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# Potency and Development Strategies of Swamp Buffaloes at Different Topography in Cianjur District West Java Indonesia

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**Abstract**

Research on the potential and development strategies of swamp bullaloes were done in Cianjur District at Januari-Maret 2014. The method done of direct observation surveys and interviews with 63 farmers buffalo and using secondary data. Location determination using purposive sampling method which represents the differences topography and Location Quotient (LQ) above one (buffalo basis). The four subdistricts represented of the highlands with altituted above 700 m asl, while the fifteen subdistricts of the lowlands. Potential development of buffalo was analyzed by Additional Capacity of Ruminant Population (ACRP). The strategy development of buffalo was analyzed by Strength, Weakness, Opportunity, and Threats (SWOT). The aim of the research was to analyze potential and development strategies of swamp buffalo. The results showed that highland farmers have higher education and their buffaloes have better performance than the lowland farmer's.

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The swamp buffaloes in differences topography have been developed with ACRP of lowland and highland 439,258.3 Animal Unit and 140,730.9 Animal Unit respectively; SWOT analysis of strategies were (1) to harness the carrying capacity and improving the ownership scale (2) to make use of government programs and strengthen the competitiveness.

***Keywords:*** potential and development strategy; swamp buffalo; topography

## 1. Introduction

Buffalo has significant roles for rural in habitans and contributes nationally toward the meat production. However, buffalo management are still undergo traditionally. Therefore, efforts to accelerate the increase in population and productivity of individuals and local buffalo population as a meat-producing livestock should be done more intensively. According to [1] buffalo is an important contributor to milk, meat, power, fuel and leather production in many developing countries. Buffaloes have immense agricultural importance by virtue of their high production potential through meat and milk for mankind besides being a source of sustenance to the poor and marginal farmers as well as landless laborers in the developing country. However, the public perception that buffalo meat is tougher and of lower quality than beef, as buffalo meat has traditionally been eaten in developing countries from retired draught animals of more than 10 years of age. The buffalo is comparable to cattle in terms of growth rate, feed conversion efficiency, and carcass characteristics [2, 3, 4, 5].

Some peculiar problems of buffaloes were late maturity, silent heat coupled with poor expression of oestrus, irregular oestrous cyclicity, seasonality in breeding, anoestrus, low conception rate, long postpartum interval and repeat breeding etc. There have been the major constraints leading to low productivity. Buffalo has recently gained a lot of attention due to its high milk yield with high fat percentage, tolerance to hot and humid climate, lean meat, draught ability and a reasonable growth rate on roughage feeding [6].

Buffaloes are better converter of poor quality fibrous feeds into milk and meat. Reference [7] reported better degradation of both crude protein (CP) and protein free dry matter (DM) in buffaloes than in cattle. Other workers have also demonstrated a better digestive ability of buffaloes than cattle to utilize poor quality roughage [8]. The heat stress affect the physiological systems governing thermal regulation and the maintenance energy of buffalo during extreme summer.

Development of the buffalo population is determined by capacities and food resources and the involvements of society and government. It required strategic analysis and consideration of all factors that could affect the productivity of buffalo. Reference [9] stated that the Strength Weakness Opportunity Threats (SWOT) matrix is an important tool of matching in order to develop an SW strategy which is to analyze the strengths and weaknesses of internal and OT is a strategy to see opportunities and external threats

## 2. Materials and Methods

Research on the potential and development strategies of swamp bullaloes were done in Cianjur District at Januari-Maret 2014. The method done of direct observation surveys and interviews with 63 farmers buffalo and

using secondary data. Research data retrieval began with determining the location based on the development of each region, the Spatial Plan (Spatial) representing Cianjur location of the altitude difference by Location Quotient (LQ>1) buffalo. The fifteen subdistricts represented of the highlands with altitude above 700 m asl, while the four subdistricts of the highlands. Face to face interview of the farmer was conducted with pretested questionnaire.

Analysis of potential and development strategies of swamp buffalo carried by collecting data to explore the potential of storage production areas and the availability of forage by calculating the value of Additional Capacity of Ruminant Population (ACRP) according to [10], meanwhile The Srength, Weakness, Opportunities and Threats analysis by the SWOT matrix [8].

