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## Research Article

# Assessment of Comparative Advantage and Development Strategy for Swamp Buffalo Livestock in Hulu Sungai Utara Regency, South Kalimantan

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## Abstract

**Background and Objective:** Swamp buffalo (*Bubalus bubalis* Linn.) is one of the existing germ plasma in South Kalimantan has great potential as producer of meat to support the food security program in Indonesia. Swamp buffalo development strategy requires a specific model based on local resource potential. Research was undertaken in Hulu Sungai Utara (HSU) regency, South Kalimantan province and aims to observe the areal potency of swamp buffalo rising, study obstacle factors and impacts raised from the swamp buffalo industry, determine related logics between swamp buffalo development and arrange logical framework approach to solve swamp buffalo development problem. **Materials and Methods:** Research design was descriptive participative method within LQ analysis, potential area analysis and Logical Framework Analysis (LFA). **Results:** The result indicates agro ecology swamp was highly profitable for swamp buffalo cultivation, meat product strategic role, manpower, resource income, supportive nutritious, breed source, tourism attraction and local wisdom development. The LQ value of 2.327, therefore, Hulu Sungai Utara regency was the basic area which has a comparative advantage for swamp buffalo development: economic density of 1.125 (highly dense), farm industry of 1.661 (dense) and area of 56.971 (dense). **Conclusion:** Swamp buffalo strategic model development in HSU regency was to increase the utilization in effective technology, promote through swamp buffalo tourism event, empower society's skill role, the role of counselors and governments, capital and cooperative relationship among businessmen, relocate cultivation close to transportation area, regulate land use and improve the institution performance.

**Key words:** Strategy development, potential area analysis, swamp buffalo, logical framework analysis

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

The meat consumption of Indonesia population is in the tendency of raising in straight line with the increasing population and also in relationship with the increased income and awareness of food and nutrition for families. Buffalo meat produce in south Kalimantan decreases 36.8% on one side but on the other side the level of meat consumption rise 4.7%. The reduction of buffalo meat produce is in relation with the population of swamp buffalo in south Kalimantan which is reducing by each year in the period of 9 year i.e., 2004 to 2013 at the scale of 38.25%<sup>1</sup>. The reduction of population growth also took place in all other province in Indonesia from 2000-2014, in 14 years the growth of swamp buffalo rate was 45.07%. Meanwhile the swamp land for forage of swamp buffalo is potentially high<sup>2</sup>.

The above mentioned situation has demanded serious effort from stakeholder to develop the swamp buffalo population to fulfill the demand of meat as food source for protein. The role of swamp buffalo as premium commodity for supplying the meat and at the same time to afford national meat self reliance. According Ministry of Agriculture<sup>3</sup>, the attempt to fulfill the demand of meat domestically by means of meat import and one of important policy is the self production of meat on the basis of indigenous resource. Chantalakhana<sup>4</sup> to revealed buffalo has been recognized to contribute significantly to the sustain ability of mixed crop-livestock farming systems as well as to farmer's income and food security in Asia.

The total area of south Kalimantan is 3,753,052 ha, with non-cultivated swamp area about 4.83% of the total area (181,169 ha) and population of more than 3 million people<sup>1</sup>. Based on the natural resources owned is a prospective potential for developing germ plasma of swamp buffalo in south Kalimantan. Swamp buffalo is still a guideline in the development of agricultural business. Paradigm of regional development today should take precedence in areas that can increase the potential of the region and not only can be utilized comparative but also seek a high competitive advantage.

Swamp buffalo (*Bubalus bubalis* Linn.) is one of the potential cattle commodities in terms of provision of meat due to low quality feed conditions, capable of digesting crude fiber better than cattle<sup>5</sup>. Hamid<sup>6</sup> to revealed water buffalo is extraordinary capacity of utilization less digestible feeds (straw, sugar cane wastes etc.) than cattle. According Diwyanto and Handiwirawan<sup>7</sup>, swamp buffalo could live in

relatively difficult areas in poor feeding conditions. Swamp buffalo also have the ability to breed in a wide range of agro ecosystems from wet areas to relatively dry areas.

