

# Interconnectivity Multi Criteria For Sustainable Development Of Beef Cattle

Basir Paly, Asmuddin Natsir, Syamsuddin Rasyid, Imam Mujahid Fahmid

**Abstract** :This research is aimed to analyze the multi criteria stakeholders in the development of sustainable beef cattle by using Participatory Rural Appraisal (PRA). There were 35 samples were observed. Data and information were collected through focus group discussion among stakeholders. By using a multi-criteria sustainability which was promoted by the Indonesian National Council on Climate Change as guidance, stakeholders were participating to pay close attention deeply, until they found criterion and subcriterion level of their choices about sustainable beef cattle development. The analysis of criterion-subcriterion level were conducted by using Analytical Hierarchy Process (AHP). The results indicate that Economic criteria (E) becomes the primary priority, followed by other criteria. While subcriterion and interconnectivity analysis reveals that the priority of sustainable beef cattle development are interconnection of addition of investment on government budget (E2), establishment of cattle farmer community (S3), ecology functions are preserved (L1) with criteria and subcriteria, leaving out experimental technology and outdated technology (T2). Although the development of sustainable beef cattle has complexity (multi stakeholder and multi criteria), should be facilitated in order to contributing each other towards one mission and the same purpose namely, development of sustainable beef cattle.

**Index Terms:** Interconnectivity, Multi Criteria, Stakeholder. Beef cattle, Sustainable.

## 1. INTRODUCTION

Development and establishment have a similar meaning, which is a process of changes into a better state. The concept of establishment is generally used in wider disciplines, while the concept of development is used in more particular disciplines such as livestock. However, in this writing, both concepts of development and establishment are often used and exchanged. Issues of sustainable development are to meet the needs of current generation without hampering the needs of future generation (WCED, 1987)[1], and have become a multi-criteria concept of welfare in all activities (Peezet, 2004)[2]. In Indonesia, livestock development is directed to food sustainability, and independency of sustainable local livestock production (Kementan, 2010)[3]. But nowadays, cow husbandry in Indonesia is facing a problem of sustainability. Index and sustainability status of cow husbandry in Indonesia is still in range of 25-50, with a less-sustainable status (Syarifuddin, 2009: 41-49 [4], Sutanto and Listiari, 2011: 01-12[5]. Government has at least three times performed some efforts in undertaking self-supporting programs for beefs (Kementan, 2012)[6].

*First*, in 2000-2005 with a program called Sufficiency Program of Beefs, but it did not give a significant result. *Second*, in 2005-2010 with a program called Acceleration Self-Supporting Program for Beefs 2010, the result was also similar with the previous one. *Third*, in 2010-2014 with a program called Self-Supporting Program for Beefs 2014, this program has not also shown any significant success. In 2013, estimation of national beef needs will reach 550,000 tons, increased 56,000 tons compared to the previous year, 25% or 137.5 thousand tons might still be imported (BPS, 2012) [7a]. Indonesian dependency on importing meats has been running since 1990, or since 23 years ago (Arifin, 2013)[8]. There have been many publications reporting that agricultural development program (including animal husbandry) in Indonesia is lack of involving stakeholders (Iqbal, 2007:89-99)[9]. Stakeholders merely become the program receivers, not the subjects of the program (Sugeng, *et al.*, 2010: 835-851)[10], and it thus makes the policy being less accepted. In their reports, those experts and researchers admit that they have been inspired by Roger (1983)[11] who opposed technological forces among farmers, as well as Popkin (1986)[12], Scott (1993)[13], and Uphoff (1992)[14] who showed moral and resistance of farmers in Asia, and Kurtz (2000)[15] who really respected the institutionalization and participation of local community in sustainable development. The experts agreed that sustainable development should be based on criteria, choices, desires and expectations of the stakeholders. Criteria, in this case, are defined as a set of desires or willing, choices, and expectations which are personally determined by the stakeholders themselves (Aliye, *et al.*, 2012: 19-28)[16]. Stakeholder is defined as an individual and or a group/organization (multi stakeholders) who feels the impacts related to the issues and problems of animal husbandry (Freeman, 1998: 171-181)[17]. In social reality, there are numbers of criteria (multi criteria) from many stakeholders (multi stakeholders). Therefore, this study aims to analyze the interconnectivity of multi criteria from multi stakeholders. Result of this study is expected to give an improvement regarding stakeholder's understanding in undertaking a sustainable development of animal husbandry.

