

SDVC II Endline Evaluation

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Introduction

The vision is within reach for Strengthening the Dairy Value Chain (SDVC)-to achieve increased incomes and more sustainable livelihoods for landless and smallholding households in North and Northwestern Bangladesh through incorporation into a strengthened milk value chain. Due to the wealth of measurement tools and experience gained by CARE through Phase 1 of the SDVC project, CARE is now ideally positioned with a clear vision for pro-dairy development. As a result of the previous work, CARE has the unique capacity to bring together in a value chain the association of processors and producers in a formalized, competitive, and sustainable industry, with CARE's neutral non-market role and ability to support implementation and partnerships.

Overview of the Dairy Sector in Bangladesh

CARE has been successful in Phase 1 of the SDVC project in advancing the potential for small-scale producers in the formalization process, despite a complex, disorganized, and inefficient dairy sector in Bangladesh, influenced by the lack of processor organization and tensions between formal and informal sectors, as well as productivity and profitability, and political and economic issues. CARE has built a network of producers and partners for supporting, in SDVC Phase 2, a profitable and sustainable dairy sector, reducing rural poverty and empowering women.

The dairy and beef industry in Bangladesh has in the past depended heavily on imports. With declining imports of cheap cattle, and increasing incomes of consumers, there is a considerable opportunity for developing the dairy sector in Bangladesh. Raising dairy cattle has also proven to be far better for very small land-less farmers relative to other agricultural initiatives. Development of the dairy sector positively impacts the life of the poor through stabilization and generation of income, employment opportunities, nutrition, providing draft animals and manure for agricultural productivity, and intra-household allocation of resources and division of labor. It has been found that, in terms of employment, most workers are employed in small-

scale milk production, with a declining number of workers employed by the larger-scale milk producer. Various studies, including those by the International Food Policy Research Institute (IFPRI), document that preschool children and pregnant and lactating women are at highest risk for malnutrition and have highest benefit from having dairy cattle, due to the nutrition in the milk as well as the potential for income production.

The huge growth potential has not been realized, and the IFPRI found a number of constraints that not only prevent growth of the industry, but also prevent the small farmer from participating in the dairy industry. These barriers for the small farmer along the value chain include:

- the widening gap between domestic production and domestic demand,
- low female nutrition due to deferring milk needs to others in the family first,
- lack of a concerted national effort nor organized producer groups that could help with economies of scale, reduce transaction costs, boost milk production and collection,
- large dairy processors investing in expanded capacity,
- pricing issues regarding inputs and inconsistent government subsidies,
- distrust among competing processors,
- high transaction costs of collecting milk from many small farmers,
- the increasing cost of feed and land, while grazing land diminishes,
- decreasing profitability in having less than 4 cows (which encompasses the majority of the producers) due to low milk production per cow,
- lack of a breed-improvement program and low quality breed stock,
- inadequate animal health services,
- lack of adequate financing, and difficulty for the small farmer in bearing risks,
- lack of information on production methods, distribution and marketing, and other marketing issues related to the volatile political and economic environment, as well as
- perishability, quality, and food safety issues.

The qualitative research for the baseline study demonstrates that the dairy value chain, from those who rear cows to the consumers of milk and dairy products, has many opportunities and hurdles. The IFPRI found that *the keys to development of the dairy sector and to improving the livelihoods of smallholder dairy farmers* primarily involves:

- improving veterinary and artificial insemination (AI) facilities,
- educating producers regarding improved feeding practices and cattle husbandry,
- facilitating access to formal micro-credit for producers,
- developing formal markets in potential areas, and
- creating a favorable and effective dairy policy environment within the government.

Widening Gap Between Domestic Production and Domestic Demand

For almost a decade now, the large milk processors (including BRAC Dairy, Milk Vita, DANONE, PRAN Dairy) in North and Northwest Bangladesh—Sirajgang, Rashahi, Natore, Pabna—have not been able to serve the increasing domestic demand nor nutritional requirements. In 2015 according to the FAO, Bangladesh produced nearly 6.1 million MT of milk annually, but can only meet about half of the growing domestic demand for dairy products, driven by population growth and changes in consumer purchasing power. Smallholder farmers (in Bangladesh this is a very small farmer with around 2-3 cows) represent over 80% of the 3 million farmers in the dairy subsector of Bangladesh and the largest aggregate in milk-production base.

The smallholder farmer takes into account ownership of assets including livestock and land, as well as human capital and any other factors that determine the farmer's access to input and output markets. The definition is country-specific.

Smallholders benefit if there is income potential in production or marketing of dairy products, and with the fertilizer production for crop yields, as well as in the dramatic effects of health improvements with even small amounts of milk consumption.

The Bangladesh Rural Advancement Committee (BRAC) is a nonprofit organization serving the poor, with a for-profit enterprise (Aarang Dairy) registered under the company. BRAC has a

dairy processing plant, about 101 chilling plants and collection centers, AI service facilities, feed manufacturing and selling facilities.

Milk Vita was developed based on the Indian Amul model with the objectives of 1) raising incomes of remote, poor, landless and marginal farmers by purchasing their milk at a reasonable price through a guaranteed co-operative market, and 2) ensuring reasonably priced, hygienic and nutritious milk and milk products to city dwellers. Over time, additional services were included to increase milk productivity, including preventive and curative medical care with 24-hour emergency services, free vaccination and AI (Artificial Insemination) services for upgrading local breeds, fodder extension advisory services to improve yields of raw milk, arrangements to access government owned land for grazing milk cooperative farmers' cattle, distribution of cattle feed at 'no profit no loss' prices, and animal husbandry training.

DANONE of France is affiliated, through a yogurt production venture in a local milk processing plant, with the Grameen Motsho Foundation. The Foundation is a subsidiary of the Grameen Bank, in a crop-livestock-fish farming integrated project with landless and marginal farmers with UNDP funding that was launched in 1998 to provide micro-credit to small groups of about five members to increase household income through livestock fattening or milk production. Four dairy processing plants were also established, owned jointly by village group members (75%) and Grameen Motsho Foundation (25%). Members are obliged to sell milk to dairy enterprises that sell locally, but can sell to bigger dairy enterprises like Milk Vita. Profits are shared among members.

PRAN Dairy Ltd. is a subsidiary of the PRAN-RFL Group, a food processing company based in Dhaka, Bangladesh, which serves South Asia, Africa, North America, Europe and the Middle East. PRAN Dairy Ltd., which collects milk from both large and small farmers in Bangladesh, is involved in setting up dairy hubs as a way to improve the dairy value chain in terms of better pricing, guaranteed market, and to ensure the growth and survival of micro entrepreneurship.

Nutritional Needs and Income

The goal of the SDVCP is to increase income of targeted smallholder and landless milk producer households through various activities along the dairy value chain. Landlessness is a major determinant of rural poverty. Survey findings suggest that nutritional status of children aged 6-60 months is positively associated with household income. According to the UN FAO in 2015, Bangladesh has one of the highest rates of underweight children in the world.

Smallholders benefit with increased income through improvements of marketing or increased production, and can benefit even without marketable surplus. Dramatic effects on the nutritional status of poor people, especially young children and nursing and expectant mothers can be achieved even if small amounts of milk are consumed.

Lack of a Concerted National Effort

Bangladesh suffers from lack of an independent collaborative national body, which would work toward enforced standards for high quality production and processing. Farmer collectivization through cooperatives, associations, group businesses, and farmer's groups would contribute substantially to a maturing and growing dairy industry. However, the country lacks the models and platforms for successful collaborative models and dairy farmer collective action and advocacy. A new government-initiated Dairy Development Council could, if vested interests could be overcome, facilitate greater collaboration in the industry by addressing price-fixing and unfair subsidies to Milk Vita. Keeping the prices low helps local milk stay competitive with imports, but reduces profitability along the chain, except for Milk Vita, which is government subsidized. Increased volumes of production per cow have been hampered by a lack of effort in breeding and herd management. Quality issues present opportunities, such as increasing the fat content, if there are mechanisms for measuring quality at each stage of the value chain. CARE and BRAC Dairy's Digital Fat Testing (DFT) pilot has the potential to significantly impact the growth of the dairy industry, but is hampered by lack of commitment and business planning between processors and producers.

Milk Pricing and Financing

The price of milk varies with demand and quality, as well as whether there is more than one sales point. Pricing in the local market is not determined by quality such as fat content, but on subjective observations such as how fresh the milk is, since unsold milk can end up in a distress sale as farmers lack preservation capacity and bargaining power. Chilling plant producers mostly get paid on fat content of the milk, even though the measurement process is quite unreliable and leads to conflict. Some use the fat scaled pricing as a strategy to exploit farmers, and some give different prices for the same quality of milk depending on competition. In both informal and formal markets, pricing increases during times of increased demand, such as festivals.

