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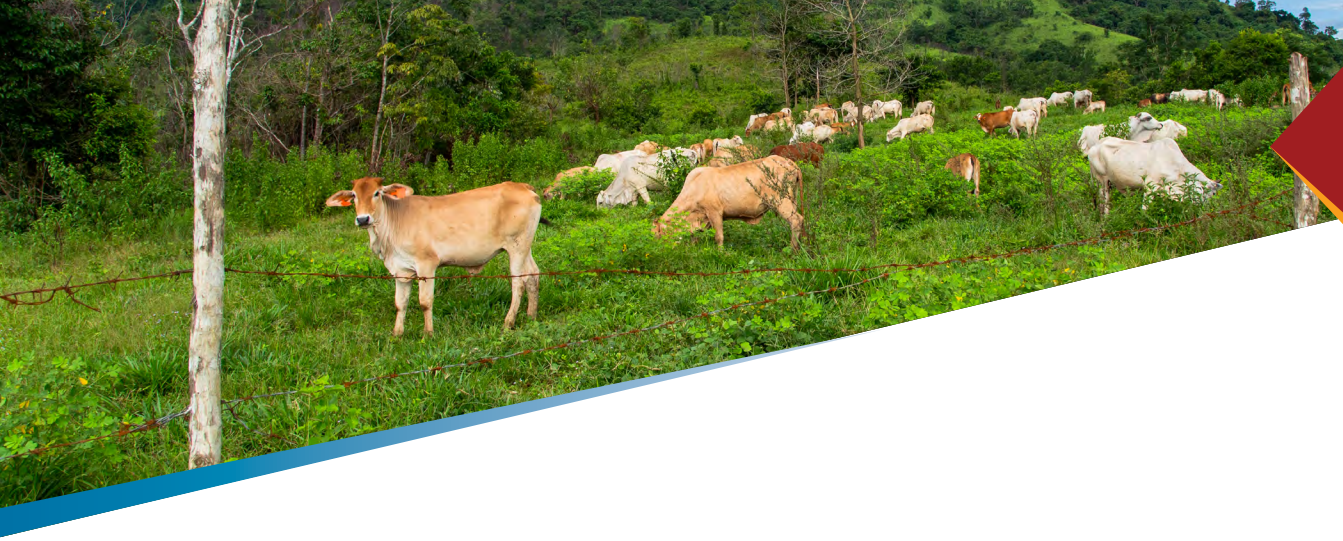
COMMERCIAL CATTLE PRODUCTION IN OPEN-GRAZING SYSTEMS IN INDONESIA

IACCB
Indonesia-Australia Commercial Cattle Breeding Program



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COMMERCIAL CATTLE PRODUCTION IN OPEN-GRAZING SYSTEMS IN INDONESIA

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01
INTRODUCTION

The open-grazing system of commercial cattle production refers to a system in which cattle directly graze native grasslands and improved pastures in a controlled manner. This differs from the communal open-grazing systems that are common in eastern Indonesia, in which cattle owned by numerous farmers graze a common grassland with no control over grazing pressure. Grasslands in communal grazing systems rapidly become over-grazed, weed-infested and degraded, as has occurred in vast areas of NTT. The open-grazing system discussed in this paper refers to a managed, commercial system whereby grazing pressure and cattle numbers are controlled, pastures are spelled to allow recovery when needed and weeds[1] are routinely eradicated before they become problematic. The key to managing grazing pressure is effective fencing to exclude cattle when necessary.

The open-grazing system relies on the availability if relatively large areas of grasslands that cannot be used for cropping or other more profitable land uses. Grazing pressures range from 1 animal unit (AU) to 10 ha in semi-arid rangelands, to 3 AUs to 1 ha in more fertile, humid-tropical locations with improved pastures. The Indonesia-Australia Commercial Cattle Breeding Program (IACCB) has undertaken applied research of open-grazing systems through a partner project in South Kalimantan – PT Cahaya Abadi Petani (CAP), where a community organisation has established a breeding operation on 120 ha of land. IACCB has also supported development of an open-grazing operation in West Java and has interacted with planned or active open-grazing operations in eastern Indonesia. This research and experience forms the basis of information presented here.

1 Weeds are defined as unpalatable plant species. Many weeds of cultivation are palatable to grazing cattle and are therefore not considered weeds of pastures and rangelands

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02

POTENTIAL FOR COMMERCIAL OPEN-GRAZING SYSTEMS IN INDONESIA

Commercial cattle breeding using open grazing systems use relatively large areas of land are relatively rare in Indonesia. Integrated production systems tend to dominate. Most commonly, these include cattle-oil palm integration, cattle-forestry integration (known as silvo-pastoral systems) and cropping-cattle integration with stall-fed kept in cropping areas.

