Mid - Term Evaluation of Dairy Village Development Project

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Foreword

The former Ministry of Agriculture, Livestock, Lands and Irrigation initiated the Dairy Village Development Project (DVDP) in 2004 to empower the dairy farmers and develop the dairy sector of the country. The project's principal aim was to increase the dairy production and promote marketing of fresh milk and milk based products with the help of farmer organisations which in return, could contribute to the upliftment of the socio-economic standards of the dairy farmers.

Under the on-going DVDP, it is expected to develop one thousand dairy villages by 2010 all over the country. Therefore, the HARTI undertook this evaluation study in response to the request of the Ministry of Livestock Development. This study mainly focused on ascertaining the level of achievement of the objectives of the DVDP by investigating various strategies implemented by the project staff.

The study has revealed that the average fresh milk production of the farmers has increased from 16.01 to 19.9 litres/per day after the project was implemented. The highest production of a farmer was reported from the Puttalam district and the production of this particular farmer has almost doubled; 18.6l before and 31.6 l/litre per day after the implementation of the project. Nevertheless, due to the effectiveness of the project, the milk consumption has increased only marginally at the household level. It has also been found that all the project strategies have not been implemented. Therefore, it is recommended that the Ministry pay attention to the findings of the study.

I take this opportunity to thank the Ministry for entrusting this important task of evaluating the on-going DVDP to the HARTI.

This study will help the policy makers to give a new outlook to the project with necessary impetus to translate the present dairy sector into a developed sector in Sri Lanka.

Prof. Ranjith Premalal De Silva
Director

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Executive Summary

Agriculture plays an important role in the rural economy of Sri Lanka. Livestock is one of the major activities coming under agriculture as an integrated farming system. Dairy farming is the dominant activity coming under livestock. Milk is an essential food for the young as well as the grownups. The total domestic milk production in 2007 was 202 million litres which met merely 15 percent of the country's total milk requirement, thus compelling to import as much as 85 percent of milk and milk based products. The total import bill of milk and milk based products in 2007 was Rs. 19,290 million (Central Bank of Sri Lanka, Annual Report, 2007). This import bill has been increasing sharply over the years and it is a huge burden on the national economy. Therefore, it is very important to develop the dairy production in the country. It will also help curtail the amount of foreign exchange spent on importing milk and milk based products.

In order to develop the dairy sector by empowering the dairy farmers, the Ministry of Agriculture, Livestock, Land and Irrigation initiated the Dairy Village Development Project (DVDP) in 2004. Its aim was to increase dairy production and promote local sales of fresh milk and milk based products with the assistance of farmer organisations and private sector entrepreneurs. The basic concept of DVDP was to develop socio-economic standards of the dairy farmers while empowering them for better decision-making in their enterprise. The objectives of the DVDP are: promoting the production and consumption of quality guaranteed domestically produced milk and milk based products; increasing income generation and self-employment opportunities in the dairy sector; promoting agricultural production systems of milk production and increasing the farm income; promoting the community and teamwork concept among dairy farmers and saving the scarce foreign exchange.

The Ministry of Livestock Development implemented this project in 2004, with the aim of developing one thousand dairy villages by 2010. At the end of 2006, nearly three hundred villages were established. At this juncture, the Ministry of Livestock Development requested the Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) to undertake a mid-term evaluation study on the Dairy Village Development Project.

The research was conducted in ten districts of the country. The multi-stage sampling technique was used to select the study locations. There are 6 dominant farming systems in Sri Lanka. At the first stage, five farming systems were selected. At the second stage, two districts were selected randomly from each farming system. Therefore, altogether, ten districts were selected for the study.

At the third stage, according to availability of dairy villages in the districts during 2004 and 2005, Veterinary Surgeon divisions were selected randomly and thirty VS ranges were studied. At the fourth stage, going by the VS ranges, thirty villages were selected. In the Dairy Village Development Project, twenty dairy farmers have benefited from each village. Therefore, finally for the questionnaire survey, ten (50 percent of the benefited) farmers were selected randomly from selected 30 villages.

In line with the objectives of the study, the methods of data collection consisted of three major components including comprehensive literature review, focus group and

key informant discussions and a questionnaire survey to understand the Dairy Village Development Project.

After implementation of the DVDP in the study area, both cow milk and buffalo milk production has increased. The average total production has increased from 16.01 to 19.9 litre/day. The highest production was observed in the Puttalam district and the increase was from18.6 to 31.6 litre/day. This is basically due to successful input delivery of DVDP and managing high yielding breeds in the district. In all the districts of the study area, milk production has increased. The total improvement of milk production was 24 percent.

Therefore, the DVDP is a very important and valuable programme for the improvement of dairy industry in Sri Lanka. This improves the production performance and family incomes of rural small-scale dairy farmers.

In the Puttalam district, the production has almost doubled due to farmers' enthusiasm and interest in dairy farming after the implementation of the programme. The private AI technicians in the district also played a major role in breed development and milk producing performances by inseminating at correct time. In this district, we observed that the chairman of FMSs paid special attention to all the member farmers of the society and FMSs provided essential knowledge and inputs (e.g.; Meddegama).

For further improvement of this programme, it was essential to conduct follow-up programmes, especially once or twice a month with the relevant VS office. The study information proved that buying a genetically improved high producing animal is a very difficult task for dairy farmers in the study area. At present, if farmers need to buy a healthy and high producing animal, it has to be from the surrounding area with minor improvement in the genetic performance. Therefore, a planned programme must be implemented to overcome this difficulty.

The area specific breeding centres must be implemented. According to the cattle farming systems of Sri Lanka, the high potential districts should be selected where a breeding centre for each district would be established. These breeding centres should be managed by a private entrepreneur under the supervision of the related VS office. As performed in DVDP, these private middle level entrepreneurs also need government assistance to initiate this kind of projects.

Due to the effectiveness of this project, the milk consumption has increased slightly from 1.06 to1.10 litres/day/household. The total number of households that consumes fresh milk has increased from 67.2 to 71.33 percent from the total after implementation of the project. Farmers in different districts in the study area also showed slight improvement in fresh milk consumption. The quantity of milk consumption has greatly increased in the Hambantota district (0.21 to 1.09 litres).

Even though the dairy farmers produce milk, the fresh milk consumption seems to be contrary to project expectations; particularly among younger generation for fear of allergies.

Further, the farmers did not take interest in producing value-added products. However, there are tremendous possibilities for income generating activities on the farm. the farmers in the study area have not given attention to this matter.

Out of eighteen, ten strategies were implemented under the DVDP in the study area. This report suggests strategies with accompanying recommendation(s) at the level of implementation.

The DVDP is thus very important and it must be continued with some adjustments to strengthen our dairy farmers and to improve domestic milk production.

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AI	- Artificial Insemination
DAPH	- Department of Animal Production and Health
DVDP	- Dairy Village Development Project
FMSs	- Farmer Managed Societies
GAHP	- Good Animal Husbandry Practices
GDP	- Gross Domestic Production
LDI	- Livestock Development Instructor
LDO	- Land Development Ordinance
MILCO	- Milk Industries of Lanka Company Limited
NLDB	- National Livestock Development Board
VS	- Veterinary Surgeon

Chapter One

Introduction

1.1 Background

Agriculture plays an important role in the rural economy of Sri Lanka. Although 30 percent of the total labour force is involved in the agriculture sector, its contribution to the national gross domestic production (GDP) was only 11.5 percent in 2007 (Department of Census and Statistics, Colombo, Sri Lanka). Livestock is one of the major components of agriculture with a contribution of 7.3 percent to agricultural GDP (National Accounts 2007), while dairy farming is an important sub-component of the farming. Milk is an essential food item and nature has gifted milk as an excellent food for mankind thousands of years ago. Milk and milk products as food are not only important for the young but also for the adult (Clarence H.E. *et al.*, Milk and Milk Products, 2004, fourth edition). The total domestic milk production in 2007 was 202 million litres and it accounted for 15 percent of the total milk requirement of Sri Lanka. As much as 85 percent of milk and milk based products are imported mainly from countries such as New Zealand and Australia. Total bill of imported milk and milk based products in 2007 was Rs. 19.29 billion, tripling the value, compared to the import bill in 2000 which was Rs. 8.4 billion (Central Bank of Sri Lanka, Annual Report, 2007). The ever increasing bill over the years has become a huge burden on the national economy. One possibility of decreasing the bill significantly is developing the dairy sector with the locally available resources in the country.

Since independence, successive governments have taken different policy decisions for the development of the livestock sector, especially with regard to enhancing milk production. However, a remarkable change in the domestic milk production sector is yet to be made. At present, dairy farming is operating at a subsistence level due to a number of constraints faced by the farmers: supply of inadequate inputs, high cost of feed, lack of support services and poor marketing conditions. The prevailing situation in the dairy sector does not attract new investors and youth involvement is almost diminishing in contrast to the situation a few decades ago.

1.2 Background of the Dairy Industry

The share of the livestock sector to the gross domestic production (GDP) including fisheries industry was 2.4 percent in 2007 and the quantity of milk and milk based products imported stands at 61,668 metric tons (Department of Census and Statistics 2008).

The total cattle and buffalo population in 2007 was 1.2 million and 0.3 million respectively (Department of Census and Statistics, 2008). The total cattle population is around four times higher than the buffalo population in Sri Lanka.

Table 1.1: Cattle and Buffalo Population from 2003 to 2007

	2003	2004	2005	2006	2007
Cattle					
Total cattle	1,138,700	1,160,900	1,185,020	1,214,650	1,222,990
Presently milking	211,800	216,050	222,300	229,230	238,610
Presently not milking	277,400	284,420	288,570	295,840	295,380
Other cows	207,600	211,640	215,620	220,990	220,550
Bulls	178,800	182,290	185,720	189,110	189,650
Calves	263,100	266,500	272,810	279,480	278,800
Buffalo					
Total buffalo	280,500	301,500	307,750	314,080	318,920
Presently Milking	51,600	53,060	54,620	55,930	57,580
Presently not milking	44,800	48,150	49,510	50,400	50,980
Other cows	70,300	75,560	77,070	78,910	79,790
Bulls	56,000	60,200	61,980	63,000	63,760
Calves	57,800	64,530	64,570	65,840	66,810

Source: Department of Census and Statistics

According to the Table 1.1, cattle and buffalo population has increased slightly over the years. It also reveals that in 2007, among the national herd, only 19.5 percent of the cattle population was used for milking and this shows little improvement compared to the 2003 value which was 18.6 percent of the national herd. This means that one-fifth of the total population are productive animals in the national herd of the country. According to present statistics, 18 percent of the total buffalo population contribute to milk production.

Table1.2: National Milk Production from 2003 to 2007 (Million litres)

Type of Milk	2003	2004	2005	2006	2007
Cow milk	132.22	134.88	136.67	139.34	169.7
Buffalo milk	25.26	25.84	26.12	26.73	32.3
Total milk production	**157.48**	**160.72**	**162.79**	**166.07**	**202.0**

Source: Department of Census and Statistics

Table 1.2 indicates that total national milk production has slightly increased from 2003 to 2007. During this period, the total production of cow milk has increased by 28.3 percent compared to 2003 production. This improvement is due to introduction of higher yielding breeds, better feed usage and better management practices. The buffalo milk production has also increased by 27.9 percent. For further development of the dairy sector, it is essential to implement necessary projects and plans in the country.

1.3 Mid-term Evaluation Study

The Ministry of Livestock Development requested the Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI) to conduct a mid–term assessment of the Dairy Village Development Project in order to identify short-term effects and impacts of the project and to find out weaknesses, loopholes and problems of the project that prevent the achievement of the objectives.

The evaluation of the Dairy Village Development Project is essential and timely because the government has already invested a large amount of money in this project and continues to invest more. Findings of the evaluation would help achieve the best results from this important project.

1.4 Objectives of the Study

The objectives of this mid-term impact assessment study are:

1. To investigate the level of achievements of the objectives of the Dairy Village Development Project;
2. To examine the problems, constraints and effectiveness of the strategies implemented to achieve the project objectives;
3. To provide necessary policy guidelines to make the Dairy Village Development Project more successful.

1.5 Study Location

This study was not confined to a particular area of Sri Lanka. According to the system of dairy farming, the study locations which were selected included initially six principal dairy farming systems: up-country; mid-country; coconut triangle, low-country wet zone; dry zone; and Jaffna urban. Due to security reasons prevailing in the Northern province, Jaffna urban system was not covered, though it had been selected for the study. Two districts were selected from each farming system to represent variations and characteristics of each farming system.

The up-country or hill country farming system is located at 1,200 m above sea level and the ambient temperature is between 10 C^0-20 C^0. In the hill country farming system, two kinds of farmers can be identified: estate farmers and village based farmers. Generally, in the hill country, temperate breeds like, *Friesian, Ayershire, Jersey* and their cross breeds show higher performances. For this farming system, the Nuwara Eliya and Badulla districts were selected.

Mid-country is situated at 450-1200 m above sea level and the ambient temperature is between 21 C^0-32 C^0. The home garden production system is popular in this region. The suitable breeds are European breeds and their cross breeds. The Kandy and Kegalle districts were selected for the study under the mid-country farming system.

Low-country wet zone lies between 0 m and 450 m above sea level and the temperature is between 29 C^0-38 C^0. *Jersey, Friesian* and *Sahiwal* cross breeds are the dominant breed types in the area. Most of the dairy farmers are part-time

performers. The Kalutara and Gampaha districts were selected for the study under the low-country wet zone.

The dry zone farming system lies between 0 m and 450 m above sea level and the temperature varies from 21 C^0-35 C^0. The predominant cattle breeds in the system are *Jersey* and *Sahiwal* cross breeds and buffalo. The main farming activity in the dry zone is agriculture (*chena* and paddy cultivation). The Anuradhapura and Hambantota districts were selected to represent the dry zone farming system for the sample.

Coconut triangle spreads between 0 m and 450 m above sea level and the average temperature is between 24 C^0-29 C^0. The main feature in cattle rearing is that, the animals graze under coconut palms. European and Indian cross breeds especially *Sahiwal, Friesian* or *Jersey* can be identified as major breeds in the area. The Kurunegala and Puttalam districts were selected for the study from the coconut triangle.

A multi-stage sampling technique was used to select the study locations. Considering the above climatic changes in the farming systems in the first stage, five farming systems were selected. Secondly, two districts were selected from each farming system randomly. Therefore, altogether, ten districts were selected for the study.

At the third stage, according to existing dairy villages in the district during 2004 and 2005, the Veterinary Surgeon (VS) divisions were selected randomly, and thirty VS ranges were also selected. At the fourth stage, going by the VS ranges, thirty villages were selected. In the Dairy Village Development Project, twenty dairy farmers have benefited. Therefore, finally for the questionnaire survey, ten (50 percent of the benefited) farmers were selected randomly from each of the selected village.

Table 1.3: Distribution of Sample by Locations

Farming System	District	VS Range	Year	Village	No. of Farmers
Hill Country	Nuwara Eliya	Nuwara Eliya	2004	Sirisamangama	10
			2005	Mipilimana	10
	Badulla	Bandarawela	2004	Kirioruwa	10
			2005	Obada Ella	10
		Welimada	2004	Dikkapitiya	10
			2005	Thennakoonwela	10
Mid Country	Kandy	Kundasale	2004	Mahawaththa	10
		Teldeniya		Megasmadiththa	10
		Gampola	2005	Uduwella	10
		Nawalapitiya		Iguruoya	10
	Kegalle	Rambukkana	2004	Meeduma	10
			2005	Baddewela	10
Low Country Wet	Kalutara	Horana	2004	Hadupalpola	10
		Bandaragama	2005	Bandaragama	10
	Gampaha	Dompe	2004	Meddegama	10
		Divulapitiya	2004	Hapuwalana	10
		Aththanagalla	2005	Wakanda	10
				Opathaella	10
Dry Zone	Anuradhapura	Galnawa	2004	Namalgamuwa	10
		Kakirawa	2005	Korangalla	10
	Hambantota	Tissamaharama	2004	Ellagala	10
		Meegasara		Raluwa	10
		Ambalantota	2005	Walawa	10
		Katuwana		Katuwana	10
Coconut Triangle	Kurunegala	Kuliyapitiya	2004	Wakkunuwala	10
		Polpithigama		Makulpotha	10
		Panduwasnuwara	2005	Nikasalpura	10
		Polpithigama		Galtanwela	10
	Puttalam	Marawila	2004	Madagoda	10
		Chilaw	2005	Ariyagama	10
Total					**300**

Source: Survey Data, 2008

1.6 Research Methodology

The following methods were applied to collect and analyse the data and other information.

1.6.1 Data Collection

In line with the objectives of the study, the methods of data collection consist of three major components including comprehensive literature review, focus group and key informant discussions and a questionnaire survey.

1.6.2 Literature Review

Literature review relied on collecting the existing published information of the dairy sector in Sri Lanka and the reports related to evaluation studies in the world through the internet. The records of the Ministry of Livestock and the regional Veterinary Office (in the study area) have given a very clear picture of DVDP. These records also helped to select the farmers for the study.

1.6.3 Discussions with Key Informants

The officers involved in the implementation of DVDP were identified as key informants. The Director of the Provincial Livestock Office, Veterinary Surgeons (VS) and Livestock Development Instructors (LDI) were interviewed using guidelines and semi-structured questionnaires. Informal discussions were also held to gather necessary information about the DVDP.

1.6.4 Questionnaire Survey

As mentioned earlier, three hundred farmers were selected randomly for the questionnaire survey. The questionnaires were pre-tested, revised and finalised with the livestock and project evaluation experts. Structured questionnaires were prepared to collect information in detail on the following aspects:

i. Performance of milk production due to DVDP
ii. Changes in milk consumption
iii. Input distribution under DVDP
iv. Information of dairy farmer societies
v. Production of value-added products
vi. Animal breeding
vii. Integrated farming
viii. Milk marketing

As indicated in the methodology, it was decided to interview 300 farming families using the questionnaire survey, but due to the constraints faced in the field survey, only 293 farming families were interviewed. According to the data, 4.3 percent (twelve farmers) of the total sample population were new dairy farmers. Therefore, when describing the situation before the implementation of DVDP, the sample population will be based on 281 farmers.

1.7 Limitations of the Study

Literature on the subject which is hard to come by, somewhat constricted the study. Most of the farmers do not keep records of their herds and they hesitate to reveal the exact milk production levels and other income related information. Farmers always overestimated their input information and underestimated their income information. This study was done with the farmers under the DVDPs in 2004 and 2005. Generally, the farmers were reluctant to divulge information about dairy farming before implementation of the project.

