mm / year and different monthly rainfall peaks. Mating strategies should be developed for each location, excluding bulls so that peak wet season calving can be avoided. Additional vigilance by stockmen is also important during calving, as rapid action can address calving issues as they arise.

Another strategy to minimise calf mortality is to include small areas of open, improved pastures. Heavily pregnant cows would be moved from the herd into these paddocks about one month prior to calving and then remain for an addition one to two months post-calving. This system enables stockmen to closely supervise the birthing cows, monitor calves to address any issues from screw fly or other disorders and provide supplementary feeds to aid recovery of cows. This strategy could also result in earlier weaning of the calves due to quicker growth.

3.3. Forages and pastures

It is not economical to develop improved pastures in the shaded area under oil palms. Shaded pastures are slow to establish and of low productivity in comparison to pastures grown in the full sun. IACCB experimented with buffalo couch (*Stenotaphrum secundatum*) a species known to be productive under coconut palms. The heavier shade created by the oil palm resulted in an establishment period of over six months and poor subsequent growth and persistence under grazing. None of the companion legumes persisted. These included centro (*Centrosema pubescens*), butterfly pea (*Clitoria ternatea*) and forage peanut (*Arachis pintoii*). Legumes tolerant of very heavy shade such as *Desmodium heterophyllum* and *D. ovalifolium* may persist but seed is difficult and expensive to obtain.

Understory pastures: The naturally occurring understory pastures can support modest growth of cattle if unpalatable species are eradicated. When supplemented with palm kernel cake, the diet will generally be sufficient to maintain the condition of breeders and support growth of weaners. Maximum production of palatable understory species can be achieved by:

- Eradicating unpalatable weeds through use of selective herbicides,
- Aligning pruned fronds in a tight line in the palm rows to avoid smothering palatable herbage,
- Spreading palm fertilizer across the entire area, rather than only in a tight circle around the palm,
- Synchronise frond pruning so that it occurs immediately prior to grazing as freshly cut fronds are a moderately nutritious cattle feed,
- Monitoring grazing pressure to ensure that pastures are never over-grazed.

IACCB has commonly recorded pre-grazing forage yields of around 400 to 700 kg dry matter (DM) per ha in well-managed SSKA systems, with yields increasing over time when carefully managed. IACCB recorded an increase in pre-grazing yields of 8% in the second year of grazing at a plantation in South Kalimantan following attention to the dot points listed above.

Understory pastures should ideally provide 400 to 500 kg per ha of forage (dry matter basis) prior to each grazing. For blocks with a history of grazing, up to 75% of the feed can be consumed over one to two days of grazing before the block is left to recover. Newly grazed blocks should not use more than 60% of the available

forage until the second year of grazing. Recovery will normally require 70 to 90 days to regain its previous yield of forage, with longer regrowth periods being necessary for heavily shaded blocks and during dry periods. Table 6 provides a guide to stocking rates for a range of conditions.

Plantations that are weed infested or are very heavily shaded will produce much less forage and may not support cattle production unless a large proportion of the necessary diet is provided as supplement. Reducing the stocking rate to low numbers of cattle is only partially effective as the density of forages is so low that grazing animals are unable to access sufficient feed each day. In addition, heavily shaded forages are low in energy and higher in moisture content than forages grown under less shade. Feeding large amounts of supplementary rations is unlikely to be cost-effective for a breeding operation. The growth of the naturalised under-story forages needs to be carefully considered prior to commencing a cattle breeding operation as this feed is the primary resource that supports low cost production.

Improved pastures: Where there is an opportunity to plant open (full sunlight) improved pastures, this should commence with the highest quality soils. With the right grass and legume mix, no additional protein or energy supplements should be needed although mineral supplements such as sodium (salt), phosphorus and sulphur may still be required. Good quality open pastures should be used for weaners, cows with low BCS and to rest bulls.

The most common grass species for these areas are the brachiarias, including signal grass (*B. decumbens*) and hybrids such as Mulatto. Lower fertility areas will generally be more productive with humidicola grass (*B. humidicola*), whereas wet areas do well with para grass (*B. mutica*). Legumes will generally struggle to compete with these vigorous grasses, particularly under heavy grazing pressure. *Desmodium heterophyllum* has generally been the most persistent of the creeping legume species in brachiaria pastures. It is also relatively tolerant of acid-infertile soils. Shrub legumes such as *Indigofera zollingeriana* and gamal (*Gliricidia sepium*) can also be persistent if care is taken to establish them thoroughly prior to planting of grasses.