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## 2. RESEARCH METHOD

### Location and Time of Research

This research was undertaken in Takalar Regency on January-March 2013. The selection of this place was based on consideration that Takalar Regency is one of Strategic Areas for sustainable development of animal husbandry (Perda, 2009)[18].

### Method

Method used was Participatory Rural Appraisal (PRA), a method which aims to comprehend certain problems with a participative way, Amanah (2003: 103-120)[19]. Population of the research is stakeholders who are related to the issue of sustainable development of animal husbandry; they are the Government (executive), House of Representatives (legislative), intellectuals (academicians), non-governmental organization (NGO), cow ranchers, and group of cow breeders. From that population, it is then defined 35 samples purposively. Data and information are collected through Focus Group Discussion among the groups of stakeholder. By using multi criteria sustainability promoted by Indonesian Climate Change National Board (DNPI) 2010 [20], stakeholders are challenged to do a more concern. This process keeps continuing until they find and can decide the criteria and sub criteria rank or level of their choice. Thus, the criteria and sub criteria are the result of multi stakeholder interconnectivity without any intervention and, surely, do not need to be reduced.

### Determination of Multi Criteria

This study uses multi criteria promoted by DNPI, 2010 [20] (Table 1). Process of decision making related to rank and interconnectivity of criteria is undertaken by using Analytical Hierarchy Process (AHP) (Saaty, 2005)[21]. In this method, grouping both main criteria and sub criteria is done. The main criteria used in this research are, Economic (E) criteria, Social (S) criteria, Environmental (L) criteria, and Technological (T) criteria. Each criterion is specified in details into three sub criteria (Table 1).

Table 1. Main Criteria and Sub-Criteria of Research

CRITERIA	SUB-CRITERIA
ECONOMIC	E1. Increasing Scale of Local Ranchers' Business
	E2. Additional Investment on Government Budget
	E3. Additional Income Acquired by local Community
SOCIAL	S1. Recruiting Labors and Establishing Job Fields
	S2. Not Causing a Potential Conflict Within Groups in the Community
	S3. Developing the Ranchers
ENVIRONMENT	L1. Maintaining Sustainable Ecological Functions
	L2. Obeying Regulations of Land Use and Layout
	L3. Maintaining Biodiversities (Genetics, Species, Ecosystems) and Not Causing Pollution
TECHNOLOGY	T1. Not Causing a Dependency on Foreign Party in Terms of Knowledge and the Use of Technology
	T2. Not Using a Trial or Obsolete Technology
	T3. Seeking to Increase the Ability and Utilization of Local Technology

Source: Adapted from DNPI (2010)

### Data Analysis

**First**, Data analysis through AHP technique is started by making the hierarchical structure, where sustainable cow husbandry as the aim is on the top of hierarchy, followed by main criteria, sub criteria, and then priority rank in the lowest hierarchy (Figure 1).

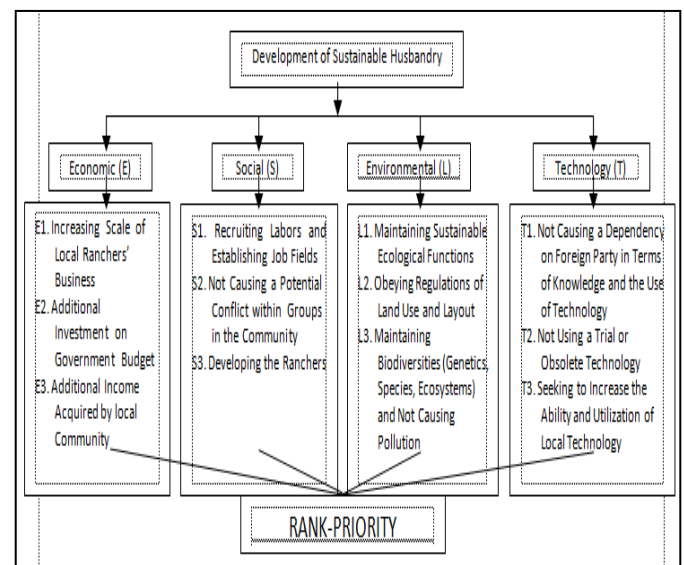


Figure 1. Hierarchy of Data Analysis (DPNI, 2010)