The Ministry of Livestock Development did not undertake a baseline survey before commencing this project. Therefore, necessary information was lacking to evaluate the performance of the project. To overcome this difficulty, the condition of the dairy farming before the commencement of the project also had to be included in the questionnaire. Gathering information was a difficult task as some of the farmers were unaware of correct information, facts and figures and they did not have any records.

Chapter Two

Dairy Village Development Project (DVDP)

In this chapter, information on established dairy villages, objectives of the DVDP, strategies to achieve the objectives of the project, activities and budgetary allocation for establishing dairy villages will be discussed in detail.

2.1 Dairy Village Development Project

In order to develop the dairy sector by empowering the dairy farmers, the Ministry of Agriculture, Livestock, Lands and Irrigation initiated the Dairy Village Development

Project (DVDP) in 2004 was aimed at increasing the dairy production and promoting the local sales of fresh milk and milk based products with the assistance of farmer organisations and private sector entrepreneurs.

The basic concept of the DVDP was to improve socio-economic standards of the farmer, while empowering them for better decision making in their enterprises by improving the production and productivity (Ministry of Livestock Development).

Table 2.1 shows the number of milk villages in different districts and dairy farming systems in 2004 and 2005. In 2004, fifty-two dairy villages were established, and in 2005 it was increased to 174 villages. Every year, the Ministry of Livestock Development invests a huge amount of money for the development of dairy sector through DVDP.

Even though the Ministry of Livestock Development stated that the implemented total no of milk villages in 2005 was 174, due to lack of secondary data only 159 dairy villages were identified as describe in table no. 2.1.

Table 2.1: Established Milk Villages in Different Districts by Farming System

Farming System	District	Villages	
		2004	2005
Hill Country	N' Eliya	3	6
	Badulla	4	4
Mid Country	Kandy	5	12
	Matale	3	7
	Kegalle	4	9
Wet Zone	Ratnapura	1	8
	Gampaha	2	5
	Kalutara	1	2
	Matara	3	6
	Galle	-	9
	Colombo	-	-
Coconut Triangle	Kurunegala	5	16
	Puttalam	2	7
Dry Zone	Anuradhapura	4	12
	Polonnaruwa	2	3
	Moneragala	4	6
	Ampara	4	13
	Hambantota	3	5
	Trincomalee	2	5
	Batticaloa	-	10
	Vavuniya	-	10
Jaffna Urban	Jaffna	-	4
Total		**52**	**159**

Source: Ministry of Livestock Development

2.2 Objectives of the DVDP

1. Promoting the production and consumption of quality guaranteed domestically produced milk and milk products;
2. Increasing the income generation and self-employment opportunities in the dairy sector;
3. Promoting integrated agricultural production systems of milk production and increasing the farm income;
4. Promoting community and teamwork concepts among dairy farmers;
5. Saving the scarce foreign exchange.

2.3 Strategies

1. Forming or re-organising farmer managed societies (FMSs)/dairy farmer organisations (DFOs) and strengthening their group activities by establishing dairy villages to improve farmer education, group based activities and their bargaining power in the market.

2. Selecting villages by a team of relevant technical officers including the District Veterinary Surgeon and Government Veterinary Surgeons of the Provincial Department of Animal Production and Health (DAPH) and district representatives of the Farmer Empowerment Project.

3. Conducting necessary baseline surveys, gap analytical studies and suitable planning exercises to prepare resource profiles, farm plans and work plans for selecting dairy farmers on an individual basis and establishment of dairy villages on a common basis by a field level technical team comprising district and area Veterinary Surgeons, district representatives of the Farmer Empowerment Project, relevant Livestock Development Instructors and Agricultural Instructors.

4. Providing necessary capital inputs such as building materials for construction/renovation of cattle sheds and biogas units, milk cans, water pumps, small water tanks and other utensils, up toa maximum value of Rs. 25,000 per individual farm at 50 percent cost.

5. Supporting quality improvement by assisting in the practise of good animal husbandry practices (GAHP) and maintaining reasonable occupational health standards.

6. Establishing model demonstration units/systems at FMS/dairy farmer organisation level for promotion of production and value addition of fresh milk and milk products with necessary equipment, machinery and utensils.

7. Establishing milk collection and local sales centres with livestock service units with the assistance of FMSs/dairy farmer organisations and providing lands, buildings, small laboratory facilities for activities such as testing of milk samples, milk boilers, ice cream makers, milk cans containing dispensing taps, chilling tanks, milking machines, grass cutters, grass choppers, small-scale feed mills, water pumps, etc to these centres depending on the requirements.

8. Conducting local feed resources utilisation programmes, supplying grass cuttings and fodder trees at no cost, organising grass cuttings distribution programmes with the National Livestock Development Board (NLDB) and establishing district fodder nurseries.

9. Conducting herd improvement and breed management programmes, supplying breedable dairy cows at 50 percent of the cost preferably by NLDB, and training the FMS/dairy farmer organisation level private artificial insemination (AI) technicians.

10. Conducting group based healthcare programmes, necessary training programmes under the leadership of the Department of Animal Production and Health (DAPH), and producing documentary films to increase awareness among dairy farmers.

11. Implementing a cattle and dairy farmer insurance scheme by Agricultural and Agrarian Insurance Board.

2.4 Activities

1. District co-ordinator of the farmer empowerment project is primarily responsible for establishing dairy villages. However, he/she has to implement this programme in consultation and concurrence with relevant FMSs/dairy farmer organisations, area Veterinary Surgeon and district livestock development committee.

2. All external inputs of this programme should be purchased under the administrative and financial control of either the Director General of the DAPH or relevant Provincial Directors of the Provincial Department of Animal Production and Health and those inputs must be distributed through relevant government Veterinary Surgeons by following normal government rules and regulations.

3. Each farmer participating in this programme at the primary production level should agree to market a minimum amount of ten litres of milk daily on an average within the first year of the implementation of the programme.

4. External capital inputs should be given to individual farmers only to fill the gap to produce ten litres of milk daily on an average within the first year.

5. A minimum of twenty active dairy farmers per dairy village should be members in the programme at any given point of time right from the beginning. A dairy village can be formed within a Grama Niladhari division or by combining a few neighbouring Grama Niladhari divisions (Ministry of Livestock Development).

2.5 Planned Selection Criteria by the Ministry of Livestock Development

Allocation for a Dairy Village in 2007

Financial assistance granted in 2007 for a new dairy village by the Livestock Division of the Ministry of Livestock and Infrastructure Development is as follows:

	Rs.
1. Purchase of capital items for the entire dairy village	4,75,000
2. Farmer training	10,000
3. Administrative expenses including stationery, subsistence, and overtime, fuel, etc.	5,000
Total	**4,90,000**

2.6 Dairy Farmer Organisations and Assessment of their Needs

Villages were selected by a team of relevant technical officers including the District Veterinary Surgeons and Government Veterinary Surgeons of the Provincial Department of Animal Production and Health and district representatives of the Farmer Empowerment Project. Criteria for the selection of a dairy village were:

1. Quantity of milk collection in the village and the nearest milk chilling centre;
2. Availability of milk marketing facility;

3. Participation of members at the FMS and dairy farmer organisation activities;
4. Potential for dairy expansion and technical innovation in the area; and
5. Adherence to accepted accounting procedures and processes.

The respective district livestock development committee comprised of the relevant Provincial Director of the Provincial Department of Animal Production and Health, District Veterinary Surgeon, relevant Government Veterinary Surgeons, Regional Managers of the MILCO (Pvt) Ltd and National Livestock Development Board, representatives from DAPH, Project Director of the Dairy Farmer Empowerment Project, District Co-ordinator of the Farmer Empowerment Project and the president of the district level FMSs/dairy farmer organisations. This committee was set up to approve the selection of dairy villages and farmer managed societies having the potential for dairy expansion.

2.7 Planned Methodology/Criteria for the Selection of Individual Dairy Farmers

The area government Veterinary Surgeon and the District Co-ordinator of the Dairy Farmer Empowerment Project selected individual farmers jointly based on resource availability and willingness of the farmer to adhere to the following criteria:

1. Expansion of his/her milk production to a minimum of ten litres per day within the next 12 months;
2. Agreement to follow instructions of the Dairy Village Development Project;
3. Farmer contribution should be 50 percent of the entire enterprise; and
4. A member of the selected FMS/dairy farmer organisation.

Having set up 52 dairy villages in 2004, the number increased to three hundred in 2006.

Chapter Three

Socio-Economic Background of Dairy Farmers

Socio-economic characteristics such as family composition, educational level, income sources and income level, labour and land usage of selected farmers in the study area are briefly discussed in this chapter. The data collected in the questionnaire survey were utilised for the understanding of the socio-economic characteristics of dairy farmers under DVDP.

3.1 Demographic Characteristics of the Sample

The total population of the sample (293 farming families) was 1,353 with 688 males and 665 females. The male-female ratio of this sample population was 51:49. The family size ranged from 2 - 6 members with an average of 4.6 members in the study area, whereas the national average is 4.1 (Household Level Income and Expenditure Survey, 2006-2007). According to the survey analysis, the male headed families were around 95 percent, whereas the female headed families were around 5 percent in the sample, however in the survey out of 293 families, 232 were male farmers and the rest were female farmers.

Table 3.1: Distribution of Dairy Farmers by Sex

District	Male		Female	
	Number	%	Number	%
Nuwara Eliya	16	80.0	4	20.0
Badulla	29	72.5	11	27.5
Kandy	21	55.3	17	44.7
Kegalle	16	80.0	4	20.0
Gampaha	31	77.5	9	22.5
Kalutara	19	95.0	1	5.0
Kurunegala	32	80.0	8	20.0
Puttalam	17	85.0	3	15.0
Anuradhapura	16	88.9	2	11.1
Hambantota	35	94.6	2	5.4
Total	**232**	**79.2**	**61**	**20.8**

Source: Survey Data, 2008

In the study area in most of the districts, the male-female ratio of diary farmers was 4:1.

The exception was in the Kandy district in Table 3.1, where the male and female dairy farmers were 55.3 and 44.7 percent respectively, the ratio was approximately 1:1. This value is more or less similar to the national male to female population ratio.

3.2 Age Distribution of Farmers

As indicated in Figure 3.1, majority of the dairy farmers are above 40 years of age. Twenty three percent of the sample population in the study area are in between 18-40 age group. The younger generation in the sample only represents 6 percent of the farmers. This indicates the reduced interest of young farmers towards the farming sector. Generally, the present farming community in the study sample represents the older generation of the population.

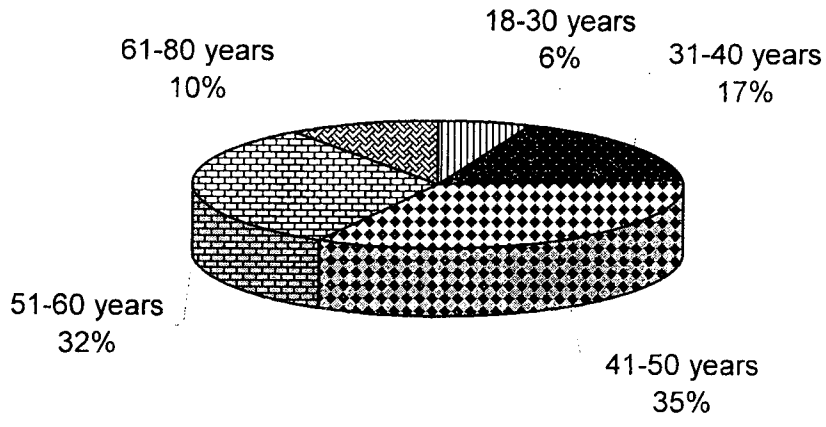


Figure 3.1 Age Distribution of Dairy Farmers

Source: Survey Data, 2008

3.2.1 Distribution of Dairy Farmers by Districts

The details of analysis of age structure are given in Table 3.2. As shown in the table, 76 percent of the dairy farmers in the total sample population are above 40 years. In the districts, on an average, 24 percent of the farmers are below 40 years of age. The main reason was that the new generation is not attracted towards dairy farming due to lack of new technology, difficulties in obtaining feed supplement and less modernization of dairy farming.

Table 3.2: Distribution of Dairy Farmers by Districts

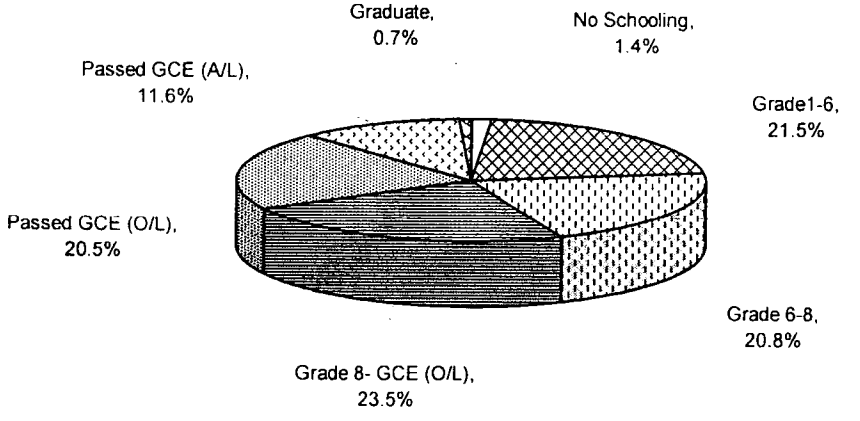
District	Age group (Percentage of Farmers)				
	18-30	31-40	41-50	51-60	61-80
Nuwara-Eliya	5	15	35	35	10
Badulla	2.5	17.5	45	30	5
Kandy	7.9	10.5	44.8	28.9	7.9
Kegalle	5	5	25	40.0	25
Kalutara	10	10	25	25	30
Gampaha	5	7.5	25	45	17.5
Anuradhapura	11.1	22.3	33.3	33.3	0
Hambantota	8.1	24.3	37.8	27.0	2.8
Kurunegala	5	27.5	32.5	30	5.0
Puttalam	5	35.0	30	25	5
Total	**6.1**	**17.4**	**34.5**	**32.1**	**9.9**

Source: Survey Data, 2008

3.3 Educational Level of Farmers

The educational level of farmers is also important to understand the socio-economic situation of the dairy farmers.

Figure 3.2: Educational Level of Dairy Farmers



Source: Survey Data, 2008

As indicated in Figure 3.2, 44 percent of the sample farmers have gained education in between grade 6 and GCE O/L and the farmers who received primary education (up to grade 6) consist of 21.1 percent. Farmers who had never been to school are around 1.4 percent. Around 23 percent of the farmers in the sample population have passed GCE (O/L), while 32.1 percent have passed GCE (A/L) and 0.7 percent are graduates. The study found that educational attainment is positively related to the best adopted practices of the dairy industry.

According to the survey, it was observed that th farmers who received better education (i.e. GCE O/L, A/L, degree) tend to practise intensive management system and continue to get a considerable income. These farmers can be considered successful farmers, compared to other farmers in those villages.

3.4 Family Income and Source of Income

All sources of income from primary and secondary occupations of all the family members were considered for the estimation of family income.

Table 3.3: Gross Income Distribution of Farming Families

Monthly Household Income (Rupees)	Number of Farmers	%
Below 10,000	59	20.1
10,000-20,000	107	36.5
20,000-30,000	80	27.3
30,000-40,000	25	8.5
40,000-50,000	9	3.1
Above 50,000	13	4.5
Total	**293**	**100.0**

Source: Survey Data, 2008

According to Table, 3.3, comparatively a higher proportion of farmers (37 percent) received Rs.10,000 – Rs.20,000 as monthly income. About 20 percent of the sample population received less than Rs. 10,000 per month with only around 4.5 percent of the farming families earning above Rs.50,000 per month. This indicates that economically 20 percent of the sample population is poor. The income distribution patterns of the districts are more or less similar, but in the Hambantota district, 40 percent of the sample population received less than Rs.10,000 per month. Reason for low income in the Hambantota district was lack of resources, opportunities and low milk production.

Table 3.4: Range, Median and Mean of the Income

Indicator	Monthly Income (Rs)
Range	1,500-238,667
Mean	21,494
Median	17,083

Source: Survey Data, 2008

Table 3.4 shows that the monthly income distribution ranges from Rs. 1,500 to Rs. 238,667. This indicates that a wide range of monthly incomes could be observed among the selected farmers under DVDP.

Table 3.5: Annual Contribution of Milk Income to Total Family Income

District	Total Family Income (Rs)	Income from Milk (Rs)	% Contribution
Nuwara-Eliya	212,360	89,600	42.2
Badulla	221,733	80,851	36.5
Kandy	256,472	58,086	22.6
Kegalle	235,680	39,042	16.6
Kalutara	333,016	137,810	41.4
Gampaha	245,850	79,325	32.3
Kurunegala	240,195	89,179	37.1
Puttalam	307,634	123,814	40.2
Anuradhapura	459,686	280,500	61.0
Hambantota	201,964	63,941	31.7
Total	**257,932**	**93,350**	**36.2**

Source: Survey Data, 2008

As indicated in Table 3.5, the average contribution to family income from milk is 36.2 percent. The highest amount of annual income from milk production (61.0 percent) was contributed from the selected dairy villages situated in the Mahaweli schemes of the Anuradhapura district. Most of the farmers belong to the second generation of the Mahaweli project land holders. Due to land fragmentation, land area acts as a limiting factor to the second generation of this area. The income in the agricultural sector is less compared to the other sectors and the farmers in this area have concentrated more on dairy farming. Therefore, the contribution of dairy farming to the total family income is higher than in the other districts.

The lowest contribution to the family income from the dairy sector was observed in the Kegalle district which was 16.6 percent of the total income. In this district, income from perennial crops is higher than the income from milk. Therefore, farmers' attention towards the milk industry is less, compared to the other districts in the study area. The contribution from perennial crops such as banana and other home garden plants was 21.3 and 23.9 percents respectively from the income (see annex – 01) and milk was mainly used for household consumption.

3.5 Ownership of Highlands and Lowlands

At the time of the survey, in order to understand the socio-economic standard of the dairy farmers, the amount of highland including home garden was taken into consideration. The ownership of land can be identified based on the different types of tenure.

Table 3.6: Distribution of Operational Highlands (Including Home Gardens by Tenure)

Types of Tenure	No. of Farmers		Extent (acres)
	Number	%	
Solely owned	266	90.8	358.47
Jointly owned	39	13.3	44.24
Leased in	06	2.0	13.18
Encroached	03	1.0	2.25
LDO	05	1.7	3.75
Total	**293**		**421.89**

Note: Percentages are based on multiple choice response
Source: Survey Data, 2008

From the total sample population, the operational total land area was 421 acres. As indicated in Table 3.6, from the total sample population, 90 percent of the farmers have sole ownership of the lands. The farmers who are sole owners could also have lands under other types of tenure such as joint ownership. Therefore, the cumulative number of operational land owned farmers were higher than the total sample population. According to the sample population, 13.3 percent of the farmers were having joint ownership lands. From the total sample population, most of the farmers solely owned or jointly owned these lands.

