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Introduction Superior Bulls and Feed Bank Enhancing Sustainability of Wanaternak Programs in Indonesia

Dicky Pamungkas
Researcher, Department of Beef Cattle Research Institute,
Indonesia Agency of Agricultural Research and Development, Indonesia Ministry of Agriculture, Indonesia
Aryogi
Researcher, Department of Beef Cattle Research Institute,
Indonesia Agency of Agricultural Research and Development Indonesia Ministry of Agriculture, Indonesia
Lukman Affandhy
Researcher, Department of Beef Cattle Research Institute,
Indonesia Agency of Agricultural Research and Development Indonesia Ministry of Agriculture, Indonesia

Abstract:
Over the past 20 years, the Wanaternak program in Indonesia has been rolled out with a forest land use scheme in a synergy and integrated with beef cattle development. There is still not much information and data that reports on the progress of this program, especially in terms of developing and increasing livestock populations in a forest area. The concept of cattle management in forest areas is through nutritional and reproductive aspects, namely the cow calf operation through semi-intensive and / or grazing, which relies on feed from forest vegetation. The target of the beef cattle breeding pattern is to produce calves, so it requires the implementation of technology on how cows can get pregnant and produce healthy calves. In order to produce good offspring, of course, an effective and efficient mating pattern is needed, in this case the natural mating pattern using superior bulls is a strategic matter, especially in areas that are difficult to reach by inseminators. On the other hand, the quantity and quality of feed are the main factors in supporting livestock productivity. Development of a feed bank, which is one of the alternative strategies for meeting the maintenance and livestock production throughout the year. The concept of developing a feed bank in an animal forest area, takes into account: (1) decreasing availability of forage, primarily the animal feed supply from existing forest vegetation, (2) optimal utilization of silvo-pasture, (3) regulating grazing patterns, (4) introduction of legume or grass that is resistant to trampling and inundation, (5) area carrying capacity index, (6) processing manure into organic fertilizer for food, estate and forest plantations. This paper is prepared as a concept of livestock management in the practical management aspects of mating and provision of feed that supports sustainable development of Wanaternak in Indonesia.

Keywords: *Integration, forest area, cow calf operation, bull, feed management*

1. Introduction

Forest products and their derivatives have been widely used by humans, but in their use, they sometimes ignore the values of sustainability and tend to overexploit natural resources, causing natural damage, especially from an ecological perspective. One solution to this problem is to apply a forestry agricultural system or what is known as silvopasture land management. that is, a form of agroforestry that combines tree planting with forages and livestock production. The benefits of implementing the silvopastura system include reducing the cost of fertilizers, the presence of livestock to prevent fires and stimulate the growth of legume seeds. The application of Wanaternak in Indonesia needs to be developed in view of the community's need for forest resources and high animal protein. The need for animal protein in Indonesia is an average of 46 g / person / day and the total need for Indonesian people is 4.38 tons / year. This is a good opportunity and prospect to implement Wanaternak. Wanaternak development can also be a solution to the problem of other forest resource needs, especially the need for industrial timber. In Indonesia, Wanaternak has not been widely applied, so it requires knowledge and skills in analyzing, planning, monitoring and evaluating Wanaternak activities. In its development, the factors of knowledge and analytical ability are needed so that simulation tools are needed in the form of designs that are able to describe the potential and solutions to problems. The concept of Wanaternak development is a policy that has been developed since the 1970s by the Indonesian government; namely by allocating around 435,680 ha of forest land [20] to be used as a livestock area with a target livestock population of around 600,000 cows.

[19] reported that the total area of industrial forest plantation (HTI) was 11,178,601.45 Ha. If a reference was made to the Minister of Environment and Forestry Regulation Number P.12 / MENLHK-II / 2015 which states that 20% of the concession area must be submitted to the community for life plants which in this case can be implemented with an agroforestry pattern or with a silvopastural pattern, then the total forest area that can be used for livestock development is 2,235,720 hectares. If this is implemented in HTI areas, HTI forest areas in Indonesia can support cattle production of up to 1,319,074 heads. A study conducted by [5] in a shelter belt forest area bordering an industrial forest area, states that the carrying capacity of the forest area for cattle development using a silvopastural pattern is 0.59 cattle per hectare. Within the optimum scheme, the area of plant life in the HTI area can supply beef as much as 129,709,022 kg. This means that it can supply 1.97 percent of the 6.6 million tons of national meat needs in order to achieve meat self-sufficiency. The scheme above, of course, only uses 20% of the HTI area which is managed silvopasturally. However, if the silvopastura system can be developed with other options such as communities being allowed to graze livestock under production forest stands or they are allowed to extract animal feed from forest areas as is the case with many oil palm plantations, then the potential for beef production will increase.