If there are no open paddocks available, thought should be given to utilising roadsides and other areas of higher sunlight. Around 8% of the area in conventionally configured plantations (with 30 ha blocks) will generally have more than 50% light transmission because of the road network. These areas can add a small but important area of high-quality feed to the grazing resource.

More information on pasture production can be found in IACCB's cattle breeding manual.

Table 6: Yield and sustainable carrying capacity of various pastures and forages

Pasture / forage type	Presentation yield (kg DM per ha)	Annual forage production (kg DM per ha)	Sustainable stocking rate (ha/AU)
Open, improved pastures	3,000 – 5,000	15,000 +	0.4
Open native pastures	1,500 – 2,500	4,000 – 8,000	1.0
Newly planted palms (1 to 4 years old)	1,200 – 2,000	3,000 – 5,000	1.5
Young palms (5 to 8 years old)	600 – 1,500	2,000 – 4,000	2.0
Mid-aged palms (9-20 years old)	300 – 600	1,200- 2,000	4.5
Densely shaded mid-aged palms	<200	<1,000	NS*
Weed-infested mid-aged palms	<200	<1,000	NS*
Old palms	600 – 1,000	2,000 – 3,500	3.0

* Not sustainable

How much improved pasture is required? Improved pastures grown on moderately fertile soils will produce around 15 to 20 t of dry matter (DM) per ha per year. Thought should be given to which class of stock should have access to the improved pasture. For a well-managed enterprise, the improved pastures should be used for weaners. However, if the enterprise is struggling with low conception and calving rates then the pasture should be allocated to heavily pregnant and lactating breeders.

30 ha of open pastures would be sufficient to grow calves from weaning through to feeder weight. Weaners would enter the pasture at 100kg and be turned off at 320 kg liveweight. PKC should be provided at around 1- 2 kg per head per day, providing approximately 20% of diet requirements. Weaners grazing improved pastures with a PKC supplement will grow at 0.4 to 0.7 kg per head per day, averaging at least 0.5 kg over the entire period.

To achieve improved production and financial performance, an additional 30 ha of improved pastures would support a herd of 300 breeders, each of which spends 90 days per year grazing the improved pasture with the balance in the plantation. This assumes that breeders calve over a nine-month period throughout the year, have a weaning rate of 75% and are provided with a supplement of 2kg PKC per head per day. Breeders grazing open, improved pastures will be much better able to maintain their condition through the calving and lactation period than if they were grazing under palms. It is also easier to monitor calving when breeders are placed in an open paddock.

If the Siska enterprise includes a breedlot, a 10-ha area of intensively farmed king grass (*Pennisetum purpureum*) will produce the same amount of feed as 30 ha of open improved pasture. The king grass plot will produce around 50 t DM per ha per year – 500 t for the 10-ha plot – providing sufficient feed for approximately 150 breeders year-round. There are significant additional costs

involved in harvesting and feeding king grass that need to be considered, as the operation may not be economically viable unless logistical arrangements are conducted efficiently.

In summary, for each 300 breeders it is ideal to allocate 30 ha to open improved pastures to support early growth of weaners. Around 10 ha of king grass will produce the same amount of feed if intensively managed, but there are significant logistical costs associated with cutting and feeding.

Table 7: Cost of pasture development (open area)

Cost items	IDR per hectare
Land preparation	
Disc harrowing x 2	2,000,000
Chaining / harrowing	500,000
Planting and seeds	
Seeding using spreader & rolling	500,000
Signal grass 4 kg @ IDR 225,000	900,000
Legume mix (Centro, etc)	400,000
Hand planting <i>D. heterophyllum</i>	1,000,000
Fertilizer	
Cost of NPK fertilizer	1,300,000
Fertilizer application	200,000
Total pasture develop cost per ha	IDR6,800,000

