

## Case study: Evaluation of implementations of good dairy farming practice (GDFF) at SRC Animal Health Dairy Farm, Nakhon Ratchasima, Thailand

Aurelia Aprilianty<sup>1\*</sup>, Meilina Rizky Fadillah<sup>1</sup>, Aprodita<sup>1</sup>, Harits Khozi Muzaki Sartono<sup>1</sup>, Lilik Eka Radiati<sup>2</sup> and Marjuki<sup>3</sup>

<sup>1</sup> Undergraduate Program of Animal Science, Faculty of Animal Science, Universitas Brawijaya, Malang 65145, Indonesia

<sup>2</sup> Department of Animal Product Technology, Faculty of Animal Science, Universitas Brawijaya, Malang 65145, Indonesia

<sup>3</sup> Department of Animal Nutrition and Feed Science, Faculty of Animal Science, Universitas Brawijaya, Malang 65145, Indonesia

\*Corresponding author: aureliaaprlny@student.ub.ac.id

Received: March 18, 2022. Revised: August 19, 2022. Accepted: September 6, 2022.

### ABSTRACT

The objective of this case study was to implement dairy farm practices in Thailand using Good Dairy Farming Practices (GDFF) as guideline tools. This observation was carried out at SRC Animal Health Dairy Farm in Pakchong, Nakhon Ratchasima, Thailand, for one month, from October 20 until November 20, 2019. The implementation process was conducted by four mimic inspectors from the program of Animal Science, Faculty of Animal Science, Universitas Brawijaya, Indonesia. The GDFF tool was developed by the Food and Agriculture Organization of the United Nations (FAO) and the International Dairy Federation (IDF) since the year 2011. The implementation covered seven areas of the farm operation, including animal health, milking hygiene, nutrition, breeding and reproduction program, animal welfare, environment, and socio-economic management. Summary of implement activities included meeting with the farm manager and staff, observing farm activities, inspecting farm facilities, inspecting farm documents on the checklist, and interview. Data indicated that the type of cow raised at SRC Animal Health Farm was the crossbred Friesian Holstein. The overall result of the implementation indicated that the mean technical score was 3.73 on 4 point scale. The score reflected that farm management was in a good category. In addition, some quality perspectives should be required to adopt or apply in order to gain better scores and international recognition based on the recommendation tools of FAO and IDF standards.

**Keywords:** dairy cattle, good dairy farming practices, milking, management

### INTRODUCTION

Dairy cattle are an animal initiated specifically to produce milk because of their ability to produce abundantly. Friesian Holstein (FH) is a breed of dairy cattle that is widely kept in Indonesia because of its high milk production. According to Prastowo *et al.* (2019) this breed carries the superior genetic potential for milk production by being able to produce 5,217 kg of milk per year. Also, FH is able to adapt to tropical and sub-tropical countries under temperatures range 5-25°C.

During the late 1950's Thailand progressively imported dairy items. Over the past 68 a long time the commonplace little holder has extended. Concurring to Suryasathaporn *et al.* (2012) Thailand has the speediest developing dairy industry in tropical Asia, with 610% more drain generation in 2006 than within the period 1990/92; a development rate of 38% per annum. On the other side moreover note, that the industry has too made a few expansive commercial ranches. A great illustration of this unused drift is "SRC Creature Wellbeing Farm" in Pakchong, Nakhon Ratchasima, Thailand. The cultivation and handling plant has been working since

2017; the cultivation managing of 207 cattle with milk production per day of 2,103.4 kg and a normal generation of 18.45 kg/cow/day. The cultivate and its offices can be considered one of the most excellent dairy operations in Thailand. Agreeing with Quddus (2012) to extend the country's drain yield, a reasonable methodology centering on tall yielding breeds and progressed administration innovation ought to be embraced for impressive dairy improvement. A few of the extraordinary highlights incorporate: (i) bolstering castles an adjusted proportion were at slightest 50% of supplements determine from roughage; (ii) a target generation not more than 2,500 kg of drain guaranteeing the lactations cattle sound through every day controlling schedule; (iii) a bolster supply that's secured primarily through contract developing operations by adjacent smallholders; and (iv) fluid excrement prepared into crops fertilizer and dispersed to crops developing operations by adjacent smallholders.

The strategy of support of dairy bovines ought to be considered persistently, all together, and proficiently both from the perspectives of breeding and generation, bolster and drinking water,

administration walled in area and gear, wellbeing, and creature welfare. Concurring to Asminaya *et al.* (2020), the application of GDFP for dairy cultivation influences the generation of drain created by animals. A higher level of drain castle upkeep administration, within the sense of great support, can be guaranteed drain production in dairy animals is additionally great. The objective of this study was to implement dairy farm management in Thailand based on Good Dairy Farming Practices (GDFP), including animal health, milk hygiene, feeding and nutrition management, breeding and reproductive management, animal welfare, environment, and socio-economic management.

## MATERIALS AND METHODS

### Location and time

The implementation was conducted in Pakchong, Nakhon Ratchasima, 30130, Thailand from 20<sup>th</sup> October to 20<sup>th</sup> November 2019. The altitude of Pak Chong district is 331 masl (meters above sea level); the latitude is 14°58:50" N 102°6:00" E. The average temperature was 22-29°C, and the humidity was around 62-88%.

