Evaluation and development strategy of cattle breeding area-based on smallholder farmers community in Jambi

D A P Sari¹, Muladno²*, S Said³, Nahrowi⁴ and R Priyanto²

¹IPB University, Kampus IPB Dramaga, Bogor, West Java, Indonesia
²IPB University, Kampus IPB Dramaga, Bogor, West Java, Indonesia
³Research Center for Biotechnology, Indonesian Institute of Sciences, Bogor, Indonesia
⁴Department of Nutrition and Feed Technology, Faculty of Animal Science, IPB University, Kampus IPB Dramaga, Bogor, West Java, Indonesia

*muladno@gmail.com

Abstract. The efforts to increase the national beef cattle population can be done through the development of area-based beef cattle. SPR-IPB were an example of the concept of developing regional-based beef cattle farming based on smallholder communities. This study aimed to evaluated the area of beef cattle farming in SPR based on the profile of the farmer, institutions, existing livestock conditions and factors that influence the development of beef cattle farming. Surveys and observations were done in October-November 2020 at SPR Kuamang Abadi, Bungo District, Jambi. Ninety-nine farmers in 4 villages (Tirta Mulya, Lingga Kuamang, Cilodang, and Sumber Harapan) were involved in this study. Qualitative and quantitative descriptive statistics were used in this study. The results of the area evaluation show that the SPR Kuamang Abadi was included in the category of built up area (score 600.5). Problems related to the development of beef cattle farming areas include the non-functioning of the organization's internal divisions, limited facilities and animal health personnel, and underutilized financial institutions. The recommendation for the results of this study was the development of beef cattle farms at SPR Kuamang Abadi can be done by strengthening human resources and institutions, strengthening facilities and infrastructure, accelerating access to technology adoption and innovation, strengthening marketing strategies, and strengthening cooperation.

1. Introduction
The meat self-sufficiency program since 2005 has not been able to be achieved, it can be seen from the number of meat imports that have continued to increase in the last five years. Based on data in 2020, the demand for meat reaches 717.15 thousand tons, while domestic production is only able to produce 422.53 thousand tons, so there is a deficit of 294.62 thousand tons which is fulfilled with imports of frozen meat, feeder cattle, and buffalo meat [1]. The decline in the national beef cattle population is highly correlated with the decline in the number of beef cattle in the population center area, so it is necessary to increase the number of cattle outside the center area [2]. One of the efforts that can be made to fulfill national meat is the establishment of a livestock development policy that was oriented towards independence based on local resources through the development of livestock areas. The strategy and implementation of sustainable beef cattle development patterns must pay attention to the characteristics of the production system and consider geographical factors, agroecosystem, land-use intensity, type of livestock and plants, and the purpose of production [3,4]. One of the improvements to the production system is through livestock group institutions [5].
Sekolah Peternakan Rakyat (SPR) was an idea created by Prof Muladno and started in 2013. SPR is the result of collaboration between the District Government through the Animal Husbandry Office and the Research and Community Service Institute (LPPM) of IPB University. SPR is an example of an area-based livestock development concept with an area of one district. Through SPR, community of smallholders in one district were guided, assisted, and motivated to manage their livestock in the collective business company [6]. The principle of establishing the SPR area is based on minimum population of 1000 dams and 100 bulls. The population number was expected to be the main indicator that can provide a principal picture of the comparative advantage of an area in maintaining the level of the livestock population concerned.

SPR Kuamang Abadi is the collaboration between the Government of Bungo District, Jambi Province through the Animal Husbandry Service and Institute for Research and Community Service (LPPM) IPB University. Bungo District has the largest beef cattle population, with a contribution of 23.9% to the total beef cattle population in Jambi Province [7]. The area of Bungo District was dominated by plantations such as rubber and oil palm with an area of 98,460 and 60,265 hectares, respectively. With the existence of a large population and land potential, especially oil palm plantations and the strengthening of science and technology and institutions, it is hoped that SPR Kuamang Abadi can become a model for beef cattle development areas supported by existing institutions in SPR. The purpose of this study was to analyze (i) the profile of institutions and individual farmers in the SPR Kuamang Abadi, (ii) the profile of the ranking of areas (new, built and independent areas) of cattle breeding to increase production and population, and (iii) the recommendation for development area to built breeding cattle business based on community in smallholder farmers.