**Second** is by making a pairwise comparison matrix to compare each criterion and sub criterion (Table 2). The purpose is to figure out the rank of multi criteria that has a priority.

**Table 2. Pairwise Comparison Matrix**

Criteria	Sub Criteria 1	Sub Criteria 2	Sub Criteria 3
Sub Criteria 1	1		
Sub Criteria 2		1	
Sub Criteria 3			1

**Source:** Saaty (2005)

The comparison result of each element will be in form of numbers from 1 to 9 showing a comparison of criteria-sub criteria level of importance. If criteria-sub criteria in the matrix are compared to itself, the result will be 1. Scale of 9 has been proven to be accepted and can differ the intensity among element (Saaty, 2005)[21]. This result of comparison is filled in the cells which corresponds to the compared criteria. Pairwise comparison scale and its definition introduced by Saaty is presented in Table 3.

**Table 3. Pairwise Comparison Scale**

Level of Importance	Definition
1	Both criteria are important
3	One criterion is a bit more important than another
5	One criterion is more important than another
7	One criterion is absolutely more important than another
9	One criterion is definitely important compared to another
2,4,6,dan 8	This scores are given if there are two compromises between 2 choices of criterion
Opposite	If activity <i>i</i> gets one number compared to activity <i>j</i> , then the activity <i>j</i> has opposite value compared to the <i>i</i>

**Source:** Saaty (2005)

**Third** is to determine the priority of criteria and sub criteria. Result of pairwise comparison is values/scores that can be used in determining the criteria and sub criteria priority. Calculation is done by summing up the score or value of each column in the matrix, dividing each value in the column with the pertinent total column, and summing up the values of each row and finally dividing them with the number of element (sub criteria) to get a mean score. The process of AHP analysis is undertaken by using Expert Choice Version 11 software.

### 3. RESULTS AND DISCUSSION

#### Level/Rank of Main Criteria

As what has been defined before, criteria is a set of desires, choices, and expectations determined personally by multi stakeholders through Focus Group Discussion. Main criteria are criteria in the field of economy (E), Social (S), environment (L), and technology (T), while priority is values/scores from those main criteria.

**Table4. Value of Main Criteria Priority**

Criteria	Value	Standard Deviation	Priority	Definition
Economic (E)	0,33	0,13	First	Very Important
Social (S)	0,24	0,19	Second	Important
Environmental (L)	0,22	0,14	Third	Quite Important
Technological (T)	0,21	0,15	Fourth	Quite Important

Based on the data in Table 4, it suggests that economic (E) criteria is placed in the *first* priority or *very important* (0.33), followed by social (S) criteria as the *second* priority or *important* (0.24). Environmental (L) criteria and Technological (T) criteria are placed in as the *third* and *fourth*, respectively, or *quite important* with respective priority values of 0.22 and 0.21. It can be ordinarily inscribed as  $E > S > L > T$ , which means that economic criteria are more dominant compared to the other three criteria (S, L, and T). This criteria priority should be interpreted as aspiration, demand, desire, choice, and or expectation (criteria) from multi stakeholders in sustainable development of cow husbandry. The result of this research is in line with Sarosa's argument (2005: 376)[22] who reported that economic criteria are more dominant in sustainable developmental activities in the Third World, like Indonesia. It is, again, important to clarify that multi stakeholders are not without concern or avoiding the issues and problems of environment. In the case of criteria priority, the stakeholders prioritize economic criteria rather than the others. Thing that needs to be considered is about income level of stakeholders in the location of this research is still low, which is Rp 4,700,000 in average, or equal to US\$479 per capita per year, or 50.47% lower than what has been achieved nationally in Indonesia (BPS, 2012) [7b]. Priority of economic criteria in the field of agriculture/animal husbandry can probably be understood, considering that this research is undertaken by households that still have a lower income. There is still no valid data regarding the number of poor households in terms of animal husbandry. However, of 28.59 million poor people in Indonesia, 18.08 million people (63.23%) live in villages (BPS, 2012) [7c], places where cow breeders live.