### Methods of implementation

The implementation was conducted using four undergraduate students from the program of Animal Science, Faculty of Animal Science, Universitas Brawijaya, Indonesia, as mimic inspectors. Summary of implement methods included meeting with the farm manager and staff, observing farm activities, inspecting farm facilities, inspecting farm documents on the checklist, and interviews. The implementation covered seven areas of the farm operation, including animal health, milking hygiene, nutrition, breeding and reproduction program, animal welfare, environment, and socio-economic management based on the guideline's implementation of GDFP (Good Dairy Farming Practice) according to FAO and IDF (2011). The evaluation quality was based on four quality scales (Table 1).

### Statistical analysis

Data from each panel were combined and analyzed using descriptive statistics (Steel *et al.*, 1997).

**Table 1.** Farm performance conversion score.

Average Score of GDFP	Quality Score	Category
0.00-0.50	0	Very Bad
0.51-1.00	1	Bad
1.01-2.00	2	Poor
2.01-3.00	3	Enough
3.01-4.00	4	Good

## RESULTS AND DISCUSSION

The success of a dairy farming business can be seen from the level of knowledge and skills as well as the application of the management and technical aspects of raising livestock owned by the farm. The standard for assessing the success of a dairy farming business according to FAO and IDF consists of several aspects, including animal health, milk hygiene, nutrition (feed and water), breeding and reproductive, animal welfare, environment, and socio-economic. The results of the evaluation of the success of smallholder dairy farming based on the score of the application of GDFP at SRC Farm can be seen in Table 2. The score of the technical aspect of maintaining private farm dairy cattle at SRC Farm based on the GDFP standard was an average of 3.73, which is in a good category (Table 2).

**Table 2.** The overall mean of implement score.

No	Good Dairy Farming Practice Aspects	GDFP Score	Category
1	Animal health	3.71	Good
2	Milking hygiene	4.00	Good
3	Nutrition (feed and water)	3.42	Good
4	Breeding and reproductive program	4.00	Good
5	Animal welfare	3.77	Good
6	Environment	3.80	Good
7	Socio-economic management	3.40	Good
<b>Average</b>		<b>3.73</b>	<b>Good</b>

The data showed that most of the farm management is slightly weak in some technical aspects such as nutrition and socio-economic management which scores were 3.42 and 3.40, respectively. The application of technical aspects of good maintenance on dairy farms certainly affects the productivity of dairy farms. Suherman (2005) stated that the success of a dairy farming business and increasing milk production depends on the application of good maintenance, feeding, reproduction, genetic, and environmental

management. Although it was in the rainy season, milk hygiene and breeding and reproductive programs were scores of 4.00 which are in the good category. In addition, aspects of environmental management, animal welfare and animal health received scores of 3.80, 3.77, and 3.71 respectively, which are also in the good category.

### *Animal health*

Animal health is crucial when running a farm by keeping an eye on animal health and preventing animal disease. Moreover, it can be crucially affected both economy and the safety of the food supply. The production of healthy livestock will ensure a safe and hygienic; it will also keep consumer prices stable. The GDFP score in animal health was 3.71 which is in the good category reflecting well-taking care of dairy cows (Table 3). The lowest score (2) came from the vermin control program; even though the treatment was flawless, the prevention was not quite enough. The vermin need to be exterminated to prevent unwanted diseases; vermin or pests are usually harmful to dairy cows, directly and indirectly. The farm has already programmed the routine vaccination for Foot-and-Mouth Disease (FMD) and plume disease for the calf, heifers, and cows. In addition, the farm also provides foot and mouth disease vaccination every four months; also, prevention and treatment for several diseases are extraordinary. For example; first, mastitis, detection using the Californian Mastitis Test (CMT), is detected when the milk forms a thick gel caused by alkyl aryl sulfonate and is treated with antibiotics injection to the mammary gland. The most commonly treated for clinical mastitis is intramammary administration of antibiotics to the mammary gland cavity (Kromker and Leimbach, 2017). Second, Laminitis, Laminitis occurs when the dermal layers inside cow claws become inflamed (Burger, 2017). Also known as foot rot, the treatment gives hoof trimming every two days. The recovery period is approximately four until six months. Third, diarrhea, calf diarrhea is most known for its damage to the farm, it can cause serious financial and animal welfare implications, not just in dairy but also in beef cattle as well (Mukhtar et al., 2015). For prevention, the calf is injected with the vaccine to increase body immunity, and if the calf still gets diarrhea, it will be continued with the injection of medicine. Lastly, metritis, the treatment is an injection of metricure and antibiotic, The cows that suffer from metritis require a systemic antibiotic treatment because of severe illness and risk for death but for assessing treatment

success is still inconsistent (LeBlanc, 2008), for the complication, as the difficulty of giving birth, it is major to perform Cesarean section to relieve the pain of the cow and prevent the cow from death.

