

A comparative study on dairy production and revenue of the dairy farms supported by a dairy cooperative with those supported by a private organization in Central Thailand

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Abstract

The objective of this study was to compare monthly milk yield and milk revenue of dairy farms supported by a dairy cooperative (DC) with those supported by a private organization (PO) in Central Thailand. The dataset contained monthly milk yield per farm (MYF), monthly milk yield per cow (MYC), monthly milk revenue per farm (MRF), and monthly milk revenue per cow (MRC) records from 642 DC farms and 449 PO farms collected between 2006 and 2009. The dataset was analyzed using a mixed model with the fixed effects of year-season-organization subclass and farm location-farm size-organization subclass, and the random effects of farm and residual. Least squares means were estimated for each trait and were compared using a Bonferroni t-test.

Monthly milk production and revenue varied across year-season-organization subclasses and farm location-farm size-organization subclasses. Across year-season subclasses, farms supported by DC had lower milk productions and revenues than farms supported by PO ($P < 0.01$). Farms supported by DC and PO had similar milk production and revenue across farm location-farm size subclasses, except for small size farms in a district (Muaklek). The farm to total variance ratio ranged from 0.47 (MRC) to 0.59 (MYF) indicating that differences among farms were an important source of variation for all traits. This result suggests that dairy organizations need to take into account individual farm characteristics and support them accordingly. To help improve milk production and revenue of dairy farms, sharing experiences and information within and between dairy organizations should be encouraged.

Key words: dairy farming, milk production, organization, revenue, tropic

Introduction

The highly competitive environment of the dairy industry in Thailand and other Asian countries is forcing dairy organizations and individual farmers to enhance their productive and economic efficiencies as well as their qualitative standards to survive in this business. To remain competitive, dairy organizations and farmers have to strive to reduce costs and improve the quality of their milk. Milk collection centers play an important role in countries where most dairy farms are small. Farmers deliver raw milk to the milk collection center, and later the accumulated raw milk from farms is transported to the dairy factory (Belavadi and Niyogi 1999; Devendra 2001). Milk collection centers constitute an efficient strategy to decrease expenditures, reduce transportation time from farms to milk processing factories, and facilitate delivery of milk from dairy farms that are far away from milk processing factories (Tantajinna 2001).

Dairy organizations that operate milk collection centers could be classified into 2 groups: dairy cooperatives and private organizations. Both types of organization collect and purchase raw milk from dairy farms, transport and sell the collected milk to dairy factories, and provide services to their farmers. Dairy cooperatives are formed by groups of dairy farmers and have a legal status. They have a set of bylaws that are approved by their members. Normally, decisions are made by committees that meet at regular times and this may cause delays when making decisions. These dairy cooperatives receive assistance and support from the government such as loans with government department interest rates (Rhone et al 2008b). A successful prototype of a dairy cooperative is Anan pattern, which has been promoting dairying (Operation Flood program) since 1969 and has increased

MRF, and MRC of the dairy farms supported by PO and those supported by DC are presented in Table 1.

Table 1: Descriptive statistics for milk production and revenue by a private organization and a dairy cooperative

Organization	Trait ¹	Number of Observations	Mean	Standard Deviation	Min	Max
Private organization	MYF, kg	19,883	3,773	2,795	203	19,731
	MYC, kg	19,809	320	88	101	599
	MRF, baht	19,848	50,773	38,902	1,011	313,444
	MRC, baht	19,702	4,276	1,247	1,018	8,399
Dairy cooperative	MYF, kg	36,572	3,959	3,3501	201	35,940
	MYC, kg	25,225	292	111	101	599
	MRF, baht	36,625	53,574	45,494	1,010	379,176
	MRC, baht	25,939	4,008	1,669	1,002	8,394
Overall	MYF, kg	56,455	3,893	3,167	201	35,940
	MYC, kg	45,034	305	102	101	599
	MRF, baht	56,473	52,589	43,312	1,010	379,176
	MRC, baht	45,641	4,123	1,507	1,002	8,399