Development of the buffalo population is determined by capacities and food resources and the involvements of society and government. It required strategic analysis and consideration of all factors that could affect the productivity of buffalo. In determining the fodder capability for livestock development (especially ruminants) in a certain region, the concept of Ruminant Carrying Capacity (RCC) was used. RCC approach started from the ideas that: (1) the farmers in the countryside, generally meet the needs of the various sources of forage (grass, agricultural waste) agro-ecosystems in rural areas, and (2) the addition of ruminant populations do not destroy the balance of agro-ecosystems are being takes place within the meaning exceed capacities (carrying capacity) of existing ecosystems.

The potential availability of forage based on several sources, i.e.: grass fields, rice fields, field dikes, plantations, typical forests, secondary forests, road sides and moors. From secondary data, the total areas of all components were calculated for each sub-district. {10] reported the availability and requirements of livestock feeds in Indonesia. The conversion values of area which capable to provide forage and the conversion value of straw that were provided or used for animal according to [10].

Total Forage Production (ton Dry Metter/years) for each sub-district can be calculated by:

$$TFP = 3.75 \Sigma AE_i + \Sigma SP_i$$

Where TFP: Total forage production for each sub-district per year (ton DM/year); $AE_i$: effective forage area (ha) to i; where i = number 1-8 as presented in Table 1 $SP_i$: straw production from source j, where j = number 1-6 as presented in Table 2.

For each unit of cattle (AU) required 2.3 ton DM/year of forage. Thus, the Ruminant Carrying Capacity of one sub-district is calculated with following formula [10]:

$$\textbf{Ruminant Carrying Capacity (AU)} = \frac{\textbf{Total Forage Potency (ton DM/Year)}}{\textbf{2.3 (ton DM/AU/Year)}}$$

The Ruminant Carrying Capacity (RCC) calculation was only a measurement of one sub-district in a certain year. In reality, the farmer had already been feeding their cattle with any forage they could find. Therefore, this amount

of forage that had already been used by one sub-district in a certain year must be calculated by counting in the existing cattle. For that, it required conversion values [10].

**Table 1:** Conversion of grasses field

| Number | The real grass field area | The available of grass field area |
|---|---|---|
| 1. | the grass field area | the grass field area |
| 2. | the rice field area | 20 % rice field area x 10 % |
| 3. | the small dike in rice field area | 2.5 % rice field area |
| 4. | the garden area | 5 % garden area |
| 5. | the forest country area | 5 % forest country area |
| 6. | the forest secondary area | 3 % forest secondary area |
| 7. | the side road area | 0.5 ha x long road |
| 8. | the dry field area | 1 % the dry field area |

**Table 2:** Conversion of straw availability

| Number | The straw feedstuff | The available of grass field area |
|---|---|---|
| 1. | Rice straw | crop area (ha) x 0.23 ton DM/ha/year |
| 2. | corn straw | crop area (ha) x 10.90 ton DM/ha/year |
| 3. | cassava straw | crop area (ha) x 5.05 ton DM/ha/year |
| 4. | sweet potato straw | crop area (ha) x 1.20 ton DM/ha/year |
| 5. | soybean straw | crop area (ha) x 1.07 ton DM/ha/year |
| 6. | peanut straw | crop area (ha) x 1.44 ton DM/ha/year |

Thus, by calculating the ruminant population of a sub-district in particular year, it was able to measure the amount of used grass field (ton DM/year) as following [10] :

$$\mathbf{RCCU = 2.3\ TAU}$$

Where RCCU = RCC used; TAU = population of ruminant (AU).

By correcting RCC and RCCU, the ECRP (Additional Capacity of Ruminant Population) in year's period was obtained as following [10]

$$\mathbf{ACRP\ (AU) = RCC - RCCU}$$

ACRP calculation was applied for each sub-district, the result of RCC mentioned above was used as a basis of the

husbandry development ecology.

SWOT analysis was conducted to see the Strengths, Weaknesses, Opportunities and Threats that very useful for planning the development of buffalo in Cianjur district by considering some of important aspects such as natural resources, human resources and institutions.