Though individuals and producers are interested in starting or increasing their livestock for milk marketing, financing is a big constraint. The financing programs offered by some of the chilling plants are not of interest due to the imposed constraints that restrict borrowers from getting better pricing. Many of the producers are relatively better off and do not qualify for loans from microfinance institutions such as BRAC or Grameen Bank. NGOs are the largest source of loans.

Large Dairy Processors, Measurement of Milk Quality, and Distrust

Though many chilling plants have systems to trace fat percentage in milk, often the equipment is inaccurately calibrated, creating distrust among suppliers. Introduction of a formal market, centered on chilling plants, has increased the trend for commercial milk production, but has also created tension among producers, milk collectors, and chilling plant employees regarding clarity of the fat testing-based milk pricing strategy. The most effective means of increased value addition in the dairy value chain is through chilling plants and formal processors, but only if clarity and honesty exist in their activities. Through the SDVC, DFT devices have been proven to increase transparency and accuracy of how prices are set, and reduce the risk of arbitrary milk pricing or buyers taking advantage of farmers in pricing their milk, giving farmers more information and greater decision-making power, improving accountability and trust between producers and buyers.

Overview of the SDVC II project

CARE Bangladesh has the mission to amplify the voices of the poor and marginalized in ways that influence public opinion, development practice, and policy at all levels. The SDVC projects are an ideal platform to cultivate the capability to gather direct experience from the grassroots level and transform that experience into meaningful evidence and understanding to be communicated to a broad and diverse audience.

Through SDVC I and II, CARE is improving cow management practices, service provider and input supplier linkages, and building marketing channels and group formation. CARE has been working toward greater smallholder farmers participating in the dairy sector market, particularly women, in North and Northwestern Bangladesh, due to the significant impacts it will have on reducing rural poverty and increasing the health and empowerment of women and children. Through SDVC I, CARE identified access to quality inputs and animal management practices, targeted and worked with private sector companies to pursue inclusive business models to strengthen the value chain and incorporate poor smallholders in the supply and distribution chains, and addressed the most critical constraints to open doors for smallholder dairy productivity and profitability.

Significant results from SDVC I include training hundreds of service providers and effectively integrating them in the value chain, more than 50% increase in average household-level milk production, 97% increase in milk sales income for participating farmers and consistent sales growth for dairy input shops, 40% increase in milk collection for 75% of the trained milk collectors, 46% increase in household-level milk consumption, and greater than 95% increase in income of Livestock Health Workers (LHW) against the original project goal. SDVC has focused on women, due to almost 85% of the participants being women dairy farmers. This has led to increased leadership skills for women, dairy farm management capacity, and contributions to family income, resulting in more respect for women's decision-making, and men sharing the household workload.

CARE has gained the knowledge, skills and resources from SDVC I to simultaneously help local stakeholders address issues of supply constraints, and help foster key services such as animal health management, producer group organization and improved animal husbandry skills, improved output market linkages for transparency and efficiency, engagement in a wide range of value chain stakeholders at every level, and resources for smallholder farmers to improve and expand their operations.

Beneficiaries of the SDVC II Project are the seven districts of North and Northwest Bangladesh (25,000 households or ~175,000 individuals) earning \$20-30 per month. These are milk-producing landless farmers who own an average of 2 cows and produce about 10% of milk in the region, and small-scale farmers who own an average of 2.9 cows and produce about 80% of the milk. CARE will continue to work with about 17,500 of these SDVC smallholder dairy farmers who live close to the chilling plants, as well as 12,500 new farmers, some of whom will have 4+ cows.

As previously indicated, the SDVC Project also is having a significant impact on women, who make up a majority of the targeted dairy farmers, perform most of the animal management work, and are extensively involved in the decision making with respect to dairy farming.

Other beneficiaries include dairy input shop owners, Livestock Health Workers (LHWs) and technicians, extremely poor households who would benefit from increased employment opportunities, farmers groups who would learn the power of group initiative and collective bargaining, non-participating dairy industry stakeholders who would benefit from the SDVC participants learning, milk availability, and improved production and value chain infrastructure.

CARE has structured the successful elements from the SDVC project's first phase accomplishments into a "Dairy Hub" model, which can be tested as a synergistic system and marketed as an easily replicated network that is equitable and profitable for all participants. In

building this model, CARE has chosen to work with BRAC Dairy, one of the largest dairy processors in Bangladesh, assuming that as this dairy finds the model successful, it will become the dairy business norm. Foundations and building blocks are now in place for stakeholders to succeed through this sustainable model that can bridge rural smallholder dairy producers (particularly women) with a growing formal sector dairy market.

Through SDVC II, adoption of the system will transition a donor-funded development initiative to the preferred way of doing business in the Bangladesh dairy sector. The organization CARE has put together through SDVC I will develop critical foundational elements in SDVC II toward irreversible momentum for the dairy industry in Bangladesh, overcoming industry hurdles that have had negative impacts on nutrition, costs and hurdles of production, milk collection, processing, marketing, and distribution.

The four key areas of focus for the next two years of SDVC II evaluation are to:

1. *Increase volume and quality of milk production among 30,000 smallholder dairy farmers (17,500 from the current SDVC project integrated with 12,500 new farmers) in three dairy clusters.*
 - a. 30,000 will provide a critical mass of production with which to test the viability of the Dairy Hub model and convince BRAC and other dairy processors to adopt and scale up in order to build an industry norm.
 - b. Farmers will continue to receive nutrition education regarding importance of increased household consumption of milk.
 - c. Current SDVC farmers will continue to be linked to individuals and producer groups, community-level collection points, dairy input shops, and LHW and AL services.
 - d. Women dairy farmers with household income of less than \$2 per day, who live in the three cluster areas, in close proximity to the chilling plants and service providers, will be given priority in selection of new participants, with the goal of the program to offer opportunities for dairy farmers to access fair markets and receive fair prices.
 - e. Activities will include strengthening capacity for the 17,500 existing farmers, promoting environmentally-friendly and health-friendly practices, and facilitating better access to inputs and community-based microfinance through group savings.
2. *Improve transparency and fair pricing for farmers through Digital Fat Testing (DFT) at community-level collection points and chilling plants*
 - a. DFT devices have been proven to increase transparency and accuracy of how prices are set, and reduce the risk of arbitrary milk pricing or buyers taking advantage of

- farmers in pricing their milk, giving farmers more information and greater decision-making power, improving accountability and trust between producers and buyers.
- b. 16 additional DFT units will be installed and maintained by BRAC Dairy at their chilling plants, paid for by BRAC under a CARE subcontract. These will be key to the SDVC II Tipping Point initiative, expanding production capacity.
 - c. 73 additional community-level DFT collection points (total 89) will be established within a 10KM radius of the BRAC chilling plants, with these points owned and managed by BRAC Dairy, which is also responsible for oversight and operation of the DFT equipment and systems.
 - d. Assessments will be conducted with farmer groups to determine locations and help BRAC establish and continuously monitor collection points.
 - e. Increases in production and prices will be documented and disseminated.
3. *Increase access to and quality of dairy farming inputs and services*
- a. 50 most promising of the ~150 privately-owned input supply shops that have sprung up in response to perceived demand are to be trained, supported, and linked to the Dairy Hub in Phase II, to meet challenges faced by entrepreneurs and dairy farmers. This includes 30 new shops and strengthening the existing 20 with intensive training in business management, and knowledge about the products they are selling.
 - b. Since the start of the SDVC project, farmers report significant increases in milk production and of their income as a result of using inputs, services, and information from dairy input shops supported by the project.
 - c. Status and empowerment of women who own dairy input shops is improving, and CARE plans to select more female shop owners to establish successful businesses and reduce discrimination.
 - d. The SDVC project will ensure that 1 LHW and 1 AI Technician for every 300 households (found to be the ideal) is developed and maintained in the 3 high-potential dairy clusters (1 for every 8 farmer/producer groups within a 3-5 km radius.)
 - f. A 3-way credit system will be piloted that connects BRAC Dairy, dairy input shops, and smallholder farmers, with CARE continuing to encourage savings and savings groups as the primary means for growing business.
4. *Consolidate and promote the replication of a sustainable Dairy Hub model within BRAC and beyond.*
- a. The definition of this Dairy Hub model will be 30,000 dairy producers representing 1,000 producer groups, 89 DFT-enabled community-level collection points (73 new in this phase), 22 DFT-enabled BRAC chilling plants (16 new), and 50 dairy input supply shops functioning as an integrated and replicable unit.
 - b. CARE will facilitate and strengthen linkages at all levels, monitor operations, promote innovations, troubleshoot challenges, and work with BRAC to optimize the model.
 - c. Key relationships and learning will be promoted, facilitated, monitored and strengthened between input shops and suppliers. Continual monitoring and documenting of results will help increase production, income, profits.