Hulu Sungai Utara (HSU) regency with the area of 892.70 km<sup>2</sup> or 2.38% of south Kalimantan region and population as 211,699 people<sup>8</sup>. It is mostly of swamp land of 85% of the territory and supported by the abundance of forage for cattle is a good place for development of swamp buffalo. At present the regency has the highest population of swamp buffalo in south Kalimantan, with the share of meat production<sup>1</sup> of 18.08%. The zone of agroecology is as supporting factor for developing swamp buffalo livestock for fulfilling the meat demand locally and also regionally so that the index of meat import can be decreased.

Swamp buffalo occupies strategies role for some part of community in HSU regency mainly its population is concentrated in Paminggir sub regency, not only as meat producer but also for labor work, source of income, tourism attraction and development of indigenous knowledges. It has been for long swamp buffalo of HSU regency has become the source of stock of swamp buffalo for other regency and the livestock has been widely distributed all over Kalimantan island and this region is the representation of swamp buffalo. Based on the above conditions, if the commodity Swamp buffalo is cultivated precisely certainly has a very bright prospect in support of national self-sufficiency in meat, unfortunately, however, the species did not receive the attention of the policy makers and the researchers in their merits, which resulted in buffalo population decline in several eastern Asian<sup>9</sup>. Therefore, it is necessary to study the potential and strategy of local cattle development along with innovative management implementation in order to give real contribution to the increase of local meat production to fulfill the consumption of protein source food and useful to present the information of clear business opportunity to encourage investors to invest their capital<sup>10</sup>. The sharp increases in food prices that occur in global and national markets in recent years and the resulting increases in the number of hungry and malnourished people have sharpened the awareness of the policy-makers and of the general public to the fragility of the global food system.

This research especially aimed to examine the potential commodity and potential region for swamp buffalo breeding, constrained factors and impacts raised from swamp buffalo development. It also determined the logical relationship in swamp buffalo development, arranges Logical Framework Approach (LFA) to solve the swamp buffalo development,

makes accurate strategy for buffalo development project includes in central government, private sectors, banks, regional government as well as higher education towards sustainable continuation.

## MATERIALS AND METHODS

This research used livestock statistics data of Animal Husbandry Service of south Kalimantan year 2008-2016, questionnaire and discussion with respondents (breeder, businessmen, policy marker and researcher). The research method used was participatory descriptive. The combination of quantitative analysis and qualitative analysis was used as one of the efforts to find scientific truth more objectively by considering social, cultural and economic approaches in society. The research was done in HSU regency, south Kalimantan province from March-October, 2016. The regency was chosen for research site because the population of swamp buffalo is the highest in south Kalimantan. The duration of this research was related to data collection and discussion activities with the respondents. Activities lasted for 8 months from March-October, 2016.

The number of respondents from population was determined by Slovin formula<sup>11</sup>, from 432 populations there are 208 respondents. The research applies descriptive-participative method. It consists of quantitative and qualitative analysis combination used applied as one of the attempts to seek for scientific truth which more objectives with social, cultural and economical is thought. Analysis of territorial capability for development of swamp buffalo is conducted by initializing the premium commodity by means of formulation method of Location Quotient (LQ) accommodated from Miller *et al.*<sup>12</sup>, Isserman<sup>13</sup> and Hood<sup>14</sup> as follows:

$$LQ: \frac{\left(\frac{p_i}{p_t}\right)}{\left(\frac{P_i}{P_t}\right)}$$

In which :

- pi = Population of swamp buffalo in HSU regency
- pt = Total livestock population in HSU regency
- Pi = Population of swamp buffalo in province
- Pt = Total livestock population in province

### Criterion validity:

- LQ>1 means that commodity basis which has comparative advantage or source of growth

- LQ = 1 means that commodity is not as basis but it can fulfill self need
- LQ<1 means that commodity is not basis and which does not fulfill self need

The method was conducted further by counting the livestock density (economic density, farm density, area density) and subsequently utilize the method<sup>15</sup>. Evaluation of development strategy for swamp buffalo development utilizes participative method by means of analysis technique of LFA. This approach is arranged with the aim of improving planning system and project development. It is one of the tools used for structured goal achievement<sup>16</sup> i.e., stakeholder, SWOT, problem tree and objective hierarchy analysis<sup>17</sup>.