**Table 3:** Alternative strategies SWOT matrix

| INTERNAL<br>Focus Strategy for internal condition | | EKSTERNAL<br>Focus Strategy for external condition | |
|---|---|---|---|
| Strength (S)<br>.....<br>.....<br>..... | Weaknesses (W)<br>.....<br>.....<br>..... | Opportunities (O)<br>.....<br>.....<br>..... | Threats (T)<br>.....<br>.....<br>..... |
| The strength determaining | The weaknesses determaining | The opportunities determaining | The threats determaining |
| The strategy is focused in the strength alternatif (S):<br>S - O<br>S – T | The strategy is focused in the weaknesses alternatif (W):<br>W - O<br>W – T | The strategy is focused in the opportunities alternatif (O):<br>O - S<br>O - W | The strategy is focused in the threats alternatif (T):<br>T - S<br>T – W |
| SO STRATEGY<br>What opportunity that is aimed to be achieved and how to achieve it depends on what strength that would be used.<br><br>ST STRATEGY<br>One or many strength is/are chosen to eliminate the threats | WO STRATEGY<br>To fix one weakness in order to achieve opportunity.<br><br>WT STRATEGY<br>Fixing particular weaknesses to avoid particular threats | OS STRATEGY<br>Interesting opportunity is available. Look for strength to achieve it<br><br>OW STRATEGY<br>Interesting opportunity is available, find the weakness that has to be covered to obtain the opportunity | TS STRATEGY<br>The threat is exists, look for the strength to eliminate it<br><br>TW STRATEGY<br>The threat is exists, find the weakness that has to be covered to eliminate the threat |

## 3. Results and Discussion

Cianjur District is one of regions in province of West Java, Indonesia, which located in $6^{o}21'$-$7^{o}25'$ SL and $105^{o}42'$-$107^{o}25'$ EL with rain density approximately 1,000-4,000 mm/year and total period of rains 150

days/year. Temperature is about 17 $^{o}$C-32 $^{o}$C, with 70-80 % of humidity. Cianjur divided in 32 sub-districts that cover high land, low land and shores.

The area of highland was smaller than lowland, the temperature were relatively similar (27 $^{o}$C) while the height difference was twice in amount. Environment condition in Cianjur district was very appropriate for buffalo husbandry based on the temperature and humidity. According to [11] buffalos would feel uneasy in area with THI (Temperature Humidity Index) more than 80, in such condition the days of stress would increase because of the heat, resulting negative influence to buffaloes oestrous state and pregnancy.

**Table 4:** Area and environment condition

| Region | Area (ha) | Altitude (m als) | Temperature $^{o}$C)* | Humidity (%)* |
|---|---|---|---|---|
| Lowland | 163,392 | 7-700 | 26.1-29.7 | 78-88 |
| Highland | 55,888 | 800-1,100 | 26.0-27.2 | 81-90 |

Source: [12]

The success of a livestock business was determined by the human resources who also depended on their age, profession, experiences, and business scale.

**Table 5:** The Farmers' age at different topography

| Farmer's age (years) | Lowland (%) | Highland (%) |
|---|---|---|
| 20-30 | 20.83 | 6.98 |
| 31-40 | 22.92 | 51.16 |
| 41-50 | 33.33 | 25.58 |
| 51-60 | 14.58 | 13.95 |
| >60 | 8.33 | 2.36 |

Table 5 indicated that the farmesr' mostly were in their prime productive age (41-50 years for Lowland and 31-40 for highland). According to [13] 44 years old is classified as young age and spirited also tend to have assertiveness in making decision. The higher scale of ownership the more amount of fodder that required, it was obvious, considering the limitation of farmers' ability in providing food for their buffalo. The Buffaloes in Cianjur district were generally utilized in cultivation. The result indicated that the farmers from both topographies had quite long experiences in buffalo husbandry, though the lowland's farmers had longer experiences by having farmer with 50 years of experiences in raising buffalo.

The highest ownership scale of buffalo in lowland was 3-4 buffaloes, while in highland 1-2 buffaloes. It also indicated the performance of the cattle, which the highland buffalo seemed to be better than lowland; it was because the method of highland farmers used in feeding their cattle by harvesting grass to provide fodder. The

higher scale of ownership the more amount of fodder that required, it was obvious, considering the limitation of farmers' ability in providing food for their buffalo. Farmers are always aiming at achievement of higher productive performance along with lower feed consumption i.e., best utilization. The Buffaloes in Cianjur district were generally utilized in cultivation, with ownership scale shown in following Table 6.