### *Milk hygiene*

Dairy cow hygiene is used as an indicator of animal welfare because it provides information about the quality of life of animals and the quality of livestock facilities (Hultgren and Bergsten, 2001; Blokhuis, 2009; Sant'Anna and Costa, 2011). SRC farm had a GDFP value of 4 (Table 4), which means that the milk hygiene aspect has a good value and quality reflecting its specializes in managing milk hygiene. The milking process at SRC Farm carried out twice a day, in the morning at 5.30 and in the afternoon at 4.30. This is in accordance with what is conveyed by FAO and IDF explaining the milking process that can be done twice a day at 7 am and 5 pm. Before milking, cows were doused with water before entering the milking room to lower their body temperature, refreshing the cows so they can avoid stress. There is ample evidence showing that air can effectively reduce stress indicators such as respiratory rate and body temperature (Gaughan, et al., 2004; Kendall, et al., 2007; Legrand, et al., 2011). SRC Farm has a Standard Operating Procedure (SOP) for milking to produce milk of good quality and safe for consumption. SOP is one of the important aspects that will affect the production of livestock and in terms to table 4, the existence of SOPs and their observance gives a good value to SRC Farm. The SOP includes cleaning the nipples with a warm towel to reduce the number of bacteria and dirt. Disinfection of dairy cows before milking has been shown to reduce the number of bacteria on the nipple skin (Gleeson et al., 2018). Dip the nipple into the iodine solution and then wipe it again with a new warm towel until the nipple is clean and dry. The milking process can be started by making sure the nipples are clean and dry (FAO and IDF, 2011). Milking begins with manual flushing 2-3 times and is discarded to remove bacteria, then a CMT test is performed to detect mastitis. CMT is used to diagnose subclinical mastitis in milk-producing cows (Tolosa, et al., 2013); then proceed to the milking process with a machine for about 10-15 minutes per head. After the milking process is complete, each nipple is immersed in the iodine solution without being washed until the next milking. The finished cow will return to the pen and pass through the disinfectant pool next to the milking room.

**Table 3.** The score of implementation on the animal health aspect.

Good dairy farming practice	Defining Factors	GDFP Score	Category
Managing the herd to prevent disease	The breeds and animals are suited to the environment and farm management	3	Enough
	Managing the farm to fit with the herd size and the availability such as land, infrastructure, feed, and others	4	Good
	Vaccinated animals as a requirement by local animal health authorities	4	Good
Prevention of any disease in the farm	Buy animals that are up to standard such as health status and quarantine after deliverance	3	Enough
	Animal transport and the farm is free of disease	4	Good
	Aware of the risk of adjacent land and boundaries of neighbors	4	Good
	Limit access of people and wildlife in the farm	4	Good
	Have a pest control program in the farm	2	Poor
	Only use medicine or treatment that are according to expiration date used	4	Good
Hold an effective management program for the herd	Have an identification system that allowed to record all the animals from birth to death	4	Good
	Create an effective health management program for herd that are focused on prevention of disease to the standard of regional or national requirements	3	Enough
	Check animals daily for disease sign	4	Good
	Sick animals must be treated quickly and appropriately	4	Good
	Sick animals must be isolated	4	Good
	Separate milk from sick animals and animals under treatment	4	Good
	Keep the records for all the medication and the identification of animals that are being treated	4	Good
Prevention of animals that can cause public health (zoonosis)	4	Good	
Traceability feed stuff that are brought to the farm	Use the chemicals that are approved and used under regulation	4	Good
	Use the chemicals by following the directions and the right dosage, also observe the expiration date	3	Enough
	Only used medication by veterinary and formulated by veterinarians	4	Good
	Store the medicine and veterinary medicine safely and disposed it appropriately	4	Good
<b>Average</b>		<b>3.71</b>	<b>Good</b>

One dairy cow at SRC Farm is capable of producing 7-15 kg of milk daily which will be stored in the cooling tank. The cooling tank used to store milk is between 3 to 4 °C. This is in accordance with FAO and IDF that milked milk can be stored in a cooling tank with a temperature of 3 to 4°C. The milk will be transported to the processing center at 2 p.m. After the milking process is complete for all cows, the milking room is cleaned by manual and automatic systems. One of the things that need to be considered in the milking room of this farm is the presence of biosecurity at the entrance of the milking room. There is a disinfectant liquid to prevent bacteria from being carried by workers into the milking room. To have a good dairy farming system, we must ensure that the housing environment is always clean (FAO and IDF, 2011). Cleanliness and good facilities give the GDFP value in terms of 4 are classified as good.

### *Nutrition (feed and water)*

The production of ruminants is largely determined by the availability of feed and drinking water. Types of feed given to dairy cows, namely forage and concentrate. Adequacy of basic nutrients in dairy cattle is used for growth, reproduction, lactation, and locomotion. Within the perspective of bolster and drinking water administration, it can be seen that the GDFP score got a normal score of 3.42. It can be said that the execution of nourishment administration at SRC Cultivate is within the good category (Table 5). The least GDFP score within the destitute category appears in Guarantee the dietary needs of creatures are met (2); Guarantee the nourish encouraged to dairy creatures is fit for a reason and will not adversely affect the quality or security of their drain or meat, where conceivable, source creature bolster from providers having an endorsed quality affirmation modified input and keep records of all bolster or nourish fixings gotten on the cultivating (3). Ensuring the nutritional needs of

animals are met is not good enough because the farm uses a total mixed ration (TMR) which the TMR formulation may not update. The TMR formulation should be evaluated and updated every two years so that the nutritional needs of dairy cows are in line with milk production. Heifer cattle are fed rice straw which is classified as poor-quality forage. Rice straw is the waste product from the agricultural product that contains 2% of crude protein. The low forage

quantity available in the dry season and low-quality protein concentrated feed leads to a decrease in the productivity of dairy cattle (Susanti and Marhaeniyanto, 2007). The sub-aspect of how to feed is included in the good category because the feed is given after the milking process is complete, this aims to reduce contamination in milk.