## RESULTS

### Potency and supporting capacity of swamp buffalo development

**Comparative superiority within swamp buffalo:** Based on area potency analysis it gain 2.327 LQ value. The LQ value more 1, indicates the area which has the comparative superiority where its population is bigger than the need of its area, so that the surplus can be exported out of regions. The accurate strategy for the surplus area is to improve the management skills for cattle breeding, make better and hygiene livestock building, develop of castle market and do the best within fodder technology through people empowerment participatory.

### Potency and supporting capacity of swamp buffalo development

**Cattle density:** The criterion within densely economic cattle is of 1.125 is very dense indicating the probability of competition, where the number of population will be the competitors for the existence of cattle in case of food supply (Table 1).

Farm industry density showed the value of 1.661, which is density category, its soil is no longer able to bear swamp buffalo enterprise development. Hence, more intensive effort should be done to benefit fodder in the field and cattle raisers' knowledge within fodder processing of swamp buffalo should also be improved. Furthermore, the area density showed the value of 56.971 with highly dense category, indicating this area is no longer possible to be loaded with a number of swamp buffalos therefore another effort is to improve the cattle raising management as well as their production (Table 1).

Table 1: Swamp buffalo density in HSU regency, 2016

Cattle density						
Regency	Economy		Farm Industry		Area	
	Value	Category	Value	Category	Value	Category
HSU	1.125	Highly dense	1.661	Dense	56.971	Dense

Table 2: Matrix SWOT swamp buffalo development in HSU regency

SWOT analysis	
S	(1) Large swampy area for swamp buffalo industry activity, (2) Climate change does not influence swamp buffalo raising process, (3) Swamp buffalo cultivation as the main industry, (4) Regeneration for cattle raising, (5) Skillful and experienced, (6) Simplified marketing
W	(1) Fodder availability depends on climate, (2) Traditional cattle raising, (3) Un optimal cattle institution, (4) Unskilled in handling the productions, (5) limited capital (self-supporting capital), (6) Relatively high mortality within baby buffalo
O	(1) Increase in meat demand, (2) Tourism object development, (3) Job opportunity, (4) Advanced technology cultivation development
T	(1) Land use adjustment due to plantation areal enlargement, (2) Potentially dangerous in swamp buffalo theft, (3) High price in fuel
SWOT strategy	
Strategy S-O	(1) Effective technology application within cattle raising development, (2) Swamp buffalo race event, (3) Enhancing the role of skillful society, counselor, government and higher education institution to proceeding with swamp buffalo raising
Strategy W-O	(1) Intensive guiding/counseling from integrated institution in cultivation and institutional, (2) Fund rising to help in business development
Strategy S-T	(1) Enhancing partnership among business owner, (2) The create industrial areas close to public transportation
Strategy W-T	(1) Improving land use in cattle breeding, (2) Strengthening cattle institutional capacity

S: Strength, W: Weakness, O: Opportunity, T: Threat (T)

### Strategy improvement within swamp buffalo industry

**Stakeholder analysis:** Parties having a role as stakeholders in swamp buffalo industry in HSU regency were buffalo breeders, industries, banks, swamp buffalo groups and higher education institutions. Within this cooperation it creates support as well as benefit among those parties.

### Strategy improvement within swamp buffalo industry

**Swot analysis:** Through the analysis of the internal environment and the external environment was then carried out a process of integration between elements of strength, weakness, opportunities and threats with the SWOT matrix to determine alternative strategies selected. From the SWOT matrix results can be obtained some alternative strategies in the development of swamp buffalo business that can be described in Table 2.