On the other hand, the trend of increasing beef cattle population has not been able to meet the demand for domestic beef consumption. The indications include an increase in imports of frozen beef by 24.46% or 493,726.38 tonnes in 2016 to 614,470.78 tonnes in 2018. The problems faced in the livestock sector in Indonesia include low productivity and genetic quality of livestock, so that it has not able to meet the needs of going to be needed. This situation occurs because most of the livestock in Indonesia are still conventional farms [3], which do not pay attention to several aspects, such as quality of breed, the use of technology, and low skills of breeders. [11] reported that financially, the pattern of keeping cows in captivity is less profitable than those being herded. However, cattle that are grazed wild in the forest will have an impact on plant regeneration and reduce the growth of plant crowns. So, what is needed now is how we can regulate the pattern of raising cows that are kept in forest areas without disturbing the forest plants and the production process of the mother plant. Several alternatives / solutions, namely by implementing an effective cow calf operation with communal or group maintenance; where the role of superior bulls is required to be able to produce quality breeds. On the other hand, what is no less important is the availability of adequate and quality feed. The pattern of providing the feed can use a feed bank system, or provision of natural feed-based feed that grows in forests, and / or planting animal feed crops, in the form of legume plants or grasses. Another opportunity was to provide crop residues, such as corn straw, rice straw or peanut straw and its were storage in a feed bank.

2. Methods

The research used a descriptive approach and was analyzed qualitatively to describe the potential and opportunities of management act in forest areas was through nutritional and reproductive breeding system approach, namely the cow calf operation through semi-intensive and / or grazing, which relies on feed from forest vegetation. The target of the beef cattle breeding pattern is to produce calves, so it requires the implementation of technology on how cows can get pregnant and produce healthy calves.

In the breeding business pattern associated with the development of silvo pasture and increase animal population, the introduction of bulls is very strategic. In a herd, the male and female balance is at a ratio of 1: 30 or 1: 50. Or even under controlled conditions, the ratio can be as high as 3: 100. This depends on the capacity or area of grazing provided and the quality of the bulls.

The pattern of providing feed depends on the existing conditions; whether the animals will be grazed continuously or combined with the cage (simultaneously). If animals are grazed continuously, then what needs to be considered is the arrangement of the grazing pattern (usually with a rotation pattern), and by regulating the type of vegetation to be planted, or the existing natural forages. The role of the feed bank becomes very prominent when the availability of feed decreases during the dry season. A feed bank can be established permanently in a location, or it can be provided semi-permanently, following a grazing pattern.

3. Results and Discussion

Cattle raising in forest areas has long been practiced in Indonesia, especially in close to the forest areas or protected forest areas, namely National Park as such at Situbondo district of East Java and other areas such as production forests in Java, Kalimantan, Sumatra and parts of Sulawesi. The livestock rearing system in forest areas is carried out with a grazing model both in industrial forest areas or taking feed from forest areas [19]. There are many Banteng (*Bos sondaicus*), namely the e*x-situ* conservation areas which were in Meru Betiri, Baluran and Ujung Kulon. They were identical to Bali cattle [17], thus, this model can be used for the development of profitable beef cattle as long as it is necessary to limit the number of cows being herded so as not to damage forest sustainability [11] or adapted to potential land such as dry land, rice fields, and plantations [18].

In order to produce good offspring, an effective and efficient mating pattern is needed, in this case the natural mating pattern using superior bulls is a strategic matter, especially in areas that are difficult to reach by inseminators. The role of inseminators was common in intensive area of beef producers (cut and carry system) who implemented the insemination. On the other hand, the quantity and quality of feed are the main factors in supporting livestock productivity. Development of a feed bank, which is one of the alternative strategies for meeting the maintenance and livestock production throughout the year.