2. Materials and methods
The present study was conducted on October-November 2020 in SPR Kuamang Abadi that located in Bungo District, Jambi Province. All members of the SPR Kuamang Abadi that totaling 99 farmers, were the research respondents. Data collection methods were carried out by interviewing respondents, direct observation, literature studies, and group discussion forums. Data were analyzed using qualitative and quantitative analysis.

Determination and assessment of beef cattle area using area criteria and indicators [8] which include: (1) land; (2) the capacity to increase the population of ruminant livestock (KPPTTR) based on availability of forages; (3) livestock; (4) cultivation technology; (5) farmers; (6) assistant staff; (7) facilities and (8) institutions. The weighting factor was determined based on the beef cattle area assessment standard [8]. The score was obtained from the primary data results in the form of interviews and direct observations. SWOT analysis were used to assess the strengths, weaknesses, opportunities and threats in the development of beef cattle for further development strategies that are most likely to be implemented at SPR Kuamang Abadi [9].

3. Results and discussion
3.1. Profile of the SPR Kuamang Abadi
The SPR Kuamang Abadi area includes 3 villages in Pelepat Ilir Subdistrict (Tirta Mulya, Lingga Kuamang and Sumber Harapan Villages) and 1 village in Pelepat Subdistrict (Cilodang Village), Bungo District, Jambi Province. Pelepat was the subdistrict with the largest area of 1,069.07 km² (22.95% of the total area of Bungo District), while Pelepat Ilir was the Subdistrict with the largest of beef cattle population (20.4% of the total cattle population in Bungo District) [10]. Pelepat and Pelepat Ilir Subdistricts also are areas with the largest oil palm potential in Bungo District with an area of 1,7797 and 14,332 hectares, respectively. The large cattle population was supported by the potential of oil palm, making the SPR Kuamang Abadi area very suitable for developing a cattle population with an integrated cattle-palm system. Matondang and Talib [11] reported that the implementation of oil palm-cow integration can increase oil palm productivity, improve plantation land ecosystems and increase beef cattle supply.
The membership of smallholder farmers at SPR Kuamang Abadi consists of 7 livestock groups, consisting of 4 groups in Tirta Mulya Village, 1 group in Lingga Kuamang Village, 1 group in Sumber Harapan Village and 1 group in Cilodang Village. The organizational structure of the SPR Kuamang Abadi consists of 9 members of Livestock Owners Representative Council (DPPT) consisting of the chairperson, secretary, treasurer and 6 people as division representatives. In general, the division was determined based on the consideration of the conditions and interests of SPR. The division in the SPR Kuamang Abadi organizational structure includes the cage, feed, health, skill, marketing and utilization division. The existence of a strong organizational and institutional structure is the basis for SPR to build a community-based collective livestock company for smallholder farmers.

The age of farmers in SPR was dominated by the range of 31-45 years (44%) over 50 years as much as 41%, 46-50 years 11% and 15-30 years 3%. The education level of farmers was dominated by elementary school graduates as much as 56%, then junior high school 23%, senior high school 11%, college graduates 1% and never attending school as much as 8%. [12] state that the level of education and age was influential on livestock management, because the higher education of farmers, new technology will be easier to accept. Education can provide a better understanding for farmers about the problems they are facing so they can think of solutions and improvements [13]. The main occupation of farmers in SPR Kuamang Abadi was dominated by plantation farmers (88%), while 2% rely on the livestock sector as their main job. Meanwhile, the farmers that raise the cattle as their main job usually raise livestock belonging to several people, then their income was obtained from the production sharing system. The duration of raising beef cattle in SPR Kuamang Abadi was dominated by the range of 1-5 years 44%, more than 15 years 29%, 6-10 years 17% and 10-15 years 10%. The longer the farming experience for the farmers were possible to receive more technological innovations related to the beef cattle business towards change, both individually and in groups [14]. The scale of beef cattle ownership was dominated by the range of 1-5 heads per farmer as much as 75%. This condition shows that the livestock ownership in SPR Kuamang Abadi was classified as a small scale. In developing beef cattle areas, increasing the scale of livestock ownership needs to be done to reduce production costs and will increase production efficiency [15].