**Table 4.** The score of implementation on the aspect of milk hygiene.

Good dairy farming practice	Defining Factors	GDFP Score	Category
Ensure milk is treated properly after milking	Ensure milk is refrigerated or sent for processing within the specified time	4	Good
	Ensure the milk storage area is clean and tidy	4	Good
	Ensuring equipment for milk storage is sufficient to hold milk at a predetermined temperature	4	Good
	Ensure equipment for milk storage is cleaned and sanitized regularly or after each milk collection	4	Good
	Ensure unhindered access to mass milk collection	4	Good
Ensure that milking activities are carried out in hygienic conditions	Make sure the cage environment is clean at all times	4	Good
	Make sure the milking area is always clean	4	Good
	Ensure sufficient water supply, good water quality and regularly maintained	4	Good
	Making sure the milker always follows basic hygiene rules	4	Good
Ensure that milking activities do not injure animals or introduce contaminants into milk	Ensure equipment for milking is cleaned regularly disinfected or after each milking	4	Good
	Identify each individual animal that requires special milking management	4	Good
	Ensure that the udder is properly prepared for milking	4	Good
	Milk regularly using a consistent milking technique	4	Good
	Separating harvested milk from sick or treated animals for proper disposal	4	Good
	Ensure equipment for milking is properly maintained and installed	4	Good
	<b>Average</b>	<b>4</b>	<b>Good</b>

**Table 5.** The score of implementing SRC farm's good dairy farming practice in aspects of nutrition

Good dairy farming practice	Defining Factors	GDFP Score	Category
Secure feed and water supplies from sustainable sources	Arrange ahead to guarantee that the herd's bolster and water requisites are met	4	Good
	Execute economical supplement, water system and bug administration hones when developing nourish	4	Good
	Source cultivate inputs from providers actualizing economical frameworks	4	Good
Ensure animal feed and water are of suitable quantity and quality	Guarantee the dietary needs of creatures are met	2	Poor
	Guarantee the bolster bolstered to dairy creatures is fit for reason and will not adversely affect the quality or security of their drain or meat	3	Enough
	Guarantee appropriate quality water is given and the supply is routinely checked and kept up	4	Good
	Utilize diverse gear for taking care of chemicals and bolster stuffs	4	Good
	Guarantee chemicals are utilized fittingly on pastures and scrounge crops and watch withholding periods	4	Good
Control storage conditions of feed	As it were utilized affirmed chemicals for treatment of creature bolsters or components of creature bolsters and watch withholding periods	4	Good
	Isolated nourishes planning for distinctive species	4	Good
	Guarantee suitable capacity conditions to dodge bolster deterioration or defilement	4	Good
Ensure the traceability of feedstuffs brought on to the farm	Declines mildew covered or sub-standard bolster	4	Good
	Where conceivable, source creature nourishes from providers having an affirmed quality confirmation modified input	3	Enough
	Keep records of all bolster or bolster fixings gotten on the cultivating	3	Enough
	<b>Average</b>	<b>3.42</b>	<b>Good</b>



Feeding management at SRC farms is differentiated based on the growth phase and ad libitum feeding system. Feeding forage for lactating cows and dry cattle is carried out twice a day in the morning and evening in a fresh state while feeding for heifers is carried out 3 times a day in the morning, afternoon, and evening. Meanwhile, the administration of concentrate for the heifer is carried out in the morning and evening only. Feeding must be in an appropriate percentage between forage and concentrate. The highest GDFF score (4) with the great category appeared in Secure bolster and water supplies from economical sources and Control capacity conditions of the bolster. The SRC farm cultivates and guarantees the accessibility of nourishment for all animals by conducting a coordinated cultivating framework in which SRC cultivate has its claim crops where the plants are utilized in making silage. Maize silage is the most bolster in SRC Dairy Cultivate. This feed silage storage will last as long as three (3) months. To avoid unsustainable water use or water deficiency, the dairy industry must focus on the development of drought-tolerant crops (Heisey and Rubenstein, 2015); shifting to water-efficient and drought-tolerant crops (Marshall et al., 2015); using soil-management practices that increase water retention, such as conservation tillage, crop residue management, or cover crops (Marshall et al., 2015). The storage system of feed materials at the farm uses FIFO (First in First Out). This means that the new feed material coming stored and feed ingredients that have been provided are used to feed material have been used up. Storage of feed materials using storage methods in the packaging (sacks) and for storage of feed ingredients and medicines/chemicals are stored in separate warehouses.