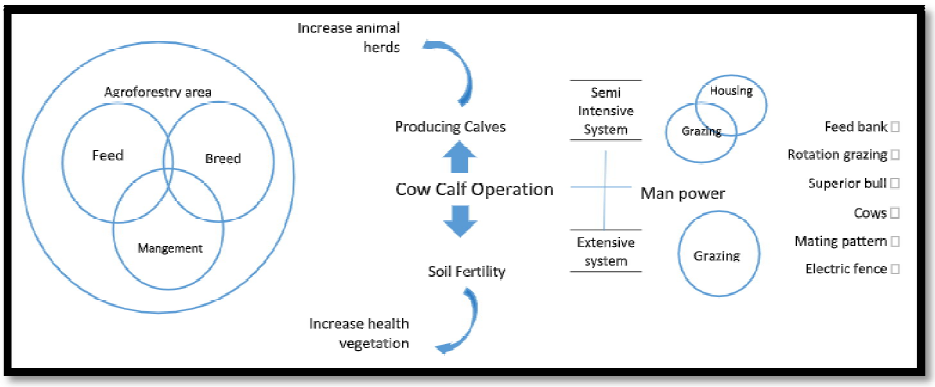

Figure 1: Managing Animal Production in the Forest

3.1. Introduction the Superior Bulls

In cow calf operation, the role of the male cattle is very important for mating and resulting pregnant and calf delivery by cows. In one grazing area, the reproductive status between each cow is not the same; so that the appearance of reproductive activity becomes different, for example a female shows symptoms of oestrus by climbing another female or by appearance the specific mucus from the vaginal part. This indication should have been caught by the bull for mating and so that pregnancy can occur.[4] reported that herd bull selection is a major cost for cattle breeders. Costs per calf are increased by lowered bull fertility, reduced cow fertility and by bull deaths. In pastoral areas which are extensive or which have numerous watering places, bull selection costs are exacerbated by the need for higher bull percentages. Bulls have a major influence on the future performance of the herd. Asuperior bull can increase performance and decrease risk; while a poor performance bull can adversely affect future production and increase the risk as a farmer.

In order to increase number animal and animal genetic improvement of local cattle in East Java, since 2019 we had introduced 25 head of Pogasi bulls (selected breed of Ongole grades) to farmer groups who existed in area's which closed to Baluran National Park atSitubondo district, East Java. Animals were raised in semi-intensive systems and they were grazing from 10.00 am up to 4.30 pm then were put in captivity over the night. The performance of bull distributed in the Baluran forest area was the result of the selection process in BCRI. The parameter reproduction observedwhich based on liveweight were illustrated in Table 1[1].

Parameters	**Liveweight (Kg)**				***P***
	170 - 210	**210-250**	**250-290**	**250-330**	
Sperm concentration (10^6 /ml)	92.5	300.0	568.0	370.0	<0.05
Live sperm (%)	21.2	66.0	59.80	75.7	<0.05
Libido score	+	++	++	+++	Na.

Table 1

+++ (Kissing, Mounting / Up, and Penis Out); ++ (Kiss and Penis Out); + (Smell) and - (No Response at All)

The bulls used as calves mu.st have good libido and semen quality as well. The criteria as follows [8]: (1) Animals were come from outside the natural male service area, (2) the age was at least 2.5 years (fixed series teeth 1-2 pairs / I1-I3), (3) Having an initial body weight more than 300 kg and height over than 140 cm, (4) Animals were healthy and free of reproductive diseases (*Brucellosis, Leptospirosis, Enzootic, Bovine Leucosis and Infectious Bovine Rhinotracheitis*), (5) Color of coat according to the typical breed. There were efforts to produce good sperm quality, namely by giving herbal supplements. [2] reported that by administering moringa oliviera, eggs, and honey, the bull sperm of Ongole grades was meet the minimum standard of motility of 70%, as shown in Table 2.