¹MYF = milk yield per farm; MYC = milk yield per cow; MRF = milk revenues per farm; MRC = milk revenue per cow

Farm and management

Most dairy farms in this study were small size [255 farms supported by DC, and 327 farms supported by PO], followed by medium size farms [253 farms supported by DC, and 293 farms supported by of PO], and large size farms [154 farms supported by DC, and 115 farms supported by PO]. Nearly all dairy cattle raised by farms from the two organizations were crossbred Holstein (H) with H fractions ranging from 25% H to 99% H. The other breeds of dairy cattle present in this population were Brown Swiss, Jersey, Red Danish, Red Sindhi, Sahiwal, Brahman and Thai native. Individual animals could have fractions from 2 to more than 7 different breeds. Farms primarily used semen from purebred H rather than crossbred H sires and sires from other breed (e.g., Jersey, Brown Swiss) to artificially inseminate their cows. Sixty seven percent of all farms used artificial insemination services provided by their organization (DC or PO) rather than from others organizations (e.g., the department of livestock development, the dairy farming promotion organization, or commercial services). Dairy farmers made sire selection decisions based on their own experience and suggestions from staff provided by their organizations. Both organizations provided veterinary services to their members. Farms in both organizations vaccinated their cows against Foot and Mouth Disease, Hemorrhagic Septicemia and parasites twice a year. Antibiotics were typically given to treat infections such as mastitis.

Farms supported by both organizations (DC and PO) had nutritional management programs that varied depending on seasons and their own resources. Grasses present in farms from both organizations were *Brachiaria mutica* (para grass), *Brachiaria ruziziensis* (ruzi grass), *Pennisetum purpureum* (napier grass), and *Panicum maximum* (guinea grass). Legumes were *Stylosanthes hamata* cv. Verano (Verano stylo), *Stylosanthes guianensis* (Thapra stylo) or *Leucaena leucocephala* (leucaena). Most farms used both cut-and-carry and pasture grazing (57% of all farms), 39% of farms used only cut-and-carry, and the remaining 4% of farms used pasture grazing only. Approximately, 30 to 40 kg of grass, which was about 10% of cattle's body weight, was fed to the dairy cows daily. Forages were more abundant in the rainy season than in the dry seasons (summer and winter). Forages were insufficient in the summer and winter seasons due to lack of irrigation in the areas of the study. Thus, during these dry seasons, cattle were additionally fed with purchased rice straw, silage, and hay. Less than 10% of all farms in both organizations made and used their own silage. Some small farmers fed their cattle with native grasses by cut and carry from public areas. Concentrates used by farms of both organizations were either made by farmers themselves or purchased from their dairy organization (DC or PO) of local private companies. The ingredients of concentrates included cassava, rice bran, palm meal, cotton meal, soybean meal, and brewers' dries grains. The amount of concentrate fed to individual cows depended on the amount of milk produced, cost, and farmer's knowledge and personal opinions. The usual rule was to give 1 kg of concentrate per 2 kg of milk.

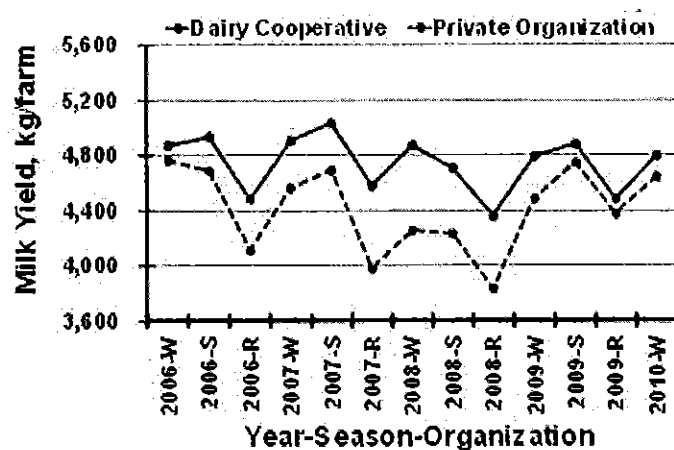


Figure 1a: Trends for year-season-organization least squares means for monthly milk yield per farm from 2006 to 2009