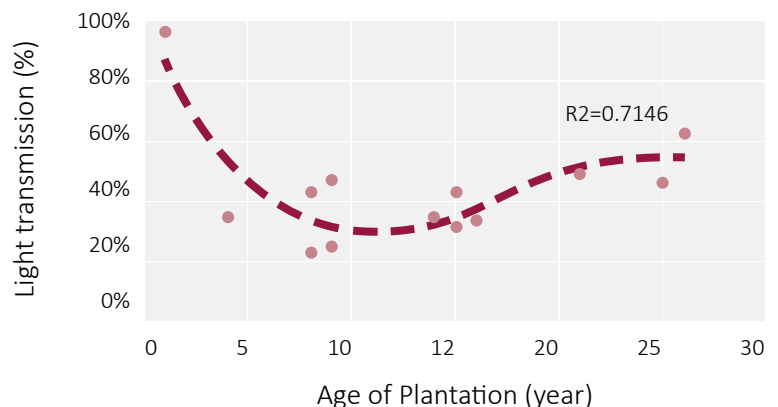
How much will improved pastures cost? Pasture development normally costs IDR 5 to 7 million per hectare (Table 7). Financial viability relies on successful pasture development within 6 months of planting and continued productivity of a 10-year period. Permanent fencing will cost an additional IDR 20 to 30 million for a 30-ha block. Annual weeding and fertiliser applications will be required in most cases, costing approximately IDR 2 million per ha per year. Where pasture development is conducted efficiently, returns of IDR 10 to 15 million per ha per year, after costs, can be generated.

Well-managed pastures can persist for several decades. In contrast, failed pasture development can be an expensive learning exercise. Pastures fail from poor preparation and planting, dry conditions following planting, inability to control the weed invasion that inevitably follows planting and excessive grazing before pastures have fully established. Over-grazing at any stage can lead to weed invasion.

Planting pastures when replanting oil palm: The oil palm replanting phase offers an opportunity to introduce improved pastures into the plantation. Typically, sunlight penetration will be sufficient to support growth of improved pastures for seven to eight years after planting. Given that cattle cannot be introduced until the palms are three years old, this leaves a relatively narrow window for grazing. However, if pasture establishment can be done at a very low cost it may be worthwhile.

Whilst IACCB has not undertaken trials with replanting, it is likely that a 1m wide strip of signal grass between the rows of palms would be sufficient, spreading over time without competing with the newly planted oil palm. Normal legume mixes of calopo (*Calopogonium muncunoides*), puero (*Pueraria javanica*) and centrosema could also be planted as per normal practice. *Calopogonium caeruleum* should be avoided as it is unpalatable to cattle.

Figure 2: Data from IACCB's research shows the heavy reduction in light transmission under 7 to 18 years old palms



Monitoring pasture availability and growth: It is important to develop an understanding of pasture yields so that grazing pressure can be matched to pasture availability. This can be done by implementing a regular monitoring program. Using 1m square quadrats, pastures should be sampled prior to and immediately after grazing⁵. In SSKA rotational grazing systems, grazing may occur over a period of one to two days in each block. Ideally, only about 60%- 75% of the pasture available should be grazed prior to removal of the cattle. This will avoid ingress of weeds and enable the remaining pasture to regenerate rapidly. Over-grazed pastures are susceptible to weed invasion and regrow very slowly.

⁵ A 1m² quadrat can be easily made from plastic conduit. Details on using a quadrat to determine pasture yield can be found here: <http://stocktakeplus.com.au/wp-content/uploads/2013/04/Yield-estimation.pdf>

3.4. Supplementary feeding

Supplementary feeding is standard practice in SISKAs systems due to the low quality and density of understory forages. Where plantations produce palm kernel cake (PKC), this will become a staple component of the diet. It should be fed out at least three times a week at a rate of around 2 kg per head per day, or around 20% of the diet. During extended dry periods, PKC can supply up to 50% of the diet. Palatability limitations will progressively restrict intake of PKC as the level of feeding increases above about 35%.

Solids (palm mill sludge) are also a valuable feed and can be fed at up to 10% of diet. Scouring is common at higher rates, with calves and weaners being particularly susceptible. Higher rates are possible if solids are dried prior to feeding. One of IACCB's partners was able to include up to 30% dry solids in the ration without negative impacts. As with any changes to diet, new ingredients should be added gradually to allow the rumen microflora time to adjust.

