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# Farmer Field School of Beef Cattle Breeding and Fattening in East Nusa Tenggara

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***Abstract*** **– The total population of cattle in East Nusa Tenggara in 2013 is 814, 450 thousand heads where East Nusa Tenggara contributes 2.28% of national meat needs. This paper reviews how technology support can speed up the productivity of beef cattle through the breeding and fattening schools in East Nusa Tenggara. Specific areas in Timor Island are in Kupang, South Central Timor, and Belu districts. The study was conducted using a technology intervention approach in the form of participatory assessment through methods: (1) interviews; (2) regular monitoring and group meetings; and (3) field observations. Technological innovations applied are (1) nursery technology; and (2) fattening technology. Innovation is done by improving maintenance system through communal enclosure and flushing feed with grass 60% and leguminous 40% or local concentrate. In breeding, the improvement were on mating management through observation of estrus, mating time, while on fattening, manure is used as fertilizer in vegetable crops. Location-specific technology interventions are indicated to improve the performance of cattle production than before. Through farmer field schools and technology materials that farmers need to change the knowledge and skills of farmers and affect the livestock in the field laboratory. The percentage of pregnancy and birth weight increased, the calving interval became short, the calf mortality decreased, so the livestock population in the group also increased.**

***Keywords*** **– Breeding, Fattening, East Nusa Tenggara, Farmer Field School.**

## I. INTRODUCTION

Field Laboratory of Beef Cattle Breeding and Fattening is pilot unit managed by breeder groups as a breeding and fattening business of beef cattle. This unit also serves as field meeting gathering, learning place, and technology implementation practice in Farmer Field School of Beef Cattle Breeding and Fattening. It become a non-formal education process for farmers who are studying from field laboratories and aims to develop or expand breeding groups of village breeding center members (VBC) and other farmer.

East Nusa Tenggara Province has an area of 47,350 km2 with a population of 4,355,121 people, has a grazing area of 832,228 Ha, and ruminants of more than 800,000 animal units. The condition of East Nusa Tenggara Province is very inadequate to increase its productivity without human intervention, including the increase of carrying capacity, and procurement in both drinking water sources and feed for livestock (Anonymous, 2009). On the other hand, although more than 760,000 Hectare of land in East Nusa Tenggara is potential for the development of crop and plantation crops business, livestock business, especially beef cattle, is the most suitable business to be developed because East Nusa Tenggara region is classified as dry climate. The population of cattle in East Nusa Tenggara is 814,450 heads (East Nusa Tenggara Statistic Bureau, 2013), with the largest population in West Timor (73.95%) (Agriculture Statistic of East Nusa Tenggara, 2012).

The type of technology, which will be implemented at the farm level, should be prioritized on needs, not desires. Thus, the biggest challenge is how to accelerate the resulting innovation quickly to and on target in answering and solving problems encountered. Thus, the technology transfer process runs fast.

## II. METHODOLOGY

This paper is a review of the implementation of farmer field schools of livestock technology assistance that has been implemented by the East Nusa Tenggara Provincial Agricultural Technology Assessment Center in Timor Island for three years of technological assistance.

*General Condition of Livestock Business in East Nusa Tenggara*

The pattern of raising large ruminant livestock varies but dominated by extensive and semi-intensive maintenance. This is because the area consists of savanna climates which are dry, while intensive cattle rearing practices are relatively small. There are several patterns such as:

1. Livestock is maintained intensively, especially raising livestock for fattening;
2. The animals are tied up during the day and put in byre at night;
3. Livestock grazed in groups during the day and put in byre at night;
4. Livestock is released throughout the day and night and is only collected occasionally when required by the owner.

There are several obstacles in population development, such as:

1. The decline of feed quality and quantity in dry season.
2. The high of calves' mortality (20%-50% depend on the length of dry season, especially in reared livestock).
3. The easily infected disease because the rearing is not quite good and also the length of dry season.
4. Livestock business is still as side business which makes inadequate effort to increase productivity and livestock value.
5. The low livestock productivity because lack of feed and water in long dry season and also the decrease of

livestock's genetic quality.