Table 3.7: Distribution of Operational Lowlands by Tenure

Types of Tenure	Number of farmers having land		Extent (acres)
	No	percent	
Solely owned	94	72.9	105.38
Jointly owned	13	10.1	18.70
Leased in	05	3.9	3.50
Mortgaged in	01	0.8	0.12
"Ande"	03	2.3	2.00
LDO	21	16.3	35.00
Total	**129**		**164.70**

Note: Percentages are based on multiple choice response
Source: Survey Data, 2008

As indicated in the Table 3.7, the number of farmers having operational lowlands was around 44 percent (129/293x100). Approximately, 73 percent of the farmers who were having operational lowlands owned them. Around 10 percent of the total sample population owned land jointly.

The land ownership pattern gives an indication of land availability of the farmers to rear a suitable number of animals through better management practices.

3.6 Summary of Chapter Three

The male to female dairy farmer ratio is 4:1 in the study area. The majority of the dairy farmers are between 40-60 age groups and this indicates that the involvement of youth in the dairy sector is low. More than 60 percent of the dairy farmers in the sample received education between grade 06 to grade 10. The average monthly income of the sample was Rs.21,494 and the contribution of milk income to total family income was 36 percent.

Chapter Four

Level of Achievement of the Objectives

The main focus of this chapter is to investigate and evaluate the achievement of the objectives of the Dairy Village Development Project and also to discuss further the activities to increase the milk production and consumption, promotion of value-added products, improvement of income generation and self-employment opportunities and how integrated farming systems affected the dairy farming and farm income improvement activities.

4.1 Objective One

"Promotion of production and consumption of domestically produced quality guaranteed milk and milk products"

To achieve this objective under the DVDP, a few strategies and activities were implemented. To increase the milk production, it was planned to improve the knowledge on local feed resources utilisation, optimum utilisation of roughages, and to provide inputs for cultivating own grasslands, and to increase the management practices. The targeted increase of milk consumption was planned to be achieved through training programmes conducted for the dairy farmers.

4.1.1 Average Milk Production/Day/Farmer

Table 4.1 describes the average of the total daily farm milk production which has increased from 16.01 litres before implementation of DVDP to 19.9 litres after the implementation of DVDP. The improvement in the production was 24.3 percent. In the Puttalam and Gampaha districts, the milk production has doubled, compared to the pre-DVDP period. The buffalo milk production has also improved from 8.6 to 11.8 litres /day/farmer, due to DVDP initiatives.

Table 4.1: Average Milk Production/Day/Farmer/Litres

District	Before DVDP			After DVDP		
	Cow	Buffalo	Total	Cow	Buffalo	Total
Nuwara Eliya	17.9	-	17.9	18.6	-	18.6
Badulla	20.2	-	20.2	20.4	-	20.4
Kandy	12.7	-	12.7	13.8	-	13.8
Kegalle	7.2	-	7.2	7.5	-	7.5
Kalutara	15.8	9.4	25.2	14.5	14.4	28.9
Gampaha	8.4	3.0	11.4	12.7	9.0	21.7
Anuradhapura	11.3		11.3	13.6	-	13.6
Hambantota	5.3	7.0	12.3	4.9	7.8	12.7
Kurunegala	8.3	15.0	23.3	14.2	16.0	30.2
Puttalam	18.6	-	18.6	31.6	-	31.6
Total	**125.7**	**34.4**	**160.1**	**151.8**	**47.2**	**199**
Average	**12.6**	**8.6**	**16.01**	**15.18**	**11.8**	**19.9**

Source: Survey Data, 2008

In the Kalutara and Gampaha districts, the buffalo milk production/day/farmer has increased considerably after the implementation of DVDP, because the farmers have improved the management practices after implementation of the project and also due to the high dairy production potential in the area.

The average milk productivity of the total sample before DVDP was 4.28 litres/cow, which has increased up to 6.44 litres/cow after implementation of the project. As shown in Table 4.2, the highest production was observed in the Badulla and Nuwara Eliya districts before and after implementation of the project, because the types of breeds reared in these districts were high yielding animals. The lowest production was observed in the Hambantota district before and after the implementation of the project. This is due to the fact that breed types were mainly local breeds whose milk production was usually low. In the Gampaha district, the milk production has doubled after implementation of the project due to management practices under the DVDP.

Table 4.2: Milk Productivity Achieved by Dairy Farmers

Districts	Milk production per cattle per day (litres)	
	before DVDP	after DVDP
Nuwara Eliya	8.5	9.23
Badulla	8.0	10.05
Kandy	5.16	6.73
Kegalle	3.28	4.80
Kalutara	3.51	5.70
Gampaha	2.89	5.74
Anuradhapura	3.44	5.03
Hambantota	1.57	2.34
Kurunegala	3.37	6.27
Puttalam	4.72	6.99
Total Average	**4.28**	**6.44**

Source: Survey Data, 2008

As indicated in Table 4.3, the total average herd size in the study area was 5.4. This shows that the herd size consists of five or six animals on an average including milking cows and other animals. The study also shows that the highest number of animals in a herd was observed in the Puttalam and Kalutara districts. In the Puttalam district, the average milk production also doubled after the project implementation and the resource availability (grassland) in the area also improved as larger herd sizes were maintained. In the Kalutara district, both cattle and buffalo were included in herds and the farmers' enthusiasm on dairy farming has increased after the project. Therefore, the herd size in the area was larger compared to other districts.

The data also revealed that the herd consisted of two milking cows on an average at the time of the study. A higher number of milking cows in a herd was observed in the districts of Puttalam and Kalutara.

Table 4.3: Average Herd Size in the Study Area

District	Average herd size	Average number of milking cows in the herd
Nuwara Eliya	3.7	1.6
Badulla	3.7	2.0
Kandy	3.9	1.6
Kegalle	3.5	1.4
Kalutara	8.4	3.2
Gampaha	5.6	2.3
Anuradhapura	6.2	2.6
Hmbantota	5.3	2.0
Kurunegala	5.3	2.2
Puttalam	10.7	4.6
Total Average	**5.4**	**2.2**

Source: Survey Data, 2008

The following are the factors that influenced the increase of milk production after the implementation of DVDP were;

1. Farmers tend to rear improved breeds;
2. Farmers started to adopt better management practices of dairy farming after the project implementation;
3. The knowledge received through training programmes was applied to feed their animals using high quality grass and accurate amount of feeds with concentrates; and
4. Special attention was paid to maintain the health of herds and to move towards intensive farming after the project implementation.

Even though the total milk production has increased, the following reasons were observed as constraints to potential higher production:

1. Aged animals in the herd. Most of the dairy farmers in the study area being Buddhists, the culling of animals was minimal and the number of animals in the herd had therefore increased. At the same time, the income from the herd and the individual attention to animals too have declined;
2. Underfeeding occurs mainly due to lack of improved grass as well as limited land area, since the farmers have not cultivated the required grass. Therefore, finding good quality grass is a difficult task in the study areas;
3. High cost of concentrates reduce the amount of concentrate/animal/day;
4. Lack of better breeds of animals; after implementation of DVDP, some farmers were motivated to buy good quality animals using their own money, but finding high producing milking animals was difficult in the study areas;
5. Weak extension services;
6. Labour scarcity, due to lack of involvement of family members in the dairy industry. Limited number of animals in a herd is leading to a reduction in, the number of milking cows.
7. Drop outs from dairy farming. Some old farmers continue dairy farming because the next generation's involvement in the sector is very low.

4.1.2 Production of Milk Based Products

The survey showed that the production of value-added products was less in the study areas. As shown in Table 4.4, the number of farmers who produced value-added products has decreased from 11 percent to 9.2 percent after DVDP. The new dairy farmers did not produce value-added products after the project implementation, while the farmers who produced value-added products before the project also decreased due to lack of proper management of the industry.

Table 4.4: Number of Farmers who Produce Value-Added Products

District	Before DVDP			After DVDP		
	Total number of sample farmers	Number of farmers who produce value- added products	%	Total number of sample farmers	Number of farmers who produce value-added products	%
N'Eliya	19	0	0	20	0	0
Badulla	40	1	2.5	40	0	0
Kandy	37	2	5.4	38	1	2.6
Kegalle	20	1	5	20	1	5
Kalutara	20	3	15	20	4	20
Gampaha	39	4	10.3	40	3	7.5
Kurunegala	35	2	5.7	40	4	10
Puttalam	19	1	5.3	20	2	10
Anuradhapura	18	0	0	18	0	0
Hambantota	34	17	50	37	12	32.4
Total	**281**	**31**	**11**	**293**	**27**	**9.2**

Source: Survey Data, 2008

The main types of value-added products in the study area are milk toffee, curd, ice cream and yoghurt. In the Hambantota district, 50 percent of farmers in the total sample had been producing curd before DVDP, which fell to 32.4 percent in the sample after DVDP. The survey showed that 90 percent of the farmers had used milk produced by their herds milk before and after DVDP and only two farmers in the sample purchased milk from outside and added to their production.

Table 4.5: Types of Value-Added Products in the Study Area

Type of Product	Before DVDP		After DVDP	
	Number of farmers	%	Number of farmers	%
Yoghurt	2	6.5	1	3.7
Curd	27	87.1	25	92.5
Milk toffee	6	19.4	6	22.0
Ice cream	1	3.2	0	0
Total	**31**	-	**27**	-

Note: Percentages are based on multiple choice response
Source: Survey Data, 2008

As Table 4.5 shows, sometimes the farmers produce two types of value-added products. Eighty seven percent and 92.5 percent of farmers produced curd before and

after DVDP respectively. One farmer in the Dikkapitiya village of the Badulla district produced yoghurt before DVDP and at present he has stopped the production because he is unable to continue this value addition activity due to his old age. Unfortunately the new generation is not attracted to value-added products.

In the Hambantota district, all the farmers produced curd under the category of value-added products in the sample population. None of them produces any value-added product before or after DVDP in both the Nuwara Eliya and Anuradhapura districts. The reasons for not making value-added products in the above mentioned districts and producing less value-added products in other districts are as follows

1. Lack of interest in value-added products; and specially reluctance to take the risk of making value-added products;
2. Inappropriate infrastructure facilities, especially unavailability of electricity, water, etc;
3. Lack of accessibility to inputs such as yoghurt cups and pots for curd production.
4. Marketing problems - new producers cannot compete with established and recognised popular products. For example, the consumers tend to buy branded products;
5. Farmers were not financially in a position to buy necessary equipment such as cream separator, fridge, etc which are required to produce value-added products.

It was observed that the farmers who produce value-added products, gain better income than selling raw milk.

4.1.3 Milk Consumption

Table 4.6 shows the number of farming families which consume fresh milk in different districts under the study area. The consumption level before DVDP was 67.3 percent of the total, whereas it has increased slightly, up to 71.3 percent after DVDP. The total average of the amount of milk consumption before implementation of the project was 1.06 litres/day and after the implementation of the project it has increased to 1.10 litres/day. After implementation of DVDP, more than 80 percent of farming families consume fresh milk in the Nuwara Eliya and Badulla districts.

Table 4.6: Fresh Milk Consumption in the Study Area

District	Before DVDP				After DVDP			
	Total sample Farmers	Consum-ption by families	%	Consum-ption/ day (l)	Total sample farmers	Consum-ption by families	%	Consum-ption/ day (l)
N' Eliya	19	14	73.7	1.39	20	16	80	1.34
Badulla	40	32	80.0	1.2	40	32	80	1.2
Kandy	37	26	70.3	1.15	38	28	73.7	1.2
Kegalle	20	08	40.0	1.25	20	10	50	1.1
Gampaha	39	23	58.9	0.99	40	26	65	1.07
Kalutara	20	13	65.0	1.04	20	13	65	1.08
Kurunegala	35	18	51.4	0.2	40	27	67.5	1.09
Puttalam	19	14	73.7	0.86	20	16	80	1.0
H'tota	34	27	79.4	0.93	37	28	75.6	1.08
A'pura	18	14	77.8	0.86	18	13	72.2	0.85
Total	**281**	**189**	**67.3**	**1.06**	**293**	**209**	**71.3**	**1.10**

Source: Survey Data, 2008

The highest fresh milk consumption per day before and after DVDP was reported in the Nuwara Eliya district. The lowest milk consuming farming families were observed in the Kegalle district before and after DVDP and they pointed out that they do not prefer fresh milk because they are used to powdered milk.

Consumption of milk and milk based products is very important to fulfil the nutrient requirements of the farming families. Table 4.7 describes the essential nutrients in milk and milk based products.

The essential nutrients such as energy, protein, fat, carbohydrate and micro-nutrients are naturally found in milk and milk based products. The products like curd, condensed milk and yoghurt contains most of the essential nutrients. Therefore, the consumption of value-added products and fresh milk is very important.

Table 4.7: Nutrient Composition of 100 g of Milk and Milk Based Products

Type of Nutrients	Cow milk	Buffalo milk	Yoghurt	Condensed milk	Butter	Cheese	Curd
Energy (calorie)	6.7	11.7	90	325	729	348	60
Protein (g)	3.2	4.3	3.6	7.9	-	24.1	3.1
Fat (g)	4.1	8.8	-	8.4	81	25.1	4.0
Carbohydrate (g)	4.4	5	0.8	56.3	-	6.3	3
Calcium (mg)	120	210	17.6	300	-	790	140
Prosperous (mg)	90	130	140	240	-	520	93
Iron (mg)	0.2	0.2	130	0.3	-	2.1	0.2
Bettino/ Vitamin A	52.2	48	0.1	40	960	82	30.6
Carotene (mg)	6	-	10	32	-	-	-
Thiamin (mg)	50	40	-	80	-	-	50
Riboflavin (mg)	190	100	30	400	-	-	160
Thiosine (mg)	0.1	0.1	150	0.2	-	-	0.1
Vitamin (mg)	02	01	0.1	2	-	-	1

Source: Nutritional Education – National Educational Institute, 1994

The following factors were identified as constraints to fresh milk consumption:

1. The majority (62.3 percent) of the farmers believe that consuming milk causes ailments associated with phlegm. Therefore, the consumption has been lesser especially among children;
2. Some farmers claim that all the dairy activities such as cleaning of animals and barns are performed by themselves, and the smell emanating there form causes dislike/reluctance towards consumption of fresh milk;
3. The majority of the farmers prefer powdered milk because of its convenience.

4.2 Objective Two

"Increasing income and self-employment opportunities in the dairy sector"

Under the DVDP , the specified activities or strategies were not implemented to increase income generating and self-employment opportunities among dairy farmers. But in this research, special focus was made to identify the income generating and self-employment opportunities in the dairy sector.

1. Production of value-added products
   E.g. yoghurt, ice cream, curd and milk toffee
   As described in Table 3.5, the production of value-added products in the sample is very less,
2. Sales outlets – for fresh milk and other milk products. At present, there is high demand for fresh milk, because price of powdered milk is very high. In urban areas, the potential for fresh milk marketing is very high compared to rural areas because of the population density and the attitude towards fresh milk consumption. In the sample area, none of the farmers maintain a dairy sales outlet.
3. Selling high quality grass
   The areas where milk production is high, the farmers with excess land, used to cultivate high quality grass and sell them to the dairy farmers. Especially in the coconut triangle, this kind of self-employment can be initiated. In the Badulla district, the dairy farmers buy grass for their animals. Among the sample population, the farmers were not disposed to selling grass, but other grass cultivators practised it as a self-employment.
4. Maintaining breeding farm
   The farmers who can afford a medium-scale breeding farm can achieve higher profits. This will be a good solution to the prevailing serious problem of high quality breeds. The study area has no such farms for breeding purposes.
5. Selling of cow dung and organic fertiliser
   Packed dried cow dung can be sold to urban home gardens. Compost can be made by mixing cattle shed refuse with cow dung and other green leaves. Nowadays, tendency towards use of organic fertiliser is rising. Most of the dairy farmers in the sample sell cow dung and they get a small extra income but none of the farmers in the sample practises it as an enterprise.

In DVDP, special attention was not paid to improve self-employment opportunities in the study area and special strategies were not implemented to increase making of value-added products among the farmers.

4.3 Objective Three

"Promotion of integrated agricultural production systems for milk production and farm income increasing purposes"

According to the integrated agricultural production in this project the refuse of dairy industry can be used as inputs of agriculture practices and refuse of agriculture (crop production) can be used as inputs of dairy farming. Refuse of dairy farming – cow dung and compost can be used as fertiliser to crop cultivation, whereas refuse of crop production - crop residues can be used to feed animals.

The training programmes under the DVDP did not focus on the improvement of this sector. Farmers used their traditional knowledge to practise integrated agricultural systems. The survey results showed that most of the farmers were not getting maximum benefit from integrated farming.

Table 4.8: Number of Farmers Using Cow dung

District	Before DVDP		After DVDP	
	Number	%	Number	%
Nuwara Eliya	19	100.0	20	100.0
Badulla	31	77.5	34	85.0
Kandy	33	89.2	34	89.5
Kegalle	16	80.0	16	80.0
Gampaha	28	71.8	36	90.0
Kalutara	12	60.0	14	70.0
Kurunegala	28	80.0	39	97.5
Puttalam	18	94.7	19	95.0
Anuradhapura	10	55.6	16	88.9
Hambantota	26	76.5	31	83.8
Total	**221**	**78.6**	**259**	**88.4**

Note: Total sample population before implementation of DVDP was 281 and after implementation was 293

Source: Survey Data, 2008

Out of the total sample population, 78.6 percent of the farmers used cow dung for their cultivations before DVDP, whereas it has increased to 88.4 percent after DVDP. The increase in the use of cow dung was 17.2 percent in the post-DVDP. Table 4.8 also describes that in the Nuwara Eliya district, the trend is 100 percent more after DVDP. This is basically due to the application of organic fertiliser in the hill country farming.