A large range of additional grains and agricultural by-products can be fed as supplements but will normally constrain overall profitability. Plantations should aim for a feed budget of IDR 3,000 per head per day, with a maximum upper limit of IDR5,000 per head per day. Once the feed costs exceed this limit viability is questionable. It may take one or two years for a new operation to achieve efficiencies in feeding and operation. During this period, welfare of the cattle should always be a priority.

High protein feeds for calves and weaners: Calves and weaners require high protein feeds to thrive. Soybean meal is commonly used as a creep feed as it is high in protein and palatability.

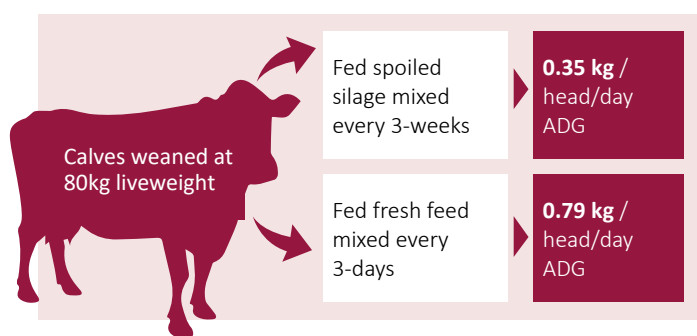
Providing creep feed for calves is an important method of ensuring their early growth. This is challenging to do in a plantation environment. Mobile creep feeders can be used but calves will need to be trained to use the feeder.

Care must be taken with ration preparation so as the best liveweight gains are achieved. Calves at a breedlot in Nakau were weaned in the kandang and fed good quality ingredients in a ration of silage and concentrates. However, the silage was spoiling as air had not been excluded during the preparation process. This led to partial rotting and reduced palatability of the feed. Calves weaned at 80kgs

liveweight grew poorly, with some initially losing weight (Figure 3). Over a 3-month period they generally averaged a growth rate of less than 0.35 kg per day – a very poor result.

Simply by mixing the same ingredients fresh every three days, so that there was limited spoilage, the intake of feed increased significantly and liveweight gains averaged almost 0.8 kg per head per day. The cost of gain in this case was extremely low, as the only additional cost was for more regular mixing of smaller batches of feed.

Figure 3: Pathways for weaners fed poor quality and good quality rations at an IACCB partner project

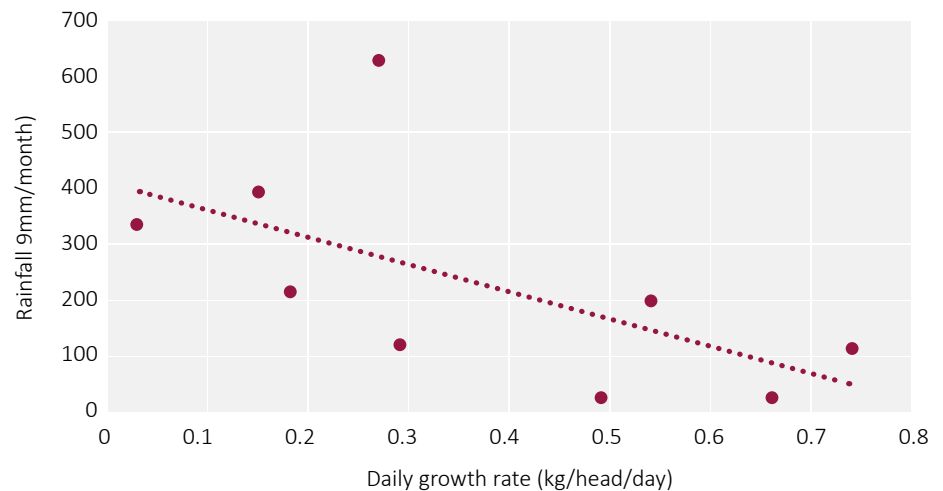


Liveweight gains will also decrease if ration ingredients are changed rapidly. This is particularly noticeable when ingredients with high oil contents are added. Changes to new diets should occur over a number of weeks so that the rumen microflora have time adjust to the new diet.