- d. A more gender-inclusive value chain will be promoted, with women's increased control over resources and decision making.

As these four goals address needs on different levels or scales, this evaluation will need to be multi-dimensional and carefully designed. These levels include a wide variety of changes and trends: within individual actors within the value chain; within the groups of producers, among the collectors, livestock health workers, Krishi Utsho Shops, the private sector value chain participants; at the level of CARE itself; as well as at the level of public policy.

The heart of this strategy is:

- 16 new carefully-selected digital fat testing-enabled chilling plants and 73 new neighboring community-level digital milk collection points with one of the country's leading private sector dairy processors'
- 50 supported dairy input shops;
- 1,000 strong and fully-trained producer groups of varying income levels and milk production capacity;
- continued promotion of community-based micro-finance in the form of savings and access to other credit facilities that support dairy production systems for poor farmers, and leverage other credit mechanisms.

The addition of Digital Fat Testing practices to the project adds an exciting new dimension to both the Impact Evaluation and the Process Monitoring potential of the SDVC II. It will provide the team with a stream of real-time data that can be used to radically shorten the feedback loop from data collection to program managers. Additionally, the centralized location of the DFT sites will enable more regular and less intrusive collection of accurate data from individual producers and service providers.

Interventions have been concentrated in three high-potential and high-leverage "dairy clusters" in North-Western Bangladesh, where private sector dairy processors are making investments to expand production. Key follow-on activities will include strategic communications, measuring

and marketing of results, and targeting key dairy stakeholders in the country to accelerate broader adoption and replication. The project will continue to take a gendered value-chain approach to ensure women's meaningful participation and empowerment.

The SDVC II project is the follow-up phase of a gold-standard example of Evaluation and Monitoring in value chain projects. The SDVC I saw the creation of innovative tools and methods of analyses that began to capture the effects of the project across a complex system of value chain players. CARE-Bangladesh, in implementing the SDVC Project Phase II (with 30,000 targeted smallholder dairy producers (approximately 70% women) across seven districts of north and northwest Bangladesh over a period of four years), aims to have dairy household milk sales income increase by 75%. The project includes a profit-driven pro-poor "Dairy Hub" value chain model for sustainability, with the potential for increasing income of the landless and smallholder dairy farmers, primarily women.

Methodology of the Monitoring and Evaluation

The SDVC II tracking tools and sampling plans draw largely from the lessons learned in SDVC I, research into best practices in value chain analysis and dairy analysis in other programs and contexts, and extensive consultation with CARE USA and CARE BD staff at M&E workshops. The impact and outcome indicators will be measured from appropriate samples at designed intervals to explore the degrees to which each target and objective of the program is being achieved.

The foundational element of the impact assessment is longitudinal panel data collection of several unique treatment and control groups that will be analyzed using mixed-effects modeling. The use of longitudinal data collection methods with producers is new to the SDVC M&E process and will add considerable depth and power to the potential insights and understanding of the effects and trends of the project.

To better understand the nuances of how the SDVC project is impacting the Bangladesh dairy sector, we have gathered data from six separate groups. Three treatment groups and three control groups. The three treatment groups are: Treatment group 1, producers who were in SDVC I and are continuing in SDVC II. Treatment group 2 are producers who are new to SDVC II and were added in the beginning months. Treatment group 3 are producers who are now to SDVC II and were added at the midline point. The control groups are all producers who own dairy cows and are not directly involved in the SDVC training project. Control group 1 are producers who were in SDVC I but are not continuing in SDVC II. Control group 2 are producers who live in areas where the SDVC trainings are occurring but are not part of the beneficiaries. Control group 3 are producers who own dairy cows and live in areas outside of where the SDVC project is working.

The sample design was a longitudinal study, or non-experimental design for longitudinal comparison of results. The sample size is determined to provide statistically representative results for household and individual level indicators at the project level. Within each intervention area, a two-stage selection process will be followed. First, villages will be selected using the probability-proportional-to-size (PPS) selection procedure, based on the total number of SDVC members in the village. Second, households with SDVC members will be randomly selected within each of the selected villages.

The minimum sample size required was computed using the formula for means provided in the FANTA Sampling Guide:

$$n = N * D [(Z_{\alpha} + Z_{\beta})^2 * (sd_1^2 + sd_2^2) / (X_2 - X_1)^2] * A$$

where:

n = required minimum sample size per survey round or comparison group

N = non-response factor

D = design effect

A = attrition factor (baseline to end-line)

X_1 = the estimated mean of the indicator at the time of the first survey

X_2 = the *expected* mean of the indicator either at some future date or for the program area such that the quantity $(X_2 - X_1)$ is the size of the magnitude of change or comparison-group differences it is desired to be able to detect

Z_α = the Z-score corresponding to the degree of confidence with which it is desired to be able to conclude that an observed change of size $(X_2 - X_1)$ would not have occurred by chance (α - the level of statistical significance)

Z_β = the z-score corresponding to the degree of confidence with which it is desired to be certain of detecting a change of size $(X_2 - X_1)$ if one actually occurred (β - statistical power)

sd_1 = the expected standard deviation of the indicator the time of the first survey

sd_2 = the expected standard deviation of the indicator at some future date

As several variables described above vary by district, each district independently calculated their sample size. Sample sizes were calculated based on household expenditures, with a targeted improvement of 60% (X_2) over the life of the activity (LOA). A design effect of 3, $Z_\alpha = 1.282$ (Z-value corresponding to a 90% significance level), and $Z_\beta = .84$ (Z-value corresponding to 80% power) were used.

In addition to the longitudinal household data collection, the monitoring and evaluation data collection design for SDVC II includes daily digital readings from the DFT collection points, and seasonal group evaluations. This data has been combined and merged to create several large longitudinal datasets. These datasets have been used along the way to monitor the trends occurring within the project. Additionally, these datasets will be used within this report to study the effects and impact of the SDVC II towards its major goals.

Analysis and Findings

Participants Sociodemographic Overview

There are currently 26,138 individual producers involved in the SDVC project – divided into 848 groups across 7 Districts. 45% of the SDVC II groups are groups that were formed during the Phase 1 of the SDVC project. The other 55% of the groups are newly formed during SDVC II. Within those groups, 33% of the producers joined the project during Phase 1 and 67% of the producers are new to the SDVC during SDVC II.

Overall, 89.6% of the SDVC producers are women and 10.4 are men. Ten percent (10%) of the women producers are group leaders while twelve percent (12%) of the male producers are group leaders.

The sample taken in our survey that includes all treatment and control farmers is a balanced sample. The farmers included as controls in our household survey are comparable to the SDVC farmers in our survey. The average age, education level, and family size are comparable across groups.

The average age of respondents in all treatment and control groups is between 39 and 41 years.

The educational status is also evenly distributed across all treatment and control groups. 37% of respondents are able to sign their own name. Another 20% have a primary education. 15% have an eighth grade education. And another 15% are illiterate. The remaining 13% have higher education than eighth grade.

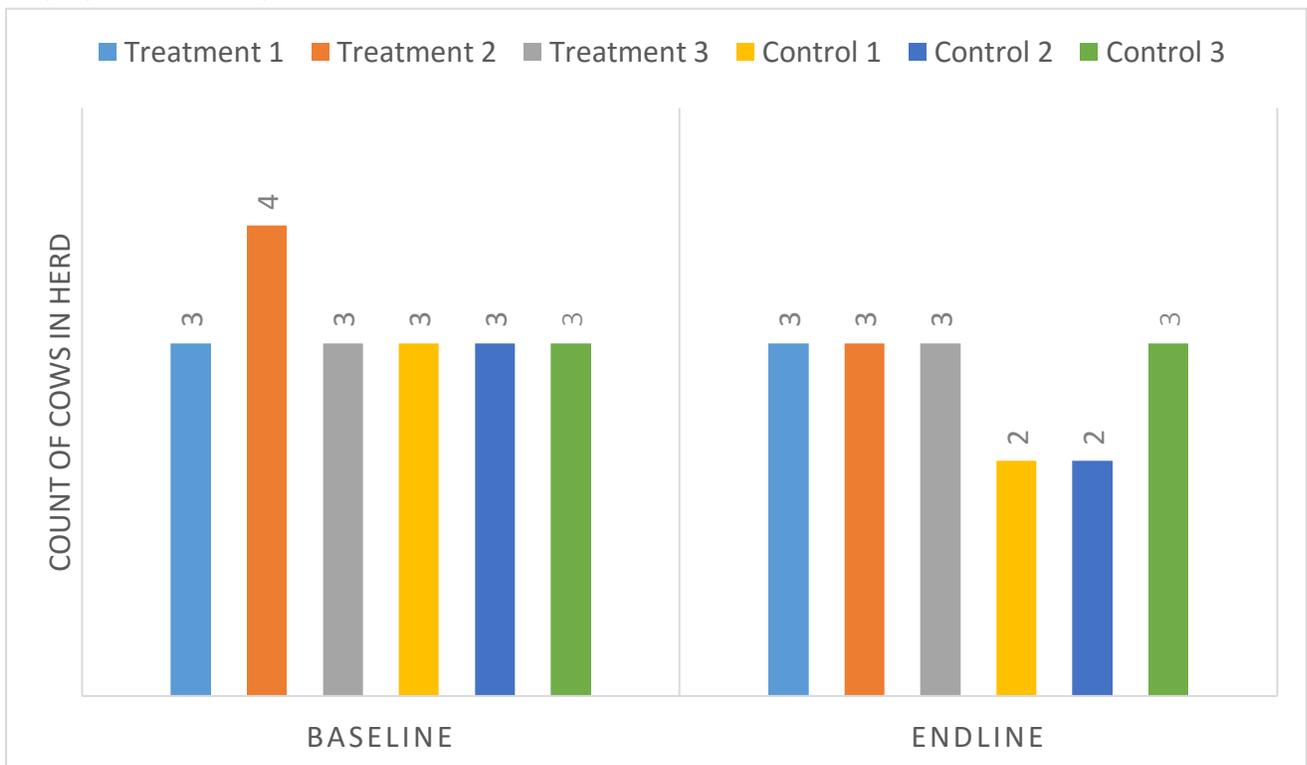
The average family size is 4 people for all treatment and control groups. For specific details of the sociodemographic of the survey respondents, please see the Data Appendix.