### Strategy improvement within swamp buffalo industry

**Three analysis problem:** There are three main components causing to be less developed within Hulu Sungai Utara district swamp buffalo industry i.e., lesser surroundings cattle's fodder, limited capital, less cattle counselors and no veterinary in duty in this sub-district.

### Strategy improvement within swamp buffalo industry

**Objective hierarchy analysis:** The development within swamp buffalo in HSU regency should be undertaken in

integrated and structured ways so that the problem can be solved precisely and accurately, that is by readily available loan, the increase in meat demand, the existence of quay, either tool or seed bed facility is guaranteed, industry group empowerment, cattle raisers skills, raisers are capable to adopt cultivation technology, areal condition information and the optimal benefit of areal cultivation.

### Strategy improvement within swamp buffalo industry

**Interrelationship problem:** The lack of optimal cattle institutions is caused by several interrelated factors, such as: (1) Traditional farming system, (2) Poor security condition, (3) Limited extension of cattle and veterinary education, (4) Lack of expertise in handling results, (5) Limited capital, only using own capital, (6) Land use change due to expansion of planting area and (7) Availability of forage feed decreased. These factors can lead to a lack of development of swamp buffalo business in HSU regency. Problem linkage chart can be seen in Fig. 1.

The development of swamp buffalo business in HSU regency can be done by using LFA. Results LFA can be seen in Fig. 2.

## DISCUSSION

Comparing the value ( $LQ = 2,327$ )  $>1$  swamp buffalo cattle and swamp buffalo cattle density value in HSU region, it can be concluded that this regency was the base of swamp

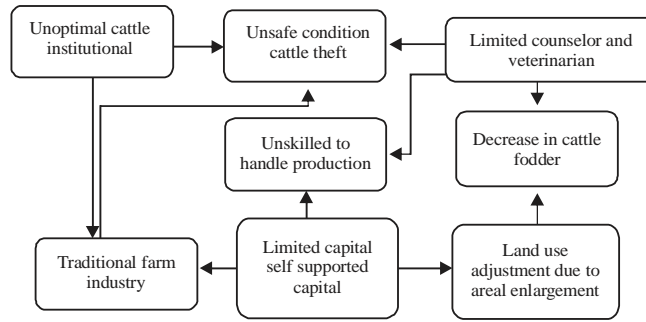


Fig. 1: Linkage of swamp buffalo business development problems

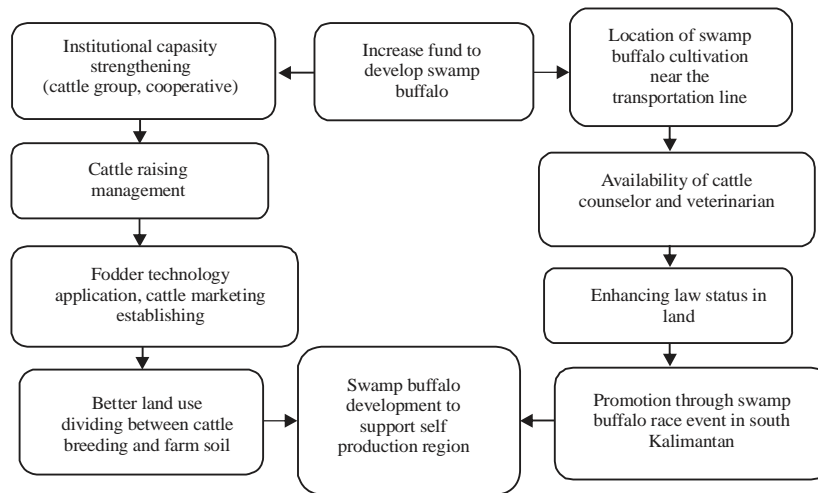


Fig. 2: Logical Framework Analysis (LFA), a new model development strategy for swamp buffalo

buffalo cattle development supported by the potential of swamp land that provides forage food, hereditary. The area of buffalo bases in this region was indicated by the maximal population which was characterized by solid cattle category, both economic density of 1.125 (highly dense), farm density of 1.661 (dense) and area density of 56.971 (dense). Hence although is basis territory which has comparative advantage but development of swamp buffalo at this region is on the point of culmination.