**Table 6:** The ownership scale at different topography

| Ownership scale (head) | Lowland (%) | Highland (%) |
|---|---|---|
| 1-2 | 35.42 | 56.82 |
| 3-4 | 50.00 | 34.09 |
| ≥5 | 14.58 | 9.09 |

The result indicated that the farmers from both topographies had quite long experiences in buffalo husbandry, though the low land's farmers had longer experiences by having farmer with 50 years of experiences in raising buffalo (Table 7).

**Table 7:** Husbandry experience at different topography

| Experiences (years) | Lowland (%) | Highland (%) |
|---|---|---|
| 1-10 | 22.92 | 70.45 |
| 11-20 | 25.00 | 22.73 |
| 21-30 | 16.67 | 4.55 |
| 31-40 | 12.50 | 2.27 |
| 41-50 | 14.58 | 0.00 |
| >50 | 8.33 | 0.00 |

Buffalo husbandry in high land was relatively dominated by 1-10 years of experience and there were no farmer with over 40 years of experience by the age of 31-40 years old. This could be potential to empower the farmers in the high land trough breeding technology programs.

**Table 8:** Reasons in raising buffalo at different topography

| Reasons | Lowland (%) | Highland (%) |
|---|---|---|
| Main business | 33.33 | 0.00 |
| inheritance | 45.83 | 79.55 |
| Side business | 20.83 | 20.45 |

Table 8 indicated that the buffalo in the highland area was not established as a main business, it was just considered as inheritance business or side business which the portion was 75.55%. In low land buffalo which were main business was about 33.33%, and buffalo considered as heritance business was 45.83%. This coincided

with the study conducted by [14] which indicated that about 69.33% of beef cattle (cow) were side business. Buffaloes had important role in agriculture for poor farmer in countryside and had been being inherited business as sources of meat and milk [1]. It is legitimately concluded that, without any significance differences to cow livestock, buffalos in Indonesia generally are people's livestock, thus it is imperative to gain attentions and interests from government so that institution for such matter is able to be established. Based on fact, high land had formed a husbandry community while it is none in low land. It had influenced the information of farmer empowerment program from government. According to [15] that the farmers must be motivated to join into groups or communities in order to improve the productivity and gained easier ways in enhancing technology and getting fund.

The education level of farmers from both topographies was mostly poor. Most farmers only had been in elementary school. Education is essentials in defining a better direction of one individual, either the aspect of cognitive, affective and psychomotor. The education level affected the ability of adopting technology. According to [16] that provided information and technology support must be available for farmers to access.

The amount and level of education is basic asset in husbandry development of Cianjur District in which the level of education is still an issue as the weakness that needs to be resolved. The lowlands subdistrict basis area of buffaloes more than highlands. That's were fifteen subdistricts and four subdistricts respectively. The basis area of buffalo was referenced Location Quotient (LQ) above one. Additional capacity of ruminant population analysis in Cianjur district presented in Table 9 and Table 10.

From the Table 4 and Table 5 , the lowland's ACRP is relatively higher than highland's, that means the chance of additional ruminant buffalo in lowlands were most likely better, that were 439,258.33 AU and 140,730.93 AU respectively.

Development of the buffalo population is determined by capacities and food resources and the involvements of society and government. It required strategic analysis and consideration of all factors that could affect the productivity of buffalo. [9] stated that the Strength Weakness Opportunity Threats (SWOT) matrix is an important tool of matching in order to develop an SW strategy which is to analyze the strengths and weaknesses of internal and OT is a strategy to see opportunities and external threats.

The strength at Cianjur district: (1) Raising buffalo has been long known hereditary with highly experienced; (2) The capacity is still large (high forage source); (3) The increase of human population and education; (4) The existence of institution handling livestock in term of improving buffallo production facilities. Weakness at Cianjur district: (1) Buffalo farmers' low level education; (2) Extensive maintenance system with low quality food, just utilized for cultivation, unavailability of breeding, high levels of inbreeding, natural mating (bad infrastructure); (3) Old age farmer; (4) Low scale of ownership. Opportunity from external Cianjur district: (1) Meat self-sufficiency program; (2) The location is close to the center of the meat consumers (Jakarta and Bandung); (3) Prices meat showed a rising trend; (4) for that support the buffalo population was increased. Threats from external Cianjur district: (1) Jobs outside Cianjur district offer higher/better salary; (2) Higher level of market competitio (increase of imported meat); (3) Low consumption of buffalo meat; (4) Agricultural

mechanization program.