#### Sub-Criteria Priority

In the analysis of sub criteria priority, the main criteria such as economic, social, environmental, and technological, are divided into three sub criteria. After given a score or value, each sub criteria that comes from the same main criteria (for instance, economic) will again be compared. This

assessment is done by the stakeholders themselves, thus the sub criteria are called as local criteria.

**Table 5. Value of Sub-Criteria Priority**

Main Criteria	Sub-Criteria	Value	Standard Deviation
ECONOMIC	E2. Additional Investment on Government Budget	0,37	0, 11
	E1. Increasing Scale of Local Ranchers' Business	0,36	0, 14
	E3. Additional Income Acquired by local Community	0,27	0, 14
SOCIAL	S3. Developing the Ranchers	0,41	0, 20
	S1. Recruiting Labors and Establishing Job Fields	0,32	0, 16
	S2. Not Causing a Potential Conflict Within Groups in the Community	0,27	0, 21
ENVIRONMENTAL	L1. Maintaining Sustainable Ecological Functions	0,43	0, 21
	L2. Obeying Regulations of Land Use and Layout	0,37	0, 01
	L3. Maintaining Biodiversities (Genetics, Species, Ecosystems) and Not Causing Pollution	0,20	0, 20
TECHNOLOGICAL	T2. Not Using a Trial or Obsolete Technology	0,31	0, 15
	T3. Seeking to Increase the Ability and Utilization of Local Technology	0,27	0, 16
	T1. Not Causing a Dependency on Foreign Party in Terms of Knowledge and the Use of Technology	0,26	0, 13

Table 5 illustrates that based on their priority values, the order for these economic criteria-sub criteria is E2, E1, and E3, or ordinarily inscribed as  $E2 > E1 > E3$ . It can also be defined that *Additional Investment on Government Budget* (E2) is more dominant than *Increasing Scale of Local Ranchers' Business* (E1), and E1 is more dominant than *Additional Income Acquired by local Community* (E3). Similar interpretation is also applied to the main criteria of social (S), where  $S3 > S1 > S2$ , environmental (L) criteria in which  $L1 > L2 > L3$ , and technological (T) criteria where  $T2 > T3 > T1$ . Symbol of  $>$  means more important than.

### Interconnectivity of Multi Criteria

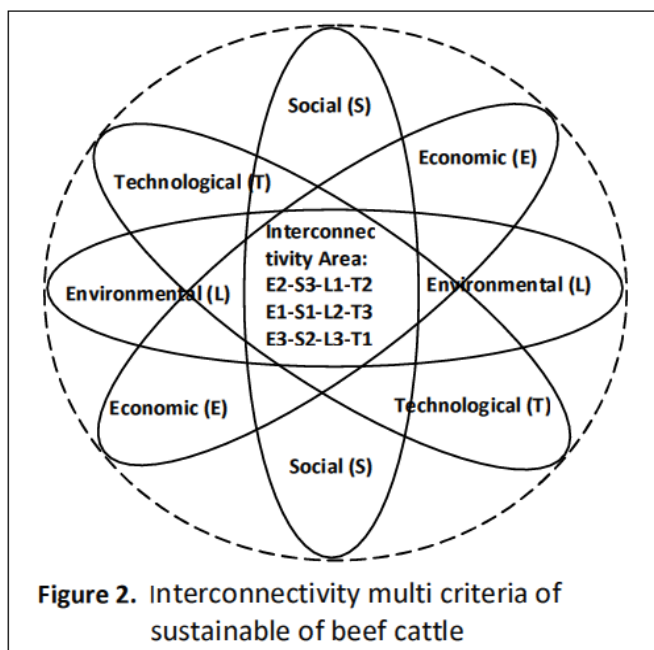
It surely becomes a weakness if the analysis of this research merely presents criteria and sub criteria priority as shown in Table 4 and Table 5. It also, as if, suggests that sustainable development of cow husbandry must firstly fix the economic problems, followed by the social problems, environmental problems, and finally the technological problems. This research is not solely aimed to be undertaken for that simple reason. Therefore, we still need to continue the analysis related to interconnectivity of multi criteria as the objectives and questions that need to be answered through this research. For that matter, the analysis result of main criteria (Table 4) and the analysis result of sub criteria (Table 5) can be combined as shown in Table 6 below. This process of combination is called *Interconnectivity of Multi Criteria*.