Profile of Herd Demographics and Productivity

Herd Size

Overall, the typical herd size has increased slightly over the course of the project. Display 1 shows that the average herd size was 3 at the start of the phase and is 3 at the end of the phase. This is true for all of the treatment and control groups, with the exception of Treatment Group 2, the new SDVC producers who have slightly more cows than the overall average. Additionally, there was a slight decline in control group herd sizes between baseline and endline. However, there are no overall significant differences between the SDVC producer herd size and the control producer herd size.

Display 1: Herd size per household



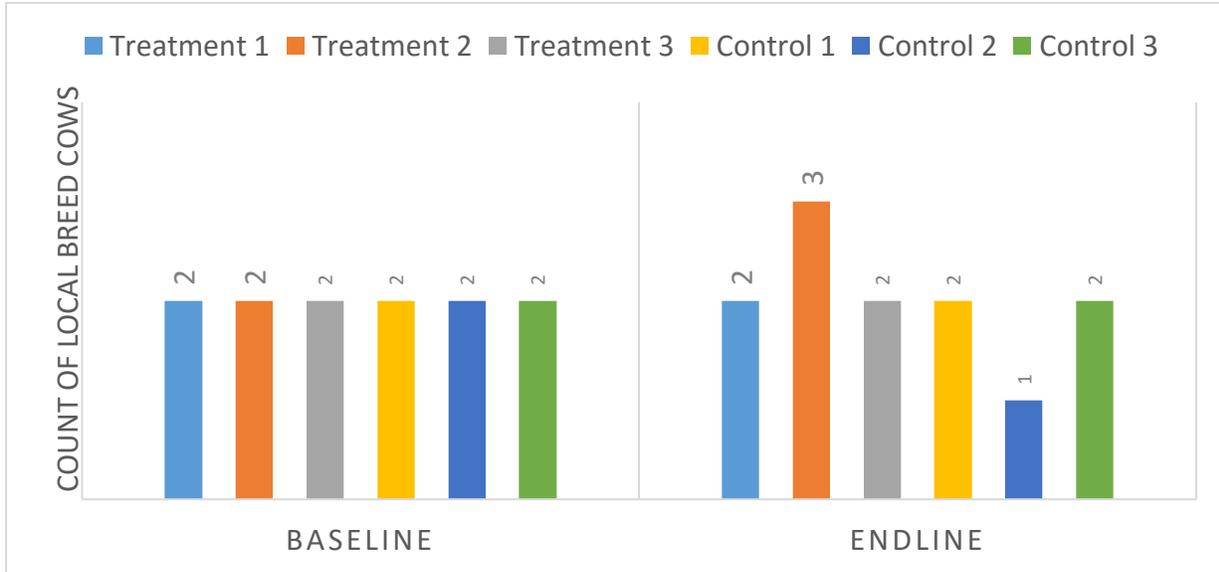
Breeds of Cow

The count of local breed cows is almost even between SDVC producers and control producers. There has been a slight increase in the overall count of local breed cows in the herds of SDVC producers in some districts. However, there is no significant change in the local breed component of most household herd, regardless of treatment or control group.

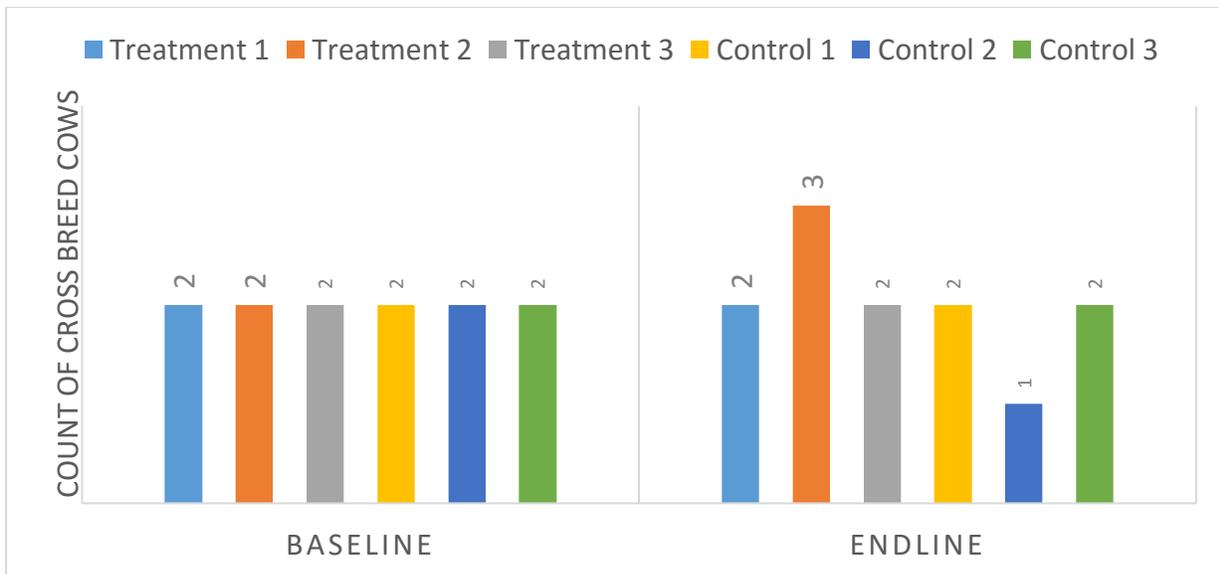
There has been a significant increase in cross breed cows in the SDVC treatment herds. This increase is attributable mostly to new SDVC producers adding cross breed cows to their herds.

This corresponds to a slight decrease in local breed cows within these same herds, which is a positive indication for the impact of the SDVC project.

Display 2 Number of local breed cattle per household, per district



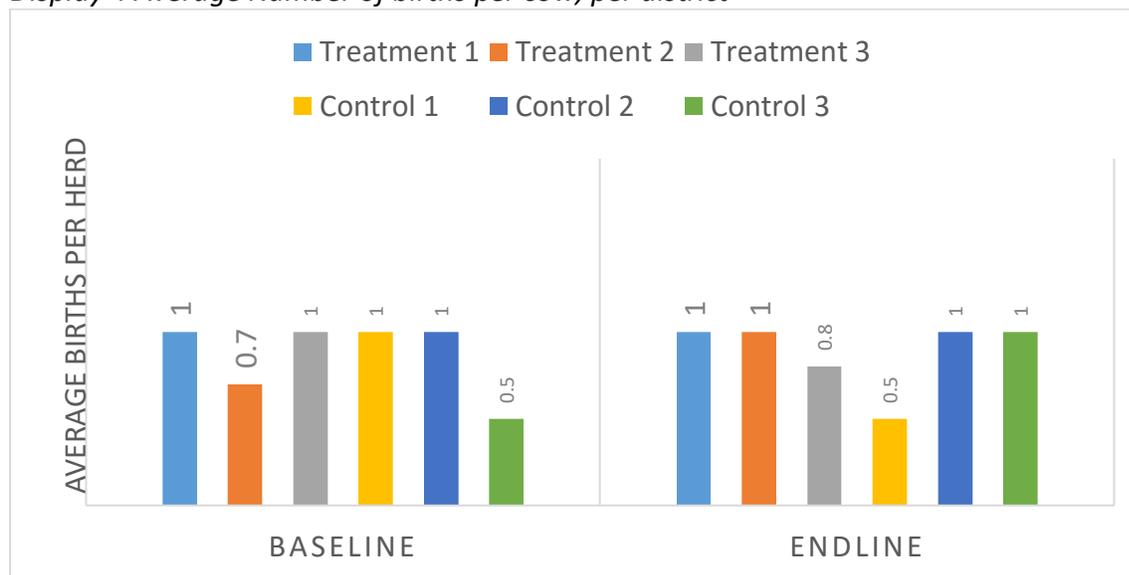
Display 3 Number of cross breed cattle per household, per district



Births of Calves

The typical number of births within the herds have been tracked over time. The births within the herds of the treatment and control groups are close to the same – with a slightly lower birth rate among the SDVC herds compared to the non-SDVC herds. But the difference is so small that it is not statistically significant.