**Table 9:** Additional Capacity of Ruminant Population in lowlands Cianjur District

| No | Lowlands Subdistrict | TFP (ton DM/years) | RCC (AU) | TAU (AU) | RCCU (AU) | ACRP (AU) |
|---|---|---|---|---|---|---|
| 1 | Sindangbarang | 124,191.89 | 53,996 | 4,805 | 11,051.50 | 42,945 |
| 2 | Cidaun | 220,242.36 | 95,758 | 7,909 | 18,190.70 | 77,567 |
| 3 | Cikadu | 135,787.16 | 135,787.16 | 2,406 | 5,648.80 | 53,389 |
| 4 | Tanggeng | 51,879.06 | 22,556 | 3,752 | 8,629.60 | 13,927 |
| 5 | Pasirkuda | 80,568.66 | 35,030 | 1,732 | 3,983.60 | 31,046 |
| 6 | Kadupandak | 91,100.41 | 39,609 | 3,530 | 8,119 | 31,490 |
| 7 | Cijati | 36,602.73 | 15,914 | 2,690 | 6,187 | 9,727 |
| 8 | Pagelaran | 140,952.33 | 61,284 | 1,827 | 4,202.10 | 57,082 |
| 9 | Campaka mulya | 53,251.82 | 23,153 | 919 | 2,113.70 | 21,039 |
| 10 | Cibeber | 95,786.82 | 41,646 | 2,926 | 6,729.80 | 34,917 |
| 11 | Warungkondang | 32,257.81 | 14,025 | 2,210 | 5,083 | 8,942 |
| 12 | Mande | 72,332.00 | 31,449 | 3,353 | 7,711.90 | 23,737 |
| 13 | Karangtengah | 35,739.61 | 15,539 | 1,796 | 4,130.80 | 11,408 |
| 14 | Cianjur | 19,818.01 | 8,617 | 1,197 | 2,753.10 | 5,863 |
| 15 | Cikalongkulon | 197,729.22 | 45,656.38 | 12,816 | 29,476.80 | 16,180 |
| | T o t a l | 1,388,239.89 | 563,269.73 | 53,868.00 | 124,011.40 | 439,258.33 |

Note: TFP: Total Forage Production, RCC: Ruminant Carrying Capacity, TAU: Total Animal Unit, RCCU: Ruminant Carrying Capacity Used, ACRP: Additional Capacity of Ruminant Population, DM: Dry Metter, AU: Animal Unit

**Table 10:** Additional Capacity of Ruminant Population in highlands Cianjur District

| No | Highands Subdistrict | TFP (ton DM/years) | RCC (AU) | TAU (AU) | RCCU (AU) | ACRP (AU) |
|---|---|---|---|---|---|---|
| 1 | Naringgul | 107,106.17 | 85,969.22 | 7,333 | 16,865.90 | 69,103.32 |
| 2 | Campaka | 29,822.19 | 46,567.90 | 2,063 | 4,744.90 | 41,823.00 |
| 3 | Pacet | 78,112.45 | 12,966.17 | 2,469 | 5,678.70 | 7,287.47 |
| 4 | Sukaresmi | 105,009.68 | 33,961.94 | 4,976 | 11,444.80 | 22,517.14 |
| T o t a l | | 320,050.49 | 179,465.23 | 16,841 | 38,734.30 | 140,730.93 |

Note: TFP: Total Forage Production, RCC: Ruminant Carrying Capacity, TAU: Total Animal Unit, RCCU: Ruminant Carrying Capacity Used, ACRP: Additional Capacity of Ruminant Population, DM: Dry Metter, AU: Animal Unit

## 4. Conclusions

The profile of buffalo farmer in highland of Cianjur District is better than the lowland's, i.e. higher level of education and younger age farmer, which is dominant there. The potential to develop buffalo livestock based on the area of forage source in which the lowland had better value of ACRP (AU), about 439,258,33 AU and meanwhile ACRP highland 140,730.93 AU. The development strategy that (1) has to be prioritized to exploit the carrying capacity and increasing the scale of ownership for the aimed of meat self-sufficiency program (2) ) to make use of government programs and strengthen the competitiveness.

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