**Table 6. Interconnectivity of Multi Criteria and Priority**

Priority	Interconnectivity of Multi Criteria (Criteria-Sub Criteria)
First (E2-S3-L1-T2)	E2. Additional Investment on Government Budget
	S3. Developing the Ranchers
	L1. Maintaining Sustainable Ecological Functions T2. Not Using a Trial or Obsolete Technology
Second (E1-S1-L2-T3)	E1. Increasing Scale of Local Ranchers' Business
	S1. Recruiting Labors and Establishing Job Fields L2. Obeying Regulations of Land Use and Layout
	T3. Seeking to Increase the Ability and Utilization of Local Technology
Third (E3-S2-L3-T1)	E3. Additional Income Acquired by local Community
	S2. Not Causing a Potential Conflict Within Groups in the Community L3. Maintaining Biodiversities (Genetics, Species, Ecosystems) and Not Causing Pollution
	T1. Not Causing a Dependency on Foreign Party in Terms of Knowledge and the Use of Technology

Table 6 illustrates that there are three interconnectivity priorities of multi criteria that can be used in sustainable development of cow husbandry. The *first* priority is interconnectivity among criteria-sub criteria (E2-S3-L1-T2). This first priority contains a significance of interconnectivity of additional investment on government budget (E2), developing the ranchers (S3), maintaining sustainable ecological functions (L1), and not using a trial or obsolete technology. The *second* priority is interconnectivity among criteria-sub criteria (E1-S1-L2-T3). This second priority contains a significance of interconnectivity of increasing scale of local ranchers' business (E1), recruiting labors and establishing job fields (s1), obeying regulations of land use and layout (L2), and seeking to increase the ability and utilization of local technology (T3). The *third* priority is interconnectivity among criteria-sub criteria (E3-S2-L3-T1). This third priority contains a significance of interconnectivity of additional income acquired by local community (E3), not causing a potential conflict within groups in the community (S2), maintaining biodiversities (genetics, species, and ecosystems) and not causing pollution (L3), and not causing a dependency on foreign party in terms of knowledge and the use of technology (T1). It can ordinarily or qualitatively written as  $(E2-S3-L1-T2) > (E1-S1-L2-T3) > (E3-S2-L3-T1)$ , where symbol of  $>$  means more important than. Thus, the result of this research has at least recommended that sustainable development of cow husbandry cannot longer be interpreted as a partial activity. The result shows that economic problems become the first priority, followed by social problems, environmental

problems, and lastly technological problems. This type of interpretation really complicates the planners and the organizers of research in fields. In contrary, the result of this research shows that interconnectivity of multi criteria of sustainable development of cow husbandry is contributed from and among main criteria, among sub criteria, and among criteria-sub criteria. As illustrated in Figure 2, not all the main criteria can be interconnected, only particular parts which are relevant, and we call it as sub criteria. The connected sub criteria still include their original main criteria. For instance E2 which means the main criteria of economic with sub criteria 2, additional investment on government budget. S3 is read as the main criteria of social with sub criteria 3, developing the ranchers. Similar meaning is also applied to L1, T2, and so forth. Principle of this interconnectivity of multi criteria is to present and to contribute simultaneously to each other, and not to nullify each other.