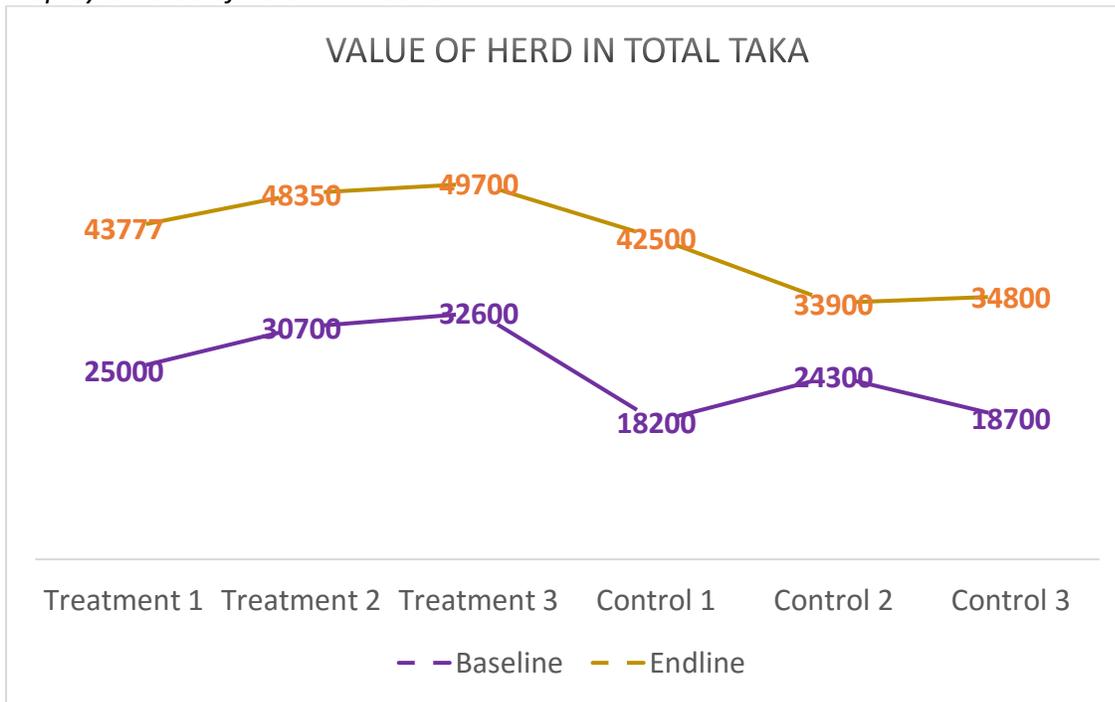
Display 4 Average Number of births per cow, per district



Herd Valuation

The value of a herd has been assessed over time by the farmers. It should be noted that these values are self-assessed and not linked to an objective market price. The value of the cattle within the herds of both the SDVC producers and the control producers has been increasing over time. However, the value of SDVC herds have increased at a higher rate than the control producer herds. Part of the SDVC increases are driven by the fact that the value of the cross breed cattle has increased quite dramatically for SDVC producers within the Kurigram district. It has remained relatively steady with a gradual increase in most other districts. Details on the value of herds broken out by breed of cow and district can be found in the Data Appendix.

Display 5 Value of herd in BD taka



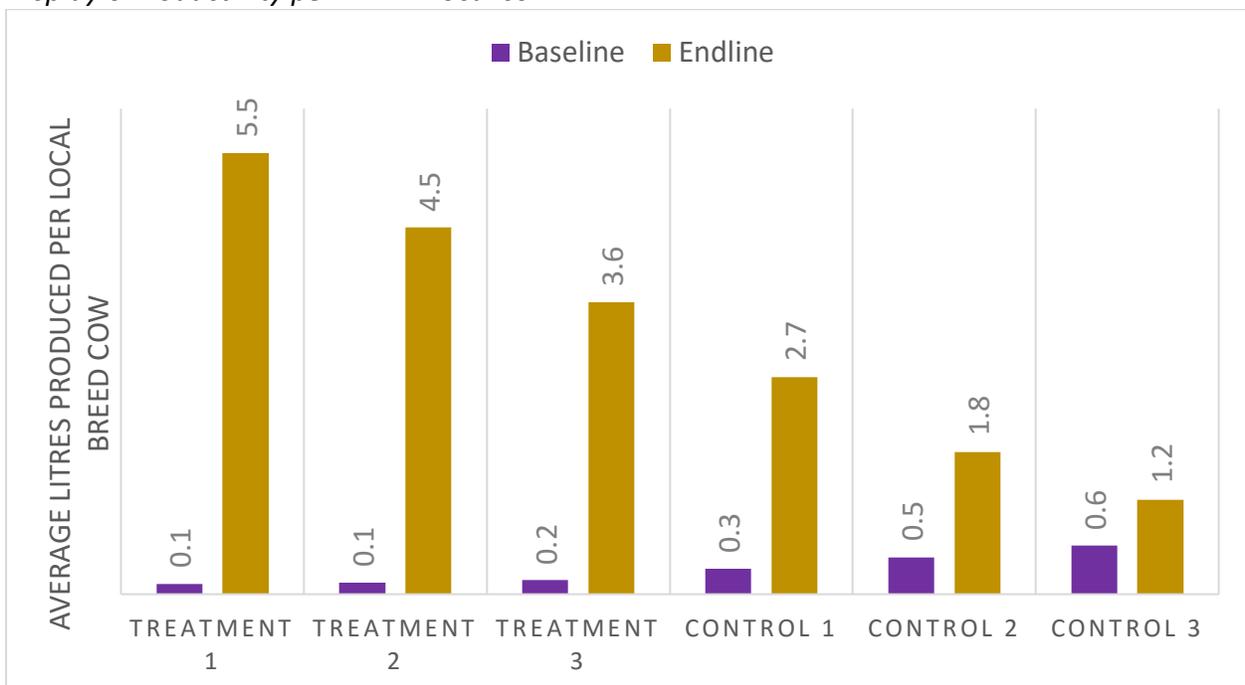
The total value of the household's herds has been increasing through two sources – increased number of cows within each herd and the rise in value of the individual cows. The overall value of each herd has increased significantly faster for the SDVC producers than it has for the control producers. Within the SDVC producers, the value of the herds has also consistently risen with each passing year.

Milk Production

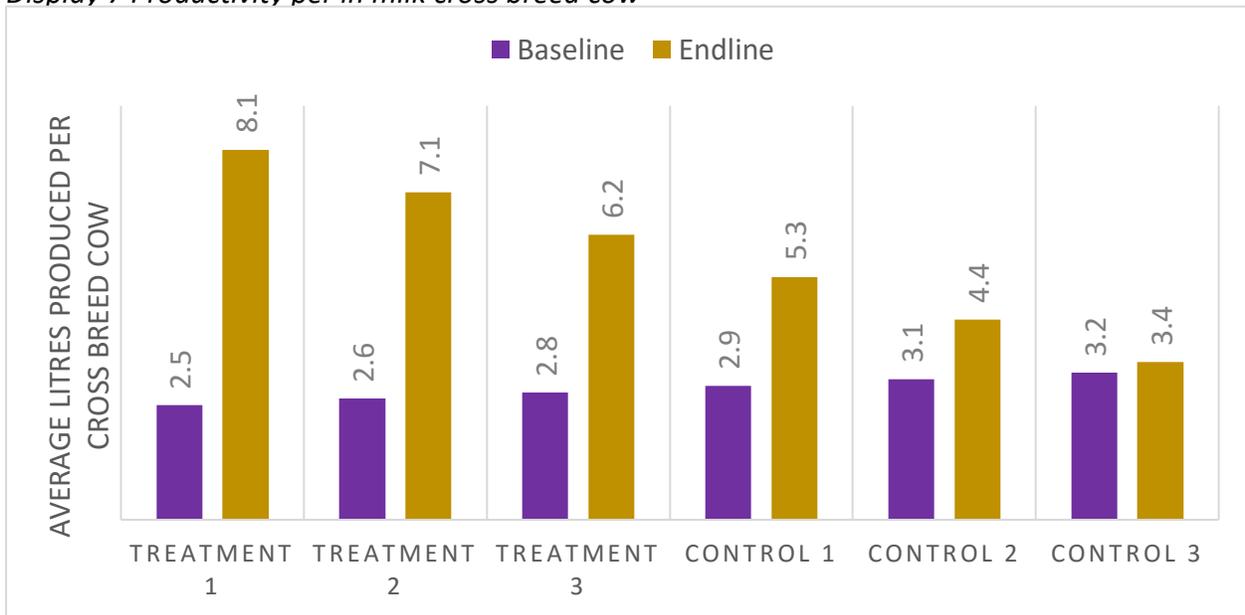
The average amount of milk produced per in-milk cow is a very important measure of progress for the SDVC project. When averaged over districts, the overall productivity per cow has increased faster for SDVC producers than it has for control producers. This is a sign of significant success for a core goal of the SDVC project. Details of the drivers of this improvement can be found in the Data Appendix. In summary, almost all districts, the average daily production has risen for SDVC farmers. Within the Nator, Rangpur and Sirajgonj districts, SDVC farms have seen a decrease in average productivity per cow. Control farmers in these districts did not experience a similar reduction in productivity.