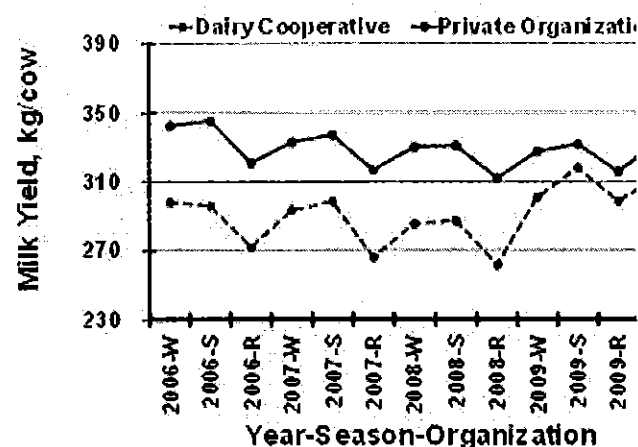


Figure 1b: Trends for year-season-organization least squares means for monthly milk yield per cow from 2006 to 2009

The LSM for MRF ranged from $49,349 \pm 2,798$ baht (2006-Rainny) to $73,405 \pm 2,791$ baht (2009-Winter) for farms supported by DC, and from $56,490 \pm 1,989$ baht (2006-Rainny) to $77,592 \pm 2,007$ baht (2009-Winter) for farms supported by PO. The MRF tended to increase significantly for both farms supported by DC ($1,721 \pm 315$ baht/year-season; $P = 0.0002$) and PO ($1,380 \pm 262$ baht/year-season; $P = 0.0003$) during the period of the study period (2006-Winter to 2010-Winter). Farms supported by DC had lower MRF than farms supported by PO across year-season subclasses, except for 2009-Summer ($5,826 \pm 2,579$ baht, $P < 0.01$; Figure 1c).



Figure 1c: Trends for year-season-organization least squares means for monthly revenue per farm from 2006 to 2009

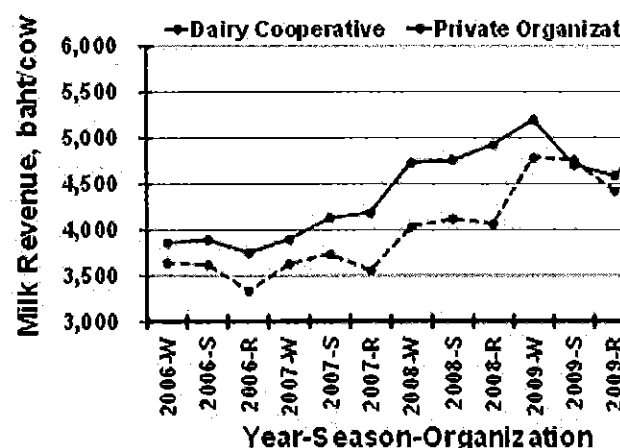


Figure 1d: Trends for year-season-organization least squares means for monthly revenue per cow from 2006 to 2009

The LSM for MRC ranged from $3,336 \pm 112$ baht (2006-Rainny) to $4,787 \pm 112$ baht (2009-Winter) for farms supported by DC, and from $3,752 \pm 82$ baht (2006-Rainny) to $5,197 \pm 84$ baht (2009-Winter) for farms supported by PO. Similar to MRF, the MRC tended to increase significantly across year-season subclasses for both farms supported by DC (112 ± 17 baht/year-season; $P < 0.0001$) and PO (110 ± 19 baht/year-season; $P = 0.0001$). Also, farms supported by DC had lower MRC than those supported by PO, except for 2009-Summer (406 ± 248 baht, $P < 0.01$; Figure 1d).