The viability of an open-grazing venture relies on the land being of relatively low value and having no viable land-use options that are more profitable than cattle breeding. Ex-mining and ex-forestry lands in Kalimantan and Sulawesi are considered as having potential for cattle grazing as the soil is insufficiently fertile to support crop production. For Example, East Kalimantan has 140,000 ha of ex-mining land and a further 320,000 ha of land that is classified as "unproductive". A significant proportion of these lands could be converted to pastures for open grazing.

Rangeland areas in NTT and NTB also have potential for open-grazing but are generally already in use by local communities communally grazing cattle in subsistence production systems. Establishing commercial production systems in these areas would require fencing and exclusion of smallholder cattle, leading to significant disruption in livelihoods.

For more information on areas of Indonesia with potential for open-grazing systems see:

Unlocking Business and Investment Opportunities in Indonesia's Red Meat and Cattle Sector[2].

2 https://redmeatcattlepartnership.org/

2.1. Variations of the commercial open-grazing system

Permanent grazing systems

The simplest of open-grazing systems involves cattle being permanently based on grazing lands and returning to the central stockyard only once every 3 months or less. This system is widely practiced across Australia and parts of South America. It relies on stock having access to feed and water in the paddock, adequate fencing to control stock movement and sufficient security so that the risk of theft or injury to stock is minimal.

Cattle over-night in a central kandang

Most smallholder farmers using open-grazing systems take their cattle back to the stockyard or kandang each evening. With this system cattle can be watered and receive supplementary feeds in the kandang on a daily basis. It also reduces the incidence of cattle theft and enables daily supervision of cattle so that animal health issues can be managed promptly. Commercial systems can use the same method if security is an issue. There are limitations to implementation of this system, particularly where grazing paddocks are located at considerable distances from the kandang – in excess of 2 km. Stock expend considerable energy walking to and from the kandang, negatively impacting their body condition and growth rates.

Open grazing for breeders and / or weaners

Breeders can remain permanently at pasture where feed and water are available in sufficient quantity and security can be ensured. This can be a low-cost method of calf production as there is limited requirement to provide additional feeds and relatively low labour inputs. Calved can be weaned and grown through to feeder weight before being transferred to a feedlot for finishing.

Plantations or breedlots may wean calves onto good quality open pasture. This approach simplifies weaning as calves are generally moved to areas physically distant from their mothers. Weaners benefit from the small amounts of improved pastures that are commonly available in plantations whilst the breeders are maintained under the larger areas of palms.

03
THE OPEN-GRAZING PRODUCTION SYSTEM

3.1. Fencing – a key component in herd management

Rangelands across Indonesia are typically of low productivity, severely overgrazed and commonly experiencing weed invasion. This outcome is a result of uncontrolled grazing pressure. Without the ability to control cattle numbers and remove stock when required, pastures will become overgrazed and unpalatable species will begin to dominate. As unpalatable weeds spread even more pressure is placed on the remaining pasture grasses. Eventually the rangeland will become completely unproductive. Good quality fences and the positioning of watering points in the paddock are crucial to controlling stocking pressure.

3.2. Management of the production cycle

Cattle grazing open pastures will normally remain in the field at all times. Consequently, natural mating is more appropriate than artificial insemination for breeding. Bulls should be active and fertile and culled every few years to avoid in-breeding and to replace those that have a poor work rate. Ideally, bulls should be rested from the breeding herd every few months or to meet controlled mating requirements. Specific bull paddocks are commonly established for this purpose. Bull paddocks require secure fencing and water and the ability to provide feed supplements. For more on bull management see : http://iaccbp.org/investors/1/commercial-cattle-breeding-manual

Controlled mating in Indonesia aims to avoid calving in the peak of the wet season. In South Kalimantan that means avoiding the months of December to March. As the peak rainfall months can shift from year to year[3] the positive impacts of controlled mating will be reduced in less typical seasons.

Selecting bulls at CAP

CAP purchased 10 PO bulls that were initially very active, siring numerous calves. However, the PO bulls were aggressive, fighting each other as well as with BX bulls. Their body condition decreased quickly and recovered slowly, even when kept in an isolation paddock and fed with concentrate.

The fighting and slow recovery is a factor of poor temperament, an essential consideration in bull selection. Temperament always should be considered in bull selection, alongside genetics, libido and soundness.

Parasite management

Ecto-and endo parasite are commonly problematic in the humid tropics of Indonesia and need to be actively managed. At CAP there were high incidents of screw fly during the wet season. Intestinal worms and cattle ticks tended to be severe during and immediately following drought periods.