The overall productivity per cow has increased faster for SDVC producers than it has for control producers. The increase in production has occurred for both types of farmers, but the SDVC producers have seen a faster increase in productivity. This is particularly true for cross breed cows. SDVC producers have seen a very significant increase in productivity within cross breed cows.

Display 6 Productivity per in milk local cow

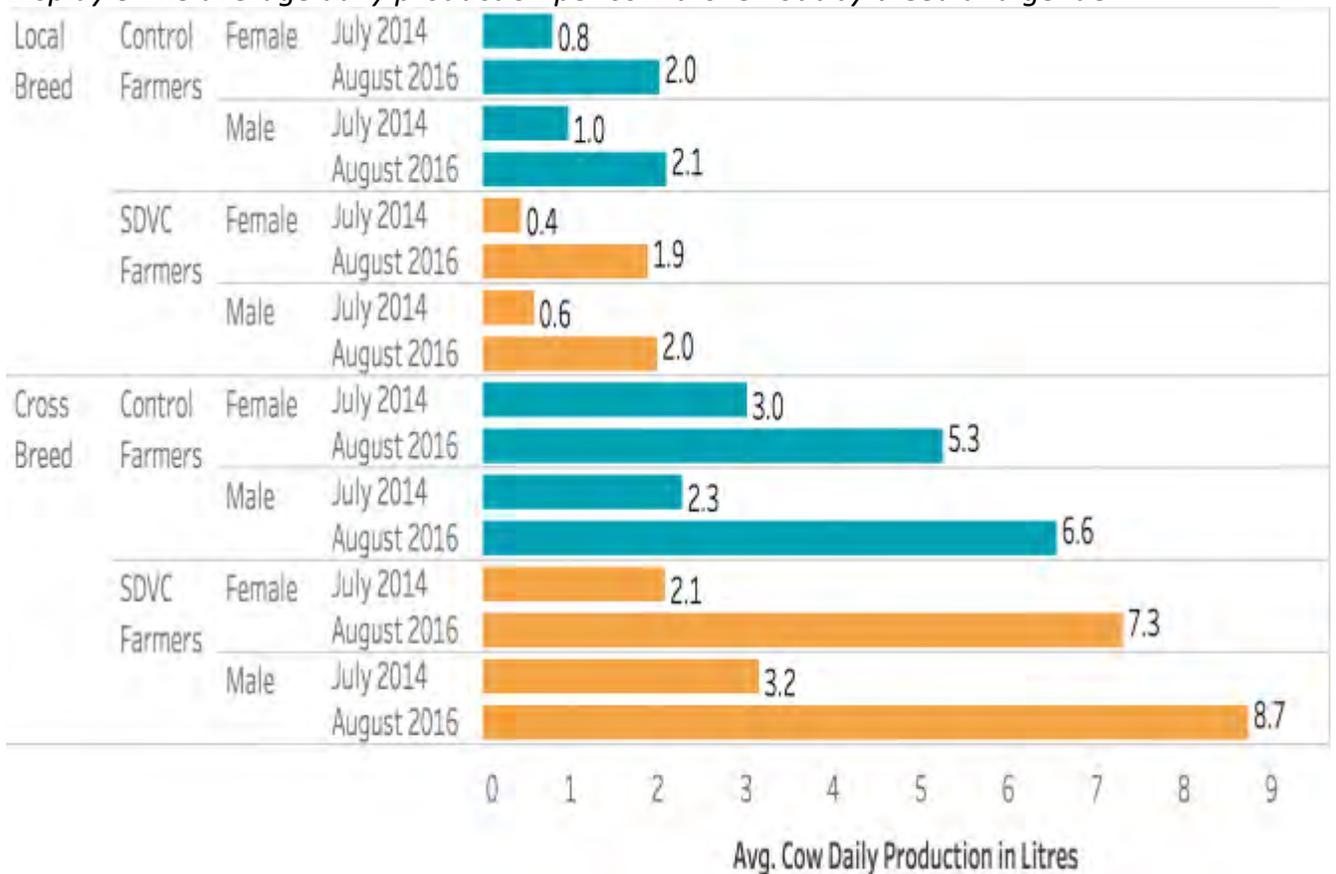


Display 7 Productivity per in milk cross breed cow



The increase in productivity has been higher fastest for female SDVC producers. These female farmers started off at the lowest levels of production per cow. However, their increase in productivity has been the fastest.

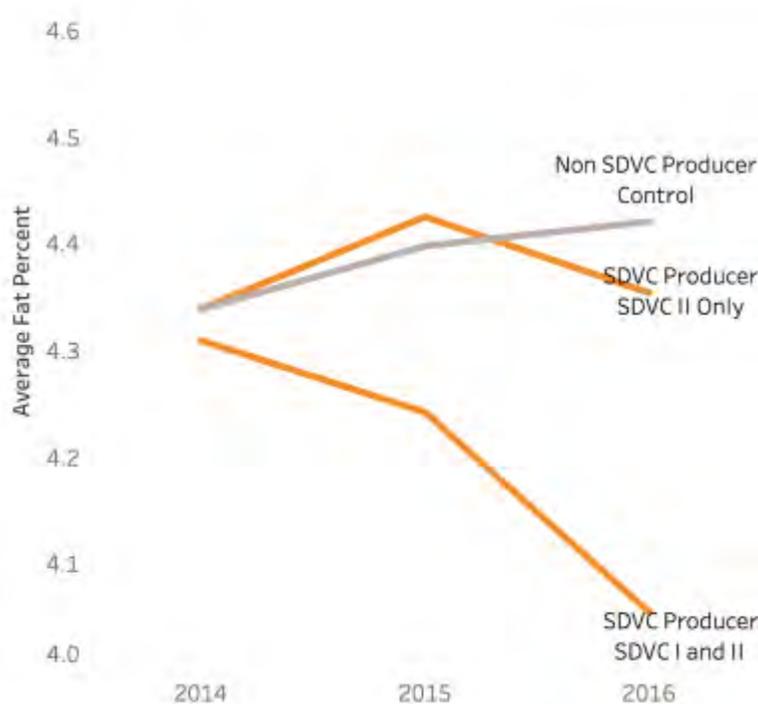
Display 8 The average daily production per cow broken out by breed and gender



Milk Quality: Fat Percent

The quality of the milk is very steady for all districts and both SDVC and control producers. There are occasional slight increases or decreases, but none of these are statistically significant. Nor do the slight changes seem to last on a permanent basis. Overall, the fat percentage in the milk being produced stays with an average around 4.3. There is a slight decrease in the fat percent for producers in the most recent few months, but it should be noted that this decrease represents a dip of less than 1 percentage point and is not meaningful in a statistical sense.