Compared with the result of Komariah, Cianjur district in West Java is also a base area buffalo has  $LQ > 1$  value<sup>18</sup>. According to Anantrao<sup>19</sup>, the research on swamp buffalo in the region of Solapur district (India) showed the LQ value of 1.31 (North Solapur) and LQ value of 1.32 (South Solapur). Based on the above research, in accordance with Miller *et al.*<sup>12</sup>, Isserman<sup>13</sup> and Hood<sup>14</sup> criterion that the commodity which has  $LQ > 1$  is basis commodity which has comparative advantage being source of growth.

The main problem of the local government of HSU regency in developing swamp buffaloes is the traditional

cattle business system, the solution offered is the strengthening of institutional capacity including the strategy of increasing the extension of cattle cultivation, capital and cattle development strategy adjacent to the transportation location. The strategy to increase counseling has an impact on improving the dynamics of cattle groups and cooperatives. Strategies to improve capital impact on improved cattle management, optimizing the application of feed technology and the development of cattle marketing centers, good land use by fencing between buffalo farms and farmland. The strategy of cattle development adjacent to the transportation location has the effect of easy extension of cattle and veterinarian to carry out the task, no land conversion takes place, facilitating tourism event of swamp buffalo typical of south Kalimantan. On the other hand, the result of Komariah study in Cianjur district, the development strategy that (1) Has to be prioritized to the exploitation of the carrying capacity and the scale of ownership for the aim of the self-sufficiency program (2) To make use of government programs and strengthen the competitiveness<sup>18</sup>.

The management of swamp buffalo cattle area in Hulu Sungai Selatan (HSS) regency in connection with the existing management capacity has not been implemented properly while the research result of Alpiator. The management capacity has the potential to be developed through non formal education such as training and extension to farmers through farmer groups<sup>20</sup>. The SWOT analysis result research of Koobkaewa the buffalo industry has strengths, weaknesses, opportunities and threats<sup>21</sup>. Buffalo is important to the economy, society and local tradition and culture in Thailand (strengths). Are associated with very poorly educated and elderly farmers, hence, adoption of new technologies for career development in buffalo industry is slow (weakness). Neighboring countries have a great demand for live buffalo both meat and breeding buffalo (opportunity) and promotion of some public sector projects causes the farmers to shift from buffalo farming because of the area problems, such as rubber and oil palm planting (threats). Premathilaka<sup>22</sup> to revealed provision of technical knowledge is a vital aspect and farmers should be educated to make processed products rather than selling of raw milk to generate significantly higher income.

Therefore, it needed to reconsider supports and attention to develop buffalo industry for food security and sustainable rural development. Buffalo's owners do not rear their buffaloes in a scientific. According to Irshad<sup>23</sup>, buffalo is a multipurpose domestic animal that helps the livelihood of people by providing high quality milk and meat, dung as fuel and organic fertilizer, mechanical or draft power and hides and skins as raw material for industry. Hamid<sup>6</sup> to revealed buffaloes are extensively used for agricultural production system (ploughing, laddering, transportation of goods, threshing and crushing etc.) in Bangladesh.

According to Hamdan<sup>24</sup>, the development strategy of swamp buffalo in south Kalimantan should be in accordance with the potential of the region and supported by advanced technology from the angle of feed, seed and management. This can be achieved with serious attention from the government consistently and intensively through the acceleration of technology adoption, counseling in terms of cultivation and institutional and utilization of land resources/agriculture through technology of alternative food repair and processing especially to anticipate shortage of feed caused by land carrying capacity or season. According Wanapat and Kang<sup>25</sup>, improvement of infra-structure for research and development as well as know-how technology for buffalo production are highly encouraged and widely disseminated. Furthermore, emphasis on buffalo production curriculum net-working ad forum developing the young scientists warrant immediate attention and

action-undertakings to cope up with the challenges of increasing meat and milk demand of global population. Hamid<sup>6</sup> recommended for buffalo development: Development of manpower by technical training should be ascertained, national research and international collaboration should be strengthened and private investment is to be explored and encouraged to invest in buffalo development infrastructure including marketing of milk and meat products in the country.