Extensive cattle productivity rates are maintained relatively low and fluctuate as they are affected by the season. During the wet season, feed quality increases but during the dry season, it decreases, including protein and mineral content, while the Crude Fiber (CF) increases. As a result, there is extreme weight loss in cattle up to 20% of the optimal weight in the rainy season. The tendency of decreasing weight loss in cattle is also influenced by several factors, such as:

1. Farmers tend to sell males that have high growth, resulting in scarcity of quality cattle for livestock breeding;
2. Productive female livestock population with one year calving interval (CI) decreases;
3. The feed is difficult to get in the dry season, consequently fertility decreases;
4. The pattern of calf births tend to be concentrated in the dry season (April to October, with peak births in July).

In free grazing systems, livestock is released for feeding on natural grasslands. Less controlled grazing can lead to under grazing and over grazing. Over grazing can make destruction of species of natural grass favored by livestock (palatable) and good nutritional value which is then replaced with a type of grass that is less good quality and short-lived.

The carrying capacity of land has been so limited to increase in livestock population. It is due to inadequate water and good grazing land. Therefore, for the development of livestock in East Nusa Tenggara, it should be made several efforts, such as:

1. The pattern of livestock rearing should be emphasized on a more intensive system. This will only work if there is enough water and feed on the farmer's land. It is necessary to encourage the development of feed through massive forage planting, so that intensive livestock farming can be improved.
2. There needs to be serious efforts to improve existing communal savannahs, among others through the introduction of herbaceous legumes, grazing arrangements according to the carrying capacity of the fields, and the provision of water resources for livestock. Most of these efforts require subsidies from the government.

*Farmer Field School Implementation Mechanism*

Field School of Breeding and Fattening Beef Cattle are done through an approach by listing the farmers / livestock in the village and sub-district. For one unit of Field School are all farmers / livestock in the village, and then determine the location of Field Laboratory. The determination of field laboratory is Field Laboratory of Breeding and Field Laboratory of Fattening or combined together.

*Farmers Group Meeting*

Preparation of Field Laboratory and field school, especially breeding and fattening beef cattle at the level of farmer is preceded by a meeting that is an attempt to inventory the farmers, name, and number of cattle ownership and maintenance pattern of each farmer in the field laboratory area. In this context, the matters discussed are implementation time, weekly activities, field laboratory location, learning places, materials, and Participatory Rural Appraisal.

*Implementation*

The learning process in Field Laboratory and Field School takes place periodically according to the stages of activity implementation. Regular meetings start at a few weeks prior to implementation to see the constraints, potentials, and opportunities through the implementation of the Participatory Rural Appraisal. In the next meeting, the activity begins with the preparation of materials needed in the application of technological innovation based on local resources such as pens, forage gardens, forage seeds to fencing around the cage, and garden forage of animal feed. If there is an urgent problem to be resolved, special meetings are required to solve the problem immediately.

*Monitoring and Observation in Farmer Field School*

Each member of the farm group is required to observe and record the cattle, the growth of Forage Feed, and the health of cattle in the Field Laboratory.

*Farmer's Practice in Farmer Field School*

The field laboratory location should be a reference for the farm owned by the participants, so that the appearance of the technological innovation is required to be good and succeed in accordance with the target to be achieved in the previous planning. If there are differences in cattle production or forage growth between fields laboratories, farmers are expected to be able to overcome them.

*Organizing Field Laboratory and Field School*

Each unit of Field and Field Laboratory of breeding and fattening beef cattle is guided by the experts (livestock officers, extension workers, researchers). Participants are farmers covered Field Laboratory's Area.

*Study Location*

Farmer learning location is in Field Laboratory where there is one farmer group consisting of 20-25 members. The results obtained are then implemented in other locations as Field School locations.

*Materials and Tools for Study*

Materials and learning tools used should be practical, simple, easy to use, consisting of stationery, materials practice, props and so on. Through Field School, it is expected to accelerate the application of technology components in support of breeding and fattening beef cattle. This is expected to increase livestock productivity and farmer income. The expected final goal is to achieve a 15% increase in livestock productivity target for cooperator breeders.

*Technology Support through Farmer Field School*

Farmer Field School is the process of non-formal education for farmers who learn from field laboratories. The goal is to develop or expand group member of *viLaboratorium Lapangage breeding centre* (VBC) and other farmer groups. From 2011 to 2015, Technological assistance implemented had been including: (1) training; (2) dissemination using leaflets, brochures and posters; (3) technological demonstrations that farmers need; (4)

regular monitoring of livestock health; and (5) institutional performance of farmer groups.

A series of technology assistance is conducted through coordination with the Regional Animal Husbandry Department. Adjustment of activities carried out on environmental conditions and farmers who will carry out activities. This is because not all technological innovations introduced can be applied equally between one region and another.

