Livestock Occupational Extension of Farmers for Problems Solving Burning in Agricultural Zone: The Case Study of Mae Na Chon Sub-District, Mae Chaem District, Chiang Mai Province

Wallratat Intaruccomporn, Suraphol Sreshthaputra, Panuphan Prapatigul*, Nathitakarn Pinthukas, and Anupong Wongchai

Department of Agricultural Economy and Development, Faculty of Agriculture, Chiang Mai University, Chiang Mai Province, 50200, Thailand.*Corresponding author: panuphan69@gmail.com

Abstract. Mae Chaem District, Chiang Mai Province is an agricultural zone and crop residues were burnt the most, especially in livestock and corn field area which later annually affected economics and society of Chiang Mai Province. This study was to support and to replace livestock occupation instead of corn plantation by using Participatory Action Research (PAR) with farmers from Mae NaChon Sub-Districts who voluntarily participated in this research until the end of the process. The study found that farmers needed livestock support including beef cattle, indigenous chicken, and fish. There are four actions: (1) co-brainstorming (2) co-planning (3) co-processing and (4) co-evaluation, which brought about six main activities: cattle breed support, basic knowledge lecture of livestock, corn husk fermentation as animal food, prototype farm project, basic accounting for farming, and building livestock farmer network in the area as motivation for farmer’s decision on area reduction or stopping corn plantation.

1. Introduction
The topography of Mae Chaem District, Chiang Mai Province is forest and steep mountain for about 70% in the total area. There are flat hills about 20% and low land for about 10%. Most of the topography is steep, causing a water shortage for agriculture. It affects all farming which they decided to farm plant that used less water, especially corn for feeding animals which become corn valley. Based on agricultural land use data, there are 107,066 square meters of maize [1]. This cause a lot of waste in agriculture in the area such as dried corn, dried corn stubble, and dried corn bark. It can be used as an organic matter to return nutrients to the soil or used as animal feed. On the other hand, most farmers prefer to use the burning method to prepare crops in the field because it has less expense, easy, convenient, and believe that burning stubble helps to destroy diseases and insects, especially during March to April of each year [2]. According to the official statistics of the hotspot, it is found that in the year 2015 Mae Chaem District had a total of 47 fields are burned mostly in the maize field of farmers. Burning produced large amounts of dust called PM10, which means small specks of dust smaller than 10 microns that cannot be visible by the naked eye. However, it can penetrate through the nose and affect the health of the population in the Upper Northern Provinces of Thailand. It gives a negative impact on the economy, society and tourism, which is the main income of the country as shown in Figure 1.
Therefore, livestock promotion is a substitute for planting corn that causes the smog problem. This research will integrate related organizations such as Chiang Mai University, Department of Livestock Development Sub-District Administration Organization and farmers in the target area. The research team focused on the participatory process of all parties concerned at all stages of the research project.

2. Methodology
This research uses participatory action research (PAR) techniques. The participatory action research (PAR) consists of four steps: (1) co-brainstorming (2) co-planning (3) co-processing and (4) co-evaluation. Population is the farmers who voluntarily participate in research until the end of the process of Mae Nachon Sub-District Mae Chaem District, Chiang Mai. This is the most combustion districts in the country. The tools used to collect data are (1) survey, (2) key informant interviews to identify the situation and issues of livestock in the area, (3) farmers participate to mobilize farmers' opinions to the plan, (4) participant observation of the research team. This research conducted from February to September 2018 (total duration of time is totally eight months). Used inductive method to analyze the data, which interpret and conclude data from the study of the document both in concrete object and observation and interviews [4].

3. Results and Discussion

3.1 Livestock situation in Mae Nachon Sub-District Mae Chaem District, Chiang Mai Province
From exploring the situation and issues of livestock in Mae Nachon Sub-District, Mae Chaem District, Chiang Mai, is able to summarize as follows. Most farmers prefer breeding indigenous beef cattle, chickens, and pigs, respectively, which most farmers use their own fund to breed the animal. The main purpose is household consumption. Except for beef cattle, they focus on distributing in the local market or middlemen outside the area. Most farmers raise cattle in the wild or public nature areas for grazing grass. There are a few farmers commercially raise the cattle by using Napier grass and food concentrates to feed their beef cattle. For indigenous chickens, they will release freely in the neighborhood for natural food. However, pigs will be raised separately from the house either animal housing or free-range system. Foods that often use for feeding consist of food waste, vegetables, bananas and etc. They need to chop into small pieces and boil together with rice bran, husk or ready-made food to feed the pigs sometimes. The problem of livestock in this area is that most farmers still lack of knowledge about livestock, shortage of quality food, lack of prevention and treatment of animal diseases, as well as marketing.
problem where the middlemen often reduce the selling price. The demand for livestock of farmers in the area is beef cattle, indigenous chicken, pig, and fish, respectively.