3 See IACCB's paper on impacts on rainfall on calf mortality: www.iaccbp.org

Cows with reasonable body conditions should be able to calve in the paddocks without problems. At CAP the only cows experiencing calving problems were those with body condition scores below 2 or those that calved during extremely wet weather. Stockmen need to be vigilant during peak calving periods to attend to issues promptly as they arise. Even minor delays in addressing calving issues often result in cow or calf death. Screw fly infections require immediate remedy as calves die quickly after being struck. Calves also struggle in boggy conditions common during intense wet seasons.

04
POTENTIAL OF NATIVE PASTURES.

Naturally occurring pastures can support modest growth of cattle if unpalatable species are eradicated. Native pastures at CAP in South Kalimantan produced approximately 3 t/ha of feed each year. Pasture growth slowed down dramatically in the dry season. If supplementary feeds are provided throughout the dry season then the pasture utilisation rate could be up to 60%. If no supplements are provided then the pasture utilisation rate should not exceed 40% of annual growth. Where there is a reliance on native pastures alone, then the long-term stocking rate will be approximately 3.0 ha per breeder. This should allow sufficient feed to be retained for moderate dry seasons.

Maximum production of palatable native pastures can be achieved by:

- Eradicating unpalatable weeds through use of selective herbicides or hand-weeding,
- Rotating cattle out of grazed paddocks to allow a recovery period to 2 to 3 months,
- Monitoring grazing pressure to ensure that pastures are never over-grazed,
- Supplying supplementary feeds to reduce pressure on pastures during dry seasons and droughts.

Pasture utilisation rate

The pasture utilisation rate is the proportion of pasture consumed by livestock within a grazing period – a grazing rotation, a season or a year. Given a presentation yield of 1,000 kg/ha, a 40% utilization would be 400 kg/ha. Cattle should be removed from the paddock once this much pasture has been consumed.

4.1. Opportunities to improve the pasture base.

The keys to achieving high rates of production in open grazing systems are the establishment of improved pastures and the ability to control grazing pressure. Improved pastures are commonly three to five times more productive than native pastures and have better nutritive value for ruminant production. If well managed improved pastures are also more resistant to weed invasion.

CAP undertook a pasture development program by planting Mulatto (*Brachiaria* hybrid) at 1.2 kg per ha and *Paspalum atratum* (cv. Ubon) at 1.2 kg per ha over a 30 ha area. The season was unusually dry resulting in slow pasture establishment. After six months the pasture was producing presentation yields of approximately 1.2 tonnes per ha (7.2 tonnes per ha annually). Once fully established yields increased significantly, doubling to around 15 tonnes per ha per year. These pastures can be grazed at higher utilisation rates than native pastures, although care is still needed to avoid over-grazing during dry periods. Pastures are susceptible to weed invasion whenever overgrazed. Carrying capacity of approximately 0.5 ha per breeder is achievable once improved pastures are fully established.

An earlier pasture development program at CAP involved planting to *Brachiaria humidicola* and hedgerows of *Gliricidia sepium*. Land preparation prior to planting had been done using a bulldozer with a conventional blade, resulting in considerable topsoil removal. The pasture was considerably less productive where significant scalping of topsoil had occurred. Use of a stick rake on the bulldozer, rather than a conventional blade, would have overcome this problem. The pasture was able to persist through periods of extreme over-grazing and drought and recovered in the subsequent wet season. The *Gliricidia* was only lightly browsed by cattle during the wet season but became more palatable as selection options diminished into the dry. Being a legume with good capacity to fix atmospheric nitrogen, the grass under the *Gliricidia* remained green and productive when sufficient moisture was available. The pasture produced annual dry matter yields of approximately 12 tonnes per ha and supported breeders in good condition when not over-grazed.

There are numerous legumes that are adapted to the acid-infertile soils of South Kalimantan, however seed is difficult to obtain and can be expensive. Legumes worth testing include *Stylosanthes* spp., particularly *S. guianensis* and *S. scabra*, *Puerario javanica*, *Centrosema pubescens* and *C. macrocarpum*, and *Indigofera zollingeriana*. Hedgerows of *Gliricidia sepium* should also be planted, particularly for its hardiness and ease of establishment. Pastures without legumes will need added nitrogen to maintain their productivity.

Native pastures can also be improved by the addition of legumes such as *Stylosanthes* spp. These can be broadcast directly onto the rangeland at the break of the season and will generally establish adequately as long as there is sufficient soil moisture and follow-up rain. Rolling with a heavy rubber-tyred roller or dragging an anchor chain after planting will further include establishment. Cattle must be excluded until the legumes are well-established.