Table 4.9: Sales of Cow dung in the Study Area (Income/Year)

District	Before DVDP			After DVDP		
	Number of farmers who sold cow dung	Percentage of farmers who sold cow dung	Average income/ year (Rs)	Number of farmers who sold cow dung	Percentage of farmers who sold cow dung	Average income (Rs)
Nuwara Eliya	5	26.3	10,800	8	40.0	16,250
Badulla	11	27.5	2,455	14	35.0	3,015
Kandy	5	13.5	3,680	8	21.1	6,313
Kegalle	3	15.0	956	5	25.0	1,108
Kalutara	8	40.0	3,125	8	40.0	6,400
Gampaha	10	26.6	1,340	10	25.0	4,497
Kurunegala	4	11.4	1,050	6	15.0	2,417
Puttalam	4	21.1	2,000	8	40.0	5,344
Anuradhapura	4	22.2	1,625	8	44.4	2,163
Hambantota	2	5.9	1,000	1	2.7	900
Total	**56**	**19.9**	**1,895**	**76**	**25.9**	**3,594**

Note: Total sample population before implementation of DVDP was 281 and after implementation was 293

Source: Survey Data, 2008

As indicated in Table 4.9, the average annual income from cow dung before and after DVDP was Rs.1,895, and Rs.3,594 per year respectively. Out of the ten districts, the demand for cow dung is high in Nuwara Eliya district, therefore income is also comparatively higher than the other districts. Before the project, in the Nuwara Eliya district around 20 percent of the sample population used to sell cow dung, and after the project, the percentage increased up to 25 percent. Farmers in all the other districts of the study area, except the Nuwara Eliya district, received income less than Rs.1,000 per month by selling cow dung because due to low demand. In the Gampaha district, the number of farmers selling cow dung was the same before and after the project, but after the project implementation they got a slightly higher income due to increase in the price of cow dung.

Due to the use of cow dung, the cost for inorganic fertiliser has beenreduced as shown in Table 4.10. The total average amount of inorganic fertiliser reduction before DVDP was 111 kg/season but after the project, this reduction widened slightly up to 141 kg/season. Even though 88 percent of the farmers used cow dung for cultivation, the cost for inorganic fertiliser has not been reduced.

Table 4.10: Amount of Inorganic Fertiliser Reduction due to Use of Cow dung

District	Before DVDP			After DVDP		
	Number of farmers utilising cow dung	Number of reported farmers after reduction of the cost of inorganic fertiliser	Average quantity of IF reduced / season	Number of farmers utilising cow dung	Number of reported farmers after reduction of the cost of inorganic fertiliser	Average quantity of IF reduced/ season
Nuwara Eliya	19	16	82	20	17	79
Badulla	31	17	73	34	19	86
Kandy	33	8	64	34	9	74
Kegalle	16	2	263	16	4	388
Kalutara	12	4	85	14	5	88
Gampaha	28	14	229	36	23	68
Kurunegala	28	14	74	39	25	227
Puttalam	18	8	119	19	10	366
Anuradhapura	10	6	57	16	10	84
Hambantota	26	14	133	31	17	132
Total	**221**	**103**	**111**	**259**	**139**	**141**

Source: Survey Data, 2008

4.3.1 Feeding of Crop Residues

According to the survey results, after the project implementation, 176 of the total number of farmers began to feed animals using crop residues, and due to this new development, 77 of them have reduced their cost for concentrated feed.

During the project implementation, the farmers did not concentrate on reducing the cost of feed, though they were given the necessary knowledge for feeding crop residues.

4.3.2 Integrated Farming System

In integrated farming system, the farm income can be increased by conducting different activities. The survey also found that by using biogas units, the farmers could reduce the cost of living, as they could be used for domestic cooking. After the project implementation, the farmers of the Baddewela village in the Kegalle district constructed biogas units with their own funds. Before implementation of DVDP, there were four biogas units in the study area and after implementation of the project, the number increased to nine.

1. Reduction of the cost of inorganic fertiliser. The amount of fertiliser needed for cultivation can be reduced by substituting cow dung and other farm yard manure.

2. Direct selling of cow dung has increased by 35.7 percent after the implementation of DVDP. For example in the Nuwara Eliya district, the dairy farmers earned extra income of Rs. 16,250 on an average per year.
3. Application of organic fertiliser leads to increasing production as well as the quality of the product. The demand for organic agriculture products is very high in the market. Therefore, the farmers can earn high profits.
4. Reducing the animal feed cost. The crop residues can be used as animal feed. Therefore, it leads to reduction of the cost of animal feed.
5. Draught power. The male animals or unproductive animals can be used for agricultural purposes, for example field preparation, threshing, etc. Farmers can use animals for different farming activities for which machinery cannot be used.

4.4 Objective Four

"Promotion of community teamwork concepts among dairy farmers"

To achieve the above objective, the implementers had used different strategies such as conducting training programmes and formation of farmer managed societies with the help of different milk collecting agents. In the training programmes performed under DVDP, the importance of the community activities was emphasised. Before the commencement of the project, 4.6 percent of the total sample population was engaged in community activities, whereas after the implementation of the project, it has increased to 15.7 percent.

The community activities undertaken by farmers are:

1. Participation in cleaning of channels for paddy cultivation;
2. Participation in village *shramadana*;
3. Participation in village festivals.

As indicated in the objectives of the community teamwork, the farmers had to involve themselves in activities which improve the dairy sector in the village. The following activities were identified:

1. The community gathering and discussing the problems and constraints in the village regarding the dairy sector, thereby exchanging ideas to solve them within the village. This was seen as a means to help overcome the problems of poor extension services.
2. In order to increase the bargaining power in the market for marketing of milk, the farmers have to work as a community. The data show that most of the farmers sell their milk individually.
3. If farmers act as a community, the supplying of inputs becomes an easy task.
   E.g. Buying concentrated feed
   When buying a large amount of concentrated feed, a price reduction can be expected, as the cost of transport also reduces according. Community action can also lead to establishment of common grasslands in the village. The community can identify bare lands and cultivate good quality grass with the help of all dairy farmers in the village and also maintain the lands. The

common grass- land was observed at the Kalutara district and it reduces the problem of supplying good quality grass to the animals.

4. Organise training programmes once a month.
   All the farmers in the community have to participate in these training programmes, as they will be able to solve problems with the help of LDI or VS. This community activity helps to get better and easy services from the above officers.
5. If farmers collectively discuss and work as a team, then the farm income of a household will increase.
   For example, one farmer can collect all the cow dung which can be sold in the village as a self-employment venture or prepare organic fertiliser as an enterprise.

4.5 Summary of the Chapter Four

The milk production increased from 16.01 to 19.9 litres after DVDP. The improvement of the milk production was 24.3 percent. The average milk productivity increased from 4.28 to 6.44 litres per cow after the project. The production of value-added products did not increase after the DVDP. The fresh milk consumption too did not increase remarkably despite the project. The second objective of the project namely increasing the income and self-employment opportunities has not been attained after the project. But, due to the improvement of milk production, the dairy farm income has increased slightly. Due to the project activities, the integrated agricultural activities have increased. The community teamwork concept which was expected from the project was to increase the co-operate decision making ability to improve the profit of the individual farmer, but that kind of community teamwork development has not been observed in the study area.

Chapter Five

Strategies Implemented by DVDP

In this chapter, the problems, constraints and effectiveness of strategies implemented under the Dairy Village Development Project (DVDP) are discussed broadly along with the prevailing situation. The findings are based on two periods: before and after the implementation of the project.

5.1 Strategy One

"Formation or re-organisation of farmer managed societies (FMSs)/dairy farmer organisations and strengthen group activities by establishing dairy villages; to improve farmer education, group based activities and bargaining power in the market"

Formation of farmer managed societies (FMSs)was done, under this project with the assistance of milk collectors, The prominent milk collectors in the study area are MILCO, Nestle, Araliyakale, CTMU, Kotmale, etc. According to above strategy, it was expected to set up FMSs and re-organise the existing FMSs. Re-organising means making inactive FMSs active by encouraging existing leaders or appointing new leaders to them. Performance of this task in the study area is presented in Table 5.1. It shows that there were six newly set up FMSs in the study area and eight re-organised FMSs. It was also found that fifteen FMSs were not re-organised due to lack of concentration on the above strategy under the project. In the Badulla district, FMS in the Obada-Ella village was not formed.

5.1.1 Availability of Dairy Farmer Managed Societies

After the implementation of DVDP, newly established FMSs in the study area joined with MILCO collecting agents. These FMSs are situated in Hadupalpola and Arukgoda in the Kalutara district, Wakkunuwala and Madahapola in the Kurunagala district, Meepilimana in the Nuwara Eliya district and Kundasale in the Kandy district. Out of eight re-organised FMSs, seven societies were re-organised with MILCO (Pvt) Limited and one society was re-organised with Cargills collecting agent in the Delwagura village of the Gampaha district. Societies were not re-organised in fifteen dairy villages in the study area after implementation of the project.

Table 5.1: Availability of Dairy Farmer Managed Societies

Type of FMSs	Number
New FMSs	6
Re-organised	8
Not re-organised	15
No. of milk societies	1
Total	**30**

Source: Survey Data, 2008

5.1.2 Activities Taken to Establish or Re-organise FMSs

According to the discussion with the LDI and the agent from the MILCO, the following activities were performed:

1. Identification of the dairy farmers in the village or surrounding area by the milk collecting agents (These agents were basically looking at the amount of milk that can be collected from the village).
2. Discussion with Veterinary Officers, to establish the FMSs and appoint suitable farmers to positions such as Secretary, President, Treasurer and other positions to run the society.

These activities were performed by the officers working under the milk collecting agent.

The success of FMSs was examined by comparing with the membership before and after DVDP. Results are shown in Table 5.1. Out of the total sample of 293 dairy farmers, 281 farmers (81 percent) had been rearing animals before the commencement of the project. This indicates that twelve farmers (4 percent) are newly initiated dairy farmers. Out of 281 farmers, 141 farmers or 50 percent of the total were members of the FMSs before DVDP. The study reveals that a substantial increase in the membership after the project: 152 out of 293 farmers obtained membership after the project which was 86 percent of the total farmers with a 36 percent increase of membership compared to the pre-project period.

Table 5.2: Comparison of Membership of FMSs

District	Before DVDP					After DVDP				
	Total No. of farmers	No. of farmers in DFMS inside the village		No. of farmers in DFMS outside the village		Total No of farmers	No. of farmers in DFMS inside the village		No. of farmers in DFMS outside the village	
		No.	%	No.	%		No.	%	No.	%
N'Eliya	19	08	42.1	05	26.3	20	15	75.0	05	25.0
Badulla	40	13	32.5	03	7.5	40	26	65.0	03	7.5
Kandy	37	20	54.0	04	10.8	38	26	68.4	08	21.1
Kegalle	20	06	30.0	08	40.0	20	08	40.0	10	50.0
Kalutara	20	03	15.0	01	5.0	20	13	65.0	05	25.0
Gampaha	39	16	41.0	04	10.2	40	21	52.5	08	20.0
Kurunegala	35	07	20.0	06	17.1	40	22	55.0	13	32.5
Puttalam	19	12	63.2	02	10.5	20	18	90.0	0.2	10.0
Hambantota	34	04	11.8	03	8.8	37	24	64.8	07	18.9
Anuradhapura	18	12	66.7	03	16.6	18	14	77.8	04	22.2
Total	**281**	**101**	**35.9**	**39**	**13.9**	**293**	**187**	**63.8**	**65**	**22.1**

Source: Survey Data, 2008

An attempt was made to analyse the membership within and outside of the village. As indicated in Table 5.2, after DVDP, 112 farmers obtained membership of a society.

In districts such as Kalutara and Hambantota, before the implementation of the project, only 20 percent of the total number of dairy farmers obtained membership of FMSs, whereas after implementation, it has increased up to 80-90 percent of the total dairy farmers. These FMSs were established according to the milk collecting agent in the area. Dairy farmers obtained membership in different societies with different collecting agents after considering the price they paid for milk.

Table 5.3: Number of Farmers per Milk Collecting Agent in FMSs

Milk Collecting Agent	Before DVDP		After DVDP	
	Number of farmers	%	Number of farmers	%
MILCO	95	61.3	179	69.9
CTMU	5	3.2	4	1.6
Nestle	19	12.3	15	5.9
Co-operative Society	16	10.3	14	5.5
Cargills	0	0	10	3.9
Araliyakale	3	1.9	0	0
Rich Life	0	0	1	.4
Don't know	8	5.2	8	3.0
No Agent	09	5.8	25	9.8
Total	**155**	**100.0**	**256**	**100.0**

Source: Survey Data, 2008

Table 5.3 indicates the number of farmers who obtained membership in the sample with different collecting agents. Further, FMS's can be identified with the milk collecting agent. Before DVDP, the MILCO, Nestle and co-operative societies played a major role in establishing FMSs and collecting milk. Before DVDP, the membership of the MILCO with FMS's was around 61.3 percent of the total society members, whereas after DVDP, it has increased up to 69.9 percent. Nestle and CTMU milk collecting agents have dominated in the Kurunegala district. After the implementation of DVDP, the institutions like Cargills and Rich Life performed as milk collecting agents in those societies. Most of the FMS's in the study area were established with the MILCO (Pvt) Limited; because the farmers had their trust in the MILCO (Pvt) Limited as it was a government institute.

Under DVDP, the FMS's were established to increase knowledge on dairy farming and to increase group based activities of the farmers, especially for creation of bargaining power in the market. But, as observed in the field, the expected benefits from the FMS's were not brought to the farmers. Because of this factor, their enthusiasm for serving on societies declined even though they were members.

It was observed that in some dairy villages where milk production was high especially in the districts of Kurunegala, Puttalam and Nuwara Eliya, there were two to three milk collecting centres. Due to competition among the collecting agents, they offered different milk prices. Therefore, by considering the milk price, the farmers could sell their milk according to their choice. It was very difficult to bring all the farmers to one FMS for purposes of creating bargaining power as expected by the project.

Table 5.4: Marketing Facilities Provided by FMSs

Type of Milk Society	Before DVDP				After DVDP			
	Membership		Having marketing facilities		Membership		Having marketing facilities	
	No.	%	No.	%	No.	%	No.	%
Milk Society within the village	101	72.1	93	N=101 92.1	187	74.2	170	N=187 90.9
Milk Society outside of the village	39	27.9	36	N=39 92.3	65	25.8	62	N=65 95.3
Total	**140**	**100**	**129**	N=140 **92.1**	**252**	**100**	**232**	N=252 **92.1**

Note: *Number of dairy farmers before and after implementation of DVDP: Before 281, after 293 within and outside the village means the location of the FMS*
Source: Survey Data, 2008

As indicated in Table 5.4, before DVDP, the dairy farmer societies provided marketing facilities for around 46 percent of the total sample population and after DVDP, this has increased up to 79 percent. Before the implementation of DVDP, 92 percent of the members of FMS's received facilities to sell their milk, and after DVDP, there had been no change of this number.

Table 5.5: Other Services Provided by FMSs

Services provided	Before DVDP Number of farmers benefited from FMSs		After DVDP Number of farmers benefited from FMSs	
	Number of responses	% N=74	Number of responses	% N=186
Providing cattle, medicine under subsidy scheme	16	21.6	59	31.7
Facilitating grass cultivation	2	2.7	3	1.61
Distributing goods and services provided by VS office	10	13.5	36	19.3
Organising training classes and field visits	16	21.6	40	21.5
Financial assistance for family functions	32	43.2	64	34.4
Providing cattle feed under subsidy	8	10.8	45	24.1
Financial assistance for education (for the children of the farming family)	01	1.3	10	5.4
Providing loans	16	21.6	29	15.6
Total number of farmers benefited	**74**	-	**186**	-

Note: Percentages are based on multiple choice response
Source: Survey Data, 2008-Multi Response

Table 5.5 describes the different services, other than marketing facilities provided by FMS's. Most of the FMS's provide financial assistance to farmers for their family functions e.g. wedding, funeral, etc. apart from subsidised animal feed and medicinal supplements as an additional service.. These services were increased after the project from 1.3 percent to 5.4 percent. According to information, the listed benefits in Table 4.5 have increased. Before DVDP, only 26 percent of the sample population used these services of the societies and after implementation of the project, 63 percent of the farmers received these services from the societies.

5.1.3 Community and Group Based Activities Taken by FMS's

According to the sample population, FMS's had undertaken community and group based activities in eleven villages (out of thirty), before DVDP. However, after DVDP, these activities were conducted in twenty-three villages. In the remaining seven villages (Gampaha-Meddegama, Kandy-Uduwella, Inguru Oya Badulla-Obadaella, Kirioruwa, Hambantota – Walasmulla, Raluwa) the group based activities were not performed. Farmers in the dairy villages did not undertake these group based activities because they did not have functional FMS's and farmers' attention to those factors was minimum in these areas.

Most of the FMS's conducted *shramadana* programmes as group based activities before and after DVDP (76 percent, 89 p ercent respectively). The questionnaire

survey indicated that 60 per cent of the dairy farmers participated in community activities after DVDP.

Table 5.6: Farmer Perception about FMS

Type of Evaluation	Before DVDP		After DVDP	
	Number of farmers	%	Number of farmers	%
Very good	19	13.6	40	15.9
Good	81	57.9	139	55.1
Satisfactory	31	22.1	43	17.1
Bad	9	6.4	22	8.7
Very bad	0	0	08	3.2
Total	**140**	**100**	**252**	**100**

Source: Survey Data, 2008

Table 5.6 indicates the farmers' perception about existing FMS's, before and after DVDP. Most of the FMS members expressed that these societies performed well before as well as after DVDP. Around 15.9 percent of the total sample population stated that the FMS's worked well in the post-DVDP period. The field observation also revealed that from the inception of the project, FMS's started to function well. By that time, the farmers' interest in these societies was waning due to different reasons; lack of sufficient time to participate at meetings with their day-to-day activities and lack of enthusiasm due to fewer benefits from FMS's.

5.2 Strategy Two

"Selection of villages by a team of relevant technical officers including the District Veterinary Surgeon and Government Veterinary Surgeons of the Provincial Department of Animal Production and Health and district representatives of the farmer empowerment project"

The villages were selected by the Provincial Directors with the help of technical officers of the Ministry of Livestock Development. In selecting the villages, the following factors were considered.

1. Availability of at least 20 dairy farmers in the village
2. Experience in dairy farming
3. Potentials for dairy farming, eg: breeds, water, grasses etc.

Considering the above factors, most of the villages were selected for DVDP by relevant officers, but villages such as Maddagama and Wakkunuwela were selected amidst interference of the politicians in 2004. However, the selected villages showed greater potential to develop as dairy villages. The discussions with relevant officials revealed that generally suitable villages were selected to develop the dairy industry though there were some irregularities in the selection criteria on a very few occasions.

5.3 Strategy Three

Conducting the necessary baseline surveys, gap analytical studies and suitable planning exercises to prepare resources profiles, farm plans and work plans for selecting dairy farmers on individual basis and dairy villages on collective basis by a field level technical team comprising district and area veterinary surgeons, district representatives of the farmer empowerment project, relevant livestock development instructors and agricultural instructors etc.