3.2. Evaluation of beef cattle breeding areas

Evaluation of area is very important in the successful development of livestock as a whole and sustainable manner. The criteria used as guidelines for determining the level of progress of an area include land, feed, livestock, application of technology, assistants, facilities and institutions [11]. Evaluation of area was carried out using the scoring method through several stages, including (1) weighting of area components, (2) distribution of component indicators, (3) assessment of indicators, (4) determination of scores, and (5) comparison with regional standard scores. Evaluation of beef cattle area based on the 2003 Ministry of Agriculture standard at SPR Kuamang Abadi, Bungo District in 2020 shown in Table 1.

The results of the evaluation of the beef cattle area assessment at SL-SPR Kuamang Abadi obtained a total score of 600.5 (Table 1). The weighting factor was determined based on the beef cattle area assessment standard [8]. The score was obtained from the primary data results in the form of interviews and direct observations. The standards used to determine the category of an area are: (a) a new area with a score of <500, (b) a built area with a score of 500-700, and (c) an independent area with score of >700 [11]. This condition means that SL-SPR Kuamang Abadi was still classified as a built area.

Several important aspects that need to be improved include the allocation of land for forages for each farmer, which is still below 25% on average. This is because the main focus of land ownership in farmers is still used for plantation lands as the main source of income. The business scale needs to be increased by providing capital and facilities so that livestock orientation can turn into a business, and the scale of livestock ownership can increase.
### Table 1. Evaluation of beef cattle area in SPR Kuamang Abadi, Bungo District, Jambi Province, 2020.

| Criteria                                      | Factor weight | Score | Total |
|-----------------------------------------------|---------------|-------|-------|
| Land                                          |               |       |       |
| Land tenure (ha)                              | 5             | 8     | 20    |
| Allocation for forages (%)                    | 2.5           | 4     | 10    |
| Availability of forages                       | 15            | 7     | 105   |
| Ruminant livestock population increase capacity (Animal Unit) | 15 | 7 | 105 |
| Livestock                                     |               |       |       |
| Birth rate (%)                                | 2.5           | 9     | 22.5  |
| Mortality rate (%)                            | 2.5           | 6     | 15    |
| Ownership scale/farmer (heads)                | 8             | 4     | 32    |
| Population (animal unit)                      | 3.5           | 6     | 21    |
| Population (% relative carrying capacity)     | 3.5           | 2     | 7     |
| Cultivation technology                        |               |       |       |
| Breed of cattle                               | 4             | 6     | 24    |
| Breeding methods                              | 7             | 7     | 49    |
| Animal feed                                   | 5             | 5     | 25    |
| Health care                                   | 4             | 7     | 28    |
| Farmers                                       |               |       |       |
| Level of knowledge                            | 5             | 7     | 35    |
| Skills of business management                 | 5             | 7     | 35    |
| Assistant staff                               |               |       |       |
| Veterinarian                                  | 1             | 7     | 7     |
| Veterinarian assistant                        | 1             | 9     | 9     |
| Inseminator                                   | 1             | 9     | 9     |
| Animal obstetrician                           | 1             | 9     | 9     |
| Vaccinator                                    | 0.5           | 9     | 4.5   |
| Counselor                                     | 0.5           | 9     | 4.5   |
| Facilities                                    |               |       |       |
| Holding ground                                | 4             | 0     | 0     |
| Diagnostic laboratory                         | 1             | 4     | 4     |
| Training unit                                 | 2             | 4     | 8     |
| Animal health post                            | 4             | 9     | 36    |
| Distributor of livestock production facilities| 2             | 4     | 8     |
| Artificial insemination post                  | 3             | 9     | 27    |
| Animal market                                 | 4             | 4     | 16    |
| Institutions                                  |               |       |       |
| Farmer institutions                           | 2.5           | 6     | 15    |
| Capital institutions                          | 2.5           | 6     | 15    |