Based on the study of area potentials and swamp buffalo development strategies, the recommended policy models for the HSU regency government for the development of swamp buffalo cattle business include: (a) Technical aspects, improved cattle raising management, provision of cattle farmers and doctors, optimizing the application of feed technology, development of cattle marketing center, good land use by fencing between buffalo farm and farmland, (b) Economic aspects, increasing the capital of business development, building business location near the transportation line, improving the legal status so that there is no change of land function and promotion of swamp buffalo typical south Kalimantan through tourism event.

## **CONCLUSION**

Based on the results of the data analysis and discussion, it can be concluded that: (1) The LQ score of 2,327 ( $LQ > 1$ ) indicates that the region has a comparative advantage of swamp buffalo cattle development supported by the potential of natural resources that provides forage food and the skills of the hereditary breeder human resources, (2) The swamp buffalo development strategy must be in accordance with the regional potential and supported by technical aspect and economic aspect synergistically to improve food security of HSU regency.

A new model was determined for the development strategy of swamp buffalo that match the potential of local resources, it is suggestion that: (1) Cattle raisers manage to improve their skills in swamp buffalo cultivation by technical guidance from governments, taking advantage the effective technology, increasing and expansion in sales of market commodity and diversification in buffalo products, (2) Regency government, banks, private sectors should be able to contribute loan, capacity building and promote the potential superiority of local commodity sustainably through tourism events, (3) Regency government immediately assigns cattle counselors as well as veterinarian in Paminggir sub-district, Hulu Sungai Utara regency as a basic swamp buffalo raising.

## **SIGNIFICANCE STATEMENTS**

This research aimed to examine the potential of swamp buffalo maintenance areas, compiling a Logical Framework Approach for solving the problem of swamp buffalo development, making the right strategy for the development of swamp buffaloes. The results of the study show that the agro ecological swamp zone in HSU regency is very beneficial for swamp buffalo cultivation, plays a strategic role in producing meat, labor, income sources, supporting animal protein sources, sources of seeds, tourism attraction and development of local wisdom. The development of swamp buffalo in the HSU regency must pay attention to the technical aspects and economic aspects.