It is found that using the waste in agriculture for benefit happens only with farmers who breed beef cattle for income only. They will use dried corn bark as food concentrates for some time and did not ferment dried corn bark as the local even there are large about of dried corn bark being burn as shown in Figure 2.

Figure 2. Source of corn bark within the area and removal of corn bark.

3.2 The results from the farmers’ participation

3.2.1 Problem-Solving Process.

The research team conducted interviews with key informants and focus group discussions with a related person, including livestock executive in Mae Chaem District, leaders, representatives of farmers and representatives of Sub-District Administrative Organization in the area to reflect on livestock issues and provide suggestions for solving problems in the area. The four main issues can be summarized as follows: (1) farmers lack the knowledge about animal husbandry, (2) most farmers do not have access to inputs such as animal breeds, veterinary medicines, and animal food, (3) most beef cattle farmers lack of knowledge and skills to produce dried corn husks as fermented valuable nutrient, and (4) the farmers in the area lack of strength that middleman able to press the selling price especially beef cattle. The issues mentioned above are a major obstacle to promote livestock to replace the cultivation of maize in the area.

3.2.2 Participatory Action Plans.

The research team open opportunities for farmers to discuss and summarize issues in the area that transform into developing an action plan (Table 1). After that, plan, promote livestock in that area and select suitable farmers to participate in “prototype farm” of the project.

3.2.3 Operational Approach.

Farmers participating in the project have implemented the plan by collaborating and support with the related agencies. They have planned for promoting the animal as the following.

(1) Lack of knowledge about animal husbandry

The researcher conducted a training program on the basic principle of animal husbandry. The purpose is to give the knowledge about animal species suitable in the area, feed production that can find in the community, and animal sanitation management. The focus of animal sanitation is preventing and giving, treatment of diseases in beef cattle, indigenous chicken and pig. This causes farmers reducing risk and loss of outbreaks in the area. There are 80 farmers participating in the program. In addition, there also project, creating prototype farm for beef cattle husbandry by selecting farmers with ability.
production beef cattle. The purpose of the project is the point of learning corn husk for raising beef cattle for farmers. It also simulates other farmers make dried corn valuable in nutrient by making corn husk to feed the beef cattle more often. This promotes the dried corn husk to be used more and being substituted for burning. However, there are two prototype farms in the area of Mae Nachon Sub-District.

**Table 1. Problem and Plan Encouraging Livestock Development for Farmers in Target Areas.**

| Problem                                                                 | Livestock Promotion Plan in Target Area                                                   |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| (1) Lack of knowledge about animal husbandry                           | (1) Training program on basic principles of animal husbandry                             |
| (2) Shortage of inputs such as animal breeds, medicine, quality animal food and etc. | (2) Building prototype beef cattle farm project                                           |
| (3) Lack of knowledge and skills on using dried corn husks to be valuable nutrient for beef cattle | (3) Promoting animal species project                                                     |
| (4) The strength of beef cattle farmers in the area                     | (4) Establish of a medical bank for animals                                               |
|                                                                       | (5) Training program to educate and train the skills of making fermented corn husk use as roughage food for beef cattle |
|                                                                       | (6) Development management project of beef cattle farmers in Mae Nachon Sub-District, Mae Chaem District, Chiang Mai province |

(2) Lack of production factor

The researcher has provided animal breeding to farmers such as indigenous chicken (two male and 10 female) to four farmers, hybrid pigs (one male and three female) to four farmers. However, the farmer that received that animal breed must return chicks/piglets not less than 50% of the initial support in order to reproduce animal species to other farmers that are interested. They also provided tilapia for three farmers, who have a basin, to use as the sources of protein in the household and community. In addition, they have established a medical bank in Mae Nachon Sub-District to serve the farmers quickly and thoroughly. The purpose is to reduce losses and the risk of outbreaks to farmers in the area, especially beef cattle, which has quite a high value.

(3) Lack of knowledge and skills in producing the corn husk to be a valuable nutrient for beef cattle

In Mae Cheam District, Chiang Mai Province, they have a lot of agricultural waste which are dried corn bark and cause burning that brings smog to the area. The training program gives knowledge and skills to produce dried corn husk as the rough food of beef cattle. This project will help reduce the amount of fuel (dried corn bark) and bring the dried corn husk to ferment into valuable nutrient (Crude protein from 1.81% to 6.85%). It helps reduce the cost of production and reserve rough food to use in the dry season of farming.