Parameters	**Value**
Motility (%)	75.5 -77.3
Concentration (10^6 /ml)	1,048 - 1,522
Viability (%)	74.5- 89.0
Abnormality (%)	4.3 - 7.0

Tabel 2: Sperm Quality of Bull Fed by Herbs Supplementation

3.2. Mating Management

One of the indicators for the success of a beef cattle business, especially a breeding based on forest area utilization, is how to manage a cow's mating to not only be able to produce calves, but also to produce quality calves in a business pattern with minimal / limited input requirements. Availability of good and sufficient bulls, as well as the existence of a feed bank as feed for cow feed is absolutely necessary.

Normal joining ratios of bulls to females are 3% (one bull to 33 cows)where bulls have been fertility tested and known to be in good working order[9]. Where fertility testing is not available or where bulls are known to be under stress (heavy reproductive activity, weight loss, nutritionalstress, harsh weather), a higher percentage of bulls would allow some to be rested and so recover their body condition – around 5% (one bull to about 20 cows).

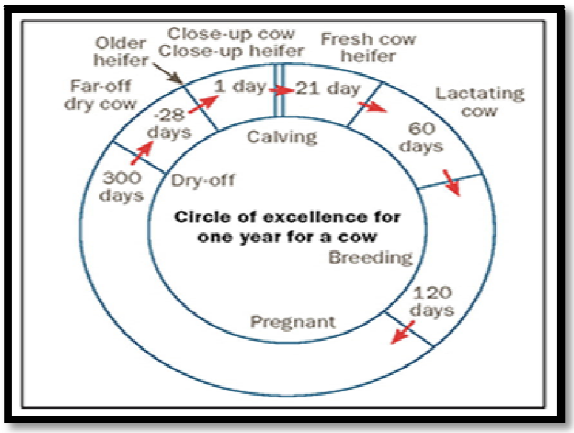

Figure 2: Circle of Excellence for One Year One Calf of A Cow [10]

3.2.1. Cow Calf Operation

Cattle may permanently graze in the fields or they may graze during the day but return to a barn at night. Byproducts and other rations can be fed to the cattle permanently in the field or when the cattle are in the barn.Management of (semi) extensive breeding of beef cattle business by grazing in forest areas, requires arrangement of parent marriage and maintenance of cows and calves until they are weaned off.

The pattern of raising cows that are released or herded in forest areas, causes most of the time and daily activities of cows to be in forest areas[11]. Conditions that have so far occurred in several locations where beef cattle are raised based on being grazed in forest areas: cows mating will occur as long as the cows are in the forest area with makeshift bulls in the area and at that time; birth, growth and even the chance for pre-weaning calves to survive or die, are more affected by natural conditions in the forest area; The speed at which the cows experience postpartum an oestrus (the cows experience their first return to lust after giving birth) is also greatly influenced by the condition of the forest area and the presence of bulls.