Impact of heat and humidity on daily gains: The combination of heat and humidity is well known to constraint animal production. Cattle need to maintain their core body temperature at approximately 39°C. In hot environments this is done primarily by evaporation, a process that is impeded by high humidity. Extended periods of heavy rainfall and high humidity commonly lead to suppression of appetite and reduction in growth rates. In addition, the dry matter content and energy concentration of forages decline in periods of very high humidity. Figure 4 shows the growth rates of BX cattle in South Kalimantan in comparison to the average daily gains of weaner and grower cattle. Whilst not a perfect correlation, it is clear that growth of cattle was generally best when rainfall was less than 250mm per month and decreased significantly when rainfall was above 300mm per month.

High humidity and low forage quality can be countered to some extent by providing high energy feed supplements so that cattle have a greater opportunity of achieving their normal rates of feed intake with a minimum of physical effort. However, daily gains will not be as high as during the drier months.

Figure 4: Impact of rainfall on growth rates of weaners and growers in South Kalimantan



Feeding urea: Urea

is a low-cost, non-protein nitrogen source and is commonly used as a protein substitute. Urea should never be available in concentrated, raw form. It should be mixed with other feeds at a maximum of 2% in the total ration. In addition, urea should be included gradually into the ration, commencing with around 25% of the desired final amount and increasing gradually over a period of 4-6 weeks. Seek professional advice when commencing a urea supplementation program. At one SSKA enterprise in Sumatra, urea was included in drinking water in large quantities. Cattle rapidly became ill. Of the nine head affected, three required emergency slaughter and the remaining cattle were able to be treated with and later returned to the herd.

Cattle can also die from consuming clumps of urea used to fertilise the oil palm. This can occur if the fertiliser program immediately precedes grazing and urea clumps have not yet degraded. Fertiliser application should always be conducted soon after the grazing round to avoid any risk of urea poisoning⁶.

⁶ Extensive additional information on supplementary feeding is provided in IACCB's cattle breeding manual in Section 2.9.

04 OPTIMIZING THE BREEDING ENTERPRISE

- 4.1. Minimising setbacks during the start-up phase
- 4.2. Growing the enterprise
- 4.3. Integrating breeding, growing, fattening
- 4.4. Selling cattle
- 4.5. KPIs and monitoring



4. Optimizing the breeding enterprise

4.1. Minimising setbacks during the start-up phase

IACCB's experience with commercial SISKAs operations includes four partner projects in Kalimantan and Sumatra. In all cases it has taken several years for the system to become efficient in terms of feeding and breeding outcomes. Breeding operations necessarily aim to produce calves that grow through to a saleable size. To achieve that outcome the operation needs to target conception, calving and weaning rates in the first instance. The IACCB partner enterprises suffered from a range of common setbacks in their early years that should be avoided if possible. These included:

- Lack of bulls ready to work at the time of arrival of the breeders: Bulls should be procured 3 months ahead of mating, so they have time to recover from transportation and adapt to the plantation environment. Select bulls that have a proven ability to service cows. A high proportion of the local bulls appeared to be inactive. This is unsurprising as they are selected based on appearance only, rather than on reproductive performance traits.
- Inadequate supplementation of newly arrived cattle: It is essential that good quality supplements are available so that heifers regain or maintain their condition to be ready for mating. Don't expect the understory pasture to be sufficient – it isn't. At a minimum there should be 2 kg/head/day of palm kernel cake available. There also needs to be an efficient method to provide the feed so that it can be delivered quickly and remain dry until consumed.
- Heavy calf losses significantly impact profitability: All projects experienced high calf losses in the first two to three years of operation. A high level of attention to heavily pregnant heifers and newly born calves cannot be overstated. Inexperienced stockmen tended to overlook incidences of screw fly strike and pneumonia, which rapidly kill untreated calves. Losses from dog attack were also significant at one location (see Table 4).
- Inadequate supplementation during dry periods: Most operations failed to plan for the amount of supplementary feed required for cattle during the dry season. Even short duration droughts of one to three months can greatly impact the feed resources and should be anticipated.
- Beginners' errors: All new operations will make mistakes. These can be costly and should be minimised by undertaking a high level of consultation and preparation prior to commencement. For example, one of IACCB's partners lost several breeders to urea poisoning when urea was mixed into drinking water.