Watch out of holes dug by artisanal miners!

Much of the land available for pasture development in Kalimantan is ex-mining land. Miners often dig deep holes in search of ore. As vegetation establishes the holes become difficult to see. There were 7 cattle at CAP that fell into holes dug by miners, resulting in the death of 4 head. Holes should be filled in or fenced off prior to cattle entering a paddock.

How much will improved pastures cost? Pasture development normally costs IDR5 to 7 million per hectare (Table 1). 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 30ha block. Annual weeding and fertiliser applications will be required in most cases, costing approximately IDR2 million per ha per year. Where pasture development is conducted efficiently, returns of IDR10 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.

Table 1: 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 *D. heterophyllum*	1,000,000
Fertilizer	
Cost of NPK fertilizer	1,300,000
Fertilizer application	200,000
Total pasture develop cost per ha	**IDR6,800,000**

4.2. Providing supplementary rations

The body condition of breeders and growth rates of weaners and growers will be improved by provision of protein supplements such as palm kernel cake (PKC). Palm kernel cake is now available in South Kalimantan and was provided at CAP as part of a regular supplement program and also as a drought feed. When pasture was plentiful breeders were provided with 1 to 2 kg PKC in the kandang each evening and maintained their body condition. As the dry season intensified and feed in the paddock became scarce breeders required 2.5 to 3.5 kg PKC per day to maintain body condition. It is more efficient to feed cattle in the paddock rather than having them return to the kandang each evening and CAP is investigating paddock feeding options for the immediate future.

4.3. Feeding supplements in the paddock

There are numerous options for feeding supplements and drought feeds in the paddock, rather than in the kandang. Cattle expend considerable amounts of energy walking to and from the pastures if they must return to the kandang each evening. Assuming that security and theft is not an issue, cattle should remain permanently in the pasture. Paddock feeders can be fabricated from local materials and filled as required on a daily basis.

Example of a paddock feeder. Homemade versions of paddock feeders can be constructed relatively cheaply.

4.4. Water points in paddocks

Grazing paddocks will need sources of water in each paddock. Water can be carted to the field each day, but this is expensive and time-consuming. Small dams should be constructed to collect from rainwater run-off in catchments. Weirs can be constructed in creeks to retain some of the flow. Dams can then be used to feed conventional water tanks if needed. Use gravity flow wherever possible to avoid the need for pumps.

Water troughs can also be used to draw cattle to specific areas within a paddock. This is a useful method of achieving a more uniform grazing pressure across large paddocks.

4.5. Planning for dry seasons

Despite having a humid-tropical climate, droughts common in Kalimantan and other parts of Indonesia. Significant droughts occurred in 1982, 1997, 2002, 2007, 2009, 2015 and 2019. In the context of the humid tropics, droughts refer to periods of little or no rain over a period of three months or longer. In South Kalimantan, consecutive months of less than 50mm rainfall per month will create drought conditions due to the regions free-draining soils and high temperatures. During the 2019 drought, IACCB's partners were forced to supply over 50% of daily rations using stored by-products such as palm kernel cake. Where companies have limited access to stored feeds, cattle can become weak and die.

Cattle producers need to plan for drought. What will the cattle be fed when rains fail and pastures don't grow? Plan for drought so that you are prepared when it inevitably arrives. This includes having:

- Reliable access to large quantities of stored feed
- Transport systems in place to move feed onto the property and to paddocks within the property
- Sufficient storage to manage large amounts of feed
- Systems to feed out rations in an effective manner without excess spoilage.

There are several options that plantations can take to get cattle through periods of drought. Whatever is to be done needs to happen quickly, as the condition of cattle and forage availability tend to deteriorate rapidly.

- ***Sell cattle:*** No operation should ever be feeding under-performing cattle, but this issue becomes critical during a drought. Cows that are infertile or have problems with calving or mothering as well as those that have poor temperament should be immediately culled, along with under-performing bulls.
- ***Plan to utilise "back" paddocks:*** Operations with excess land may have paddocks that are not normally included in the grazing rotation. These paddocks should be prepared for strategic use during droughts. In some countries, these can be less-accessible paddocks, often referred to as "back" paddocks.
- ***Store feed:*** Stored silage and hay is the most common method of getting through dry times around the world. It costs money to store feeds and quality is always lost in the storage process. Further, large amounts or stored feed will be needed to feed cattle through an extended drought – as high as 10kg dry matter per head per day. It is possible to make and store silage in humid tropical regions, but it is also difficult and spoilage can be significant.
- ***Purchase by-products as supplementary feeds:*** Indonesia is fortunate in having access to a range of by-products that are continuously produced. These include palm kernel cake, onggok (cassava waste), molasses and other agro-industrial wastes and by-products. Make sure you can access the quantities required to feed cattle over a minimum of three-months. Develop logistical systems to transport store and feed out the rations. Don't change rations quickly – cattle take time to get used to even the best feeds. Rapid changes in supplements and rations will result in decreased intake and liveweight gains. Gradually introduce new ration components over a period of weeks if possible.