A higher economy growth is usually shown by a higher productivity, increased income per capita, and improvement of quality of life (Todaro and Stephen, 1998: 34-35)[23]. However, there have been many evidences that higher economic growth has taken our natural resources so rapidly, while natural rehabilitation is really low. The conclusion is that higher economic growth does not merely direct to life improvement. It might be in contrast with that. It might be a process of impoverishment of local community. Therefore, criteria-sub criteria of environment are an absolute consideration to be assessed. In other hand, criteria-sub criteria of social have a strong connection to sustainable development. If there are social problems or issues, such as discrepancy between the rich and the poor, then it is a fact of social problem (Adams, 1990[24], Becker et al., 1999 [25], and Kurtz, 2000 [15]). Poor people want to make their lives better, they tend to change a condition, and refuse status quo (Budiman, 1995: 6)[26]. If their power enables them, they would do a social and political disturbance to destroy the results of development that have been achieved. Thus, it is not only environmental damages that will hamper

sustainability, but also social disturbances. Technology developed in these days, is really effective in creating higher economic growth. It can exploit the resources rapidly, decreases the portions of human energy that previously get an income, and stimulates economic and social discrepancies. (Briffetta, et al., 2003: 171-196) [27]. Technology is like a two-sided knife. It depends on the purpose and who uses it. Therefore, interconnectivity among criteria-sub criteria of economic, social, environmental, and technological is definitely needed. Although it does not direct too the field of animal husbandry, OECD (2006)[28] has been expressing sustainable development as interconnectivity among three main criteria (economy-social-environmental) and DNPI (2010)[20] presents interconnectivity among four main criteria (economic-social-environmental-technological). In the reality, it is difficult to find a system with a clear limitation, because what exists is interconnectivity among sub systems (criteria and sub criteria) as a state of that reality. Interdependency paradox has come and explained that there is no free matter that can stand alone, because that matter is the form of interconnectivity (Amin, 2002 and Salman, 2012: 34-35)[29]. It is just like a rhizome which is bound to each other and prop up a tree and its branches until it produces flower and fruits. Development of cow husbandry is a complex system which has multi criteria. In those multi criteria, there are sub criteria that can produce and reproduce themselves to be more complex sub criteria, and thus the solution is interconnectivity. The result of this research is suitable to be applied in Takalar Regency which has multi stakeholders. In Takalar Regency, stakeholders of beef cattle come from bureaucratic groups (executives), House of Representatives (legislatives), academicians/intellectuals, traders (suppliers), entrepreneurs (industry), mass media, non-governmental organization (NGO), and other households or ranchers. We call them as stakeholders. It is clear that they all have different expectations, needs, and demands - multi criteria. However, those multi criteria can still be facilitated to contribute as shared visions and goals, which is sustainable development beef cattle.

#### 4. CONCLUSION

Result of this research concludes that interconnectivity of multi-criteria development of beef cattle sustainability is a contribution of and among one main criterion and other main criteria, among one sub criterion and other sub criteria, and among one criteria-sub criteria and other criteria-sub criteria. Hence, development of sustainable beef cattle is not a partial activity which sets out economic issues in the first place and then social, environmental and technological issues in the end, but rather the interconnectivity of multi-criteria stakeholder. The principle of this multi-criteria stakeholder is to present and to contribute simultaneously, and not to nullify each other. The result of analysis of the main criteria shows that, Economic (E) criteria becomes the first priority in the development of sustainable beef cattle, followed by Social (S) criteria, Environmental (L) criteria, and then finally the Technological (T) criteria. While the analysis of interconnection-subcriteria indicate that the priorities in the development of sustainable beef cattle is interconnectivity between the additional investment in the government budget (E2), developing the ranchers (S3), maintaining sustainable ecological functions (I1) and the criteria-sub criteria of not using a trial or obsolete technology (T2).

Result of this research also shows that although this activity has stakeholders and complex multi criteria, it can still be facilitated to contribute to each other towards similar shared visions and goals, which is the development of sustainable beef cattle.

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