Any new SISKAs enterprise will experience a range of challenges that will impact productivity and financial performance. It is crucial to be able to respond rapidly to challenges as they arise. Being part of a network of companies with SISKAs operations can be a valuable part of rapid learning and avoiding mistakes during the start-up phase.

4.2. Growing the enterprise

Commercial SISKAs herds need to be 500 breeders or more to achieve reasonable profitability. IACCB's experience is that it is practical to start with a herd of 300 breeders and grow the herd steadily, reaching 500 to 600 head by year 4 through a combination of heifer retention and additional purchases. Arrangements can be

made with Indonesian feedlots to purchase feeder heifers that arrive pregnant. Additional importation of breeders is the most probable option for enterprises wanting much larger herds.

4.3. Integrating breeding, growing, fattening

Beyond breeder numbers, many enterprises envisage establishing areas of open, improved pastures and / or a small feedlot so that the company can maximise profitability from its growers and proximity to local markets. It is also possible to incorporate breedlots to better care for breeders and calves if the plantation's management system is inadequate or if land resources are scarce.

4.3.1. Fattening growers in the plantation

Growers can be grown to slaughter weight in the plantation environment if provided with sufficient quantities of supplementary feeds. This would require a minimum of 25% of the daily ration to be provided as concentrate feed – generally a mix of PKC and high protein products such as copra meal or soybean meal. High quality cut-and-carry forages such as young king grass and Indigofera can also be used. Systems to efficiently feed out and keep the feed dry in wet weather are essential issues in long-term paddock feeding.

4.3.2. Incorporating a feedlot

Incorporating a feedlot increases the options for marketing of the plantation's progeny. It also makes it possible to purchase feeder cattle from elsewhere to fatten and sell, which may be necessary if the plantation is not producing enough of its own feeder cattle to fill the feedlot.

Feedlots require large quantities of feeds purchased at low prices. Most commonly feedlots are located close to sources of agricultural by-products that can be used as high-quality feeds and in easy access of markets for fat cattle. Feedlots located on plantations also need to keep these factors in mind by addressing two key questions:

- 1) What is their source of low-cost, high-quality feed rations (balanced high energy and protein)?
- 2) What is the market for finished cattle?

Assuming that positive outcomes are identified for these key issues there should be potential to establish a viable feedlot on the plantation. There are numerous texts and manuals covering the establishment and operation of feedlots in Indonesia, including MLA's publication, *Manual for Southeast Asian Cattle Feedlots*⁷.

4.3.3. Incorporating a breedlot Breedlots are an expensive option for feeding breeding cattle and should generally be avoided unless absolutely necessary. Breedlots are most commonly incorporated where insufficient land area is available for the grazing herd or where calf mortalities are high and additional supervision is required. Commercial enterprises that run breeders exclusively in breedlots are rarely financially viable. An exception is smallholder cooperative breedlots, where much of the labour input provided by farmers is not costed (Table 8). Where land shortages occur, options for paddock feeding of supplements should be investigated before incorporating a breedlot.

⁷ <https://www.mla.com.au/research-and-development/reports/2009/se-asian-feedlot-manual4/>

Table 8: Costs and returns for SSKA and breedlot production options

Enterprise type	Operational costs (IDR/hd/day)	Feed costs (IDR/hd/day)	IRR	NPV (Billion IDR)
SSKA 500 breeder operations	4,900	7,050	11.9%	18.8
Commercial breedlot ¹	>8,000	>15,000	<1%	
Commercial SSKA with breedlot ¹	>5,000	>10,000	<8%	
Smallholder breedlot 20 breeders	3,600	11,400	2.8%	0.2
Smallholder breedlot 50 breeders	2,500	11,400	5.6%	1.0

¹Data are based on IACCB's estimates of breedlot costs

Assuming that a breedlot is considered to be essential, every step should be taken to ensure that it is as efficient as possible. These steps include:

- Only use the breedlot for cows that are heavily pregnant through to two months post-calving or sick cows.
- Develop the lowest-cost ration possible that supports recovery of BCS.
- If cut forages are used in rations, ensure that these can be efficiently harvested, processed and fed out. This may include having forage banks in close proximity of the breedlot.
- Develop SOPs for workers so that labour costs are kept to a minimum whilst achieving good quality husbandry support.
- Ensure that good hygiene is maintained, including provision of clean water as poor hygiene or dirty water can result in calf mortality from diarrhoea and scouring.
- Ensure that cows don't lose condition in the breedlot!