Cull early – don't delay this decision!

If you wait until conditions are very bad to sell cattle, everybody else will also be selling and prices will be low.

05
INFRASTRUCTURE AND ASSETS

5.1. Sourcing cattle

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. With a rigorous selection program it would be possible to develop a relatively high quality Ongole herd, but this would take several years to achieve.

The alternative is to import Brahman cross (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 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. IACCB has proven that appropriately fed BX cattle will out-perform local cattle in growth and have equally good rates of reproduction. They are also commonly of better temperament as temperament is a trait that is aggressively selected for in Australia.

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 of the foetus 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 Indonesia[4]. IACCB's cattle breeding manual also provides additional information on cattle selection and management.

4 http://www.iaccbp.org/files/rpj3I-best-practice-guide-for-the-transport-of-cattle-in-indonesia.PDF

Avoid having breeders arrive in peak wet season: Some regions with potential for open-grazing operations are located in high rainfall environments. 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, extreme heat and high rainfall. Losses are more common under stressful environmental conditions, especially for pregnant heifers. Time the arrival of cattle to coincide with the driest months and ensure that sufficient feed and water is available.

5.2. Pens, yards and equipment

The requirement for infrastructure and facilities will vary greatly between operations depending on size and herd number. Some operations may have large yards with concrete troughs, steel rails and corrugated iron roofing while another may use wooden railings, atap roofing and plastic troughs. Any operation that will be based on imported stock under a government program must meet certain ESCAS[5] and OIE[6] standards for animal management.

Important factors for infrastructure and facilities include design standards and value for money. Value for money looks at the capital cost, the speed of depreciation or longevity of the structure, and the ease of management and labour costs. The establishment of all-weather access roads should be considered to facilitate efficient management.

Many operations have a centrally placed cattle yard to which all cattle are delivered and are then used regularly (every 60 to 90 days for one rotation) for weighing, drafting, weaning and animal health procedures. There are numerous designs of yards of varying complexity with plans available on the internet. It is best to seek local information for features that have been modified with experience under local conditions. The main yard should have sufficient area to hold the whole herd with a average area of 1.6 m^2/head (Table 1).

Additional side pens are required for holding sick or injured stock, for weaners and for selected classes of stock. http://iaccbp.org/investors/1/commercial-cattle-breeding-manual

Table 2: Area required per head for various classes of cattle

Class of cattle	Holding Yards	Forcing Yards
100- 300 kg	1.3m^2	0.6m^2
300- 500 kg	1.4m^2	1.0m^2
Over 500 kg	1.6m^2	1.2m^2
Cows & Calves	2.2m^2	2.2m^2

Source: http://www.nationalstockyards.com.au/standard-plans/

5.3. Fencing requirements

The ability to control stock movement and grazing pressure is absolutely essential in any grazing system. For this reason particular effort must be used in planning and erecting good quality fencing. Permanent fences should be used for all boundary fences and for special purpose paddocks for cows and weaners, bulls and paddocks adjoining the stockyard. Permanent fences are normally constructed of:

5 ESCAS is the Exporter Supply Chain Assurance System. See: http://www.agriculture.gov.au/export/controlled-goods/live-animals/livestock/information-exporters-industry/escas/auditor-standards-and-checklist

6 OIE stands for animal management can be found here: https://oldrpawe.oie.int/index.php?id=280

- Large strainer posts buried at least 600mm into the ground and supported by stays
- Four strands of barbed wire strained to a high level of tension between strainer posts
- Timber, steel or concrete posts positioned at regular intervals between strainer posts.

The most expensive component of a permanent fence is the barbed wire. – currently in the order of IDR10 million per kilometre for a four-strand fence.

In 2019 a permanent, barbed-wire fence was costed at IDR18 million per kilometre for a four-strand fence (Table 3). The advantages of permanent fences are that they do not need to be erected for each use and are long-lasting if properly constructed. Their disadvantages are that they cannot be moved and require regular maintenance.