### Breeding and reproductive program

In dairy cows, reproductive management and breeding have a very crucial influence on the economic aspect. Therefore, it is necessary to manage the breeding and reproduction of the right cows so that the productivity of dairy cattle runs smoothly. According to Ribeiro et al. (2012) For each cultivate and for each bovine, there's an ideal time for pregnancy, which is for the most part affected by the level of generation, tirelessness of lactation, and equality. dairy cattle business because it will affect the success of the livestock business. The score of GDFF for the breeding and reproductive program at SRC Farm is in a good category (4) as shown in Table 6. Based on observations in the field, it is known that the breed of dairy cattle kept on the farm under study is Frisian Holstein (FH) which belongs to the breed of cows with high milk production with characteristics including dominant coat color of black and white stripes and in small quantities, there is a with red and white stripes, the head is relatively long, wide and straight with relatively short horns that

point laterally and curve forward, and have a calm and docile temperament (Efata, 2018).

Breeders at the research site are breeding by crossbreeding between FH cattle and Jersey cattle. It aims to produce high-quality and quantity milk production. As we know, FH breed produces a high quantity of milk, while Jersey breed produces high quality (high-fat content) of milk. According to Makin (2011), the milk-producing castle FH is the highest in the world with an average of 6000 liters per lactation and a fat percentage average of 3.5%, which varied from 2.5 to 4.3%. Choose livestock seeds that have entered the age of ready to mate. The conception method aspect is considered good because this farm already uses breeding technology such as synchronization estrus, artificial insemination, and embryo transfer. The condition of the knowledge aspect of lust is in a good category because in this farm a recording system related to the reproductive cycle has been recorded on the computer and the presence of an IoT necklace sensor makes it easier for veterinarians to monitor the movement of cows that are about to enter estrus. Ideal development rates of yearlings are basic for future creature execution. In arrange to maximize lifetime generation, Holstein yearlings ought to calve at around 23 to 24 months of age with ~85% of grown-up body weight (Gabler et al., 2000; Etema and Santos, 2004). Yearlings calving at a more youthful age (i.e., 25 months) have no changes in efficiency at, to begin with, lactation (Gabler et al., 2000; Etema and Santos, 2004), with extra days of useless life and nourishment costs. This appears that smallholder dairy ranchers at SRC cultivate are exceptionally concerned about the administration of breeding and generation viewpoints.

**Table 6.** The score of implementing SRC farm's good dairy farming practice on breeding and reproductive aspects

Defining Factors	GDFF Score	Category
The breed of cattle	4	Good
Selection method	4	Good
Conception method	4	Good
Knowledge about estrus	4	Good
Age of first calving	4	Good
Mating after first calving	4	Good
Calving interval	4	Good
<b>Average</b>	<b>4</b>	<b>Good</b>

### Animal welfare

The welfare of an animal depends on how it perceives the situation in which it lives (Keeling, 2013). There are five principles of animal welfare;

the animal never feels hungry, thirsty, and malnourished; the animal does not feel physical and thermal discomfort; the animal is free from injury, disease, and pain; the animal is mostly able to express its normal pattern of behavior; animals do not feel fear and distress. Based on the data from our research, SRC Animal Health has implemented Good Dairy Farming Practices in the Animal Welfare aspect. The results show the number 3.77 which is in the good category. The score of implementing SRC Farm's Good Dairy Farming Practice on the Animal Welfare aspect can be seen in Table 7.

In SRC Animal Health Farm, the animal fed very well and properly (Table 5). The farm applies an integrated farming system that consists of not only a dairy cattle farm but also a wide area of plantations such as grasses, fruits, and vegetable gardens. It makes the feed availability so abundant because the farmer makes their own silage from their own land. This farm also implements very good health management by routinely providing vaccines, disinfectants, vitamins, and adequate nutrition, and is provided by a trained veterinarian and nutritionist.

SRC Farm applies free stall cages to all parts of the farm, including dairy cattle, breeding cattle, heifer, and dry cattle. Comfort in livestock is one of the important factors that influence the profitability of dairy farming because of its relationship with their productivity.

However, SRC Animal Health has some activities and routines that are not in accordance with animal welfare principles. Most of the workers on the farm handling the cattle or moving the cattle from one cage to another use improper handling and restraint techniques that could make the cattle to feel stress, fear and distress due to insufficient training in handling and restraint or awareness of animal welfare principles. Besides, the relationship between mother and baby after birth is not supporting the freedom to express normal behavior. The newborn baby calf will be separated from the mother to a pen for the calf right after the mother gives birth to prevent the mother-calf bonding. The baby will be given colostrum for a few days and given formula milk instead. This is done for perceived benefits from an economic point of view, by accumulating higher milk yields for human consumption (CIWF, 2013)

