

FACTORS AFFECTING SWAMP BUFFALO PRODUCTION IN SONGKHRAM WET LAND, NAKHON PHANOM PROVINCE, THAILAND

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ABSTRACT

The current study was conducted to find out the factors affecting to swamp buffalo production in Songkhram wet land area (consisting of 3 districts: Si Songkhram, Tha Uthen, and Na Wa Districts), Nakhon Phanom province, Thailand. The data were collected from 370 farmers and analyzed by using Chi-square to test association of the studied factors between farm groups (Group 1: farmers who produced the swamp for fancy buffaloes and showing, and Group 2: farmers who produced the buffaloes for power work and meat production) in the study population. The results showed that many factors that affected to buffalo production, such as source of knowledge used for buffalo production, patterns of buffalo production, kinds of land, objectives for buffalo production, record keeping, types of roughage, person who suggest to select buffalo, mating systems, changing sire, information for considering for replacement dams selection, age at first mating, and problem and obstacle related to the achievement of swamp buffalo production ($P < 0.01$) excepted for gender of farmers, educational level and type of labor for buffalo production ($P > 0.05$). This information implied the need of increasing efficiency of buffalo

production, and also improvement of knowledge, understanding and chance in sire selection of the farmers.

Keywords: *Bubalus bubalis*, buffalo, buffalo production, Songkhram wet land, Nakhon Phanom, Thailand

INTRODUCTION

Nakhon Phanom province was ranked as the sixth biggest province in Thailand for buffalo production (accounted for 5.09% of the whole country, 6.97% of north eastern Thailand and 18.32% in term of land area (Department of Livestock Development, 2017). In another report by the Department of Livestock Development (2016), Nakorn Phanom owned proximately 62,800 buffaloes and most of the buffalo farms located along the Songkram river, of which Si Songkhram district was leader with the largest number of buffaloes with 11,857 heads (7.0 buffaloes per family averagely), followed by Na Wa and Muang districts with 7,800 and 3,700 buffalo respectively. Having abundance of water with a large area of wet land was an advantage for the buffalo production

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in the region. The original source of water is from the Poopan Mountain in Nonghan district which is located in Udon Thani province. The river flows through Sakon Nakorn and Nong Khai and then the river traces its way back to the east and flows into Nakhon Phanom Province in the areas stated above and becomes the Songkram river at Na Wa and Songkram districts before it goes down to the Mekong river at Chai Buri sub-district, Tha Uthen district (Nakhon Phanom Province office, 2016).

According to Sarakul *et al.* (2016), who carried out a study in the same area and reported that nearly 80.00% of farmers raised buffalo as source of power for work. However, income from buffalo production was ranked as the second important source for 67.30% of farmers in the region, after rice cultivation. Even though buffalo production was one of main activities for farmers in the region, it was still facing many difficulties which can influence to number of buffalos, revenue and income of farmers such as knowledge, attitude of farmers and local veterinary services. This study was conducted in order to explore and classify the factors that affecting buffalo swamp production in Songkhram wet land, Nakhon Phanom province, Thailand, supporting to build up a guideline for maintenance and development of buffalo production in the region.

MATERIALS AND METHODS

Population, sampling and study area of dataset

In current study, data was collected by using the survey research method. The tools in gathering the data were the questionnaires and interviews from November 2014 to July 2015. In-depth study was applied along with field studies. The areas focused for the information were 3 districts located around

the Songkram river. Each district was subdivided into three sub-districts (9 sub-districts in total). In Si Songkram district the areas focused were Ban Uang, Nadua, and Sampong sub-districts. For Tha Uthen district there were Na Wa, Row Pattana and Ta Rue sub-districts. In Na Wa districts, the areas covered Ta Jampa, Panom and Ramrat sub-districts at Nakhon Phanom province, Thailand. Three hundred and seventy farmers were obtained by the purposive sampling. The farmer samples were categorized into two groups by the purposes of the buffalo production: Group 1 was the farmers focused in fancy buffalo and shows whereas people in Group 2 aimed to gain the draught buffalo and meat production.