5.3.1 Farmer Selection

For farmer selection, the following activities were planned to be implemented under DVDP

1. Necessary baseline surveys;
2. Gap analysis studies;
3. Suitable planning exercises to prepare resource profiles;
4. Farm plan/work plan - individual basis and village basis;
5. Resource availability and willingness of the farmer for expansion of milk production to a minimum of ten litres (if a farmer is producing less than ten litres/day within a year);
6. Agreement to follow instructions given by DVDP;
7. Ability to contribute 50 percent of the entire enterprise;
8. Member of FMS/dairy farmer organisation.

Conducting baseline surveys: These are essential before implementation of DVDP to identify the farmer's potential for increasing milk production. This also helps to measure the improvement of milk production and social and economic gains among farming families. According to the information received, most of the Veterinary Surgeons have data on individual milk production. The detailed baseline surveys were not conducted before the implementation of DVDP.

Gap analysis: Gap analysis was performed to identify the gaps and in achieving the required amount of milk production. These gap analysis were also done by the Livestock Development Instructors (LDIs) in the relevant areas. DVDP was initiated in 2004 as a cattle shed distributing programme. Therefore, the highest priority was given to construct cattle sheds. Even from the gap analysis, the cattle sheds and the scarcity of high yielding animals were identified as limiting factors. This gap analysis was not performed in detail, but merely for distributing the inputs.

Planning exercises to prepare resource profile: According to discussions with Veterinary Surgeons (VSs) and LDIs, the resource profiles for the area were available with them, for example, resources of feed, animals, water, grasslands, etc. But, using these resource profiles, intensified programmes were not implemented to improve the individual milk production performance.

Farm plans and work plans: Individual and village basis farm plans and work plans were prepared by LDIs in relevant villages. But, these plans were not carried out under this project. Generally, the inputs were distributed merely for building cattle sheds and for conducting training programme to farmers.

5.3.2 Criteria Used for Farmer Selection

The criteria adopted to select farmers for DVDP is described in Table 5.7 According to the sample survey, 33.4 percent of farmers was selected for DVDP by considering their high milk production capacity, while 63.1 percent was selected considering their systematic dairy farming. The latter refers to the dairy farming which uses the high yielding animals and practises better management (i.e. providing better feed, practising artificial insemination for breeding, etc.). A number of farmers were selected to the project due to close relationships they had with the VS office (9.6 percent). Some farmers expressed that in addition to above factors, the political support also influenced the selection of beneficiaries. Some farmers were unaware as to why they were not selected to DVDP.

Table 5.7: Criteria Used in Farmer Selection

Criteria	Districts Number of farmers																				Total	%
	N'Eliya		Badulla		Kandy		Kegalle		Kalutara		Gampaha		K' gala		Puttalam		A'pura		H'tota			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
1.Having high production	3	15	9	22.5	12	31.5	2	10	11	55	32	80	16	40	7	35	5	27.7	1	2.7	98	33.4
2.Systematic dairy farming	16	80	32	80	22	57.8	19	95	10	50	8	20	23	57.5	15	75	14	77.7	26	70.2	185	63.1
3.Close relationship with VS office	1	5	2	5	3	7.5	1	5	3	15	5	12.5	8	20	1	5	1	5.5	8	21.6	33	11.3
4.Having a close connection with ruling party	0	0	0	0	0	0	0	0	3	15	2	5	1	2.5	0	0	0	0	1	2.7	7	2.3
5.Farmers selected to DVDP without bias	0	0	2	5	5	13.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	2.3
6.Responsible member in DFMS	0	0	1	2.5	0	0	0	0	0	0	0	0	0	0	1	5	3	16.7	1	2.7	0	0
7.Unaware	1	5	2	5	2.5	5.2	0	0	0	0	0	0	0	0	0	0	0	0	1	2.7	6	2.0
Total	**20**		**40**		**38**		**20**		**20**		**40**		**40**		**20**		**18**		**37**		**293**	

Source: Survey Data, 2008

5.3.3 Farmers' Satisfaction on Selection Criteria

The field survey has indicated that 87.7 percent of the sample population from the total was suitable for DVDP. The remaining 12.3 percent of the farmers expressed that they were unsatisfied regarding the selection of unqualified farmers (i.e.; those who do not perform well in dairy farming and do not concentrate on the improvement of the industry).

5.3.4 Problems and Constraints on Implementing the Third Strategy

Selecting twenty farmers from a village became a problem in some places of the study area. Therefore, the farmers were selected from two or three adjacent villages. But, at the initial stage of the project, the farmers showed greater interest about the project in order to receive the inputs from the programme. However after some time, most of the farmers gradually showed less in interest in dairy farming because benefits from the project were not sufficient

The survey data revealed that 12.3 p ercent of the farmers in the total sample population were not in agreement with the selection of farmers. The focus group discussions and the individual farmer interviews helped to sort out t he factors relating to the farmers' disagreement with the selection criteria. Some farmers did not like to disclose the reasons for disagreement over the selection, as they thought that such disclosures would turn to their disadvantage. Farmers' disagreement was principally due to following reasons:

1. Some farmers had provided wrong information with a view to get benefits to construct cattle sheds.
2. At inspections it was found that some farmers produced their neighbours' animals as their own.
3. Some officers were biased towards selecting farmers due to their close relationship to farmers.
4. Politicians were given priority in the selection of candidates in some villages, e.g.; Wakkunuwala.
5. Decrease the of thirty dairy farmers for DVDP over the stipulated 20 farmers.

5.3 Strategy Four

"Providing necessary capital inputs such as building materials for construction and renovation of cattle sheds and biogas units, milk cans, water pumps, small water tanks, other utensils, etc, up to the maximum value of Rs. 25,000 for a farm which is 50 percent of the cost"

5.4.1 Distribution of Necessary Inputs

The material needed to construct cattle sheds were the main inputs distributed in kind under DVDP. As much as 96.3 percent of the farmers received inputs for construction of cattle sheds. According to observations and discussions with the farmers, it was understood that some farmers' requirements were animals, biogas units or other inputs to increase their milk production and farm income, instead of cattle sheds.

According to the sample population, 10.5 percent of the farmers did not use cattle sheds for rearing animals, instead they used these sheds for storing up firewood and other household things. In the Gampaha district, the research team observed that a family was using the cattle shed as its residence and another family was using a part of the shed for cattle and the other part for their use.

According to the objectives of the project, these inputs were distributed with the aim of increasing milk production. In DVDP, the distributed inputs were not of the same quantity and value in all the study areas. According to districts, some variations can be observed in the pattern of the delivery of inputs. In two districts, the cattle were distributed, but the distribution did not take place equally: eight cows in the Hambantota district and one cow in the Gampaha district. On the other hand, in the Hambantota district, the farmers received only biogas units. Unlike the farmers in other districts, they got a chance to receive three kinds of inputs under the project; e.g.; cattle sheds, milking animals and biogas units.

Meanwhile, in the Badulla district, the farmers received three kinds of inputs which were somewhat different from the Hambantota district, e.g.; milking animals, boots, and shovels.

Table 5.8: Benefits to Dairy Farmers under DVDP

District	Name of dairy village	Total number of farmers	Type of benefits obtained by dairy farmers under DVDP						
			Cow shades	Milking cans	Biogas	Animals	Boots	Shovels	Storage for paddy straw
Gampaha	Opathaella	10	10						
Gampaha	Wekanda	10	10						
Gampaha	Hapuwalana	10	10			1	4	2	
Gampaha	Meddegama	10	10	6			7	6	
Kalutara	Handupelpola	10	10	6			5	6	
Kalutara	Arukgoda	10	8	1		2			
Kurunegala	Wakkunwala	10	10				1	7	
Kurunegala	Makulpotha	10	10				1	5	
Kurunegala	Galtenwewa	10	10	1					
Kurunegala	Nikasalpura	10	10						
Kandy	Uduwella	10	10			2			
Kandy	Inguruoya	8	8						
Kandy	Mahawaththa	10	10						
Kandy	Megasmediththa	10	10			2			
Puttalam	Medagoda	10	10					7	
Puttalam	Ariyagama	10	10						
Kegalle	Baddewela	10	10	8				8	
Kegalle	Meeduma	10	10	6			7	7	
Anuradhapura	Namalgamuwa	9	9					8	
Anuradhapura	Korosgolla	9	9						1
Badulla	Obadaella	10	10	1					
Badulla	Kirioruwa	10	10	6		2	5	6	
Badulla	Tennakoonwela	10	10	6					
Badulla	Dikkapitya	10	10	10		2	10	10	
N'Eliya	Sirisamangama	10	10						
N'Eliya	Meepilimana	10	10						
Hambantota	Ellagala	10	10			2			
Hambantota	Mamadala	10	9		1	2			
Hambantota	Walasmullla	8	6		4	4			
Hambantota	Raluwa	9	8	8					
Total		**293**	**287**	**59**	**5**	**19**	**40**	**72**	**1**

Source: Survey Data, 2008

Considering the money allocation, the respective Provincial Directors brought the inputs and distributed to the relevant VS offices following the government rules and regulations.

In the project planning and implementation, analysis has to be performed to increase the milk production for the success of the project. In this project, the prior focus was given to increasing the quantity of milk and to intensifying dairy farming by providing cattle sheds. According to the survey data, at the time of implementation, the real needs of the farmers were identified as indicated in Table 5.9.

Table 5.9: Immediate Assistance Dairy Farmers Needed

District	Type of Immediate Assistance Needed								
	Cow sheds		Biogas units		Animals		Fodder cultivation		Total No.
	No.	%	No.	%	No.	%	No.	%	
Nuwara Eliya	19	95.0	-	-	01	5.0	0	-	20
Badulla	39	97.5	-	-	01	2.5	-	-	40
Kandy	37	97.4	-	-	01	2.6	-	-	38
Kegalle	20	100.0	-	-	-	-	-	-	20
Gampaha	38	95.0	-	-	02	5.0	-	-	40
Kalutara	16	80.0	-	-	04	20.0	-	-	20
Kurunegala	32	80.0	-	-	08	20.0	-	-	40
Puttalam	19	95.0	-	-	-	-	01	5.0	20
Anuradhapura	16	88.9	-	-	02	11.1	-	-	18
Hambantota	23	62.2	03	8.1	11	29.7	0	-	37
Total	**259**	**88.3**	**03**	**1.02**	**30**	**10.2**	**01**	**0.34**	**293**

Source: Survey Data, 2008

As in Table 5.9, it was revealed that at the time of implementation only 88 percent of the farmers needed cattle sheds, but with regard to input distribution, 98 percent of the farmers received inputs for constructing cattle sheds. Twenty percent of the farmers were interested in obtaining high yielding animals under this project in districts like Kalutara and Kurunegala, but, in the distribution process in the Kalutara district, only 10 percent of the farmers received animals. In the Kurunegala district, animals were not distributed and inputs were distributed to develop cattle sheds.

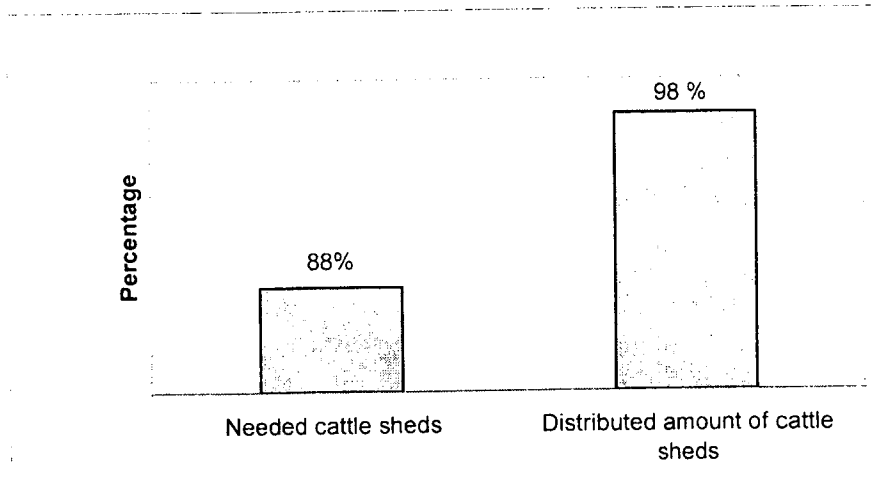


Figure 5.1: Cattle Sheds Needed and Distributed Amount

Source: Survey Data, 2008

Figure 5.1 clearly shows the cattle sheds needed and the distributed amount among the farmers under DVDP.

According to Table 5.9, 10.2 percent of the farmers of the total sample needed high yielding animals to increase the production performances. But, in reality, only 6.5 percent of the farmers received animals under DVDP. The distributed milking animals were also obtained from the neighbouring villages. Therefore, the farmers were highly unsatisfied about the animals which had been distributed. Farmers stated that those animals also did not provide a good milk yield.

5.4.2 Farmer's Satisfaction on Distributed Benefits

Figure 5.2 illustrates the satisfaction of the farmers regarding the inputs distributed under DVDP. Ninety three percent of the farmers who benefited were satisfied with the given inputs. The remaining 7 percent farmers were unsatisfied regarding the distribution and they stated that because of less inputs given under DVDP, they were unable to build their cattle sheds. This statement was true of Obada-Ella – a village in the Badulla district and Ellagala – a village in the Hambantota district, because the value of the inputs distributed was only Rs.2,250 and Rs.5,000 respectively. Ninety three percent of the farmers expressed that in reality under the prevailing economic crisis it was not possible to construct a cattle shed unless they received some funds in the form of assistance. Farmers who received milking animals also complained that animals distributed were somewhat poor in milk production.

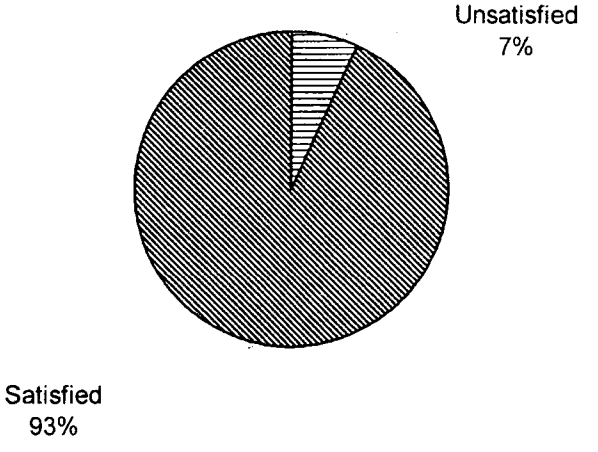


Figure 5.2: Satisfaction of Farmers Regarding Distributed Inputs
Source: Survey Data, 2008

5.4.3 Cost Incurred on Cattle Sheds

For the construction of the cattle sheds, the farmers also had to spend 50 percent of the full expenditure. The type of expenses incurred by the farmers for construction of cattle sheds is illustrated in Table 5.10.

Table 5.10: Average Cost Incurred on Cattle Sheds under DVDP

District	Name of the dairy village	Value of materials/ cash given by DVDP	Cost incurred by the farmer			Total value of the cattle shed
			In cash	In kind	Labour	
Gampaha	Opathaella	25,000	1,810	6,480	5,315	38,605
Gampaha	Wekanda	20,000	2,425	1,570	4,840	28,835
Gampaha	Hapuwalana	20,000	5,164	0	3,820	28,984
Gampaha	Meddegama	20,000	4,450	1,855	5,690	31,995
Kalutara	Handupelpola	20,000	8,037	4,300	5,820	38,157
Kalutara	Arukgoda	23,750	6,388	800	3,320	34,258
Kurunegala	Wakkunwala	35,000	10,880	650	3,860	50,390
Kurunegala	Makulpotha	25,000	5,228	3,800	4,170	38,198
Kurunegala	Galtenwewa	22,500	12,880	1,100	3,450	39,930
Kurunegala	Nikasalpura	22,500	4,850	2,450	3,260	33,060
Kandy	Uduwella	20,000	10,958	250	2,683	33,892
Kandy	Inguruoya	25,000	13,088	563	4,319	42,969
Kandy	Mahawaththa	20,000	50,950	1,350	2,750	30,050
Kandy	Megasmediththa	15,000	9,083	167	2,858	27,108
Puttalam	Medagoda	22,500	27,475	0	7,850	57,825
Puttalam	Ariyagama	22,500	11,300	800	6,250	40,850
Kegalle	Baddewela	17,500	6,750	640	4,170	29,060
Kegalle	Meeduma	20,000	7,030	200	4,540	31,770
Anuradhapura	Namalgamuwa	30,000	8,233	222	5,256	43,711
Anuradhapura	Korosgolla	40,000	12,639	2,556	6,719	61,914
Badulla	Obadaella	2,250	20,910	250	5,860	29,270
Badulla	Kirioruwa	20,000	8,558	42	3,583	32,183
Badulla	Tennakoonwela	14,550	4,135	1,150	1,730	21,565
Badulla	Dikkapitya	22,000	6,542	167	2,529	31,238
N'Eliya	Sirisamangama	20,000	14,164	800	4,260	39,224
N'Eliya	Meepilimana	25,000	12,650	470	5,825	43,945
Hambantota	Ellagala	5,000	2,550	417	1,075	9,042
Hambantota	Mamadala	22,000	4,045	1,182	3,100	30,327
Hambantota	Walasmullla	15,000	4,200	115	2,292	21,608
Hambantota	Raluwa	20,000	4,111	478	2,889	27,478
Total Average		**21,068**	**8,434**	**1,124**	**4,054**	**34,680**
Average Percentage		**60.8%**	**24.3%**	**3.2%**	**11.7%**	**100%**

Source: Survey Data, 2008

Under the DVDP, the farmers on an average received a sum of Rs.21,000 for inputs. The lowest value of inputs was distributed in Obadaella of the Badulla district and Ellagala of the Hambantota district. In the Obadaella milk village, the inputs were distributed among all the dairy farmers but there was no farmer managed society. In Ellagala due to influence from a political leader those who received inputs were distributed among 30 farmers. According to the information, the average value of a cattle shed constructed under DVDP was around Rs.35,000. This value ranged

between Rs.9,000 to Rs.50,000 in Ellagala and Wakkunuwala respectively. Due to lack of input value, the value of the cattle shed also varied in the study area.

Table 5.10 also points out that 60.8 percent of the total average value of a cattle shed distributed under the project was borne by the project. But, it was expected to contribute only 50 percent of the cost of the farmers. The study found that the farmer contribution towards the cattle sheds was 40 percent of the total cost. The contribution by the farmer can be further categorised as 24.3 percent in cash, 3.24 in kind and 11.7 percent in labour.