Table 3: Cost of permanent barbed-wire fencing in 2019

Item	Cost/km fence
Barbed wire- 4 strands	IDR 10.0 million
Ties- 1 roll @ IDR 950,000/roll	IDR 0.95 million
Nails- 5 kg @ IDR 22,000/kg	IDR 0.11 million
200 posts @ IDR 15,000/post	IDR 3.0 million
4 strainer posts IDR100,000/ post	IDR 0.4 million
Labour (digging holes + pulling wire)	IDR 4.0 million
Total cost per linear kilometer	**IDR 18.46 million**

Electric fences are moveable and can be located within permanently fenced paddocks for additional control of stock and grazing pressure. Electric fencing usually consists of a powerful portable battery-powered energiser with a single wire supported on insulated fencing posts. Two wires may be used with new cattle unaccustomed to electric fencing. Tall grasses must be trimmed to avoid shorting and reduction of pulse and battery life.

Typical requirements for two adjoining 16ha paddocks are given below for electric fencing purchased in Indonesia in 2017 (Table 4). The dimensions of each paddock are 400m x 400m. This works out at a cost of IDR 2.8 million per hectare of fenced paddock. Fencing the same paddocks with electric fencing would cost IDR 1.8 million per ha fenced but as the disadvantage of being permanently located.

At CAP, permanent fences were erected around areas of improved pasture development, whilst electric fences were used to strip graze crop stubble and improved pasture paddocks. Electric fences are rarely sufficiently robust to control calves being weaned or hungry stock during severe dry seasons.

Table 4: Cost of electric fencing for two 16ha paddocks in 2017

Type	Quantity	Unit Price	Sub Total	Need	Reserved
Reel Geared Med with Stpd Trb Braid 400m	8	IDR 3,325,241	IDR 26,601,928	7	1
Tester Faultfinder Smartfix Int	1	IDR 2,246,759	IDR 2,246,759	1	0
Energizer B700	1	IDR 6,740,276	IDR 6,740,276	1	0
Solar Panel 40W with Mounting Kit	1	IDR 9,147,310	IDR 9,147,310	1	0
Lead Connector Single	10	IDR 192,138	IDR 1,921,380	8	2
Earth Rod and Clamp Galv 1.5 M	2	IDR 211,448	IDR 422,896	2	0
Reel Stand 900 M	10	IDR 959,724	IDR 9,597,240	8	2
Treadin Steel 875 MM PK 10	30	IDR 728,966	IDR 21,868,980	28	2
Battery 12V100Ah (VRLA)	1	IDR 2,800,000	IDR 2,800,000	1	0
		Sub Total	IDR 81,346,769		
		PPN 10%	IDR 8,134,677		
		Total	**IDR 89,481,446**		

06

KEY PERFORMANCE INDICATORS (KPIS) AND BENCHMARKS

6.1. Production KPIs

Production KPIs and quality factors are inherently linked. Providing appropriate supplementary rations assists in maintenance of the body condition score (BCS) of breeders. Correct BCS supports high conception and calving rates. Effective weaning leads to high weaner ADGs and so on.

IACCB has developed benchmarks for each of the crucial KPIs. These benchmarks will take two to three years to be achieved but are possible based on experience among IACCB's partners. For example, our partners were able to achieve weaning rates of approximately 65% and weaners achieved ADGs of approximately 0.45 kg. These are good results for a new breeding operation. Ideally weaning rates should improve to approximately 70% or higher with good management and experience.

KPIs were lower than benchmarks at CAP due to financial constraints, a severe dry season in 2018 and the limited initial knowledge of management and staff. Outcomes are steadily improving as seasons, skills and knowledge improve.

6.2. Benchmarks

IACCB has developed a set of key performance indicators (KPIs) from which to benchmark the performance of open-grazing 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 5). 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 business and herd 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 open-grazing 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.

Table 5: KPIs for Open-grazing 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%	KPI >80%	A high conception rate requires cows to be in good condition (BCS≥3.0) and working bulls
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 5-10%	KPI 3-8%	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 >60%	KPI >70%	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; availability of clean 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 ≥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	16-20 months	15-18 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	IDR4,000	IDR2,500	Will be low where cattle have good quality improved pastures & low-cost supplements
Daily operational costs	Average daily cost of labour for all cattle operations	IDR2,300	IDR2,500	Will improve as herd size grows and management & skill levels improve
Cost-of-gain	Variable costs to produce 1kg liveweight	Rp22,000 to Rp30,000	Rp15,000 to Rp20,000	Feed and labour costs required for a grower to gain 1kg

Based on the outcomes achieved by CAP, the total cost of producing a weaned calf was approximately IDR 4.35 million. The total cost of producing feeder cattle averaging 320 kg live weight was approximately IDR 7.33 million (Table 6). A liveweight of 320 kg can be achieved within 17 months after weaning (assuming calves are weaned at 4 months old at 100 kg). It is therefore possible to produce feeder cattle at **IDR 22,900** per kg liveweight at CAP. The average cost of a feeder steer imported from Australia was IDR 40,000 to IDR 45,000 per kg in 2019, and up to IDR50,000 per kg in 2020. Even using the lower cost range for Australian cattle (IDR 40,000/kg), the feeder production cost at CAP is **43% lower** than for imported cattle.