Statistical analysis

Data in the study was classified to 4 catalogues. 1) Farmer's personal information consisted of gender of farmer, educational level (no education, primary school, high school, and bachelor degree), type of labor (family and hired people), and source of knowledge and information used for buffalo production (book and magazine, seminar and training, from other farmers and governmental officers). 2) factor of buffalo production and management was defined as patterns of buffalo production (rounded up the herd, tied up with housing, raised in wall round stall, and cut and carries fresh grasses or rice straw to their housing), kinds of land (land belongs to themselves, land from rent and land from public), objectives for buffalo production (produce calves for selling, for fancy and value added, for fertilizer and for as the heritage), record keeping (no kept record, sometimes kept record, and kept record), and types of roughage (fresh grasses and rice straw). 3) factor of decision making on selection was classified as person who suggest to select buffalo

(farmers themselves, lectures, farm personnel, government officials, and head of group), mating systems (natural mating, artificial insemination, and both natural mating and artificial insemination), changing sire (no changing sire and changing sire), information for considering replacement dams selection (no selection, phenotype characteristics, pedigree of sire and dam, and fertility of buffalo), and age at first mating (less than 22 months, 22 to 24 months, 25 to 27 months, and more than 27 months). 4) factor that related with the problem and obstacle of buffalo production (lack of area for buffalo production, lack of fresh grasses and rice straw, lack of labor for buffalo production, lack of knowledge to produce buffalo production, lack of knowledge to select sire and dam, and reproductive and disease problem). All this information was analyzed to evaluate the effects on buffalo production between two groups of farmers (Group 1 who raised buffalo as fancy buffalo and shows, and Group 2 who raised buffalo for draught and meat production). Least square means of the studied traits were estimated by the considering factors, and then were compared using a chi-square test, at an $\alpha = 0.05$.

RESULTS AND DISCUSSION

Farmer's personal information

Factors of farmers' characteristics were gender, education level, type of labor and source of knowledge used for buffalo production. It could be classified the purposes of raising buffalo into two different groups: Group 1, the group of farmers who produced the swamp for fancy buffaloes and showing (accounted for 20.27%); and Group 2, who produced the buffaloes for power work and meat production (79.73%). It was interesting to find that

sources of knowledge were significantly important ($P < 0.01$), but gender, education level and type of labor did not strongly relate to achievements of buffalo production ($P > 0.05$). The results showed that swamp buffalo production depended on sources of knowledge applied to buffalo production. In the Group 1, half of the farmers obtained knowledge from seminars and training (50.00%), followed by learning from other farmers (48.00%). There were only 2.00% of farmers in this group who received knowledge from governmental officers, and book and magazine. On the other hands, most farmers who raised their buffaloes as draught buffalo and meat production obtained knowledge from other farmers (64.00%), followed by from governmental officers (32.00%), book and magazine (2.00%), and seminar/training of the buffaloes (2.00%).

This indicated that the farmers in Group 1 could actively receive knowledge and practice as being learnt from seminar and training. This was different from farmers in Group 2, who received the secondary information from other farmers mostly and was not able to earn the knowledge personally. This may lead to the inability to apply the knowledge in practice directly. For farmers in the Group 1, to become a fancy buffalo for shows, the animal needs to meet many special requirements on phenotype as well as behavior and genetic characteristics. Thus, the buffalo was not only high valuable, but also was their hobby and concern. This can explain why farmers in this group paid more attention to their products, motivated in accumulation of new knowledge and willing to spend more for any innovation (Suhachavalit *et al.*, 2013; Yaemkong *et al.*, 2017). However, in the past, all farmers raised buffalo either as a source of power work for agricultural activities or source of meat for human. Since mechanism growing and increasing demand of human for cultural and

social entertainment, they depend less on animal power and lead to the increasing proportion of buffalo for shows. The differences of productive purpose resulted in differences of farmer's attitude, interests, and behavior in buffalo production (Chantalakhana, 1991 and 1994; Bunyavejchewin, 1995).

Buffalo farming production and management

Among all the factors, patterns of buffalo production, kinds of land, the objectives of buffalo production, record keeping and types of roughage that were related significantly to the achievement of buffalo production in the region for both groups ($P < 0.01$). The study also found the differences of patterns used for buffalo production, kinds of land, objectives for raising buffalo, record keeping, and types of roughage between two groups.

Most of farmers in the Group 1 (51.00%) cut fresh grasses or rice straw and carries them to feed their buffaloes which were kept in cage. Proximately (27.00%) of them raised in wall round whereas the others stall buffalo rounded up the herd (16.00%) and tied up with housing (6.00%). These farmers mainly used their own land for buffalo raising (57.00%), while 40.00% of farmers used public land for raising buffalo and the others (3.00%) had to rent land to raise their buffaloes. In opposite, only 4.00% of farmers in the Group 2 cut and carries fresh grasses or rice straw for their buffaloes. Most of them (55.00%) kept their animals rounded up the herd, followed by tied up with housing (28.00%), and the others raised buffalo in wall round stall (13.00%). This group of farmers also relied more on public land with 53.00% of surveyed farmers often release the animals to public land. Only 32.00% of them used their own land for buffalo and the remain (15.00%) needed to rent land for their animals.