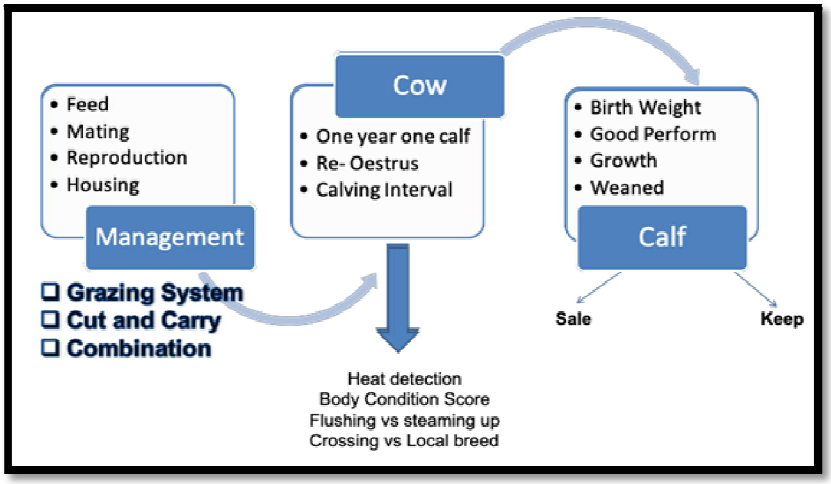

Figure 3: Critical Point in Cow Calf Operation

Cows who are pregnant for 8 months until later suckling their calves for at least 3 months need more and more complete nutrient intake. Adequate intake of these nutrients is needed to prepare cows for calving until at least the first three months of calf feeding. Lack of nutrient intake experienced by a pregnant cow will increase the likelihood of abortion, or a cow that is lactating her calf will increase the likelihood of calf death and even death of the mother cow. Therefore, the ability of forest areas to provide adequate feed nutrients in quantity and quality should be the main concern of breeders. If the condition of the forest area is not able to provide adequate nutrient needs for cows, then the introduction of feed banks in pens must be done, farmers must provide additional feed in the pen for the cows to consume after returning from the forest until the next day before returning to herding.

The speed at which the cows experience postpartum an oestrus (experiencing the first return to oestrus after giving birth) is more determined by the condition of the mother's body while still breastfeeding her calves. Cows that are breastfeeding their calves will experience a decrease in weight and body condition. Weight loss and body condition that is

too large will cause the reproductive cycle of the cows to be disturbed or become abnormal, so it will delay the cows from being able to re-estrus after calving[16]. Therefore, cows whose physiological status is lactating their calves are then grazed in the forest area, especially if the forest area is not capable of providing feed, they must get enough additional feed from the feed bank provided in their pen.

The condition of the cow's body is scored with numbers ranging from 1 (the body looks bones wrapped in skin) to 9 (the body is very fat), the conditions needed by the mother to immediately experience postpartum an oestrus are those that survive at a score of 5.5 to 6.5 When the cows have been nursing their calves for more than 30 days, so that if the cows can immediately experience heat again, then mating occurs and produce pregnancy, a very good calving interval (distance between two calves) will be obtained, which is around 11-13 months.

3.2.2. Village Breeding Based Forestry

Village Breeding Center, hereinafter abbreviated as VBC, is a livestock development area based on smallholder farmers which is a member of a breeder group. The establishment of forest-based beef cattle development, namely being released or grazed in forest areas, clearly requires a different pattern / method when compared to the intensive pattern, which is only suitable for the establishment of cattle breeding business areas.The extensive and/or semi-intensive beef cattle development patterns are suitable to be applied in forest areas, especially for cow calf operation only, not for fattening [12].

If the cow calf operation in the forest area has developed well, the next VBC development will be based on a wider area, namely as a breeding source area. Breeding source area is an area that has the capability to develop livestock from certain clumps of both pure and crossbred in accordance with the agro-ecosystem, market, support facilities and infrastructure available. The source area for livestock breeds is an agro-ecosystem that is not limited by government administration and has the potential for the development of livestock seeds of certain species or clumps. A livestock breeding unit is a foundation stock and breeding stock area equipped with a Performance Test Station. Supporting components for breedig source areas include: (1) foundation stock, obtained from the selection process for clumps or lines that have breeding values above the average value; (2) breeding stock, obtained from the process of developing basic breeds; and (3) commercial stock, obtained from the process of developing parent stocks[13].

So far, the VBC program in Indonesia was not develop well, however there are several provinces that still maintain VBC in their respective regions, including those related to the development of native cattle; namely Pasundan cattle in West Java, JaBres cattle and PO Kebumen in Central Java, Galekan cows in East Java. However, since 5 years ago in the nursery center (district) in East Java, it has conducted performance tests to conserve and develop specific breeds. The most problems were came from the fund.

VBC program in Sragen district is reported to be able to increase animal herds and to increase farmer's income[12]. Meanwhile, behavior change of man power to accept new things has not been effective because many breeders refuse communal sheds and house their cows together. However, to change habits, namely communication between the agency and breeders and group members has been effective. There are no communication barriers. The use of financial resources is hampered by a lack of funds, which affects facilities. Facility resources are not yet effective because many are still damaged and inadequate. Meanwhile, human resources, namely officers, are able to serve breeders well and there have been no complaints.