Table 6: Actual weaner and feeder production costs and KPI outcomes at CAP to mid-2020

Cows' Costs		
Feed costs (hd/day) - Cows	IDR	4,000
Operational costs (hd/day)	IDR	2,300
Sub-total Daily Costs /hd	IDR	6,300
Calving Rate		53.9%
Calves Mortality		2.1%
Total Daily Costs /hd - Cows*	IDR	11,930
Weaner Cost (100 kg)	IDR	4,354,450
*incl. the costs' calculation of non-productive cows and calves mortality		
Calf weight at weaning (kgs/hd)		100 kg
Grower weight gain (kgs/hd/day)		0.43 kg
Target weight at sale		320 kg
Months required (Weaning to sale)		17 mths
Growers' Costs		
Feed costs (/hd/day) - Growers	IDR	3,300
Operational (/hd/day) - Cows + Growers	IDR	2,300
Sub-total costs to weaning (/hd/day)	IDR	5,600
Grower mortalities		3.6%
Total Daily Costs (/hd/day) - Growers	IDR	5,810
Rearing Costs from Grower to Feeder /hd (320 kg)	IDR	2,972,600
**incl. the costs' calculation of grower mortality		
Total Feeder Costs /hd (320 kg)	IDR	7,327,050

CAP struggled in its start-up period due to inexperience in cattle breeding and a lack of funds for critical supplementary feeds. The calving rate of under 54% that was achieved is well below expectations. As CAP gains experience the calving rate is rising steadily and should exceed 70% over the next two years. This will effectively reduce the cost of producing weaners and feeders.

6.3. Cost of Gain

All production cattle breeding operations should be considering what can be done to achieve the highest rate of daily liveweight gain for calves, weaners and growers at the lowest cost. Feeding very high-quality rations to these cattle may produce very high ADGs but may not provide the greatest profitability due to the cost of the ration. Conversely, feeding very low-cost, low-quality rations will result in very low ADGs, long durations to reach sale weights and low overall profitability. For each operation there will be an optimum supplementary ration depending on the quality of the plantation pastures and the cost and availability of supplementary feeds. Feed by-products produced in cropping areas, such as maize stubble and rice bran, and feeds produced in plantation areas, such as PKC and sludge are likely to give low cost liveweight gains. Small amounts of very high protein rations, such as soybean meal can boost ADGs at relatively low cost, as low as there are good quality roughages provided as the base feed. The services of an experienced ruminant nutritionist should be engaged to achieve the right ration to deliver the desired ADGs and the lowest cost.

07
FINANCIAL CONSIDERATIONS

7.1. Start-up costs, cash flow requirements and financial results for various herd sizes

CAP is a very small enterprise by normal standards for a commercial cattle breeding operation. It provides useful information for a small operation but better financial outcomes could be expected for a larger operation. Using IACCB's financial modelling tool, CALFIN, three scenarios of breeder size and rate of scale up were predicted. The scenarios were:

1. Organic 200 - Initial purchase of 100 breeders and organic herd growth to maximum 200 breeders. All heifers were retained for herd growth to 200 breeders apart from 5% that were culled for poor genetics. The target breeder population was reached in Year 4.
2. Organic 600 - Initial purchase of 100 breeders and organic herd growth to maximum 600 breeders. All heifers were retained for herd growth to 600 breeders apart from 5% that were culled for poor genetics. The target breeder population was reached in Year 6.
3. Organic plus purchase 600 - Initial purchase of 100 breeders plus an additional 200 breeders purchased in Year 4 and organic herd growth to maximum 600 breeders. All heifers were retained for herd growth to 600 breeders apart from 5% that were culled for poor genetics. The target breeder population was reached in Year 4.

Table 7 provides outcomes of the modelling.

Not surprisingly the Year 1 capital and operating costs were higher for an initial herd of 200 breeders compared with 100 breeders. The major cost of start-up is the cost of cattle. Scenario 3 also required significantly more investment in Years 2 to 10 due to the purchase of an additional 200 breeders in Year 4. The larger herds would also require larger investment for stockyards, fences and water and feed infrastructure. Operating costs were higher due to addition labour, feed and animal health inputs.