Display 9 Fat Percentage by SDVC Status



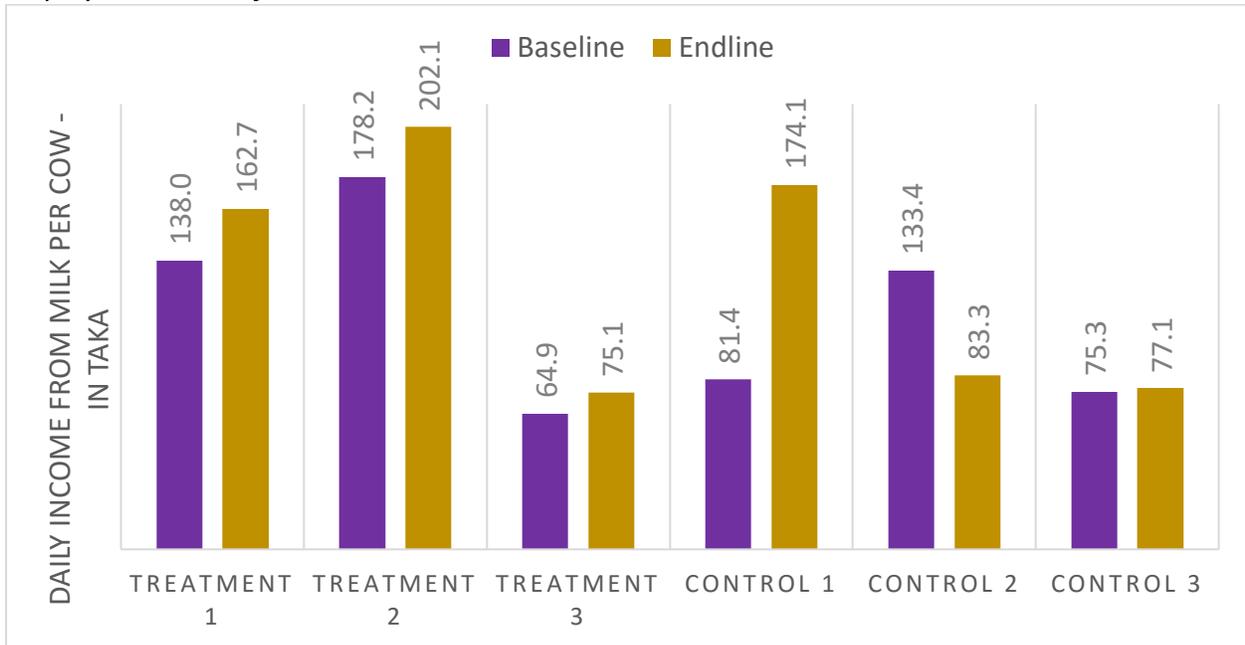
Milk Sales and Consumption

Income from Milk

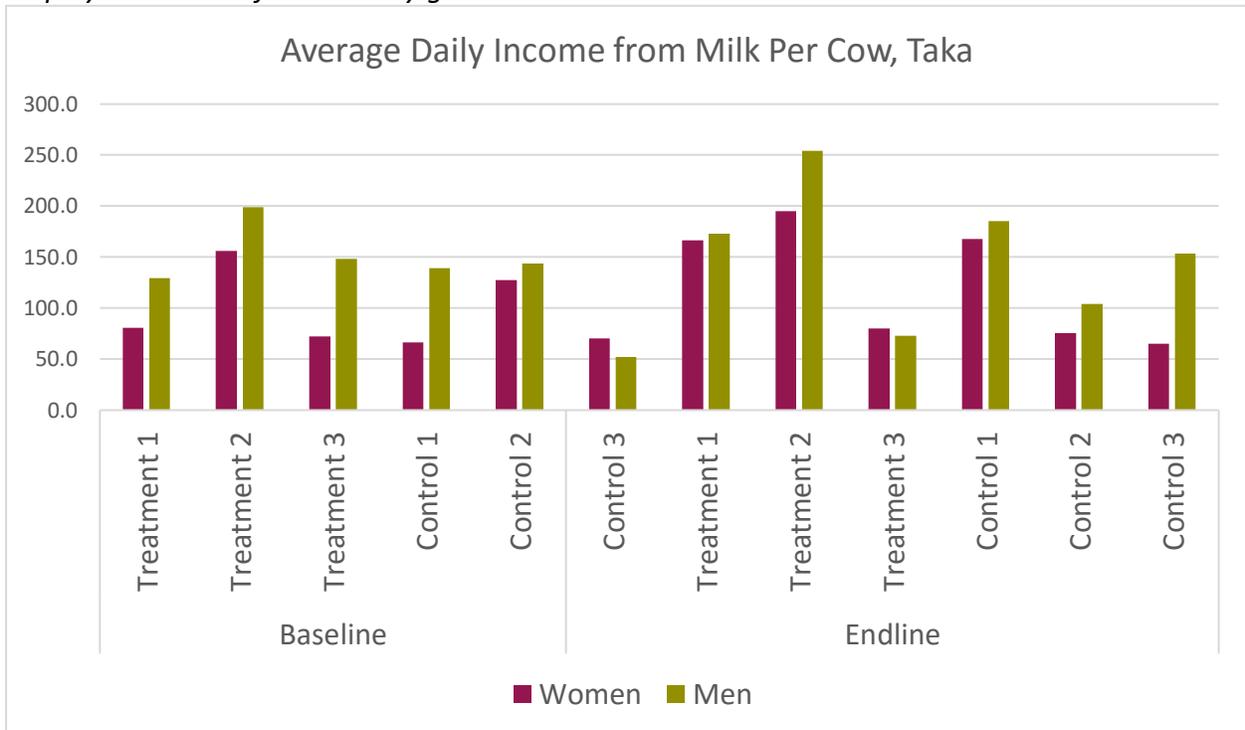
Both the SDVC producers and the control producers are earning increased incomes from milk sales. These increases have a much higher rate for the SDVC producers than for the control producers. This is due to two influences – the SDVC producers are getting more litres of milk each day from their cows. Secondly, the SDVC producers are finding ways to earn more taka per litre produced. These two in combination are resulting in higher levels of income from milk for SDVC producers than for the control producers. It is important to note that among the

control producers who did see an increase in their income from milk, it was among those producers who live in areas that are affected by the SDVC trainings and project initiatives. This is a positive sign of splatter impact of the SDVC project on the farmers that are not directly involved but who are positively impacted nonetheless. Display 11 also illustrates that these positive gains are happening at higher rates for SDVC women than for any other subgroup. This is even more signs of positive impact of the SDVC project towards their intended goals.

Display 10: Income from Milk



Display 11: Income from Milk by gender



Milk Consumption

In terms of milk consumption, the total number of litres that households are consuming is decreasing slightly. This is true for both SDVC and control households. However, when looked at more carefully, as in Display 13 which examines the litres of milk consumed per person, it becomes obvious that the consumption rate has essentially remained unchanged over the course of the SDVC II project.

Display 12 Total Milk Consumption in Liters

Round of Data Collection	Treatment/Control	Average Total Milk Consumption in Liters
Baseline	Treatment	1.33
Endline	Control	1.18
Baseline	Treatment	0.96
Endline	Control	0.89

Display 13 Total Milk Consumption in Liters Per Person

Round of Data Collection	Treatment/Control	Average Milk Consumption per Person in Household in Liters
Jul 2014	Treatment	0.27
Jul 2014	Control	0.26
Jul 2016	Treatment	0.22
Jul 2016	Control	0.22

However, the place that change in milk consumption has taken place over the course of the project is the priority of who can consume milk within the household. Of the milk that is consumed within households, there has been a sharp increase in the number of households who provide milk for consumption to all members of the household. At the start of phase 2 of the project, fewer than 10% of households had milk for all family members to consume. By the end of the phase, a full 40% of households provide milk to all family members for consumption. Details of who gets priority in milk consumption can be found in the Data Appendix.

Market Linkages

Of the milk that is sold to market, currently most of the milks is sold directly to the company. This is true for both SDVC farmers and control farmers. The second most common place to sell milk is to DFT sites. One additional piece of good news is that the proportion of all the milk that is produced that is lost to spoilage has decreased significantly from 2014 to 2016.

Display 14 Milk Distribution Patterns – percentages

Round of Data Collection	Treatment/Control	Milk Consumed	Milk Given Away for Free	Milk Sold to Neighbors	Milk Sold at DFT	Milk Sold to Milk Collector	Milk Sold at Open Market	Milk Sold Directly to Company	Milk Sold Directly to Sweet Shop	Milk Spoiled
Baseline	Treatment 1	0.3%	8.1%	7.7%	34.1%	13.7%	2.7%	33.0%	0.2%	1.0%
	Treatment 2	0.1%	1.0%	2.6%	22.8%	3.0%	2.1%	67.6%	0.6%	0.1%
	Treatment 3	0.2%	4.5%	5.1%	28.4%	8.3%	2.4%	50.3%	0.4%	0.6%
	Control 1	5.0%	2.3%	0.0%	58.0%	30.1%	2.3%	1.2%	0.8%	1.0%
	Control 2	6.0%	7.4%	0.0%	29.8%	21.4%	2.7%	35.0%	0.0%	0.0%
	Control 3	0.3%	12.5%	0.0%	30.7%	33.4%	20.8%	0.0%	2.2%	0.3%
Endline	Treatment 1	1.7%	3.1%	34.5%	13.1%	7.8%	15.1%	16.6%	6.6%	1.7%
	Treatment 2	1.9%	2.4%	18.5%	16.3%	8.1%	14.6%	33.6%	2.7%	1.9%
	Treatment 3	8.9%	8.3%	6.3%	21.3%	15.8%	18.8%	12.5%	0.0%	8.9%
	Control 1	1.6%	4.2%	17.1%	12.7%	9.8%	23.5%	25.0%	4.4%	1.6%
	Control 2	1.6%	4.2%	17.1%	12.7%	9.8%	23.5%	25.0%	4.4%	1.6%
	Control 3	6.0%	10.0%	0.0%	30.7%	30.0%	17.0%	0.0%	5.0%	2.0%