**Table 7.** The score of implementing SRC farm's good dairy farming practice on the animal welfare aspect

Good dairy farming practice	Defining Factors	GDFP Score	Category
Ensure animals are free from thirst, hunger and malnutrition	Provide adequate feed and water to all the livestock every day	4	Good
	Adjust stocking rates and/or supplementary feeding to ensure sufficient supply of water, feed and fodder supply	4	Good
	Protect animals from toxic or harmful plants and other hazardous substances	4	Good
	Provide a good quality water supply which is regularly checked and maintained	4	Good
Ensure livestock are free from discomfort	Design and construct buildings and handling facilities to be free of obstructions and dangers	3	Enough
	Provide enough space and clean bedding	4	Good
	Protect animals from bad weather conditions and their consequences	4	Good
	Provide animal housing with adequate ventilation	4	Good
	Provide suitable footing and flooring for housing and animal traffic areas	3	Enough
	Protect animals from injury and distress during loading and unloading also provide suitable conditions for transportation	4	Good
Ensure livestock are free from injury, disease and pain	Have a program of regular checkups and effective herd health management	4	Good
	Do not use practices and procedures that cause unnecessary pain	4	Good
	Follow appropriate weaning and birthing practices	4	Good
	Have proper procedures for marketing young dairy cattle	4	Good
	Protect against lameness	4	Good
	Milk the lactating dairy cattle regularly	4	Good
	Avoid bad milking practices as it can injure dairy cattle	4	Good
	Avoid unnecessary stress or pain when animals have to be euthanized on the farm	4	Good
Ensure livestock are free from fear	Consider herd management routines and dairy cattle behavior when developing livestock infrastructure	4	Good
	Provide competent husbandry skills, stock handling and appropriate training	2	Poor
	Use appropriate facilities and equipment for stock handling	3	Enough
Ensure the dairy cattle can engage in relatively normal patterns of livestock behavior	Ensure the dairy cattle can engage in relatively normal patterns of livestock behavior	4	Good
<b>Average</b>		<b>3.77</b>	<b>Good</b>

## Environment

SRC Farm is located in the Amphoe Pak Chong district, Nakhon Ratchasima Province, Thailand. Pak Chong District Altitude is 331 masl. The temperature in this place ranges from 22 to 29°C with humidity around 62 to 88%. Cattle are affected at any time when the ambient temperature is more than their thermoneutral zone, which ranges from 25°C (Atrian and Shahryar, 2012). The farm has a total area of 48 ha which is divided into 4 sections including housing, buildings (offices, laboratories, workers' houses, milking facilities, and warehouses), waste lagoons, and crop fields. The cage area has an area of 22 ha, a building area of 3.7 ha, a WWTP area of 0.3 ha, and a planting area of 22 ha. SRC Farm is located in an area with a sufficient water supply and abundant feed availability. Livestock can meet their nutritional needs properly. The drainage owned by SRC Farm is also quite good so that the cage is clean and not damp. Spatial conditions and livestock facilities are quite good indicating that the milk production produced is also good. Good layout and

environmental conditions give SRC Farm a GDFP value which is seen in Table 8 is good.

The SRC farm cleans the garden two to three times daily manually by workers and using a tractor. The manure produced by livestock is cleaned and managed properly by the farm. The manure will be processed into fertilizer which will then be sold or used by SRC Farm itself. The rest of the waste in the form of water will be disposed of at the disposal of the SRC Farm so that it does not pollute the surrounding environment and this provides good value for environmental treatment in terms of GDFP. SRC Farm is still not able to manage the more complex biogas which will later be useful as an energy source other than electricity; so in table 8, there are still points that have a value of 3 or sufficient because they have not maximized the utilization of other resources and more complex processing. FAO and IDF (2011) explain that in order to have a good dairy farming system, we must implement proper practices to reduce, reuse or recycle livestock as waste.

**Table 8.** The score of implementing SRC farm's good dairy farming practice in environmental aspects

Good dairy farming practice	Defining Factors	GDFP Score	Category
Implementing an environmentally friendly farming system	Use agricultural inputs such as water and nutrients efficiently and sustainably	4	Good
	Minimizing the production of environmental pollutants from dairy farming	4	Good
	Managing dairy cattle to minimize negative impacts on the environment	3	Enough
	Choosing and using energy resources appropriately	3	Enough
	Maintaining and/or promoting biodiversity in agriculture	4	Good
Have an appropriate waste management system.	Implement appropriate practices to reduce, reuse or recycle agricultural waste	4	Good
	Manage waste storage and disposal to minimize impact on the environment	4	Good
Ensure that dairy farming practices do not have a negative impact on the local environment	Contains milk runoff on farms	4	Good
	Using chemicals, agricultural and veterinary fertilizers appropriately to avoid contamination of the local environment	4	Good
	Ensuring the overall appearance of the milking activity is appropriate for a facility where high quality food is harvested	4	Good
<b>Average</b>		<b>3.8</b>	<b>Good</b>

## Socio-economic management

The score of GDFP for socio-economic management at SRC is in a good category, with a score of 3.4 as shown in Table 9. However, the lower score came from the aspect of employing staff based on national laws and experience with the score of 2 being the poor category because some new crew members were inexperienced foreigners and needed to be trained before achieving professional performance in dairy practices. This is followed by implementing sustainable work practices, managing human resources effectively, ensuring that their working conditions comply with applicable laws and international conventions, inducting and working,

and ensuring staff is appropriate for their work, given a score of 3 with a sufficient category. The busiest times for the workers are in the early morning and afternoon because their activities include the milking process, cleaning the stables, and feeding the cows. Because the farm activity had to run every day, the farm allowed one day of the week as a holiday depending on individual purposes. Research on leisure activities suggests that the activities people engage in during non-working time influence their level of Health and Well-being (De Bloom, 2011).