3.2.3. Breed Options

The success of the breeding pattern for beef cattle released in forest areas is largely determined by the condition of the forest area where the cows are herded. The type of plant, the amount, the quality of the biomass nutrient content and the continuity of the availability of plants as a source of feed for cattle, which are usually limited, the land which is usually dry, and the temperature that has extreme differences between the rainy season and the dry season, will greatly affect the performance of production and reproduction of beef cattle. Therefore, a certain national choice (clump, line, pure, cross) is needed which can be introduced in forest area conditions.

Cows that are suitable to be developed in such forest area conditions are breeds of cattle that are resistant to conditions of limited quantity and quality of feed, as well as heat stress and limited drinking water, namely local cattle (*B. indicus* or *B. sondaicus)* or cross cattle with *B. taurus* blood. not more than 25%. Cross-breed cattle whose blood of Bos Taurus is still 50% or more, have proven unable to grow, develop and reproduce better or as well as local cows. Therefore, cow cultivation patterns in forest areas are only suitable for local cattle breeds [13](Ongole Grades, Bali, and Madura) or another local germplasm (Jabres, Galekan, Pesisir, Rambon,Pasundan, Katingan, Sumba Ongole, Donggala, etc.).

Beef Cattle Research Institute (BCRI)as one of the Technical Service Units under the Indonesia Agricultural Agency for Research and Development (IAARD) of the Ministry of Agriculture, has releasednew breed, namely POGASI (*PO Grati Hasil Seleksi*) Agrinak cattle as a new line of Ongole breeds with the advantage of being able to grow and develop optimally on cultivation conditions in marginal areas with conditions of dry land areas and limited feed quality and quantity, as well as hot temperatures. The superiority of this POGASI Agrinak has been tested in more than 14 provinces (Sumatra, Java, Kalimantan, Sulawesi) in Indonesia. So far, this institution already distributed Pogasi around 400 head and the program was started at 2016.

3.3. Feed Bank

Ruminant livestock development cannot be separated from the provision of adequate forage in terms of quantity, quality and continuity. The most important aspects of the grazing ruminant's diet are proteinand energy. Protein in the

diet is used to build protein in the body for muscle, and energy for basic metabolic function and to drive themuscles. Both are used in large amounts for reproduction and lactation [7]. The problem commonly experienced by farmers is the uncertainty of feed purchase throughout the year as a result of reduced land for planting grass and differences in seasons. In the dry season, the supply of forage for livestock is very critical, so that to meet the need for animal feed, they are forced to use agricultural waste in rural areas such as palm fronds, rice straw, corn stalks, peanut stalk, soybeans and others.

The concept of developing a feed bank in an silvopastural, takes into account: (1) decreasing availability of forage, primarily the animal feed supply from existing forest vegetation, (2) optimal utilization of silvo-pasture, (3) regulating grazing patterns, (4) introduction of legume or grass that is resistant to trampling and inundation, (5) area carrying capacity index, (6) processing manure into organic fertilizer for food, estate and forest plantations.In a limited area of the cage, the construction of a feed bank is to store and serve fiber feed (dry forage) which is provided in a stock system. The aim of the feed bank is to meet the needs of animal feed so that cattle can consume fiber sources at any time of the day on an ad libitum basis (unlimited). The feed bank has the following benefits and advantages: 1) Providing fiber source feed; 2) Efficiency of time and labor; 3) Reducing feed costs; 4) feed is always available. On the other hand, the potential for waste from food crops and plantations is very abundant [14]. These wastes are an opportunity to be used as a feed reserve to ensure the availability of beef cattle feed.

Proper and quality feeding must be done consistently. If the giving is not done consistently, it will interfere with the growth of the cattle. This often occurs especially in tropical countries, such as Indonesia, where in general the animal feed given during the dry season is of lower quality than the animal feed given during the rainy season. Thus, the growth of domestic cows will experience an up and down curve, during the dry season the growth of livestock will decrease, while in the rainy season the growth of livestock will increase rapidly, because the feed provided meets the required requirements.