In general, the facilities and infrastructure at SPR Kuamang Abadi were still limited and need to be improved. There are 2 animal health posts at the SPR location joining the artificial insemination post, one each in Pelepat Ilir and Pelepat Districts. Animal health officers at SPR Kuamang Abadi consist of 1 veterinarian and 4 inseminators. The limited number of veterinarians in Bungo Subdistrict has resulted in inseminators doing more technical handling of livestock health in farmers. To support livestock production, the availability and access for the distribution unit for livestock production facilities (SAPRONAK) need to be an important consideration for all livestock stakeholders in this region.
Sales of beef cattle were currently still limited to one SPR area and were carried out between farmers. Animal markets that far from the location of the SPR area become an obstacle for farmers to obtain quality of the dams or feeders and in the sale of livestock products, so that the livestock trade system remains controlled by brokers. Farmers generally sell their cattle only during the Eid al-Adha. In the order hand, the demand for beef cattle in Bungo District was still quite large and the shortage of supply from the regions within the district yet to be fulfilled. Besides the functioning to make it easier for farmers to sell their cattle, animal markets are also important to increase the selling value of cattle because the determination of the selling price is based on the scales that have been provided, it also cuts the marketing chain, so that the profits obtained by farmers are higher [16].

The financial institutions of banks or People’s Business Credit (KUR), was still few used by farmers. This is due to the difficulty in obtaining credit facilities and the limited ability of farmers to return their capital. The credit scheme facilities offered by the Government, such as KUR, are also still a few used to support livestock businesses, because of their small budget and the absence of collateral owned by farmers as collateral to obtain larger credit. In addition, the financial institutions were still exploited by individuals, not form groups, so that each farmer has difficulties in repaying the loans and experiencing losses. This condition causes other farmers to refuse to take advantage of the role of financial institutions.

3.3. Strategy of development beef cattle breeding area based on community

The SWOT matrix were used to formulate alternatives beef cattle development strategy based on strength, weaknesses, opportunities and threats in SPR Kuamang Abadi. The alternative strategies include: S-O (Strength–Opportunities), W-O (Weakness–Opportunities), S-T (Strength–Threats), and W-T (Weakness–Threats). The SWOT matrix for beef cattle development at SPR Kuamang Abadi is presented in Table 2.

Based on the strategic direction of the SWOT analysis results, the general strategy for developing the beef cattle area at SPR Kuamang Abadi as follows:

(i) Strengthening of human resources and institutions of SPR: (1) routine evaluation of SPR at least once a year by the central and local governments, (2) there is a rotation or change of management periodically (at least every 5 years), (3) the need for a program or product sustainable excellence, especially for SPR who have passed, so that SPR activities and membership remain solid, (4) sustainable technical guidance from the government and universities as a means of transfer of knowledge.

(ii) Strengthening of facilities and infrastructure: (1) chopper assistance for processing palm fronds so it can be used as a source of feed other than forage, (2) provision of livestock production facilities in the internal SPR area to facilitate the farmers, (3) activation of animal health centers in District (PUSKESWAN), (4) additional of veterinarians and inseminator and (5) routine health services from the government such as providing vitamins, deworming medicine and periodic checks related to diseases caused by reproductive disorders.