Table 9: Markets and prices for various classes of sale cattle

Class of stock	Weight range	Market	Price/kg ¹
Bulls			
Mature bulls	400- 600kg	Qorban	65,000
Aged cull bulls	500-650kg	Abattoir	40,000
Young working bulls	500kg	Breeding companies	60,000
Grower bulls	150- 350 kg	SH ² fatteners	50,000
		Feedlots	45,000
Weaner bulls	100- 150kg	SH fatteners	75,000
Heifers			
Herd replacement			
Mature heifers	280- 340kg	Breeding companies	46,000
Culls heifers	280- 340kg	SH fatteners	46,000
Weaner heifers	100- 150kg	SH breeders	60,000
Cows			
Cull cows- low BSC	300- 400kg	Abattoir	40,000
Cull cows- fat	400- 550kg	Abattoir	40,000

¹Average prices as of 2020

²SH = smallholder cattle farmer

4.4. Selling cattle

The class of cattle able to be sold will depend on the capacity of the enterprise to fatten and the availability of markets. It is rarely possible to sell weaners at a profit. It costs a SSKA enterprise approximately IDR5.7 million to produce a 100 kg weaner⁸, but the sale value of the weaner is only IDR6.0 million (at IDR60,000 per kg liveweight). The same weaner grown to a weight of 320 kg liveweight can be sold at a profit of approximately IDR4 million. If the 320 kg feeder can be fattened to a weight of 500 kg in a feedlot, then an additional profit of IDR4 million can be generated.

Not all markets require a 500 kg cow, so it is essential for each enterprise to assess its market options. Brahman-cross cattle are well known close to the commercial feedlots in the big centres, but not elsewhere across Indonesia, only in the specific areas where feedlots are situated. This affects prices that can be achieved. In Bojonegoro, the traders of the local market offered very low price compared to crossbreed of Limousin/Simmental. Table 8 provides some potential markets and average prices for various classes of stock.

The Qurban religious festival market is a reliable, high-priced market. However, at some point this market will reach saturation. There is also a preference for smaller-framed cattle as the price per head is more affordable for local communities. Lighter cattle are also preferred in regional areas where few butchers have refrigeration. The whole carcass must be sold through the local “wet market” in a single day to avoid spoilage and associated financial losses.

Sales to feedlots and slaughterhouses are location dependent. Transport of cattle is generally expensive in Indonesia, particularly if sea voyages are required. These factors must be considered in determining revenue projections.

4.5. KPIs and monitoring

IACCB has developed a set of key performance indicators (KPIs) from which to benchmark the performance of SSKA operations. These KPIs provide essential information on the productivity and efficiency of the operation and underpin the record-keeping or monitoring and evaluation (M&E) system (Table 10). All business management software and financial viability assessment models will require data to produce results. Most of the KPIs listed below are typical of the data necessary to generate their reports.

Herd management software typically generates reports on the most important of these KPIs. The KPIs used in Indonesia are provided below for years 1 to 3 and for the longer term. Networking with other SSKA operations to discuss outcomes and issues is an essential part of the learning process. More details on KPIs and the establishment of a monitoring and evaluation system can be found in section 4.2 of IACCB’s cattle breeding manual.