5.4.4 Availability of Cattle Sheds

Availability of cattle sheds is shown in Table 5.11. Before implementation of DVDP, 65 percent of the sample farmers were having cattle sheds, but those were sub-standard in nature. After the implementation of the project, 99 percent of the farmers owned cattle sheds. Three farmers from the total sample population did not build cattle sheds; (01) Kalutara-Arukgoda, (02) Hmbantota-Ellagala and Walasmulla. Some farmers, especially from Wakkunuwala and Paduwasnuwara in the Kurunegala district as well as in the Hambantota district used constructed cattle sheds for purposes of storing up firewood and parking tractors.

Table 5.11: Availability of Cattle Sheds

	Total number of farmers	Availability of cattle sheds	%
Before DVDP	281	182	**65.0**
After DVDP	293	290	**99.0**

Source: Survey Data, 2008

5.4.5 Conditions of Cattle Sheds

Considering the climatic condition of the region, the roofing materials of the cattle sheds varied. Cattle sheds were constructed according to the plans given by the VS office. The space for these cattle sheds was enough for three animals. According to the plan, the standard floor area was 168 ft^2. This indicated that the cattle sheds of 70.4 percent of farmers were at standard level. Remaining 29.6 percent of the cattle sheds' floor area were bigger than the standard area. The average floor size of that 30 percent of the cattle sheds was around 337 ft^2. These farmers used these cattle sheds to locate more than three animals. Even though there was a standard size, in the construction of cattle sheds there was no restrictions to build c attle sheds according to the farmer's wish.

The roofing material used for most of the cattle sheds (75 percent) was metal sheets. Roofing material used in cattle sheds in the Kurunegala, Puttalam and Anuradhapura districts was cadjan (16 percent). But, in some areas of the Kurrunegala district (Wakkunuwala), the farmers used metal sheets. Other farmers used tiles, asbestos and tarred sheets as roofing materials but in the sample population, two farmers did not have roofs for their cattle sheds in the Hambantota district (annex 02 and annex 03). The survey data indicated that most of the farmers (92 percent) applied cement on the floor area of cattle sheds, but in the Hambantota

district especially in the Ellagala village, a few farmers did not do so due to lack of cement. The type of support bars in the cattle shed was concrete filled PVC pipes (81 percent).

Before DVDP, most of the cattle sheds were of sub-standard quality compared to the post-DVDP period. They also used to rear animals in these cattle sheds after the project. This helps usage a clean milk production and the healthiness of the animals. But, some cattle sheds constructed under the project have a few shortcomings.

Table 5.12: Defects in Cattle Sheds

Defects in Cattle Sheds	Number of Farmers	% N=287
Unavailability of water tank/feeder box	62	21.6
Unavailability of electricity	13	4.5
Inadequate floor area	52	18.1
The feeder box being too large	03	1.0
No covering over short walls around the cattle shed	20	7.0
No perforated iron pipes for cattle standing space	15	5.2
Unavailability of a draining system	08	2.8
Decaying of roof in the cattle shed	50	17.4
Others	38	13.2
Total no. of respondents	**190**	**66.2**
Total no. of cattle sheds	**287**	-

Source: Survey Data, 2008

Table 5.12 reveals that 66.2 percent of the constructed cattle sheds were detected with a number of defects; especially the water problem (21percent), the decaying of the roof (17.4 percent) and lack of floor area (18 percent). The survey indicates that in the post-DVDP period, the mastitis infection has decreased by 36 percent of the total sample population. However, around 27 percent of the farmers expressed that the trend of infection of mastitis had not changed or they were not in a position to reveal the real position of this trend (annex 04).

5.5 Strategy Five

"Support for quality improvement by adhering to good animal husbandry practices (GAHP) and maintain reasonable occupational health standards"

The inputs given for construction of cattle sheds were helpful to improve good animal husbandry practices. Rearing animals inside the cattle shed will help to improve the quality of milk.

5.5.1 Training Programmes

Systematic training programmes played a significant role in the improvement of the milk industry. Farmers received knowledge through training programmes on

different disciplines of dairy farming. Majority of the dairy farmers expressed that their existing knowledge improved due to the trainings given under DVDP.

The themes of the conducted training programmes can be identified as follows:

1. Clean milk production – practices in clean milk production
   After DVDP, most of the farmers followed the correct method of milking.
2. Rearing in cattle sheds – importance of rearing animals in the cattle sheds was stressed and how it reduced the risk of infection of mastitis.
3. Intensive methods of rearing
   How intensive farming increased milk production and methods of feeding were discussed.
4. Disease control
   Benefits of having high yielding animals and rearing them under intensive management systems and the common diseases in the area and disease control.
5. Improvement of grass and grass cultivation - convey knowledge on nutritious value of the different grass varieties (e.g. Co_3 increases milk production) and benefits of grass cultivation.
6. Artificial insemination (AI)
   Sharing knowledge about the importance of the AI and benefits of having high yielding animals through AI.
7. Value-added products - practical knowledge on value-added products.
8. Biogas - especially in the Hambantota district the farmers were gaining knowledge about biogas and its benefits and how it reduced farm expenditure.

Table 5.13: Farmer Participation in Training Programmes

District	Before DVDP			After DVDP		
	Number of farmers	Number of farmers participated	%	Number of farmers	Number of farmers participated	%
N'Eliya	19	04	21	20	07	35
Badulla	40	04	10	40	21	52.5
Kandy	37	17	45.9	38	30	78.9
Kegalle	20	05	25	20	12	60
Kalutara	20	02	10	20	20	100
Gampaha	39	16	41	40	37	92.5
Kurunegala	35	16	45.7	40	37	92.5
Puttalam	19	05	26.3	20	20	100
Anuradhapura	18	07	38.9	18	17	94.4
Hambantota	34	07	20.5	37	23	62.2
Total	**281**	**83**	**29.5**	**293**	**224**	**76.5**

Source: Survey Data, 2008

As shown in Table 5.13, the farmers who had received training were 29.5 percent before DVDP and after the project it increased up to 76.5 percent of the total. In the Nuwara Eliya district, the farmer participation in the training programme was the lowest compared to other districts in the study area.

Some of the farmers did not participate in training programmes because;

1. They stated that they had sufficient knowledge about dairy farming as they practised it for a long period.
2. Inconvenience due to day-to-day household activities.

Focus group discussions and other information indicated that these training programmes were successful and provided valuable knowledge on dairy farming to participants. Discussions with the officers also proved that the objective of the training programmes was achieved.

5.5.2 Improving Quality of Milk Production

Regarding clean and quality milk production, the following aspects are very important:

1. Cleaning cow sheds and animals;
2. Clean milking; and
3. Proper feeding of animal.

Cleaning of cattle shed is very important for the production of quality milk as well as for the reduction of the infection of mastitis. The study indicated that the farmers under DVDP cleaned cattle sheds twice a day. As observed in the field, most of the farmers follow clean milking practices. Clean milk production includes proper washing of the udder twice using hot water and wiping it with a clean piece of cloth, and cleaning hands and utensils, which are essential activities for clean milk production. Rejection or acceptance of farmer milk in the post-implementation of the project can be considered a proof of quality of the milk.

The quality and the quantity of milk production depend highly on the quality of the feed. Therefore, to improve the quality of production of milk, the animals have to be fed with protein rich soluble carbohydrate concentrate feed and grass. The study observed that the farmers gained adequate knowledge on feeding in the training programmes under DVDP.

Table 5.14: Milk Rejection (during last 6 months)

Location of the milk collecting centre	Before DVDP			After DVDP		
	Number reported reject milk		Number of days rejected	Number reported milk rejected		Number of days rejected
	No.	%		No.	%	
Collecting centre in the village	21	7.5	60	65	22.2	3.8
Collecting centre outside of the village	15	5.3	43	23	7.8	3.0
Total number of farmers	**281**	**12.8**	-	**293**	**30**	-

Source: Survey Data, 2008

Though the overall percentage of farmers whose milk was rejected increased in the post-DVDP period from 12.8 to 30 percent, the number of days of milk rejection has reduced from 50 to 4 days in six months. Due to the absence of proper record keeping, it is difficult to gather accurate data on milk rejection. Observations and focus group discussions indicate that, in the post-DVDP period, milk rejections are less compared to the pre-DVDP period.

Milk rejection was mainly due to bacterial infections, unclean milk production and adulteration of water with milk. Some farmers also expressed the fact that they were unaware of the exact reason why their milk was rejected. Farmers had an interest in knowing the exact reason for the rejection of milk.

Under DVDP, it was planned to provide the services of checking the quality of milk in collecting centres situated in the village but the facilities were not provided. Therefore, it is very important to provide the facilities and educate the farmers on clean milk production.

5.5.4 Good Animal Husbandry

Good animal husbandry means rearing animals under a no stress pattern: providing better sheds, quality feeding, better management system, etc. Under the better management system, dairy farming can be performed according to the availability of resources in the farm. The popular management systems practised in Sri Lanka are intensive, semi-intensive and extensive management.

Table 5.15: Methods of Rearing Milking Cows

District	Methods of Rearing							
	Intensive		Semi-Intensive		Extensive		Total	
	Number of animals	%	Number of animals	%	Number of animals	%	Number of animals	%
Nuwara Eliya	6	6.9	80	93.1	-	-	86	14.2
Badulla	6	11.8	39	76.4	6	11.8	51	8.4
Kandy	6	7.6	73	92.4	-	-	79	13
Kegalle	20	34.5	24	41.4	14	24.1	58	9.6
Gampaha	26	28.3	46	50	20	21.7	92	15.2
Kalutara	2	8	23	92	-	-	25	4.1
Kurunegala	4	8.7	42	91.3	-	-	46	7.6
Puttalam	39	48.1	42	51.9	-	-	81	13.4
Anuradhapura	3	9.4	25	78.1	4	12.5	32	5.3
Hmbantota	2	3.6	48	85.7	6	10.7	56	9.2
Total	**114**	**18.8**	**442**	**73**	**50**	**8.2**	**606**	**100**

Source: Survey Data, 2008

Table 5.15 describes the management types practised in the study area by the dairy farmers. According to the systems of rearing, the duration that animals are kept inside the cattle shed varies. If one practises intensive rearing system, the animals should be housed or caged (inside of the cattle shed) the whole day. Therefore, on such occasions, the cleaning of cattle sheds must be performed frequently for quality milk production. In the study area, 18.8 percent of the milking cows were reared under the

intensive system. Most of the milking cows (73 percent) were reared under semi-intensive system. In this system, the animals were housed inside of the cattle shed mainly during the night as well as during pregnancy and milking periods. In the extensive management system, the animals were not housed inside the cattle shed. When the number of animals in the herd was larger and the operating land area was high, the farmers tend to practise extensive management system. From the total number of milking cows in the study area, 8.2 percent of the animals were reared under the extensive management type.

As shown in the Table 5.15, in the Hambantota, Anuradhapura, Kegalle, Gampaha and Nuwara Eliya districts, 8.2 percent of animals were reared under the extensive management system.

5.5.5 Availability of Water

For quality and good animal husbandry management, the availability of water was very advantageous.

Table 5.16 indicates water facilities available to the dairy farmers in the study area. Before DVDP, available water facility was 92.5 percent, whereas after DVDP, 96 percent of the total sample had water facilities. When considering before and after the implementation of the project, a significant change in water facilities could not be observed in the study area.

Table 5.16: Water Facilities Available for Dairy Farming

District	Before DVDP			After DVDP		
	Total Number of farmers	Number of farmers having water facilities	%	Total Number of farmers	Number of farmers having water facilities	%
Nuwara Eliya	19	17	89.5	20	18	90.0
Badulla	40	40	100.0	40	40	100.0
Kandy	37	35	94.6	38	36	94.7
Kegalle	20	17	85.0	20	18	90.0
Gampaha	39	34	87.2	40	40	100.0
Kalutara	20	19	95.0	20	20	100.0
Kurunegala	35	31	88.6	40	37	92.5
Puttalam	19	18	94.7	20	20	100.0
Anuradhapura	18	15	83.3	18	15	83.3
Hmbantota	34	34	100.0	37	37	100.0
Total	**281**	**260**	**92.5**	**293**	**281**	**95.9**

Source: Survey Data, 2008

The available water sources in the study area can be described using Table 5.17. The majority of the farmers (74.2 percent) had well water facilities before DVDP and 63.7 percent of farmers had well water after the project. Due to improvement of pipe-borne water facilities, the usage of well water for cattle rearing has decreased. Pipe-borne water was available for 37 percent of the farmers (105) after DVDP.

But, before DVDP, only 18.8 percent of the farmers were having pipe-borne water facilities. Other farmers used stream, river or irrigation water for dairy farming.

Table 5.17: Sources of Water

Sources of water	Before DVDP		After DVDP	
	Number	%	Number	%
Pipe-borne water	49	18.8	105	37.3
Well water	193	74.2	179	63.7
Stream/River/ Irrigation	42	16.1	35	12.4
Total	**260**	-	**281**	-

Note: Percentages are based on multiple choice response
Source: Survey Data, 2008

Cleaning of cattle sheds using well water and stream water was a very difficult task since it required a large quantity of water. According to observations, some farmers needed water pumps to develop their dairy farming and to improve the quality of the production.

5.6 Strategy Six

"Establishment of model demonstration units/systems at FMS/dairy farmer organisation level for the production and value addition of fresh milk and milk products with necessary equipment, machinery and utensils"

Under DVDP, the model demonstration units were not established in the study area. Even though this strategy was included in the plan of DVDP, the implementers did not pay much attention to this. Farmers were directed to NLDB farms to gain practical knowledge instead. The instructions were delivered by VS officials under the project to construct cattle sheds according to the standard level.

As indicated in strategy six, it is important to establish model demonstration units. But as an initiation, these units can be established at VS office level. Successful farmers are engaged in value addition of milk as their own enterprise. The value addition to products rather than selling as raw milk increases the farm income.

Case study 1: Milk Toffee Production

1. Name of the farmer: R M W G W Bandara
   (His sister R M W G W Sugandhika was engaged in milk toffee production.)
2. Age: 28 years
3. Educational level: Year 13
4. Main occupation: Cattle farming
5. Ancillary occupation: i. Self-employment - Managing a boutique
   - Milk toffee production
   ii. Collection of milk for Rich Life
6. Average Milk Production: 15 litres/day

Every other day, she produces milk toffee using two litres of milk, and within one month she produced milk toffee using thirty litres of milk. The usual pieces of milk toffees per litre of milk are around forty-two. But, she produces hundred pieces of milk toffees from one litre of milk. If she sells thirty litres of raw milk she can earn only Rs.900 (30x30) a month.

Price of a piece of milk toffee	=	Rs.1
Income/month	=	Rs.3,000
Production cost per one litre	=	Rs.60
For 30 litres = 60x30	=	Rs.1,800
Profit/month=Rs.3,000 -1,800	=	Rs.1,200
Other Incomes/month		
From boutique	=	Rs.3,000
Milk production	=	Rs.15,000
Milk toffee	=	Rs.3,000
Milk collection	=	Rs.3,000
Manure selling	=	Rs.500
Total income	=	Rs.24,500

Percentage of the milk income from total income $= \frac{15{,}000 \times 100}{24{,}500} = 61.22\%$

In 1993, she started cattle rearing with one cow. Under DVDP assistance scheme, she improved the herd and at present she owns five cows. She was given money to build a cattle shed and to construct a well. She spent Rs.12,000 to build the cattle shed. As a courageous woman, her aim was to increase the milk production.

At present, there are two milking cows in the herd. One is *Jersey* cross and other one is *Friesian* cross. They produce seven to eight litres of milk per day. She milks the animals twice a day. The evening milk was kept under refrigerated condition and sold in the morning. She does not face any marketing problems in the milk toffee enterprise.

5.7 Strategy Seven

"Establishment of milk collection and local sales centres having livestock service units with the assistance of FMSs/dairy farmer organisations, lands, buildings, small laboratory facilities for activities such as testing of milk sample, milk boilers, ice cream makers, milk cans having dispensing taps, chilling tanks, milking machines, grass cutters, grass choppers, small-scale feed mills, water pumps, etc, which will be provided to these centres depending on their requirement"

According to the survey results, the number of milk collecting centres has increased after DVDP.

Table 5.18: Availability of Milk Collecting Centres in the Village

District	Before DVDP			After DVDP		
	Number of farmers	Number of MCCs in the village	%	Number of farmers	Number of MCCs in the village	%
N'Eliya	19	14	73.7	20	13	65
Badulla	40	36	90	40	38	95
Kandy	37	26	70.3	38	31	81.6
Kegalle	20	12	60	20	13	65
Gampaha	39	23	59	40	28	70
Kalutara	20	03	15	20	11	55
Kurunegala	35	09	25.7	40	27	67.5
Puttalam	19	17	89.5	20	18	90
Anuradhapura	18	14	77.8	18	15	83.3
Hambantoa	34	05	14.7	37	13	35.1
Total	**281**	**159**	**56.6**	**293**	**207**	**70.6**

Note: MCC – Milk Collecting Centre
Source: Survey Data, 2008

Before the DVDP, the number of farmers having milk collecting centres in the villages of the Kalutara, Kurunegala and Hambantota districts was less than 25 percent. But after the DVDP, 70 percent of the total sample farmers were getting the services of milk collecting centres in their villages. This has increased from 15 to 35 percent in the Hambantota district and from 15 to 55 percent in the Kalutara district. Before the DVDP, Makulpotha village in the Kurunegala district did not have a milk collecting centre but according to information, after DVDP, only four farmers benefited by having a milk collecting centre in the village. A milk collecting centre was not found in the Raluwa village of the Hambantota district before and after DVDP.

The main milk collectors in the study area can be described as indicated in Table 5.19.

Table 5.19: Milk Collecting Agent

Collecting Agent	Before DVDP Number of farmers				After DVDP Number of farmers			
	In the village		Outside the village		In the village		Outside the village	
	No.	%	No.	%	No.	%	No.	%
1. MILCO	85	53.5	52	71.2	140	67.7	46	53.5
2. Rich Life	1	0.6	7	9.6	2	1.0	2	2.3
3. CTMU	3	1.9	2	2.7	2	1.0	2	2.3
4. Nestle	18	11.3	3	4.1	23	11.1	18	20.9
5. Cargills	1	0.6	0	0	7	3.4	2	2.3
6. Araliyakele	3	1.9	1	1.4	0	0	1	1.2
7. Wecragama	1	0.6	0	0	0	0	1	1.2
8. Co-operative Society	21	13.2	2	2.8	15	7.2	6	7.0
9. Private Collector	24	15.1	5	6.8	15	7.2	6	7.0
10. Do not know	02	1.3	1	1.4	3	1.4	2	2.3
Total	**159**	**100**	**73**	**100**	**207**	**100**	**86**	**100**

Source: Survey Data, 2008

The majority of the farmers used to sell milk to MILCO collecting centre before the commencement of the project. It was the collecting centre for more than 50 percent of the total sample population. The second highest collector of the sample population was a private collector. The Nestle and co-operative collectors also played a significant role in milk collecting before DVDP.