(iii) Accelerated adoption of technology and innovations: (1) arrange the recording data of productive and reproductive performance for each individual cattle (2) maintaining male cattle with superior performance to serve as bulls (3) mating system by artificially insemination at least 80% of the total beef cattle population (4) cattle selection with good performance (5) utilize of feed technology from waste sludge and oil palm cake as additional feed for cattle (6) utilize fronds and maximize the existing chopper function for silage (7) superior grass cultivation.

(iv) Strengthening of marketing strategy: (1) a one-door marketing system, through the Marketing Division in SPR Kuamang Abadi, or at least coordinated by each livestock group of SPR members, (2) sales of livestock were use scales or simple methods using linear body measurements to obtain an estimate of body weight if there is no scale at the nearest location, (3) record of each cattle sale is made so that it can be seen how many cattle can be removed in the SPR area in one year, (4) exchanging information and cooperation with SPR throughout Indonesia in feeder sales, (5) initiating the establishment of animal markets, (6) cooperation with local slaughterhouses in providing livestock regularly (6) utilizing social media to provide information to the general public outside the SPR.
Table 2. SWOT strategy formulation.

| Internal factor | Strength (S) | Weakness (W) |
|-----------------|--------------|--------------|
| a. The productivity and performance of cattle was good so has potential to increase the cattle population | b. Carrying capacity and capacity to increase the population of ruminants was quite a lot | 1. Facilities and infrastructure were still limited and inadequate |
| c. Potential for an integrated cattle-oil palm-based maintenance system, as well as the use of by-products from oil palm production to use a source of feed | d. Training and coaching activities were routinely both from the college and the government | 2. Limited number of animal health personnel and minimal health service activities from the government |

| External factor | Opportunity (O) | S-O strategy | W-O strategy |
|-----------------|-----------------|--------------|--------------|
| 1. The need and demand for meat in Bungo District is high | Building a CSR program with the palm oil processing industry to supply solid waste and oil palm cake as a feed ingredient for cattle as well as fertilizer marketing, use of feed processing technology with support from local/central government facilities (managing S1, S2, S3, S4, S5 and make use of O1, O2, O3) | Cooperate with local governments to build animal markets; build cooperation with financial institutions; building livestock production facility providers (minimizing W1, W2, W3, W4, W5, W6, W7 and utilizing O1, O2, O3) |
| 2. Opportunities for the CSR program with the palm oil processing industry around the SPR area | 3. The need for fertilizer for the company’s oil palm land is very high |
| 3. The need for fertilizer for the company’s oil palm land is very high | | |

| Threat (T) | S-T strategy | W-T strategy |
|-----------|--------------|--------------|
| 1. The number of competitors from outside the Jambi area | Increase animal health and assistance personnel, tighten access to the cattle that enter the SPR area, collaborate with the government to carry out the routine health service (manage S1, S2, S3, S4, S5 and overcome T1 and T2) | Improving the organizational structure of SPR members and activating the functions of each division, increasing cooperation between community groups, private companies and the government in supporting the development of beef cattle areas (reducing W1, W2, W3, W4, W5, W6, W7 and avoiding T1 and T2) |
| 2. The existence of disease from external area such as Jembara was caused by less strict protection from animal health | | |

(v) Strengthening of cooperation and partnerships: (1) development of agribusiness partnerships; (2) financing incentives; (3) improvement of upstream-on-farm-downstream business infrastructure; and (4) trade system development. The efforts and good synergy need to be made from the internal parties of SPR Kuamang Abadi, central of SASPRI, local governments and financial institutions to help and facilitate farmers to obtain capital so that business-oriented farmer businesses can be started and achieved.