Therefore, over a period of five years of technological assistance, several location-specific technological innovations have been observed. These technologies are considered to provide good hope to be developed and continued in one area, namely technology of breeding and fattening.

*Breeding Technology*

Field schools provide materials on beef cattle breeding technology, site-specific concentrate feeds, giving concentrate on lactation cow, giving concentrate on pre weaning calf. Field school education showed positive results, such as: (1) increasing in the percentage of pregnancy (90-95%); (2) decreasing calf mortality (<3%); (3) increasing birth weight (> 12 kg); (4) population increase reaches 75%, (5) calving interval (CI) becomes short (Rubianty et al., 2013). The performance of parent cattle production in the three districts where farmer field schools placed can be seen in Table 1

Table 1. Production Performance of Breeding Cattle on three location of Farmer Field School in Timor

| Description | Location | | |
|---|---|---|---|
| | Kupang | South Central Timor | Belu |
| Conception Percentage | 61 % | 60% | 45% |
| Calving interval (month) | 13-15 | 14-15 | 13-15 |
| BCS Breeding Cattle | 2.5-3 | 3-3.5 | 3.5-4 |
| BCS Calves | 2.5-3 | 2.5-3 | 3-3.5 |
| Birth Weight | >12 kg | < 12 kg | > 12 kg |
| Calf's mortality | <3% | >20% | <3% |
| Population Improvement | 40% | <50% | <40% |

*Sources: Processed primary data, 2014.*

The data in Table 1 shows that the performance of cattle breeding in three locations of the field schools is relatively the same except for calf mortality. Mortality of calves in the region of south central Timor is higher (> 20%) compared to Kupang and Belu. This condition is likely due to grazing pattern in South Timor Tengah Regency which is done extensively by utilizing communal pasture land and post-harvest rice fields.

Based on the data, it is known that the expected production target is CI 12-13 months. To achieve this, concentrated feed technology has proven to be a positive outcome, especially in birth weight and calf mortality that affects the shorter CI. So in the maintenance of breeding cattle, there are things that need to be considered, namely as follows: (1) appropriate marriage patterns; (2) proper feeding pattern; and (3) pre-weaning calf feeding pattern. The technology of feed improvement aims to make breeding cattle quickly become estrous after 70 days of gestation. This is done so that the breeding cattle can be pregnant again after 90 days after gestation. This can be seen in the performance of calf production which gets additional concentrate on feed and which is not in table 2.

Table 2. Performance of calf production which gets additional concentrates on feed and which is not

| Description | Initial Body Weight (kg) | BCS | Final Body Weight (kg) | BCS | ADG (kg/head /day) |
|---|---|---|---|---|---|
| With Concentrate | 74.5 | 2-3 | 101.1 | 4 | 0.4 |
| Without Concentrate | 75.4 | 2-3 | 87.5 | 3 | 0.2 |

*Sources: Processed primary data, 2014*

The data in Table 2 show that giving concentrate gives a higher daily body weight of calf and a higher body condition score than those who do not. This indicates that the concentrate has a positive effect on calf growth. Because, it will take enough protein and energy to fulfill the body's functions in the period of growth,

In Table 3, we show the appearance of lactation parent production and pre-weaned calves fed with maize concentrate and rice bran. This is a pilot facility in the field laboratory in cattle breeding.

Table 3. Lactation performance of cow and pre weaning calves at the Field Laboratory in West Sumba Regency.

| Description | Initial Body Weight (kg) | Final Body Weight (kg) | ADG (kg/head/day) |
|---|---|---|---|
| **Lactation Cattle** | | | |
| • Traditional | 297.50 | 299.25 | 0.02 |
| • Legume + corn + rice bran | 291.75 | 323.00 | 0.34 |
| **Pre Weaning Calf** | | | |
| • Traditional | 155.50 | 173.25 | 0.19 |
| • Legume + corn + rice bran | 157.50 | 199.00 | 0.45 |

*Sources: Rubianty et al., 2013*

Table 3 show that the concentration of lactation parent and calf pre-wean gives greater weight gain than lactation parent and pre-weaned calf fed with farmer pattern (without concentrate). This indicates that concentrate may improve the appearance of lactation and calf pre-weaning, although the type of concentrate given is not the same. Giving concentrate to lactation parent and calf pre-weaning gives good hope if it can be done regularly, so that breeding cattle can quickly reach estrus and pregnant again.