Cattle will naturally prefer higher quality feeds to those with lowerprotein and energy content and lower palatability. Adding higher quality supplements to a low-quality base feed often stimulates overall intake
at first. The extra protein in the supplement stimulates rumen microbes, improving fermentation and digestion resulting in higher growth rates. If too much supplement is fed, some 'substitution' may occur with the cattle eating less of the cheaper base feed [9].In the dry season, there is usually a decrease in energy, minerals, and protein contained in forage because forage plants experience a lack of water. Thus, the feed given during the dry season often does not meet the requirements and is of low quality. Conditions like this result in stunted livestock growth, adult cattle will experience a decrease in body weight and a low percentage of carcasses. In addition, livestock breeding will also experience a decline due to decreased fertility.

The feed bank for ruminants is divided into two forms, namely: for the basal feed (main) and for the feedstuff for concentrates. storage of feed ingredients in the form of concentrate is the same as for poultry and / or non-ruminants. The basal feed ingredients stored can be in the form of forage and / or agricultural or plantation crop residues in the form of water content and high-fiber feed ingredients. In addition, the feed ingredients can also be in the form of waste products (corn), agricultural and / or plantation industrial crops (rice bran, wheat bran and meal which have low water content [22].

3.3.1. Forage Based Feed Bank

In an open grazing system, the feed base will be a mix of native and improved grasses and legumes. Many smallholder farmers use rice straw and other crop residues as the feed base. The fulfillment of basal feed ingredients for cows in forest areas can be in the form of utilizing natural grasses and grasses that are intentionally planted. Planting arrangements can be optimized by considering the nutritional quality of plants, which generally come from superior grasses and legumes. Good pasture land has a botanical composition of 50% grass and 50% legumes [12]. The amount of moisture content and dry matter that a mixture must have is 70 to 80% for levels of water and 20 to 30% dry matter. Pasture forages require a rest period to regrow 16 to 36 days after being cut. Therefore, pastures are grazed on a rotational basis to provide opportunities for the forage to regrowth, and also to prevent worm infections.

Forage that has the potential to be developed in forest areas is *S. secundatum*.This grass is very fast growing, has dense rhizomes and stolons, strong roots, the ability to compete with weeds is very strong so that it is able to suppress weed growth and is resistant to heavy grazing. This type of grass shows better growth and production on shaded land than in the open / without shade. Adaptation to shade conditions is very good as seen in the morphological characteristics (plant height, leaf width) and physiology (chlorophyll content). The study showed that the highest *S. secundatum* production was at 55% shade (54 tonnes / ha / year) and was relatively the same as 75% shade treatment production (47 tonnes / ha / year). Production was even lower in the shadeless condition (32 tonnes / ha / year). The results of chemical analysis showed that the dry matter content, crude protein, NDF and ADF were relatively the same in both shade and open conditions. Organic matter content is about 87%. Crude energy content of 4816 Kal / kg dry matter. Crude protein content ranges from 6-8% while fiber (NDF) is between 82-85% [6].

Figure 4: S. Secundatum to Develop in Forest Area

As feeding strategy, grasses and legumes planting programs can be adjusted to the area provided, among others by paying attention to (1) plant spacing, (2) age and height of the tree (shade), (3) water availability, and (4) the area provided and not interfere the main crop / tree production process. The concept of forage plantation integrated forest plantation in which the rotational grazing to be implemented was shown in Figure 4.Through this scenario, the effectiveness of pasture land use will occur by a herd of livestock which is adjusted to the production period of forage crops. This displacement pattern can be strengthened by adding an electric fence. Recommended types of grass and legumes are shade and stamping resistant, i.e.: *B.ruziziensis, B.decumbens, B.humidicola, S.secundatum,* and *M. sativa.*