⁸ Assumes 70% weaning rate and ADG of 0.35kg from birth to weaning

Table 10: KPIs for SISKAs operations in Indonesia based on IACCB experience

Performance indicator	Definition	Year 1 -3 benchmarks	Long-term benchmarks	Comment
Conception rate	Percentage of cows getting pregnant in a 12-month period	KPI >70% for SISKAs	KPI >80% for SISKAs	A high conception rate requires cows to be in good condition (BCS \geq 3.0) and working bulls or effective AI program
Still-birth, abortion rate	Percentage of pregnant cows that do not deliver a calf due to still birth or abortion in a 12-month period	KPI 5-15% for SISKAs	KPI 3-8% for SISKAs	Generally linked to condition of cows, but also impacted by extreme humidity or heavy rain
Calving rate	Percentage of breeders delivering a live calf in a 12-month period	KPI >70% for SISKAs	KPI >75% for SISKAs	The result of conception rate, less problems with abortion and birthing
Calf-mortality rate	Percentage of calves that has died in a 12-mth period	<8%	<3%	Related to the condition of calves and cows; the cleanliness of pens and water; seasonal factors such as intense rainfall; incidence of pests and diseases, dog attacks
Mature cattle mortality rate	Percentage of cattle that has died in a 12-mth period	KPI <5%	KPI <3%	Generally low for companies with good management- BCS \geq 3.0, capable stockmen, etc.
Weaning rate	Percentage of calves weaned per total number of breeders in a 12-month period	KPI >60%	KPI >70%	The result of calving rate, less calf mortality. Weaning at 100kgs/4-6 months old is recommended to reduce the calving interval
Calving interval	The average number of months between calves for each cow	16-18 months	14-15 months	The average number of months between calves for each cow in a stated period. Can only be determined for cows that have produced more than one calf
Weaner growth rates	Average daily gain (ADG) of weaners	0.35kg/day	0.5kg/day	ADG of weaners 100kg – 320kg expressed as kg/head/day
Feeder growth rates	Average daily gain (ADG) of feeders	0.5kg/day	0.6kg/day	ADG of feeders >320kg liveweight
Daily feed costs	Average daily cost of supplements/pastures	IDR5,000	IDR4,000	Will be low where cattle have good understory pastures & low-cost supplements
Daily operational costs	Average daily cost of labour for all cattle operations	IDR6,000	IDR5,000	Will improve as herd size grows and management & skill levels improve
Cost-of-gain	Variable costs to produce 1kg liveweight	Rp30,000 to Rp35,000	Rp20,000 to Rp25,000	Feed and labour costs required for a grower to gain 1kg

05 FINAL THOUGHTS ON
COMMERCIAL SISKA IN
INDONESIA



5. Final thoughts on commercial SSKA in Indonesia

The SSKA system of integrating cattle into commercial oil palm plantations holds significant potential for Indonesia, diversifying income streams for oil palm companies, reducing reliance on feeder cattle imports and going some way to addressing self-sufficiency ambitions. Not all of Indonesia's 14.3 million ha of oil palms will be suited to cattle integration, but even if 25% were suitable that could halve the current reliance on imported feeder cattle.

To achieve the potential financial returns, SSKA systems must be managed efficiently, with the cattle and oil palm components cooperating effectively and skilled staff appointed to cattle management.

The ability to feed weaner cattle through to a feeder size will greatly improve the profitability of a SSKA operation. To do this it is ideal to allocate around 30 ha of open improved pasture for every 3,000 ha of oil palm – 1% of the land area. Whilst not essential, an additional 30 ha of open improved pasture should also be considered for birthing calves if land is available.

Adding the capacity to fatten feeder cattle in a feedlot also has the potential to improve profitability but requires additional investment and capability and will be subject to availability of local markets or efficient supply chains.

Many oil palm plantations have been reluctant to commence cattle integration because of a perceived risk of elevated *Ganoderma* spread. *Ganoderma* is a significant disease of oil palm, causing palm death. Recent research has proven that commercially managed cattle are unlikely to impact *Ganoderma* infection and spread.

Government policy settings will be important to encourage the commercial oil palm sector to invest in cattle integration. Suggested actions include:

- Provision of financial incentives to oil palm and cattle breeding companies such as tax reductions, soft loans or competitive loan interest rates
- Ease of business licensing
- Conduct research to examine options for smallholder producers to collaborate with SSKA companies for mutual benefit.
- Support for appropriate capacity building initiatives to ensure there is a competent workforce with skills and capabilities to implement SSKA operations.
- Dissemination of information on SSKA- programs to build awareness and encourage investment are required.
- Improve the supply chains from major oil palm producing locations in Sumatra and Kalimantan to feedlots and slaughterhouses in Java, Lampung and South Sumatra.

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