Marawali *et al*., (2012) said that concentrate on older pregnant mother (8-9) months of age had an effect on better calf growth, while the breeding cattle could quickly reach estrus compared with non-concentrated livestock. This was seen in the observation of farmers participating in the farmer field school.

*Fattening Technology*

Fattening beef cattle will be beneficial for farmers as producers of selected cattle seed stocks where their

livestock is able to meet national seed standards. The situation will result in a higher selling price compared to the surrounding farmers. In addition, improved feed quality in fattening cattle in farmer groups will be useful in shortening fattening times, improving body weight gain, and ultimately helping farmers' income grow larger. Fattening technology using local concentrate and Putak (local feed of Timor Island) in Timor Island can be seen on Table 4.

Table 4. Average Daily Gain (ADG) of Cattle using concentrate and Putak at Farmer Field School in Timor

| Location | ADG (kg/head/day) |
|---|---|
| South Central Timor | |
| • Concentrate | 0.3 - 1.1 |
| • Putak | 0.2 - 0.4 |
| Belu | |
| • Concentrate | 0.3 - 0.5 |

*Sources: Processed primary data, 2014*

Table 4 shows that ADG fattening cattle that consumed concentrates received higher ADG than those consuming putak in both field schools sites. As basal feed, farmer uses rice straw, for additional feed, they use concentrate and putak as much as 1.5% from BW. Provision of good feed and sufficient livestock needs are one of the determinants of success in obtaining cattle production (Prawiradiputra and Bambang, 2005).

The results of Wirdahayati et al., 1999 and Marawali et al., 2004 using local feed (natural grass + *Leucaena leucocephala*) and the use of probiotics (starbio) can increase the Bali Cow BWG by 400-600 g / head / day when compared to fattening patterns Local farmers who only amounted to 200-300 gr / head / day. ADG fattening cattle can be maintained at 0.38 kg / head / day in the dry season if using silage, while those not and only reach 0.15 kg / head / day (Ratnawaty et al., 2006). Nutrition content of feed applied in farmer field school can be seen in Table 5.

Table 5. Nutrition content of feed applied in farmer field school

| Feed | Nutrition | | |
|---|---|---|---|
| | Crude Protein (%) | Crude Fiber (%) | Energy (Kcal/kg) |
| Rice Straw | 4.01 | 33.87 | 3.567 |
| Putak | 2.05 | 6.35 | 3562.55 |
| Concentrate of Industrial Byproduct | 8.92 | 20.41 | 3643.85 |

*Source: Laboratory of livestock nutrition, Faculty of Animal Husbandry University of Brawijaya, 2014*

The results of nutrient analysis show that feed treatment is sufficient nutritional content for livestock to meet basic life and reproduce. More specifically, the crude protein content in the nutrient feed is still quite high. Therefore, the protein content is one of the indicators to determine the quality of feed, so the ration of treatment of good quality because based on protein requirement for rumen microbe that is equal to 6% (Mc Donald et al., 1995). It is also means that there is enough ammonia source (N-NH3) which can be used as protein utilization by microbes. Beside protein, energy content in feed play vital role which can diminish production if there is not enough.

The result of previous research, technological improvement, at farmer level applied technology, showed significant result to advance of farming business. Some of them are as follows: (1) increasing the number of fattened cattle in group cages; (2) increasing the number of group cages and increasing the number of farmers in the Tobu Village; And (3) enhancement of cooperation network with the Livestock Service Office of Timor Tengah Selatan Regency. Furthermore, the increase of cooperation network is done in the form of 39 cattle (25 males and 14 females), Biogas 2 unit, Animal Zoo of 5 hectares (Ratnawaty et al., 2007). Furthermore, it was reported that fattening cattle using group cages at the farm level turned out to increase ADG range from 0.5 to 1.3 kg / head / day.

## III. Conclusion

Farmer Field School of breeding and fattening beef cattle in East Nusa Tenggara gives positive results, which can be seen from the appearance of livestock at each location of assistance. The knowledge and skills of farmers at the assistance location have positive response; this is due to the implementation of intensive technological assistance as well as with the technological material needed by farmers. Continuous technological assistance is an effort to increase national meat self-sufficiency program, so it can produce cattle seeds and cattle, and followed by the provision of diverse, quality and continuous feed. Technological support through farmer field schools is needed to support the beef self-sufficiency program in East Nusa Tenggara resulting in an increase in each stage of assistance which shows better cattle production performance compared with those not.

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