4. Conclusions
Based on the scores obtained in the area analysis, it can be concluded that the SPR Kuamang Abadi, Bungo District classified as a built area because it is in the range of 500-700 (60.5). Based on the SWOT analysis, there are several things that must be improved so that the beef cattle area in SPR Kuamang Abadi can be upgraded to a development area, namely: (1) improvement of human resources and SPR Kuamang Abadi institutions through routine evaluation and periodic rotation of management; (2) improvement of facilities and infrastructure such as choppers, activation of animal health centers, addition of veterinarians and inseminators and routine health services such as giving vitamins; (3) accelerated adoption of technology and innovations; (4) strengthening marketing strategies such as a one-door marketing system and initiating the establishment of an animal market; and (5) increase
cooperation and partnerships through the development of agribusiness partnerships, financing incentives, improvement of upstream-to-farm-downstream business infrastructure; and trading system development.

**Acknowledgment**

This work was supported by *Program Magister menuju Doktor untuk Sarjana Unggul* (PMDSU) project Number 1/E1/KP.PTNBH/2021 from the Ministry of Research and Higher Education of the Republic of Indonesia. The authors would like to extend gratitude to SPR Kuamang Abadi for kindly help and assistance with data support and collection during the research.

**References**

[1] BPS 2020 *Peternakan dalam angka 2020* (Jakarta: Badan Pusat Statistik)

[2] Sodiq A 2011 Analisis kawasan usaha pengembangbiakan dan penggemukkan sapi potong berbasis sumberdaya lokal pedesaan untuk program nasional percepatan pencapaian swasembada daging sapi *J. Agripet* **11** 22–8

[3] Devendra C 2007 Perspectives on animal production systems in Asia *Livest. Sci.* **106** 1–18

[4] Sodiq A and Setianto N A 2007 Kajian pengembangan sapi potong: identifikasi ciri sistem produksi sapi potong di pedesaan *J. Pemang. Pedesaan* **7** 1–8

[5] Sodiq A and Hidayat N 2014 Kinerja dan perbaikan sistem produksi peternakan sapi potong berbasis kelompok di pedesaan *J. Agripet* **14** 56–64

[6] Sari D and Muladno 2019 Female Bali cattle performance in field station of Sekolah Peternakan Rakyat (SPR), Sungai Lilin District, Musi Banyuasin Regency The 8th Seminar on Tropical Animal Production, Prospects and Challenges for Sustainable Tropical Animal Production System, September 23-25, Yogyakarta pp 75–81

[7] BPS 2020 *Provinsi Jambi Dalam Angka 2020* (Jakarta: Badan Pusat Statistik)

[8] Departemen Pertanian 2003 *Kriteria Teknis Kawasan Agribisnis Peternakan Sapi Potong, Kerjasama* Direktorat Pengembangan Peternakan dengan Fakultas Peternakan IPB Jakarta

[9] David FR 2004 *Manajemen Strategis: Konsep-Konsep* (Jakarta: PT Indeks)

[10] BPS 2020 *Kabupaten Bungo dalam angka 2020* (Jakarta: Badan Pusat Statistik)

[11] Matondang R and Talib C 2015 Model pengembangan sapi Bali dalam usaha integrasi di perkebunan kelapa sawit *Wartazoa* **25** 147–57

[12] Kusuma S, Ngadiyono N and Sumadi 2017 Estimasi dinamika populasi dan penampilan reproduksi sapi peranakan ongole di Kabupaten Kebumen Provinsi Jawa Tengah *Bul. Peternak.* **41** 230–42

[13] Van den Ban, AW and Hawkins HS 2000 *Agricultural Extension. 2nd Edition* (UK: Blackwell Science)

[14] Soeharsono S, Rustijarno S and Triwidyastuti K 2008 Pembibitan ternak sapi potong dalam sistem integrasi tanaman – ternak di Kawasan Pantai Selatan Kabupaten Bantul *Saïns Peternak* **6** 49–55

[15] Ekowati T, Prasetyo E and Handayani M 2018 The factors influencing production and economic efficiency of beef cattle farm in Grobogan Region, Central Java *J. Indones. Trop. Anim. Agric.* **43** 76–84

[16] Nuryono R 2012 Studi kelayakan pengembangan pasar hewan di Kabupaten Bekasi *J. AKP* **1** 25–49