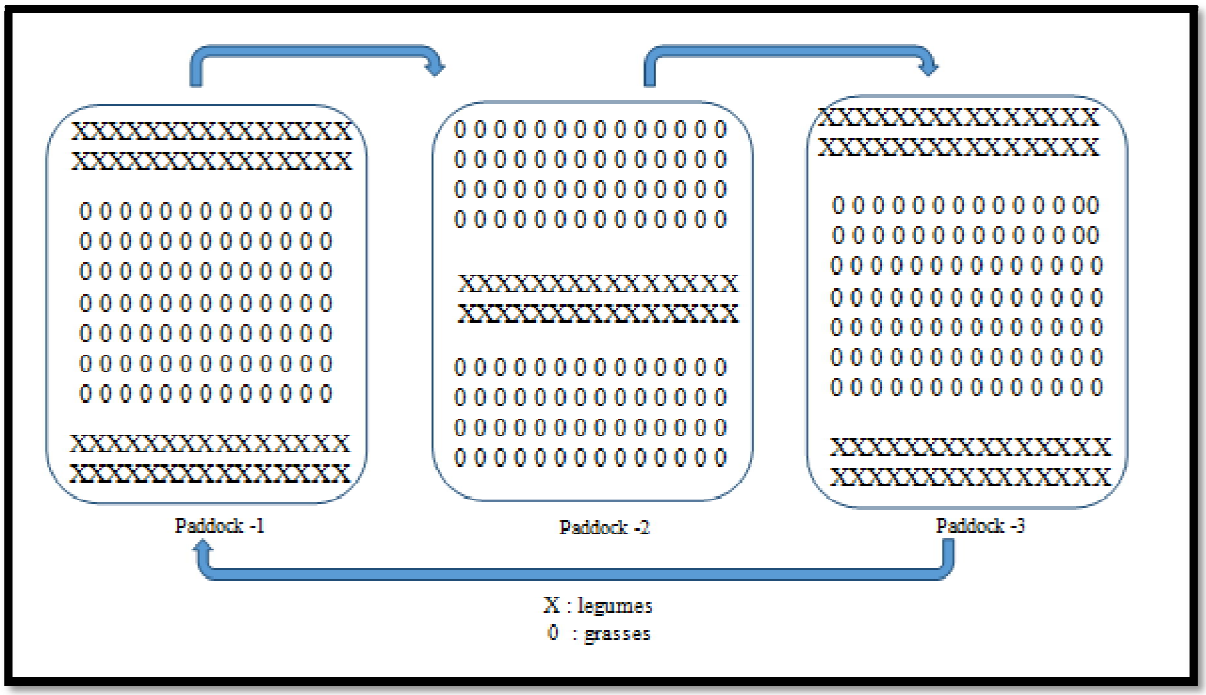

Figure 5: Rotational Grazing with the Improving Pasture in Forest Area

3.3.2. Preserved Feed

Conserving forage is an essential component of ruminant livestock production systems in most temperate climates, but in subtropical and tropical regions the use of hay and silage is not as widespread. Forage production in warm climates is based on perennial four carbon intermediate grasses. Economic factors are major determinants of the extent to which forage is conserved as hay or silage. Field-cured hay has an important role in feeding ruminant animals in many parts of the world [23]. Defoliation management can be described in terms of frequency, intensity, and timing. Field curing involves both drying and rewetting processes.

Hay can be packaged in numerous forms including small and large rectangular bales, small and large round bales, and various stack systems. However, in the context of fulfilling energy sources for livestock in forest areas (semi-intensive system), the most effective and efficient thing to do is manufacture Hay (dry feed) as feed.Hay can come from rice straw, corn stover, or legume crop residues, such as peanuts, soybeans, mungbean, gude, and others.

Silage is the feedstuff produced by the fermentation of a forage crop of high moisture concentration with high water content as a result of fermentation and it can be given to ruminants or used as biofuel through anaerobic digestion. Silage is generally made from grass plants (from the Gramineae tribe), including corn, sorghum, and other cereals by utilizing all parts of the plant, not only the grains. Silage can also be made from oil palm, cassava, rice, hemp, and market waste. Silage can be made by placing forage pieces in the silo, stacking them with plastic covers, or by wrapping them into large rolls (bale).Both hay and siage can be used as feed banks as a strategy to meet nutritional adequacy for livestock which can be implemented into as feed bank for extensive and semi-intensive systems.

4. Conclusion

The Wanaternakor Silvopasture was combination programs between forestry and livestock business and it should be maintained and be supported by all stakeholders. In the context of cattle breeding in forest areas, mating management (through the introduction of superior bulls) and the provision of feed are tipping points for an increase in birth rates (herds). In addition, understanding the concept of providing feed throughout the year can be fulfilled by implementing a feed bank that is fulfilled to meet the nutritional needs of livestock.

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