At the time of the survey, a large number of farmers (67 percent) sold their milk to MILCO. The second largest collector in the sample after DVDP was Nestle (Pvt) Ltd. The co-operative societies and private collectors too continued to play an important role even in the post-DVDP. According to Table 5.19, the milk collecting agents of MILCO played a major role in the study area both before and after DVDP. The private milk collectors were mainly concentrated in the Badulla and Hambantota districts.

It was found that the establishment of livestock service units helped to increase milk production in dairy villages. Establishing a livestock service unit/village was not practical. Therefore, it was suggested that a livestock service unit, be started for a group of five dairy villages, if they are situated nearby.

The livestock service units were not established with milk collecting centres even though it was indicated in strategy seven, due to lack of attention on the part of the implementers.

5.8 Strategy Eight

"Conducting local feed resource utilisation programmes"

The knowledge on local feed utilisation was shared under the training programmes and the practical knowledge was also given using NLDB farms. The local feed utilisation is very important to increase farm income by reducing feed cost.

Table 5.20: Local Feed Utilisation (Concentrated)

Type of feed	Before DVDP		After DVDP	
	Number	N=281 %	Number	N=293 %
1. Cattle feed mixture Prima/Highland/CIC	69	24.5	89	30.4
2. Poonac	163	58.0	197	67.2
3. Broken Rice/Rice Bran	136	10.0	180	61.4
4. Omie	09	3.2	20	6.8
5. Mineral blocks	28	10.0	49	16.7
6. Unfilled grain	01	0.4	01	0.3
7. Maize	01	0.4	02	0.7

Note: Total number of farmers before implementation of the project was two 281, and after the project was 293

Source: Survey Data, 2008

Table 5.20 describes the types of local feed utilised in dairy farming in the study area. Before and after implementation of the project, 24.5 percent and 30.4 percent farmers respectively used manufactured feed mixtures as concentrated feed. The local feeds such as poonac, broken rice/rice bran and omie were the main types used by the farmers. Poonac and broken rice/rice bran are the widely used local feed in the study area. Usage of poonac and broken rice/rice bran was 67.2 percent and 61.4 percent respectively in the study area. Omie is a by-product of beer production and its usage is very high in the Madagama village in the Puttalam district. Farmers stated that after the utilisation of omie, the milk production had increased and it was a little cheaper than the manufactured concentrated feed.

Table 5.21: Local Feed Utilisation (forage)

Type of feed	Before DVDP		After DVDP	
	Number	N=281 %	Number	N=293 %
Legumes	219	77.9	247	84.3
Paddy straw	107	38.1	140	47.8
Paddy straw with urea	06	2.1	11	3.8
Silage	01	0.4	05	1.7
Crop residues	123	43.8	140	47.8

Note: Total number of farmers before implementation of the project was two 281, and after the project was 293

Source: Survey Data, 2008

The Table 5.21 shows the utilisation of forage such as legumes, crop residues and paddy straw. After the project, the number of farmers using them for feeding animals increased slightly.

Table 5.22: Concentrated Feeding

Districts	Before DVDP			After DVDP		
	Total number of farmers	Number of given	%	Total number of farmers	Number of given	%
Nuwara Eliya	19	19	100	20	20	100
Badulla	40	38	95	40	39	97.5
Kandy	37	36	97.3	38	36	94.7
Kegalle	20	16	80	20	17	85
Kalutara	20	16	80	20	20	100
Gampaha	39	28	71.8	40	38	95
Kurunegala	35	25	71.4	40	38	95
Puttalam	19	15	78.9	20	20	100
Anuradhapura	18	08	44.4	18	17	94.4
Hambantota	34	05	14.7	37	13	35.1
Total	**281**	**206**	**73.3**	**293**	**258**	**88.1**

Source: Survey Data, 2008

Table 5.22 describes the number of farmers who fed the animals using concentrated feed. It also shows that, 73.3 percent of the farmers from the total sample population fed their animals using concentrated feed before DVDP. After the implementation of the project, it has increased to 88.5 percent of the sample. This improvement was 15.2 percent of the usage of concentrated feed compared to the situation before the project. In the Hambantota district before commencement the project, 14.7 percent of the farmers used to feed the animals with concentrated feed because they were rearing large herds by practising extensive management systems. But, after implementation of the project, the concentrated feed usage has increased to 35.1 percent among the farmers.

The usage of concentrated feed was 100 percent among the selected farmers in the Nuwara Eliya district before as well as after implementation of the project. In the Nuwara Eliya district, most of the animals were of high producing varieties and reared under intensive and semi-intensive systems. Therefore, the farmers fed the animals using concentrated feed.

5.8.1 Problems Related to Concentrated Feed

The study indicated the use of manufactured concentrated feed was very expensive and it increased the cost of production of milk. The lack of adequate amount of broken rice/rice bran also is a problem to dairy farmers where the dairy production is high.

5.8.2 Reasons for not Using Concentrated Feed

The farmers who were not feeding their animals with concentrated feed reasoned that they were rearing local breeds and they produced smaller amount of milk (two litres a day). Therefore there was no necessity to incur an additional cost of feed. The difficulty in finding concentrated feeds is also another reason.

5.9 Strategy Nine

"Supply of grass cutting and fodder trees free of charge"

Table 5.23 describes that the total land extent of grasslands in the study area before and after the project. Before the project, the total cultivated area of grasslands was 33.1 acres. It has increased to 51.76 acres after the project. Compared to other districts in the study area, the highest extent of cultivated grasslands was in the Puttalam district. The total cultivated grassland in the Puttalam district was 7.82 and 13.51 acres before and after DVDP respectively. The lowest average of the land area cultivation grass was observed in the Anuradhapura and Nuwara Eliya districts. In the Anuradhapura district, the land was a very limiting factor because the dairy farmers are members of the second generation of the Mahaweli settlers. Therefore, they have not paid much attention to grass cultivation. In the Nuwara Eliya district also, the land was used intensively for vegetable cultivation. Therefore, the area allocated for grass cultivation was very limited. The improvement of grass cultivation in the district after DVDP was 56.4 percent, compared to the pre-project situation.

Table 5.23: Total Cultivated Grassland Area (Acre)

District	Before DVDP	After DVDP
Nuwara Eliya	0.80	1.05
Badulla	4.71	5.57
Kandy	4.94	4.41
Kegalle	1.58	1.64
Kalutara	2.00	3.67
Gampaha	5.03	6.36
Kurunegala	3.14	9.71
Puttalam	7.82	13.51
Anuradhapura	2.10	3.19
Hambantota	1.00	2.65
Total	**33.1**	**51.76**

Source: Survey Data, 2008

After the implementation of the project, 57.3 percent of the total sample population was involved in grass cultivation in their lands and 26.71 percent of the dairy farmers started to cultivate grasslands compared to pre-implementation period of the project. In the Puttalam, Kurunegala and Gampaha districts, the availability of own grasslands were somewhat higher compared to the other districts. After the project, the availability of own grasslands was more than 50 percent of the total sample

population in the districts, namely Badulla, Kurunegala, Kalutara, Gampaha and Anuradhapura.

Table 5.24: Maintenance of Grasslands

District	Before DVDP		After DVDP		Number of farmers initiated grassland
	Total number of farmers having grassland	%	Total number of farmers having grassland	%	
Nuwara Eliya	08	42.1	09	45	03
Badulla	22	55	26	65	06
Kandy	08	21.6	12	31.6	09
Kegalle	05	25	05	25	02
Kalutara	04	20	16	80	14
Gampaha	14	35.9	21	52.5	19
Kurunegala	13	37.1	35	87.5	27
Puttalam	11	57.9	17	85	08
Anuradhapura	05	27.8	11	61.1	07
Hambantota	03	8.8	16	33.3	13
Total	**93**	**33.1**	**168**	**57.3**	**108**

Note: Total number of farmers before implementation of the project was two 281, and after the project was 293

Source: Survey Data, 2008

In the Nuwara Eliya district, the most popular and common grass variety is *Napier* and CO-3. Clone 13 also can be seen. In the Badulla district, most of the farmers do not know the variety which they grow. CO-3 and *Brachiaria briszantha* are also grown in the district. In the Kandy district, the common grass variety was (2.5 acre), CO-3 (1.5). *Brachiaria ruziziensis* and *pusagaint* (0.2 acre) are also grown by farmers. CO-3 is the most common grass variety in the Kegalle district beside *Brachiaria* varieties. In the Kalutara district (wet zone) CO-3 (1.83 acres) is the largest grown variety and *Brachiaria briszantha* (0.49), *Napier* (0.5), *Brachiaria milifomis* (0.47), *Panicum maximum* (0.26) and *Genia* (0.26) are also grown in the study area. In the Gampaha district, the varieties such as CO-3 (2.88), *Brachiaria briszantha* (0.53), *Napier* (0.25) *Panicum* (0.1) and *Guinea* (0.88) are grown.

The coconut triangle of the Kurunegala district, 8.02 acres of land were cultivated with CO-3 and *Brachiaria briszantha* w as also cultivated in 0.75 acre. In the Puttalam district, the CO-3 was cultivated in 13.5 acres and it was the largest acreage of cultivation of this variety in the study area. Guinea was also cultivated in 0.02 acre.

In the Anuradhapura district (dry zone), CO-3 was the most popular grass variety. 3.19 acres of cultivated land was observed in the study area and in the Hambantota district the land extent covered by CO-3 consisted of 1.84 acres. The study showed that the grass cuttings were distributed according to the demand of the farmers. The relevant VS officers supplied grass cuttings from different sources.

5.9.1 Sources of Grass Cuttings

Table 5.25 describes the different sources of grass cuttings in the study area. Before and after the project, the grass cultivators mainly obtained grass cuttings from Veterinary Surgeons, friends or relatives.

Table 5.25: Sources of Grass Cuttings for Dairy Farmers

Sources	Number of farmers before DVDP	%	Number of farmers after DVDP	%
Provincial Training Centre	11	11.8	23	13.7
Veterinary Surgeon	35	37.6	71	42.2
Friends/Relatives	36	38.7	62	36.9
Private/State	04	4.3	05	3.0
Milk Collecting Company	02	2.2	04	2.4
Private AI Technicians	01	1.1	01	0.6
Upper Watershed Development Project	04	4.3	02	1.2
Total Number	**93**	**100**	**168**	**100**

Source: Survey Data, 2008

5.9.2 Reasons for Not Cultivating Grasslands

1. Lack of sufficient lands for grass cultivation
   (Especially in the Nuwara Eliya and Anuradhapura districts)
2. Lack of suitable grass cuttings and knowledge on grass cultivation
3. Farmers' lack of knowledge about grass cultivation and their benefits and most of the farmers are unaware of the importance and nutritional value of the improved grass varieties.

5.10 Strategy Ten

"Organising of grass cutting distribution programme with the National Livestock Development Board (NLDB)"

The discussions with Livestock Officers revealed that grass cutting distribution programme has not been organised by the NLDB farm in the study area.

5.11 Strategy Eleven

"Establishment of district fodder nurseries"

This activity was not implemented in the study area. But, VS offices and related NLDB farms were maintaining small nurseries. As a result, the farmers were in a position to obtain grass cuttings.

5.12 Strategy Twelve

"Conducting herd improvement and breed management programmes"
The breed management and herd improvement are performed using artificial insemination (AI) in the study area.

Table 5.26: Number of Farmers Following AI

Districts	Before DVDP			After DVDP		
	Total Number of farmers	Practising AI	%	Total Number of farmers	Practising AI	%
Nuwara Eliya	19	19	100	20	20	100
Badulla	40	36	90	40	40	100
Kandy	37	34	91.8	38	36	94.7
Kegalle	20	16	80	20	20	100
Kalutara	20	14	70	20	19	95
Gampaha	39	28	71.8	40	40	100
Kurunegala	35	26	74.3	40	37	92.5
Puttlam	19	19	100	20	20	100
Anuradhapura	18	10	55.6	18	16	88.8
Hambantota	34	10	29.4	37	24	64.9
Total	**281**	**212**	**75.4**	**293**	**272**	**92.8**

Source: Survey Data, 2008

As shown in Table 5.26, the average usage of AI technique has increased from 75.4 to 92.8 percent after the DVDP. Before the DVDP in the Hambantota district, AI performance was 29.4 percent and it has increased to 64.9 percent. In all other districts, after the project, utilisation of AI has increased by more than 90 percent. AI was mostly done by the Livestock Development Instructor (LDI) in the relevant study area. The private AI technicians have also performed a very small amount (2 percent) of AI in the study area.

The information shows that twelve (0.04 percent) farmers who used AI as a breeding tool were not satisfied with the service due to lack of AI officers in the centres and also during holidays it was difficult to get the services. The distance from farm to AI office has also created transport problems to the officials. Some farmers complained that officials were not arriving at the appointed time. Therefore, the AI has to be repeated on many occasions. In the study area, the average cost per AI was Rs.110 before DVDP, and Rs.170 after DVDP.

5.13 Strategy Thirteen

"Supplying dairy cows at 50 percent of the cost preferably from NLDB"

The distribution of breeding dairy cows from NLDB was not observed in the study area. Farmers always complained that they did not have a proper source to buy high yielding animals. The Ministry of Livestock Development also agrees that the further development of breeding of animals is important.

5.14 Strategy Fourteen

"Training of private artificial insemination (AI) technicians at FMS/dairy farmer organisation level"

Training of private AI technicians under this project was not observed in the study area. The project implementers pointed out that, due to lack of allocation of funds and poor attention, the private AI technicians were not trained under this project. But in the coconut triangle, the private AI technicians were trained before implementation of DVDP. Generally, the trained private AI technicians make available their services to dairy farmers.

5.15 Strategy Fifteen

"Conducting of group based healthcare programmes"

As stated by the VS officials, the special healthcare programmes were not conducted in the dairy villages. But, the normal healthcare programmes were conducted in the VS range and they gave higher priorities for these dairy villages.

5.16 Strategy Sixteen

"Implementation of a cattle and dairy farmer insurance scheme by the Agricultural and Agrarian Insurance Board"

Before the DVDP, 45.9 percent of the farmers were aware of the cattle insurance schemes and after the implementation, it has increased to 80.2 percent. This knowledge was mainly gathered from the training programmes conducted under DVDP. But, the promotion of this programme was not held in the study area, because the membership of some insurance schemes has reduced from 33.3 to 20.9 percent.

5.16.1 Reasons for Not Attracting Insurance Schemes

1. Lack of knowledge about the Cattle Insurance Scheme
2. Lack of trust on the insurance schemes
3. Difficulties in obtaining insurance claims
4. Scarcity of high breed valuable animals which need to be insured
5. Higher premium of insurance schemes.

5.17 Strategy Seventeen

"Raising awareness through production of documentary films"

Documentary films were not used in any awareness programmes under this project. Officers stated that they did not have facilities in the VS office to use these modern techniques for training programmes.

5.18 Strategy Eighteen

"Each participating farmer of this programme at primary level should agree to market a minimum amount of ten litres of milk daily on an average within the first year"

The average percentage of farmers who produced more than ten litres of milk was 53.6 percent under this project in 2007. The highest number of farmers supplying more than ten litres of milk was observed in the Puttalam district (90 percent). In the Badulla district too, 87.5 percent of the sample was producing more than ten litres. In the Hambantota district, only 13.5 percent of the farmers were producing more than ten litres of milk per day.

Table 5.27: Farmers who produced more than 10 litres of milk per day in 2007

District	Total number of farmers	Number of farmers achieved target	%
Nuwara Eliya	20	14	70.0
Badulla	40	35	87.5
Kandy	38	13	34.2
Kegalle	20	03	15.0
Kalutara	20	14	70.0
Gampaha	40	23	57.5
Kurunegala	40	23	57.5
Puttalam	20	18	90.0
Anuradhapura	18	09	50.0
Hmbantota	37	05	13.5
Total	**293**	**157**	**53.6**

Source: Survey Data, 2008

Chapter Six

Conclusions and Recommendations

In this chapter, conclusions and recommendations are made based on the project objectives and strategies. In the study, there are four objectives and eighteen strategies. For each objective and strategy, conclusion(s) and recommendations are given separately.

6.1 Milk Production

After the implementation of DVDP in the study area, both cow milk and buffalo milk production has increased. The average total production has increased from 16.01 to 19.9 litres/day/farmer. The highest production was observed in the Puttalam district and the increase was from 18.6 to 31.6 litres/day/farmer. This is basically due to successful input delivery of the DVDP and managing high yielding breeds in the district. In all districts of the study area, the milk production has increased. The total improvement of milk production was 24 percent.

Thus, the DVDP is a very important and valuable programme for improvement of the dairy industry in Sri Lanka. This improves both the production performance and family incomes of the rural small-scale dairy farmers.

In the Puttalam district, the production has almost doubled due to farmers' enthusiasm and the interest in dairy farming has improved after the implementation of the programme. The availability of private AI technicians in the district also played a major role in breed development. In this district, we observed that the chairman of FMS's paid special attention to all the member-farmers of the society and FMS's provided essential knowledge and inputs (e.g.; Meddegama).

For further improvement of this programme, it was essential to conduct follow-up programmes, once or twice a month with the relevant VS office.

Recommendations

1. There must be milking cows in a herd at any given time of a year. This inevitably leads to continuous production.
2. Supply of high yielding animals to the best dairy farmers at a reasonable cost.
3. Better coverage of AI services in all the dominant dairy farming areas.
4. Conducting meetings of farmer managed societies once a month with the participation of relevant officers and thereby introducing follow-up programmes.
5. Encourage dairy farmers by granting subsidies to the selected best farmers of the village.
6. Introduce a dairy feed subsidy programme.
7. Conduct training programmes every three months to deliver new knowledge.
8. Introduce loan schemes to attract new farmers to the dairy industry and convey new technology to attract the younger generation to the industry.
9. Provide high breed animals.

The study information proved that buying a genetically improved high producing animal is a very difficult task for dairy farmers in the study area. At present, if farmers need to buy a healthy and high producing animal, they have to buy it from their surrounding area with minor improvement in the genetic performance. Therefore, a planned programme must be implemented to solve this problem.

The area specific breeding centres must be implemented. According to cattle farming systems in Sri Lanka, the highly potential districts should be selected, where a breeding centre for each district would be established. These breeding centres should be managed by a private entrepreneur under the supervision of the related VS office. As performed in the DVDP, this private middle level entrepreneur also needs government assistance to initiate this kind of projects.

6.2 Milk Consumption

Due to the effectiveness of this project, the milk consumption has increased slightly from 1.06 to 1.10 litres/day/household. The total number of households that consume fresh milk has increased from 67.2 to 71.33 percent after the implementation of the project. Farmers in different districts of the study area also showed slight improvement in fresh milk consumption. The quantity of milk consumption has greatly increased in the Hambantota district (0.21 litres to 1.09 litres).