**Table 9.** The score in socio-economic management aspects

Good dairy farming practice	Defining Factors	GDFP Score	Category
Implement effective and responsible management of human resources	Implement sustainable work practices	3	Enough
	The staff on the farm is based on national law and experienced	2	Poor
	The farm is managed to maximize the human resource and made sure that the working conditions is in accordance to laws and international conventions	3	Enough
	Assure the farm to have a working environment that up to standard such as health and safety requirements	4	Good
Ensure farm tasks are carried out competently and safely	Have an equipment and procedure that are up to standard for dairy farming task	4	Good
	Able to train and educate the workers for their work	3	Enough
	Assure the staff to complete their task	3	Enough
	Pick the best people for the farm, whom are competent and able to communicate very well	4	Good
Manage the farm to secure their financial viability	Have a good financial management program	4	Good
	Using an agricultural practice that can reach productivity and profitability goals	4	Good
	Have a backup plan for a financial crisis	4	Good
<b>Average</b>		<b>3.4</b>	<b>Good</b>

While the highest aspect is ensuring the farm work environment complies with relevant occupational safety and health requirements, adopting farming practices that contribute to the company's productivity and/or profitability goals, having the appropriate equipment and procedures to perform dairy farming tasks, selecting competent people for training, planning ahead to manage financial risks, interventions and advice, and implement financial management systems get a score of 4 in the good category. This is because SRC Animal Health Dairy Farm has good financial management by implementing an integrated farming system. The main income from SRC Animal Health comes from exclusive milk production from dairy cattle and has relatively more expensive prices than milk in general. The additional income comes from processed cow waste that has been collected and processed into fertilizer, culling calf or cattle, plantation, and other agricultural products including watermelon, papaya, banana, and various other fruits and vegetables. Moreover, the worker makes their own silage from the plantation as cattle feed; so, it can reduce the feed cost which is the majority of production cost. SRC Farm adopts agricultural practices that contribute to the company's profitability and/or productivity goals, called Integrated Farming System. By implementing the integrated farming system, they produce their own food without having to buy products from outside which are relatively more expensive and increase production costs. Implementing an integrated farming system can generate additional income ranging from `9,000 to `200,000 per hectare, depending on the type of additional farming business, the amount involved and the effective combination thereof (Ponnusamy and Devi, 2017).

## CONCLUSIONS

Good Dairy Farming Practice (GDFP) has a few viewpoints that must be followed to in carrying out the administration of dairy bovines such as creature wellbeing, breeding and regenerative program, drain cleanliness, bolstering and sustenance, creature welfare, environment, and socio-economic administration. According to the implementation outcome, SRC Animal Health Dairy Farm received an average technical score of 3.73 on 4 point scale that reflected that overall farm management is in a good category. Based on the tools of GDFP FAO and IDF standards, the farm has a great opportunity to expand its activity to an international level in terms of doing internships or research for international students around the world. In addition, some quality perspectives should be considered to adopt or apply on the farm to achieve full scores and international recognition.

## ACKNOWLEDGMENT

The authors gratefully acknowledge that several support from the committee of Brawijaya-Rajamangala International Class Program; Mr. Prawin Payapsthan, the owner of SRC Animal Health Dairy Farm, Nakhon Ratchasima, Thailand; Mr. Arthit Thitwong the manager of SRC Animal Health dairy farm, Thailand; Assoc. Prof. Dr. Suntorn Wittayakun, Dean of Faculty of Science and Agricultural Technology, Rajamangala University of Technology Lanna, Thailand.