To maintain the farm, most of farmers in the Group 1 (57.00%) stated that they could produce calves for selling and got added value from fancy buffalo to generate income. Besides, they could get benefit from this activity by using manure as fertilizer for plantation (25.00%) and the other raising buffalo as the way of cultural conservation and heritage for their descendant (18.00%). In the contrast, only 29.00% of farmers in the Group 2 could earn money from selling calves. Besides of using buffalo as working power, most of them considered raising buffalo for collecting fertilizer (55.00%) whereas the others considered this activity concerning to cultural conservation and heritage (16.00%). The result from Group 2 agreed with those from Sapanan *et al.* (2013) who reported that the main objectives of raising buffalo were utilizing of buffalo's manure (38.00%), selling their animals (35.20%) or maintaining the activity from their parent (26.80%).

The number of farmers keeping farm record was low in Group 1. the results showed that 60.00% of farmers did not keep the records, 25.00% of them sometimes keep it and only 15.00% of them always did. In the contrast, most of farmers in the Group 2 (92.00%) always kept the farm record, 7.00% kept it sometimes and only 1.00% never did it. Although the value of buffalo in the Group 2 was lower than that of Group 1, farmers in Group 2 paid more attention for keeping record. Buffalo seemed to be more important for this group of farmers when more people realized the necessary of this habit. Probably, it was not only because of they were poorer, they were also a tool for them to maintaining the agricultural farm (rice cultivation and power for transportation on the field).

The results of the study also found that farmers in the Group 1 used mostly roughage as fresh grass (accounted for 81.00%) and remain

used rice straw (19.00%). As consequent, farmers spent more time to either grow or collect grass for their buffalo in order to serve them better food. In contrast for farmers in Group 2, the number of farmers used fresh grass and rice straw seemed to be equal (48.00 and 52.00% respectively for fresh grasses and rice straw). It indicated that farmers in Group 2 did not care much for the type of roughage used for their buffalo.

Decision making in breeding selection

Factors of decision making on selection were determined by person who decided or strongly influenced to the decision to select buffalo, mating systems, changing sire, information for considering replacement dams selection, and first mating age. All of these factors were related significantly to the achievement in buffalo production of farmers ($P < 0.01$). In the Group 1, almost half of the farmers (48.00%) need help from governmental officers to select sire, 41.00% of them consulted from neighbor farmers, the others looked for help from lecturers (8.00%), and materials the head of Group (3.00%). In contrast, most farmers in the Group 2, 9.00% of the farmers could give decision by themselves in selection of buffalo. Most of them get consult from other farmers (56.00%), from governmental officers (25.00%) and from head of group (10.00%). Farmers of both groups primarily used natural mating (64.00 and 87.00%), followed by both natural mating and artificial insemination (20.00 and 8.00%), and artificial insemination within their farms (16.00 and 5.00%, respectively for Group 1 and 2). All of farmers in the Group 1 frequently changed sire to mate their dam whereas 35.00% of farmers in the Group 2 changed sire but within their farms, the remain (65.00%) have never changed sire at all.

In the factor information for consideration

of dam replacement, 60.00% of farmers in both groups considered phenotype characteristics as a parameter to decide replacement of dams. However, 32.00% of farmers in Group 1 and 16.00% farmers in Group 2 considered fertility of buffalo as indicator to replace dams.

The majority of farmers in the Group 1 (54.00%) stated that their buffalo got the first mating at the age of 25 to 27 months whereas 41.00% reported that the first mating of their buffalo was more than 27 months and the other recorded for 22 to 24 months (5.00%). While farmers in the Group 2 reported that their buffaloes got longer time for this parameter. Most of farmers (82.00%) reported that their buffaloes needed 27 months to get first maturity, followed by 25 to 27 months (9.00%), less than 22 months (8.00%) and 22-24 months (1.00%), respectively.

It was noticed that this group used male buffaloes to control the buffalo herd in their farms but sires have never changed. This might cause the reduction of body size in the next generation. All though farmers of both groups substituted female buffaloes by considering their phenotype, the heredity of buffalo herd also depended on genealogy of animals with many genetic parameters needed to be considered. Furthermore, expertise and knowledge with accurate manipulation could influence also to the successes. Nevertheless, 21.00% of farmers never substituted female buffaloes in the study was still high.