Even though the dairy farmers produce milk, the consumption seems to be less than expected by the project. Farmers stated that fresh milk consumption among younger generation is less due to fear of allergies.

Recommendations

1. Emphasising the importance of fresh milk consumption by advertising in the electronic media.
2. Conducting national and regional training programmes to change the attitude towards fresh milk consumption and offer remedies for allergies caused by fresh milk consumption.
3. Improving local fresh milk sales centres, especially targeting school children and officers. In the present context, the prices of powdered milk are very high. Therefore, it is essential to turn the population towards fresh milk consumption, which in return leads to reducing the cost of living.
4. Improving the fresh milk distribution in the urban areas.

6.3 Value-Added Products

The farmers did not take interest in producing value-added products which was expected after the project.

Recommendations

1. Conduct a feasibility study and identify the potentials of value-added products according to variations of the areas.
2. Select the interested farmers (two farmers from a village) to produce value-added products and direct them to proper training programmes.
3. Provide necessary equipment and low interest loans from a state or private bank to initiate the production.
4. Introduce a safe market system (e.g. supermarket) to the farmers.
5. Maintain the standard in order to compete with other popular brands.
6. Appoint a technical officer to follow up these small projects. He/she must discuss and solve the problems and constraints which are faced by farmers.

6.4 Income Generating Activities

Even though there are tremendous possibilities for income generating activities on the farm, the farmers in the study area have not given attention to this matter.

Recommendations

1. Identify different income generating activities such as sales outlets, selling cow dung for compost preparation, value-added products, business with grass and fodder, animal feed industry, milk collecting, etc., according to the suitability and interest of farmers.
2. Provide necessary credit facilities at low interest to initiate these income earning activities.

6.5 Strategy One - Formation or Re-organisation of Farmer Managed Societies (FMS's)

All the FMS's in dairy villages have been re-organised or newly formed. After the implementation of DVDP, 50 percent of the societies were newly formed and re-organised in the study area. MILCO is the most common milk collecting agent with FMS's in the study area. Eight percent of the farmers who are members of FMS's received marketing facilities from the FMS's after the project.

Other than marketing facilities, most of the FMS's did not provide other required facilities to the dairy farmers. The expected bargaining power of the societies was not observed at least even in one of the dairy villages in the study area.

Recommendation

As indicated in the first strategy, it is very important to hold the meetings of the FMS every two months with the participation of VS or LDI in the relevant VS division and an officer from the Ministry of Livestock Development. At these meetings, the officers can investigate the prevailing situation of the dairy farmers, especially the production and consumption of milk and the problems, constraints and solutions. The officers also can share knowledge on the advantages of the bargaining power with the farmers. If it is possible to initiate a revolving fund with FMS's, the farmers themselves can solve most of the problems relating to the dairy

industry in their village. The benefits also can be distributed among all the dairy farmers in the society.

6.6 Strategy Two - Selection of Dairy Villages

The correct villages must be selected. The decided criteria can also be used for future selection.

6.7 Strategy Three - Farmer Selection

The study proved that around 87 percent of the farmers selected for the project were suitable.

Recommendations

1. Avoid political interference with respect to the selection of farmers.
2. Identify the farmers' needs with the help of Grama Niladari, Agriculture Research and Production Assistant and Livestock Development Instructor so as to increase the milk production.
3. Check whether given inputs were used for the correct purpose.
4. The individual farm plans must be used for development of each dairy farmer according to his/her resource availability.

6.8 Strategy Four - Distribution of Inputs

Under the DVDP, 98 percent of the farmers received inputs to construct cattle sheds. The study found that 10.5 percent of the farmers had not utilised these cattle sheds for animal rearing. The average cost of a cattle shed was Rs.35,000 in the study area. Sixty percent of the cost was borne by the government and 40 percent by the dairy farmers. Using the given inputs, 99 percent of the farmers constructed cattle sheds. Before the implementation of the DVDP, 64.8 percent of the total sample had cattle sheds, whereas after the implementation of the project, 99 percent of the farmers have cattle sheds.

Recommendations

1. Before the commencement of DVDP, it is important to analyse the essential needs of the individual farmer to develop milk production.
2. The size of the cattle shed must be designed considering the number of animals in the herd.
3. It is important to identify the type of roofing materials according to climatic conditions of the region.
4. The government should come to an understanding with the farmer before distributing these inputs, e.g. Teldeniya VS range in the Kandy district. It is easy to take legal action against farmers when they do not utilise the inputs properly.
5. It is essential to conduct follow-up programmes to identify weaknesses of the farmers in addition to problems and constraints faced by them under the project.

6.9 Strategy Five - Support for Quality Improvement

Farmers' knowledge has increased the quality of milk production through training programmes. Number of days of milk rejections has also been reduced after the project implementation.

Recommendations

1. Continuous training programme will help increase knowledge on clean milk production.
2. Before distribution of inputs to the farmers, it should be made mandatory for them to attend the training programmes.
3. Organise farm visits to get practical experience.
4. Give special attention to water availability for dairy training.
5. Organise a programme to get to know about the quality of the milk supplied by the individual farmer, e.g. the fat content and SNF content of the milk.

6.10 Strategy Six - Model Demonstration Units

The model demonstration units have not been developed in each village under this project.

Recommendation

1. Select the best farmer in the village and make his/her farm as a model farm by giving extra subsidies to develop dairy farming further.

6.11 Strategy Seven - Establishment of Milk Collecting Centres with Livestock Service Units

Even though the milk collecting centres operated in the study area, the livestock service units did not operate. MILCO was the most popular milk collector in the study area. Nestle and CTMU played a major role in the Kurunegala and Puttalam districts.

Recommendations

1. Strengthen FMS's and provide facilities to livestock service units.
2. Provide milk collecting facilities where collecting centres are not established under the project.

6.12 Strategy Eight - Local Feed Resource Utilisation Programme

With DVDP, the farmers' feed utilisation has improved. The concentrated feeding has increased from 73.3 percent to 88.5 percent. The most dominant types of local feed are poonac and rice bran/broken rice. The utilisation of poonac and rice bran/broken rice was 67.2 percent and 61.4 percent respectively. After the project, the feeding of crop residue straw and legumes has increased.

Recommendation

The use of local feed resources has increased slightly after implementation of DVDP, but the expected improvement in the industry could not be achieved through the use of locally available resources. Therefore,

1. It is very important to identify the different types of locally available feed, their utilisations and nutritional values.
2. Provide practical knowledge on how to use these feed in the correct amount and using proper method at the right time.
3. Introduce new technology to farmers to improve utilisation of the locally available feed.
4. The provision of local feed at low cost at least to dairy villages. This will grab the farmers' attention to increasing utilisation.

6.13 Strategy Nine - Supply of Grass Cuttings Free of Charge

The grass cuttings were supplied by the relevant VS offices according to the need basis. Maintaining of grassland has increased from 33.1 percent to 57.3 percent after DVDP in the study area. Co-3 is a common type of grass variety grown in the study area.

Recommendation

Improved grass play a major role in increasing the milk production of dairy cows. Therefore, maintaining high quality grasslands is very important. Before implementing this project, t he farmers had to develop their own grasslands or common grassland in the village (For one farmer even one to two perch are enough when land is limited). A well-organised training programme on maintaining grasslands has to be conducted before starting the project and it will give better results. In selecting the farmers for future DVDP, availability of grasslands too should be introduced to the selection criteria in further projects.

6.14 Strategy Ten - Grass Cutting Distribution with NLDB

Grass cutting programmes were not organised under this project.

6.15 Strategy Eleven - District Fodder Nurseries

District fodder nurseries were not implemented in the study area.

Recommendation

The remaining small grasslands (in the VS office) can be developed further according to the requirements of the area, to enable, the farmers to easily obtain grass cuttings.

6.16 Strategy Twelve - Herd Improvement Programmes

AI practice improvement was from 75.4 percent to 92.8 percent of the total sample farmers after implementation of the project.

Recommendations

1. Increase further knowledge about AI
2. Increase the number of AI technicians according to the number of animals in the area.
3. Conduct a survey to find out the total number of AI technicians in the country and fill any vacancies to provide a better service.
4. Select a farmer from those interested in AI from one or two dairy villages to train as a private AI technician.

6.17 Strategy Thirteen - Supply of Dairy Cows at 50 percent Cost from NLDB

Distribution of breedable dairy cows by NLDB was not undertaken under the project, but there is a demand for breeding animals in the country.

Recommendation

Provide facilities to NLDB farms to produce high quality breeding animals.

6.18 Strategy Fourteen - Training of Private AI Technicians

Private AI technicians were not trained under the project.

Recommendation

An efficient young farmer from one or two dairy villages nearby has to be trained as an AI technician.

E.g. A case studied in the Madagada milk village of the Puttalam district - a farmer was trained in AI and he provides a better service to other dairy farmers in the village. All the farmers are soliciting his services and they are satisfied with his services as they can get the services at the required time.

6.19 Strategy Fifteen - Special Healthcare Programmes

Special healthcare programmes were not conducted under the project.

Recommendation

If officials can organise evaluation programmes once a month, it will increase the quality of the products and health of the animals.

6.20 Strategy Sixteen - Cattle and Dairy Farmer Insurance Schemes

Farmers' awareness about insurance schemes has increased in the post-project period but their participation was lower compared to the pre-project period.

Recommendations

1. Organise awareness programmes to convey the knowledge on benefits of insurance
2. Introduce easy repayment systems.

6.21 Strategy Seventeen - Production of Documentary Films for Awareness Programmes

Documentary films were not used in any awareness programme under this project at the VS official level.

Recommendation

Provide facilities to VS office for using of modern techniques in training programmes.

6.22 Strategy Eighteen - Each Farmer Should Produce 10 Litres of Milk within First Year of the Project

The percentage of farmers who produced more than 10 litres of milk under this project in 2007 was 53.6 percent of the study area.

Recommendation

To increase the production, the farmers have to manage the milking animals in the herd. The study pointed out that, milking animals producing ten litres at any given time must be in the herd.

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Annex 1

Composition of average annual household income by source of income

Source of Income	DISTRICTS																					
	Gampaha		Kalutara		Kurunegala		Kandy		Puttalam		Kegalle		Anuradhapura		Badulla		N' Eliya		Hambantota		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Livestock (Cattle)	79325	32.3	137810	41.4	89179	37.1	58086	22.6	123814	40.2	39042	16.6	280500	61.0	80851	36.5	89600	42.2	63941	31.7	93350	36.2
Paddy Cultivation	10332	4.2	8365	2.5	33015	13.7	1092	0.4	14522	4.7	13299	5.6	54111	11.8	3457	1.6	1000	0.5	17987	8.9	14598	5.7
Export Agrculture Crops	11285	4.6	3967	1.2	10076	4.2	8205	3.2	10100	3.3	2380	1.0	1000	0.2	4775	2.2	0	0.0	12703	6.3	7394	2.9
Other Crops	24873	10.1	22030	6.6	27592	11.5	25723	10.0	54490	17.7	50247	21.3	38483	8.4	43630	19.7	54500	25.7	32786	16.2	35410	13.7
Livestock (Others)	9155	3.7	180	0.1	3523	1.5	1107	0.4	4700	1.5	1428	0.6	66	0.0	1605	0.7	3920	1.8	584	0.3	2862	1.1
Government Employment	7950	3.2	2700	0.8	13846	5.8	30473	11.9	17500	5.7	30857	13.1	44000	9.6	16800	7.6	27900	13.1	10378	5.1	18683	7.2
Private Sector Employment	43662	17.8	74400	22.3	15692	6.5	50684	19.8		0.0	25523	10.8	6666	1.5	24720	11.1	14400	6.8	22432	11.1	29131	11.3
Agriculture Labourer	4375	1.8	1200	0.4	0	0.0	1263	0.5	0	0.0	2542	1.1	3000	0.7	7150	3.2	3600	1.7	8595	4.3	3517	1.4
Non-Agriculture Labourer	1350	0.5		0.0	0	0.0	6605	2.6	8400	2.7	5619	2.4	0	0.0	6900	3.1	0	0.0	1946	1.0	3205	1.2
Skilled Jobs	25900	10.5	21800	6.5	10358	4.3	39631	15.5	46800	15.2	9142	3.9	14666	3.2	16500	7.4	6600	3.1	4135	2.0	19519	7.6
Self Employment	15618	6.4	22800	6.8	17025	7.1	15473	6.0	9300	3.0	32285	13.7	4000	0.9	10050	4.5	4200	2.0	22081	10.9	15603	6.0
Foreign Employment	2250	0.9	24000	7.2	15384	6.4	12631	4.9	500	0.2	0	0.0	0	0.0	0	0.0	0	0.0	662	0.3	5749	2.2
Hiring Agri Equipment	400	0.2	900	0.3	1923	0.8	0	0.0	5000	1.6	0	0.0	3555	0.8	0	0.0	0	0.0	0	0.0	932	0.4
Pension / Rent / Leased	5325	2.2	10800	3.2	0	0.0	2526	1.0	600	0.2	20571	8.7	7333	1.6	3600	1.6	3600	1.7	227	0.1	4524	1.8
Government Subsidies	750	0.3	120	0.0	0	0.0	94	0.0	0	0.0	8	0.0	0	0.0	180	0.1	0	0.0	292	0.1	185	0.1
Samurdi	1380	0.6	1854	0.6	2582	1.1	2879	1.1	1158	0.4	2737	1.2	2306	0.5	1515	0.7	540	0.3	3147	1.6	2090	0.8
Other Subsidies	60	0.0	90	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	68	0.0	23	0.0
Others	1860	0.8		0.0	0	0.0	0	0.0	10750	3.5	0	0.0	0	0.0	0	0.0	2500	1.2	0	0.0	1158	0.4
TOTAL	245850	100.0	333016	100.0	240195	100.0	256472	100.0	307634	100.0	235680	100.0	459686	100.0	221733	100.0	212360	100.0	201964	100.0	257932	100.0

Annex 02

Condition of the cattle sheds constructed before the DVDP

District	No. reported having a cattle shed	Type of Roof									Type of Floor					Type of Pillars				
		1	2	3	4	5	6	7	8	9	1	2	3	4	5	1	2	3	4	5
Gampaha	18	4	13	0	0	1	0	0	0	0	3	14	1	0	0	16	1	1	0	0
Kalutara	14	5	5	0	4	0	0	0	0	0	6	8	0	0	0	12	0	1	1	0
Kurunegala	20	0	20	0	0	0	0	0	0	0	9	10	0	0	1	18	0	2	0	0
Kandy	35	10	14	0	0	1	0	3	2	5	16	13	1	5	0	31	0	3	0	1
Puttalam	12	1	8	0	3	0	0	0	0	0	8	4	0	0	0	7	1	3	1	0
Kegalle	12	2	9	0	1	0	0	0	0	0	3	9	0	0	0	11	0	1	0	0
Anuradhapura	10	1	9	0	0	0	0	0	0	0	1	9	0	0	0	10	0	0	0	0
Badulla	37	29	0	2	5	0	0	0	1	0	22	15	0	0	0	26	0	2	7	2
N' Eliya	19	16	0	1	2	0	0	0	0	0	7	11	0	1	0	13	0	3	3	0
Hambantota	5	2	1	0	0	1	1	0	0	0	3	2	0	0	0	4	0	1	0	0
TOTAL	182	70	79	3	15	3	1	3	3	5	78	95	2	6	1	148	2	17	12	3

Type of Roof

1. Aluminium sheet
2. Cadjan
3. Paddy straw
4. Tiles
5. Asbestoes
5. No roof
7. Tar sheet
8. Polythene covers
9. Mana leaves

Type of Floor

1. Cement
2. Mud
3. Graval
4. Metal
5. Bricks

Type of Pillars

1. Wooden
2 . Iron pipes
3. Concrete
4 . Metal
5. Cement blocks

Annex 03

Condition of the cattle shed constructed under DVDP

District	No. reported having a cattle shed	Type of Roof						Type of Floor				Type of Pillars				
		1	2	3	4	5	6	1	2	3	4	1	2	3	4	5
Gampaha	40	40	0	0	0	0	0	36	3	0	1	0	4	36	0	0
Kalutara	19	19	0	0	0	0	0	17	1	1	0	1	1	17	0	0
Kurunegala	40	19	20	1	0	0	0	37	2	1	0	3	1	36	0	0
Kandy	38	34	0	1	3	0	0	37	1	0	0	2	1	35	0	0
Puttalam	20	8	11	1	0	0	0	20	0	0	0	0	1	19	0	0
Kegalle	20	20	0	0	0	0	0	20	0	0	0	0	1	19	0	0
Anuradhapura	18	0	16	1	1	0	0	18	0	0	0	0	3	15	0	0
Badulla	40	36	0	1	1	1	1	38	1	1	0	9	0	23	6	2
N' Eliya	20	11	0	1	8	0	0	19	1	0	0	1	0	15	4	0
Hambantota	35	33	0	0	1	1	0	26	9	0	0	10	3	22	0	0
TOTAL	290	220	47	6	14	2	1	268	18	3	1	26	15	237	10	2

Type of Roof

1. Aluminium Sheet
2. Cadjan
3. Tiles
4. Asbestoes
5. No roof
6. Tar sheet

Type of Floor

1. Cement
2. Mud
3. Graval
4. Metal

Type of Pillars

1. Wooden
2. Iron pipes
3. Concrete (cover with PVC)
4 . Metal
5. Cement blocks

Annex 04

Farmers' opinion about the trend in mastitis infection due to use of cattle shed

District	BEFORE DVDP					AFTER DVDP				
	No. of farmers having a cattle shed	Trend in mastitis infection				No. of farmers having a cattle shed	Trend in mastitis infection			
		1	2	3	4		1	2	3	4
Gampaha	18	7	2	6	3	40	21	4	11	4
Kalutara	14	4	3	4	3	19	11	1	5	2
Kurunegala	20	5	3	7	5	40	15	2	11	12
Kandy	35	1	4	14	16	38	14	1	14	9
Puttalam	12	2	5	3	2	20	6	6	5	3
Kegalle	12	2	0	3	7	20	3	1	8	8
A'pura	10	2	3	1	4	18	11	1	2	4
Badulla	37	6	6	12	13	40	12	3	13	12
N' Eliya	19	5	0	5	9	20	4	2	4	10
Ha'tota	5	1	0	1	3	35	10	1	8	16
TOTAL	182	35	26	56	65	290	107	22	81	80

Trend in mastitis infection due to use of cattle shed

1. Decreased
2. Increased
3. Not changed
4. Not Known