Monthly milk yield (MYF and MYC) and revenue (MRF and MRC) of both farms supported by DC and PO varied across year and season subclasses. Monthly milk production (MYF and MYC) and revenue (MRF and MRC) in both farms supported by DC and those farms supported by PO dropped every year during the rainy season (Figure 1). This decrease in milk production and revenue could be due to environmental stress and stage of lactation.

Farm location-farm size-organization subclasses

Monthly milk yield (MYF and MYC) and monthly revenue (MRF and MRC) varied by farms location-farm size-organization ($P < 0.0001$). Small size farms supported by DC and PO had similar MYF in WM ($2,979 \pm 958$ kg vs. $2,662 \pm 240$ kg) and PC ($2,282 \pm 234$ kg vs. $2,202 \pm 343$ kg), except for ML ($2,121 \pm 145$ kg vs. $3,020 \pm 109$ kg; $P = 0.0001$). Similar MYF were found among medium size farms supported by DC and PO in ML ($3,892 \pm 143$ kg vs. $4,124 \pm 110$ kg), WM ($3,265 \pm 958$ kg vs. $4,141 \pm 245$ kg), and PC ($3,935 \pm 246$ kg vs. $5,159 \pm 363$ kg). Large size farms supported by DC had MYF higher than, similar to, and lower than those supported by PO in ML ($7,981 \pm 179$ kg vs. $5,413 \pm 133$ kg; $P < 0.0001$), WM ($5,976 \pm 1,106$ kg vs. $6,118 \pm 281$ kg) and PC ($7,292 \pm 334$ kg vs. $9,879 \pm 549$ kg; $P = 0.0086$), respectively (Figure 2a).

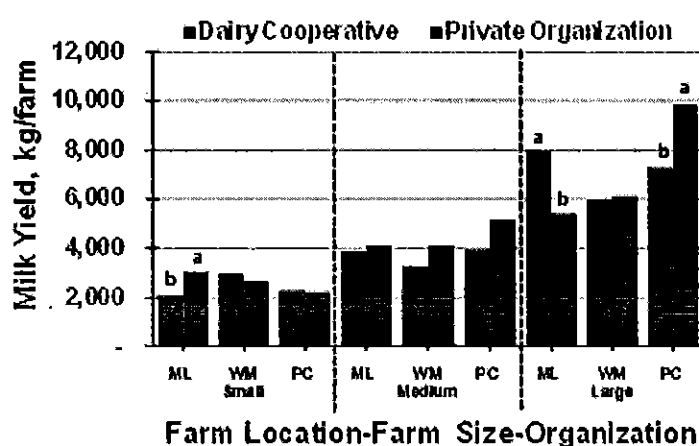


Figure 2a: Least squares means for monthly milk yield per farm by level of farm size-farm location-organization subclasses [ML = Muak Lek; WM = Wang Muang; PC = Pak Chong]

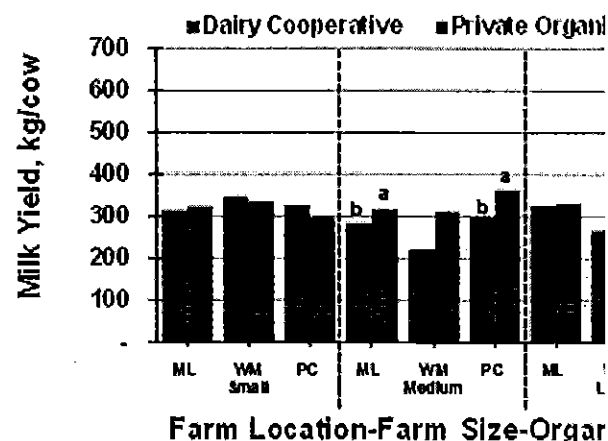


Figure 2b: Least squares means for monthly milk yield per cow by level of farm size-farm location-organization subclasses [ML = Muak Lek; WM = Wang Muang; PC = Pak Chong]