## REFERENCES

- Asminaya, N. S., Bani, A., Sandiah, N., Muhsafaat, L., Irawan, F. Y., Indi, A., and Sulfitriana, A. 2020. Earth and environmental science. IOP Conf. Ser. Earth Environ. Sci. 465: 012055.
- Atrian, P., and Shahryar, H. A. 2012. Heat stress in dairy cows. Res. Zool. 2: 31-37.
- Blokhuis, H.J. 2009. Welfare Quality assessment protocol for cattle. Welfare Quality Consortium. Lelystad, Netherlands.
- Burger, M. 2017. Nutritional factors affecting the occurrence of laminitis in dairy cows: a review. *Elsenburg Journal*. 14 (1): 59-64.
- CIWF. 2013. Dairy cow-calf separation and natural weaning. Compassion in World Farming. Online available at: <https://www.compassioninfoodbusiness.com/media/5822658/cow-calf-separation-and-natural-weaning.pdf>. Accessed on September 30<sup>th</sup>, 2021.
- De Bloom, J., Geurts, S.A., Sonnentag, S., Taris, T., de Weerth, C., and Kompier, M.A. 2011. Health and well being. *Psychology & Health*. 26: 1606-1622.
- Efata, K. B. 2018. Addition of feed with and without pineapple leaves on protein and lactose levels of FH (Frisian Holstein) crossbred dairy cows in Ngancar District, Kabupaten Kediri. Undergraduate Thesis. Wijaya Kusuma University, Surabaya, Indonesia. (in Indonesian).
- Ettema, J.F. and Santos, J.E.P. 2004. Impact of age at calving on lactation, reproduction, health, and income in first-parity Holsteins on commercial farms. *Journal of dairy science*. 87(8): 2730-2742.
- FAO and IDF. 2011. Guide to good dairy farming practice: Animal Production and Health Guidelines. No. 8. Food and Agriculture Organization of United Nations and International Dairy Federation, Rome, Italy.
- Gabler, M.T., Tozer, P.R., and Heinrichs, A.J. 2000. Development of a cost analysis spreadsheet for calculating the costs to raise a replacement dairy heifer. *Journal of Dairy Science*. 83(5):1104-1109.
- Gaughan, J.B., Davis, M.S. and Mader, T.L. 2004. Wetting and the physiological responses of grain-fed cattle in a heated environment. *Australian Journal of Agricultural Research*. 55(3): 253-260.
- Gleeson, D., Flynn, J. and Brien, B.O. 2018. Effect of pre-milking teat disinfection on new mastitis infection rates of dairy cows. *Irish veterinary journal*. 71(1):1-8.
- Heisey, P. W., and Rubenstein, K.D. 2015. NAE Global Chapter 4. United State Department of Agriculture. 139: 1-29.
- Hultgren, J. and Bergsten, C. 2001. Effects of a rubber-slatted flooring system on cleanliness and foot health in tied dairy cows. *Preventive veterinary medicine*. 52(1):75-89.
- Keeling, L., Evans, A., Forkman, B., and Kjaernes, U. 2013. Welfare Quality® principles and criteria. In H. Blokhuis, M. Miele, I. Veissier, & B. Jones (eds.), *Improving farm animal welfare: science and society working together: the Welfare Quality approach*. Wageningen Academic Publishers, Wageningen. p. 91-114.
- Kendall, P. E., Verkerk, G.A., Webster, J.R., and Tucker, C.B. 2007. Sprinklers and shade cool cows and reduce insect-avoidance behavior in pasture-based dairy systems. *Journal of Dairy Science*. 90(8): 3671-3680.
- Krömker, V., and Leimbach, S. 2017. Mastitis treatment-reduction in antibiotic usage in dairy cows. *Reproduction in Domestic Animals*. 52: 21-29.
- LeBlanc, S. J. 2008. Postpartum uterine disease and dairy herd reproductive performance: a review. *The Veterinary Journal*. 176(1): 102-114.
- Legrand, A., Schütz, K. E., and Tucker, C. B. 2011. Using water to cool cattle: Behavioral and physiological changes associated with voluntary use of cow showers. *Journal of dairy science*. 94(7): 3376-3386.
- Makin, M. 2011. Management of dairy farming. 1<sup>st</sup> ed. Graha Ilmu Publisher, Yogyakarta. (in Indonesian).
- Marshall, E., Aillery, M., Malcolm, S., and Williams, R. 2015. Climate change, water scarcity, and adaption in the U.S. Field Crop Sector. ERR-201. United States Department of Agriculture, Washington DC.
- Mukhtar, Y., Mamo, G., Tesfaye, B., and Belina, D. 2015. A review on major bacterial causes of calf diarrhea and its diagnostic method. *Journal of Veterinary Medicine and Animal Health*. 7(5): 173-185.
- Ponnusamy, K., and Devi, M. K. 2017. Impact of integrated farming system approach on doubling farmers' income. *Agricultural Economics Research Review*. 30(conf): 233-240.
- Prastowo, S., Nugroho, T., Mahfudhoh, N., Putra, F. Y., Subiakti, Ratriyanto, A., Susilowati, A., Sutarno, Widyas, N. 2019. Milk production of imported Holstein cows over different environment. IOP Conf. Ser. Mater. Sci. Eng. 633: 012021.
- Quddus, M. A. 2012. Adoption of dairy farming technologies by small farm holders: practices and constraints. *Bangladesh Journal of Animal Science*. 41(2): 124-135.
- Ribeiro, E.S., Monteiro, A.P.A., Lima, F.S., Ayres, H., Bisinotto, R.S., Favoreto, M., Greco, L.F., Marsola, R.S., Thatcher, W.W., and Santos, J.E.P. 2012. Effects of presynchronization and length of proestrus on fertility of grazing dairy cows subjected to a 5-day timed artificial insemination protocol. *Journal of Dairy Science*. 95(5): 2513-2522.
- Sant'Anna, A. C., and da Costa, M. P. 2011. The relationship between dairy cow hygiene and somatic cell count in milk. *Journal of dairy science*. 94(8): 3835-3844.
- Suherman, D. 2005. Ratio of native grass and concentrate in the ration to the quality of milk production of Holstein cow. *Anim. Agric. J*. 7: 14-20.
- Steel, R.G.D., Torrie, J.H. and Dicky, D.A. 1997. Principles and procedures of statistics, a biometrical approach. 3<sup>rd</sup> ed., McGraw Hill, Inc. Book Co., New York.
- Suriyasathaporn, W., Chupia, V., Sing-Lah, T., Wongsawan, K., Mekrirat, R., and Chaisri, W. 2012. Increases of antibiotic resistance in excessive use of antibiotics in smallholder dairy farms in northern Thailand. *Asian-Australasian journal of animal sciences*. 25(9): 1322.
- Susanti, S., and Marhaeniyanto, E. 2007. Digestibility, nitrogen retention and their relationship to milk production in Friesian Holstein (PFH) cattle fed pollard and rice bran. *Jurnal Peternakan*. 15: 142-143. (in Indonesian).
- Tolosa, T., Verbeke, J., Piepers, S., Supré, K. and De Vlieghe, S. 2013. Risk factors associated with subclinical mastitis as detected by California Mastitis Test in smallholder dairy farms in Jimma, Ethiopia using multilevel modelling. *Preventive Veterinary Medicine*, 112(1-2): 68-75.