The total herd size at year 10 including all breeders, calves and growers ranged from 463 head for Scenario 1 to 1,341 head for Scenarios 2 and 1,401 head for Scenario 3. The large herd size required that more pasture area was required for Scenarios 2 and 3. Our estimates are that approximately 400 ha of native pasture and 200 ha of improved pasture would be required for these herds assuming that most of the feed base is to come from the pasture. Lower areas would be acceptable if significant amounts of feeds were to be provided as supplements.

Scenario 1 produced an internal rate of return (IRR) of 12.8%, whereas the larger herds produced IRRs of 14.2% and 15.5% for Scenarios 2 and 3 respectively. These are all good rates of return by industry standards. The net present value (NPV) of the investments was substantially higher for Scenario 3 than for the other Scenarios. This is an important consideration for investors as all three scenarios require a high level of skill and commitment. If the skill and commitment is present then higher returns will be achieved for larger breeder herds.

All three scenarios generated positive cash flow in Year 3 and had an investment payback period of 10 years. Investment in cattle breeding is long-term by nature and the long payback period can rarely be avoided. The time to positive cashflow and payback can be improved by purchasing pregnant, rather than dry heifers, although this involves some additional risk (see Section 5.1 for more details on risks).

Table 7: Costs and returns for three scenarios of open grazing cattle production in South Kalimantan

Scenario	Scenario 1: Organic 200[1]	Scenario 2: Organic 600[2]	Scenario 3: Organic plus purchase 600[3]
Initial No. of breeders	100	200	200
No. breeders purchased Year 4	0	0	200
No. of breeders at Year 10	203	618	603
Total cattle population at Year 10	463	1,341	1,401
CAPEX Year 1 (IDR million)	3,195	5,800	5,800
OPEX Year 1 (IDR million)	453	800	800
CAPEX Years 2 to 10 (IDR million)	830	2,348	7,041
OPEX Years 2 to 10 (IDR million)	8,129	19,044	22,802
Positive Cash Flow (years)	3	3	3
IRR at Year 10	12.8%	14.2%	15.5%
NPV at Year 10 (IDR million)	820	2,618	4,233
Pay Back Period (years)	10	10	10

[1] Initial purchase of 100 breeders and organic herd growth to maximum 200 breeders
[2] Initial purchase of 100 breeders and organic herd growth to maximum 600 breeders
[3] Initial purchase of 100 breeders plus addition 200 breeders purchased in Year 4 and organic herd growth to maximum 600 breeders

7.2. 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 an open-grazing enterprise approximately IDR4.35 million to produce a 100 kg weaner, so if a sale value of IDR6.0 million (at IDR60,000 per kg liveweight) a small profit of IDR1.65 million will be generated. The same weaner grown to a weight of 320 kg liveweight can be sold at a profit of approximately IDR5 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. The ability to produce a feeder will depend on the amount of improved pasture available.

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.

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.

08

FINAL THOUGHTS ON OPEN GRAZING CATTLE BREEDING SYSTEMS IN INDONESIA

The open-grazing cattle breeding system holds significant potential for Indonesia but is limited by the availability of large areas of low-cost land of reasonable quality for pasture development. Ex-mining lands hold the most significant potential as they are available in relatively large areas and are often unused. Soil remediation will be required in areas where topsoil has been removed.

Without question, the key to achieving high financial returns from open-grazing cattle breeding systems is the ability to develop productive improved pastures. With sufficient areas of improved pastures it is possible to produce good quality feeder cattle with little or no supplementary feeds at very low cost per kg liveweight. Added to this is the need for good quality management in all aspects of production. Management constraints become rapidly apparent during severe dry seasons as was experienced in Kalimantan in late 2018.

Government policy settings will be important to encourage the investment in open-grazing cattle breeding systems. Suggested actions include:

- Provision of financial incentives to companies to develop ex-mining leases for cattle breeding - tax reductions, soft loans or competitive loan interest rates.
- Conduct research to examine options for smallholder producers to collaborate with cattle breeding companies for mutual benefit.
- Technical assistance for development of open grazing ranches and pasture systems as there is limited expertise within Indonesia .
- Support for appropriate capacity building initiatives to ensure there is a competent workforce with skills and capabilities to implement open-grazing cattle breeding operations.
- Dissemination of information on open-grazing cattle breeding systems to build awareness and encourage investment.
- Improve the supply chains from potential production locations in Kalimantan, NTT, NTB and Sulawesi to feedlots and slaughterhouses in Java, Lampung and South Sumatra.

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