Small size farms supported by DC had similar MYC with those farms supported by PO in ML (313 ± 6 kg vs. 324 ± 4 kg), WM (347 ± 36 kg vs. 335 ± 9 kg), and PC (326 ± 9 kg vs. 332 ± 13 kg). Medium size farms supported by DC had lower MYC than farms supported by PO in ML (284 ± 5 kg vs. 317 ± 4 kg; $P = 0.0003$) and PC (297 ± 9 kg vs. 362 ± 15 kg; $P = 0.0238$), but they were similar in WM (221 ± 36 kg vs. 312 ± 9 kg). As with small size farms, large size farms supported by DC had similar MYC to farms supported by PO in ML (289 ± 7 kg vs. 310 ± 6 kg), WM (268 ± 42 kg vs. 305 ± 11 kg) and PC (280 ± 13 vs. 366 ± 24 kg; Figure 2b).

Similar to MYF, small size farms supported by DC and PO had similar MRF in WM ($39,577 \pm 12,982$ baht vs. $36,321 \pm 3,264$ baht) and PC ($30,765 \pm 3,176$ baht vs. $27,588 \pm 4,667$ baht), except for ML ($28,245 \pm 1,967$ baht vs. $41,657 \pm 1,480$ baht; $P < 0.0001$). Medium size farms supported by DC and PO had similar MRF in ML ($53,764 \pm 1,937$ baht vs. $55,298 \pm 1,494$ baht), WM ($44,867 \pm 12,988$ baht vs. $55,701 \pm 3,325$ baht), and PC ($54,875 \pm 3,328$ baht vs. $69,758 \pm 4,945$ baht). Large size farms supported by DC had MRF higher than, similar to, and lower than those supported by PO in ML ($109,331 \pm 2,424$ baht vs. $73,755 \pm 1,836$ baht; $P < 0.0001$), WM ($84,230 \pm 14,990$ baht vs. $85,762 \pm 3,838$ baht) and PC ($101,837 \pm 4,522$ baht vs. $154,090 \pm 7,543$ baht; $P < 0.0001$), respectively (Figure 2c).

Monthly milk yields per cow of small size farms supported by DC was similar to MYC from small size farms supported by PO in ML ($4,314 \pm 78$ baht vs. $4,390 \pm 60$ baht), WM ($5,086 \pm 516$ baht vs. $4,527 \pm 132$ baht), and PC ($4,484 \pm 127$ baht vs. $4,469 \pm 191$ baht). Medium size farms supported by DC had lower MRC than farms supported by PO in ML ($3,890 \pm 77$ baht vs. $4,259 \pm 61$ baht; $P = 0.0264$) and PC ($4,092 \pm 132$ baht vs. $4,989 \pm 208$ baht; $P = 0.0420$), but they were similar in WM ($2,912 \pm 516$ baht vs. $4,160 \pm 136$ baht). Large size farms supported by DC had similar MRC to those farms supported by PO in ML ($3,935 \pm 96$ baht vs. $4,142 \pm 80$ baht), WM ($3,699 \pm 595$ baht vs. $4,136 \pm 165$ baht) and PC ($3,824 \pm 180$ baht vs. $4,818 \pm 355$ baht; Figure 2d).

The large farm variance ratios obtained here suggest that it is important to consider the individual characteristics of each farm when trying to improve milk production and revenue. Each farm would require different services and support from the dairy organization because of their particular problems and characteristics (Rhone et al 2008a; Yeamkong et al 2010b). Furthermore, individual farmers would likely have different levels of knowledge, learning ability, and levels of receptiveness to advice and suggestions (Suksawat 2004; Rhone et al 2008a; Yeamkong et al 2010a). Thus, farms would need to be classified into groups according to particular areas of support needed within an organization. Information recorded within individual farms would help in this regard. To successfully increase level of dairying ability and commercial opportunities for farmers, multiple levels of training and services should be implemented by dairy organizations and be provided to individual farmers or to group of farmers as needed. In addition, dairy farm performance and profitability should be periodically monitored (Moran 2009), a critical aspect to ensure the sustainability of dairy enterprises. Furthermore, farmers should strive to acquire appropriate decision making skills, share their knowledge and expertise with the dairy community, and become actively involved in dairy social networks.