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## **REFERENCES**

1. Animal Husbandry Service of South Kalimantan, 2016. Livestock statistics. Banjarmasin.
2. Suryana and A. Hamdan, 2011. Capability of swamp land in south kalimantan for dedevelopment swamp buffalo. Prosiding of National Symposium on Swamp Buffalo Enterprise for Supporting the Program of Meat Sufficiently, (SBESPMS'11) Agency for Agriculture Technology Research, South Kalimantan.
3. Ministry of Agriculture, 2011. Release of meat cattle data summary. Dairy cow and water buffalo trueout Indonesia. National Statistical Agency, Indonesia.
4. Chantalakhana, C., 2001. Urgent need in buffalo development for food security and self-sufficiency. Proceedings of the National Workshop on Swamp Buffalo Development, December 17-18, 2001, Hanoi, Vietnam, pp: 1-10.
5. Lemcke, B., 2010. Is there a major role for buffalo in Indonesia's beef self sufficiency program by 2014? Principal Beef/ Buffalo Research Officer, Northern Territory Department of Resources, Darwin, Australia.
6. Hamid, M.A., M.N.A. Siddiky, M.A. Rahman and K.M. Hossain, 2016. Scopes and opportunities of buffalo farming in Bangladesh: A review. SAARC J. Agric., 14: 63-77.
7. Diwyanto, K. and H. Handiwirawan, 2006. Swamp buffalo development strategy. Prosiding of National Symposium on Swamp Buffalo Enterprise for Supporting the Program of Meat Sufficiently, (SBESPMS'06), Research and Development Center for Animal Husbandary, Bogor.
8. National Statistical Agency Office of HSU Regency, 2016. Hulu Sungai Utara in figures. Banjarmasin.
9. Nanda, A.S. and T. Nakao, 2003. Role of buffalo in the socioeconomic development of rural Asia: Current status and future prospectus. Anim. Sci. J., 74: 443-455.
10. FAO., 2009. How to feed the world in 2050. Proceedings of the Meeting on High-Level Experts Forum on How to Feed the World in 2050, Proceedings of the Meeting on High-Level Experts Forum on How to Feed the World in 2050, FAO., Rome, Italy.
11. Sevilla, 2007. Consuelo G. research methods. Rex Printing Company, Quezon City.
12. Miller, M.M., L.J. Gibson and N.G. Wright, 1991. Location quotient: A basic tool for economic development analysis. Econ. Dev. Rev., 9: 65-68.
13. Isserman, A.M., 1977. The location quotient approach to estimating regional economic impacts. J. Am. Inst. Plann., 43: 33-41.
14. Hood, R., 1998. Economic analysis: A location quotient primer. Principal Sun Region Associates.
15. Ashari, E., E. Juarini, Sumanto, Wibowo and Suratman, 1995. Guidance for analysis of reginal potential for distribution and development of livestock breeding. Agency of Research for Animal Husbandary and Direktorat of Livestock Distribution, Jakarta.
16. Norad, 1999. The Logical Framework Approach: Handbook for Objectives-Oriented Planning. 4th Edn., Norwegian Agency for Development Cooperation, Norway.
17. Delevic, M., 2011. Guide to the Logical Framework Approach: A Key Tool for Project Cycle Management. 2nd Edn., Republic of Serbia Government, European Integration Office, Belgrade, ISBN: 978-86-914485-0-9.
18. Komariah, S. Cece, N. Henny, Nurdiati and Melatih, 2015. Potency and development strategies of swamp buffaloes at different topography in Cianjur district West Java Indonesia. Int. J. Sci.: Basic Applied Res., 23: 260-270.
19. Anantrao, S.V., 1997. Marketing of pahdharpuri buffaloes in Solapur district of Maharashtra state. Departemen of Agriculture Economics Mahatma Phule Krishi Vidyapeeth Rahuri, India.
20. Alpianor, B. Danang, Hafizianor and Husaini, 2017. Strategies for developing swamp-buffalo husbandry in Hulu Sungai Selatan regency. EnviroScienceae, 13: 7-23.
21. Koobkaewa, K., S. Nakavisut and K. Kiyothong, 2013. Thailand buffalo strategic plan 2012-2016. Reasons and the need for setting up buffalo strategies of Thailand. Buffalo Bull., 32: 83-89.



22. Premathilaka, S., T. Seresinhe and C. Gajaweera, 2016. Socio-economic characteristics of small scale buffalo farms in Tanamalwila area in Moneragala district of Sri Lanka. Proceedings of International Seminar on Livestock Production and Veterinary Technology, August 10-12, 2016, Bali, Indonesia, pp: 198-203.
23. Ali, I., M.M. Tariq, M.A. Bajwa, F. Abbas and G.B. Isani *et al*, 2011. A study on performance analysis of holstein-friesian cattle herd under semi-intensive management at Pishin dairy farm Balochistan. J. Inst. Sci. Technol., 1: 53-57.
24. Hamdan, A., E.S. Rohaeni, A. Subhan and R. Qomariah, 2011. Swamp buffalo development strategy in South Kalimantan. Proceedings of the National Seminar and Symposium on Swamp Buffalo, (SB'11), Agency for Agriculture Technology Research, South Kalimantan, Banjarbaru, pp: 115-121.
25. Wanapat, M. and S. Kang, 2013. World buffalo production: Challenges in meat and milk production and mitigation of methane emission. Buffalo Bull., 32: 1-21.