In another study, Punsawat *et al.* (2007) who studied the buffalo rearing in Nakhon Si Thammarat found that a large number of the farmers reared the buffaloes in order to continue habits or traditional activities from their predecessors. In that system, natural method of breeding without selection of heredity was mainly adopted. This technique could affect to the size of buffaloes, resulted in smaller

size and inability to off-springs (Satchaphun *et al.*, 2005). The results in current study agreed with another one carried out by Sarakul (2010) who reported that the level of education, experiences, labor, source of knowledge, pattern of rearing, feed and the experts who advised for the decision making could affect to the quality of breeding selection.

Factor that related with the problem and obstacle of buffalo production

The problem and obstacle of buffalo production was the factor that inhibit the achievement in buffalo production of farmers ($P < 0.01$). The results revealed that most important problems and obstacles for farmers of both groups were lack of area for buffalo production (56.00% and 36.00% respectively for Group 1 and 2), followed by lack of labor for buffalo production (19.00 and 22.00%). Lack of knowledge in buffalo production seemed to be a problematic for farmers in the region also when 12.00% and 11.00% of farmers in the Group 1 and 2 stated it. Some farmers considered lack of knowledge to select sire and dam (7.00 and 12.00%), lack of fresh grasses and rice straw (3.00 and 10.00%), and reproductive and disease problem (3.00 vs 9.00%), respectively.

This result was similar to those reported in many previous literatures (Pookduang and Pinyotepratan, 2008; Phothong *et al.*, 2013; Sapanan *et al.*, 2013; Jumrasboonhirun and Akkrajun, 2015; Phasuk and Ruangchoengchum, 2016). These studies pointed out that the biggest problem and obstacle of buffalo farmers was the lack of pasture, forage and knowledge. This could be occurred because the land in this area was mainly used for cultivation of rice, sugar cane and cassava or rubber tree (Sarakul *et al.*, 2016). In the study area, farmers used the natural grass growing

around the field and rice straw - a byproduct from rice production as feed for buffalo. Some farmers could use a part of their land for growing grass but it was not enough (Phasuk and Ruangchoengchum, 2016). However, since buffalo production was not the major activity, they could not get priority for land use that led to lacking of pasture, space and resulted in the lack of feed and inadequate of roughages. Facing to this limitation, farmers should know how to collect, process and store roughages for their buffaloes in dry season. This point agreed with other studies by Pookduang and Pinyotepratan (2008); Yaemkong *et al.* (2017); Yaemkong *et al.* (2018a); Yaemkong *et al.* (2018b) who reported that lack and inadequate of roughages were the problematic for raising buffalo, beef and dairy cattle. All of these problems and obstacles should be suggested to governmental authorities, policy makers who could support and promote the development of buffalo production in the region.

This study also illustrated that there were many factors could affect to the buffalo production in the region, in which the main factor affected to farm management relating to the knowledge of farmers was the capacity in updating new innovation and sources of information on buffalo production. The other factors such as rearing methods, space and feed as well as making decision for breeding selection also influenced to buffalo production in the region. This parameter involved to the persons (guru's or expert's) who advised farmers technique in breeding selection, breeding methods, sire selection and when farmer should change sires. The farmers in the study area also suggested that the Department of Livestock Development should provide financial support in terms of training and promoting sire selection; improving public land for raising buffaloes; forage production; using animal for agriculture; and using buffalo's manure

efficiently.

CONCLUSION

The conclusion for this research was confirmed that source of information used for buffalo production, patterns of buffalo production, kinds of land, the objectives for buffalo production, record keeping, types of roughage, person who suggest to select buffalo, mating systems, sire selection, information for considering replacement dams selection, age at first mating, and the problem and obstacle of buffalo production were related to the achievement in swamp buffalo production of farmers.

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REFERENCES

Bunyavejchewin, P., S. Sangdid and C. Chantalakana. 1995. Socioeconomic conditions affecting the use of draught buffalo versus two-wheeled tractor in some villages of Surin province, p. 41-54.

In Proceedings of a Symposium Held at Kasetsart University, Thailand.