Thai dairy farmers involved in this study had higher milk yields per cow (8.5 to 11.1 kg/cow/day), had higher number of milking cows per farm (14 cows/farm), and got higher price (12.5 to 18.0 baht/kg) than dairy farmers in India, Pakistan and other countries in Southeast Asia (FAOSTAT 2009; Moran 2009). However, Thai dairy farmers did not produce enough milk to satisfy the demand of consumers in the country (FAOSTAT 2009) as it happened in India and Pakistan. To achieve self-sufficiency dairy farmers in Thailand would need to increase the number of dairy cows, milk yield per cow, or both. Increasing the level of training and support (technical and economic) to farmers from DC and PO may help decrease the time to achieve this goal. In addition, competition among DC and PO would encourage better quality of service and support for their farmers (and perhaps attract new ones), and likely increase dairy production per farm and per cow. Lastly, sharing of experiences and support strategies among organizations would help identify and solve common problems more easily and efficiently. This will speed up improvements in dairy production efficiency, reduce support costs, and improve revenues in Central Thailand and serve as a model for similar strategies at a national level.

Conclusion

- Monthly milk production (MYF and MYC) and revenue (MRF and MRC) varied across year-season-organization and farm location-farm size-organization subclasses. Farms supported by DC had lower monthly milk production and revenue than farms supported by PO across year-seasons subclasses. However, monthly milk production and milk revenue of farms supported by DC were not significantly different from farms supported by PO in many farm location-farm size subclasses. Variation among farms accounted for 47% to 59% of the total variance of monthly milk production and revenue traits, suggesting that dairy organizations should take into account individual farm characteristics when providing service and support to their members. Sharing strategies, experiences, and information, and collaboration among organizations would help increase the efficiency of support, and speed up changes in production efficiency and revenue of dairy farmers in Central Thailand.

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Sent: Saturday, March 03, 2012 5:19 PM

To: Dr. Thanathip Suwanasopee (KU); Dr. Supawadee Yamkong; Elzo, Mauricio Aguirre; maelzo2002@gmail.com

Subject: FW: 111221koon-Revised manuscript (New)- Status?

Dear Dr. Elzo, Dr. Thanathip and Dr. Suphawadee,

Our manuscript submitted to LRRD, *"A comparative study on dairy production and revenue of the dairy farms supported by a dairy cooperative with those supported by a private organization in Central Thailand"*, was accepted and it is being formatted for April issue.

Best regards,

Skorn K.

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Sent: 4 มีนาคม 2555 3:59

To: Dr. Skorn Koonawootrittriron

Subject: Re: FW: 111221koon-Revised manuscript (New)- Status?

Dear Authors

Thanks for reminder.

The paper is being formatted for April issue of LRRD

Regards

TRP

On 3/3/2012 9:06 AM, Dr. Skorn Koonawootrittriron wrote:

Dear the senior editor (Dr. Thomas R Preston),

Relating to the manuscript 111221koon, titled *"A comparative study on dairy production and revenue of the dairy farms supported by a dairy cooperative with those supported by a private organization in Central Thailand"* (S Koonawootrittriron, M A Elzo, S Yeamkong, T Suwanasopee), we will appreciate if you could let us know its status.

Thank you very much.

Best regards,

Skorn Koonawootrittriron

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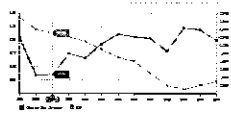
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