(4) The strength of farmers in the beef cattle area

The result of the study found that the grouping of beef cattle farmers in the area is informal which make a project and involved activities are ineffective. Therefore, the beef cattle management process will focus on the group of beef cattle farmers in Mae Nachon Sub-District, Mae Chaem District, Chiang Mai Province. The researcher develops the management process to be more effective, for example, establish a new group, determine the roles and responsibilities of each farmer, and regulation for the new group. Moreover, this will allow all participating farmers to participate in the development process at all stages.

(5) Follow up and evaluation

In this process, the researcher has established a committee to monitor the progress of the project. This committee will compose of researcher representing Administration Organization Mae Nachon Sub-District, a representative from the Department of Livestock Development Mae Chaem District,
Chiang Mai Province and representative farmer from the local. Currently, this project is in the range of monitoring and evaluating.

The research project about promoting livestock career for farmers to solve the problem of burning in the area of Mae Nachon Sub-District, Mae Chaem District, Chiang Mai Province, focus on developing three important facts by using participatory processes from all sectors involved in the area. The three important facts are human resources (farmers), factors (basic inputs) and management factors (a group of farmers). This project has participated in various activities with farmers that are aware of the pollution caused by the burning of agricultural waste. Most of the farmers have the idea of reducing space and stop planting maize. Even though, the livestock industry can generate more income for the household. However, the transform of maize industry is time-consuming and need to the gradual process along with promoting livestock among the farmers. Therefore, government agencies, private agencies, and local people must work together integration and continuously as shown in Figure 3.

Figure 3. Livestock promotion for farmers with integration and application for Sufficiency Economy Philosophy.

4. Conclusion

The promotion of livestock to farmers in Mae Chan Sub-District Mae Chaem District, Chiang Mai Province considered the following issues.

1) The animal species that are promoted to the farmer must consider the suitability of the area and the culture of consumption in the area. Most of the local people at Mae Nachon Sub-District are people from S’gaw tribe. The tribe ritual is to preserve indigenous pigs with black fur for ancestor worship and consume. It related to evidence-based research, a group of researchers in 2010 “The study of sustainable livestock farming in upper northern Thailand”, and the research of Suradet [5] “System of breeding pigs suitable for high altitude conditions; Case study for developing highland agriculture according to Royal Initiative of His Majesty the King at Doi Om Phai.

2) The number of animals must relate to the number of laborers in the family. It must strongly associate with the amount of feed ingredient in nature or available in the area. However, if there are encouraging more animal husbandry, there must be more food sources in the area. If the food is from other source or purchase, it must be in the right amount because this will increase the expense of the farmers.
3) To transfer Philosophy Sufficiency Economy of to farmers must focus on the small farmers. The farmers must start animal husbandry by focusing on household consumption. If there is surplus, the farmers can sell in the local market. Later, it can develop to groups of farmers and distribute in the commercial area.

4) The breeding beef cattle in the wild consider as the culture of the tribe in the upper land. It is related to the study of Boonserm [6] about “Development of Raising Cow in Highland”. Therefore, they must manage the number of beef cattle balance with natural resources. For the farmers with the potential of raising beef cattle, is recommended to change the system of raising cattle to a grazing system instead.

The encouragement of livestock for farmers to reduce space and stop planting maize in Mae Nachon Sub-District, Mae Chaem District, Chiang Mai Province will accomplish or not it’s up to the group of farmers. Encouraging farmers to become self-reliant based on available resources in the community. It is one of the ways that agencies give the first priority. For example, the sentence “Help them to help themselves”, which leads to the sustainable development in the community.

References
[1] Chiang Mai Provincial Agriculture and Cooperatives 2018. Fundamentals of Plan Production. Available on http://www.chiangmai.doae.go.th/reports/stat_plan/stat_plantproduction59-60.pdf
[2] Wirat N, Sunan S, and Pornchulee N 2014 Rice Production and Straw Management by Farmers in the Irrigation Area of Wat Bot District in Phitsanulok Province. The 4th STOU Graduate Research Conference.
[3] Pollution Control Department 2018 The Maximum Rate Information of Particulate Matter 10 Micrometers or Less in Diameter (PM 10) in Chiang Mai Between 2014 to July 2018. Available on http://air4thai.pcd.go.th/webV2/download.php.
[4] Aumporn L 2015. Technical of Analyzing Data Qualitative. Available on https://edu.msu.ac.th/jem/home/journal_file/240.pdf.
[5] Suradet S 2008. Deep Breeding Pig Production in Highland a Case Study of Royal Project, Doi Om Phai Highland Agriculture Development Station. Master of Science in Geosocical Based Sustainable Development. Maejo University. Chiang Mai.
[6] Boonserm C I. 1990. Livestock of Beef Raising on Highland. Workshop of Livestock for Beef Raising on Highland. Chiang Mai University.

Acknowledgments
The authors would like to acknowledge assistance and encouragements from working institutions to kindly support all technical equipment, staff, and financial support to complete this research.