Chantalakana, C., P. Bunyavejchewin, S. Chotemetepirom and K. Kaewlompprasong. 1991. Household characteristics and monitoring of year-round buffalo husbandry and activities in two villages in northeast Thailand, p. 239-268. *In Proceedings of a Workshop Held at Kasetsart University, Thailand.*

Chantalakhana, C. 1994. Swamp buffalo development in past three decades and sustainable production beyond 2000. *In Proceedings of 1st Asian Buffalo Association Congress, Khon Kaen, Thailand.*

Department of Livestock Development. 2016. *Livestock Infrastructure Information: Number of Some Livestock Involved Organization 2015.* Bureau of Livestock Standards and Certification, Ministry of Agriculture and Cooperative. Bangkok, Thailand.

Department of Livestock Development. 2017. *Livestock Infrastructure Information: Number of Some Livestock Involved Organization 2016.* Bureau of Livestock Standards and Certification, Ministry of Agriculture and Cooperative. Bangkok, Thailand.

Nakhon Phanom Provincial Livestock Office. 2016. *Conclusion Report Group of Fancy Swamp Buffalo in Ban Don Samo.* Nakhon Phanom: Department of Livestock, Development Ministry of Agriculture and Cooperative, Bangkok, Thailand.

Jumrasboonhirun, L. and A. Akkrajun. 2015. *A Study on Situation in Buffalo Raising of Farmers in Mukdahan Province.* Mukdahan Provincial Livestock Office. Available

- on <http://pvlo-man.dld.go.th/webfile/knowledgecenter2.html>
- Phasuk, K. and P. Ruangchoengchum, 2016. Approaches to enhance productivity of buffaloes in Ubon Ratchathani province. *MBA-Khon Kaen University Journal*, **9**(1): 203-215.
- Punsawat, N., S. Kloybanmai and P. Laowthon. 2007. *Situation of Swamp Buffalo Production by Farmers in Nakornsritammarat Province*. Bureau of Animal Husbandry and Genetic Improvement. Department of Livestock, Development Ministry of Agriculture and Cooperative, Thailand.
- Phothong, T., A. Thanadet and S. Boonprong. 2013. *A Study on Situation in Raising Buffaloes and Satisfaction of Farmers in Srakaew Province*. Office of Regional Livestock, Thailand. 33p.
- Pookduang, J. and C. Pinyotepratan. 2008. *Factors of Effecting on Sustainable Density of Swamp Buffalo Raising in Surin Province*. Surin Provincial Livestock Office, Thailand. 26p.
- Sarakul, M. 2010. *Factors affecting genetic improvement for milk production of dairy cattle at farm level in the central part of Thailand*. M.S. Thesis, Kasetsart University, Thailand. 81p.
- Sarakul, M., S. Yaemkong, P. Rodchoom, P. Sirisom, T. Suranarakul and P. Jaipong. 2016. Situation and factor affecting on swamp buffalo production for conservation and genetic develop swamp buffalo of farmers in Songkhram wet land, Nakhon Phanom province. *Khon Kaen Agriculture Journal*, **44**(Special Issue 2): 841-849.
- Sapanan, S., K. Rimkeeree, P. Chusen, C. Dongpaleetan, G. Photikanit, A. Na and S. Boonprong. 2013. The Problems and obstacles on raising buffaloes of local farmers in Central Thailand: A case study of Saraburi Province. *Buffalo Bull.*, **32**(Special Issue 2): 1208-1211.
- Satchaphun, B., T. Sookyoi and P. Vudhipanee. 2005. *Economic, Socio and Technical Feasibility Study of Swamp Buffaloes Production in 9th Region Livestock Area in 2004*. Office of Regional Livestock, Thailand. **3**(9).
- Suhachavalit, S., P. Sricharoen, T. Luesopha, T. Srisakdi, A. Na-Chiangmai and S. Boonprong. 2013. Swamp buffalo production system and needs for extension on local scale farmers in the lower northeast of Thailand. *Buffalo Bull.*, **32**(Special Issue 2): 1204-1207.
- Yaemkong, S., C. Chiyasuk and N. Ngamjitpituk. 2017. Situation of buffalo production of farmers in Chat Trakan, Bang Rakam and Phrom Phiram districts, Phitsanulok province. *Khon Kaen Agriculture Journal*, **45**(Special Issue 1): 678-683.
- Yaemkong, S., T. Nguyen Ngoc and S. Yaemkong. 2018a. Factors affecting problem and obstacle of beef cattle production in Phitsanulok province, Thailand. *J. Appl. Anim. Sci.*, **11**(1): 31-38.
- Yaemkong, S., T. Nguyen Ngoc, P. Kolnathon and S. Yaemkong. 2018b. Smallholder dairy cattle production in the northeast of Vietnam. *Naresuan Phayao Journal*, **11**(2): 45-48.