Dairy Practices

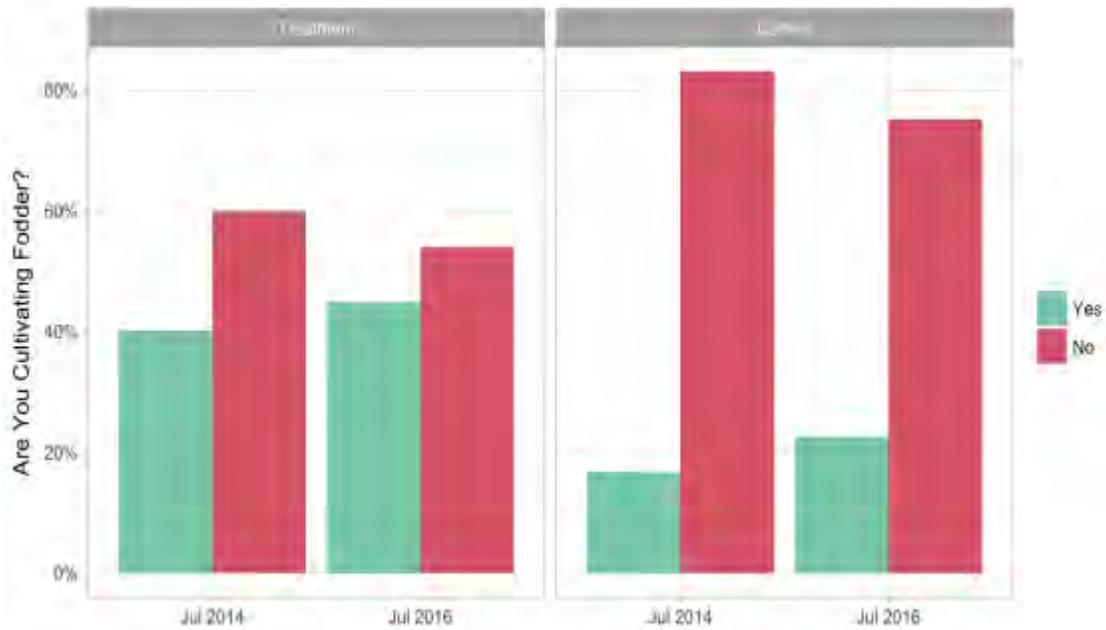
Improvements in the dairy practices employed by producers is a key aspect of the SDVC II implementation. It is through these improved dairy practices that we are expecting producers to increase their yields and success rates. The following displays seem to illustrate success in many of these areas. For complete details on the diverse agricultural practices being implemented as part of the SDVC can be found in the Data Annex.

Fodder and Grass

In terms of fodder, there is a significant increase in the proportion of SDVC producers who are cultivating fodders. And the rate of increase is significantly higher than the increase rate for non-SDVC producers.

In addition, a large proportion of producers are cultivating a wider range of high quality fodder by the end of this phase of the SDVC.

Display 14 Fodder



When looking at feeding cattle green grass, the rates of producers in the SDVC project who are already using green grass are so high that there is very little room for improvement. The rate has stayed relatively steady from baseline to endline.

Display 15 Green Grass



Deworming and Bio Security

The rates of deworming were very high for the SDVC producers right from the beginning of this phase. And it stayed at a high level throughout. The rate of the non-SDVC producers using deworming was much lower at the start of this project. This rate did increase in the past two years, however, it is still lower than the SDVC producer level.

Display 16 Deworming



In a similar trend as deworming, the levels of producers who washed their cattle was extremely high at the start of the project. In 2014, nearly 100% of SDVC producers did wash their cattle. This level stayed steady throughout the project's second phase. Interestingly, the proportion of control producers who say they do not wash their cattle has increased significantly since the start of the project.

Bio-Security is an important aspect of the dairy value chain. Overall, there have been good increases in the adoption level of bio-security measures in the producers. The SDVC producers have largely moved from using a single method – most commonly a mosquito net or coil to using multiple bio-security measures, including at least on mosquito net or coil. By the endline, almost 20% of the SDVC producers were using multiple methods of biosecurity compared with only 10% of control producers.

Artificial Insemination

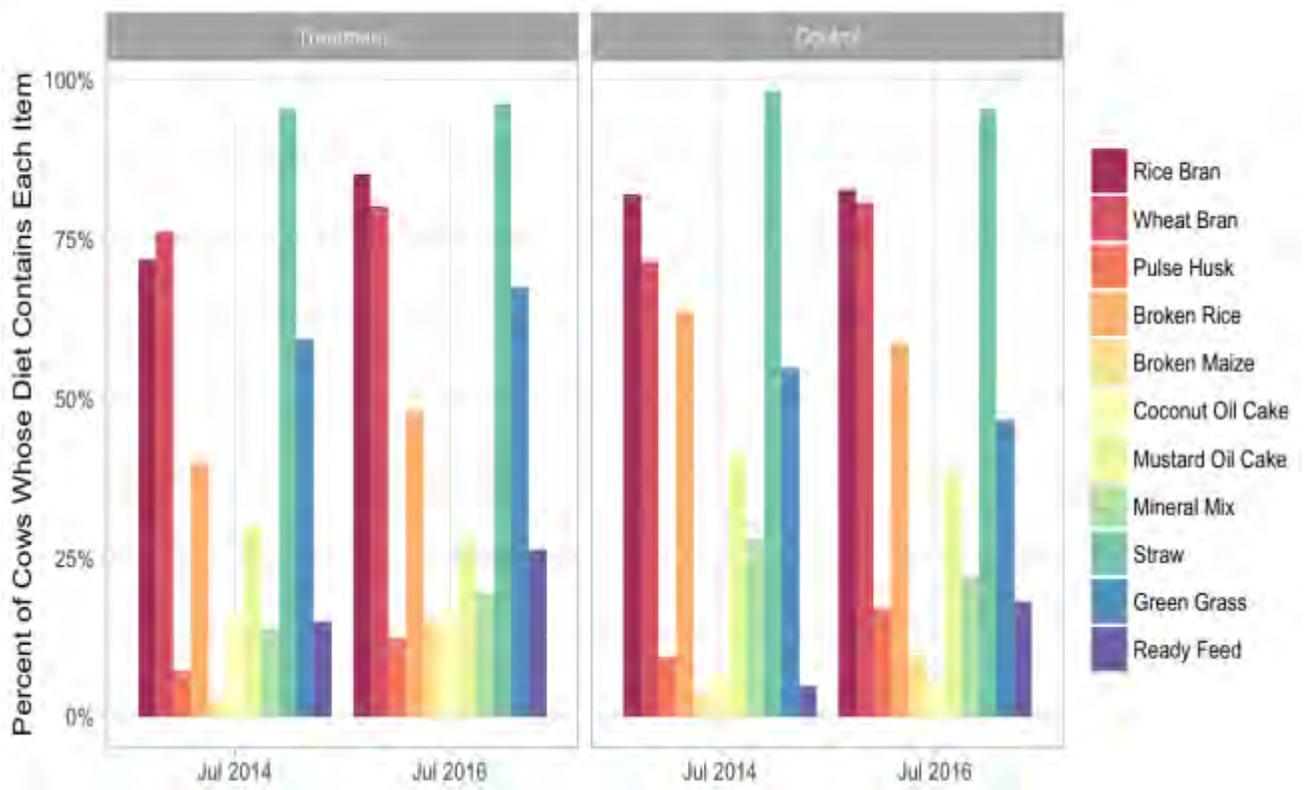
The use of artificial insemination has been a key focus of the project. The various methods and best practices have been consistently taught among the learning groups. The proportion of SDVC producers using AI has dropped slightly from 2014 to 2016. At the same time, the proportion of control producers using AI has increased. Among the SDVC producers who do use

AI, most now use the services of NGOs and most of the control producers use private AI. This may be an indication that private AI service providers have been more successful at marketing their services than NGO providers have been.

Herd Diet

The diet of the cattle is crucial to the dairy change success. The majority of the cattle in SDVC households now eat a diverse diet that includes grass, bran and mineral mix. A positive indicator is the significant increase in the proportion of cows who regularly eat ready feed. Both SDVC and control producers have increased their use of high quality feeds, but the SDVC producers have increased their high nutrition offers more quickly.

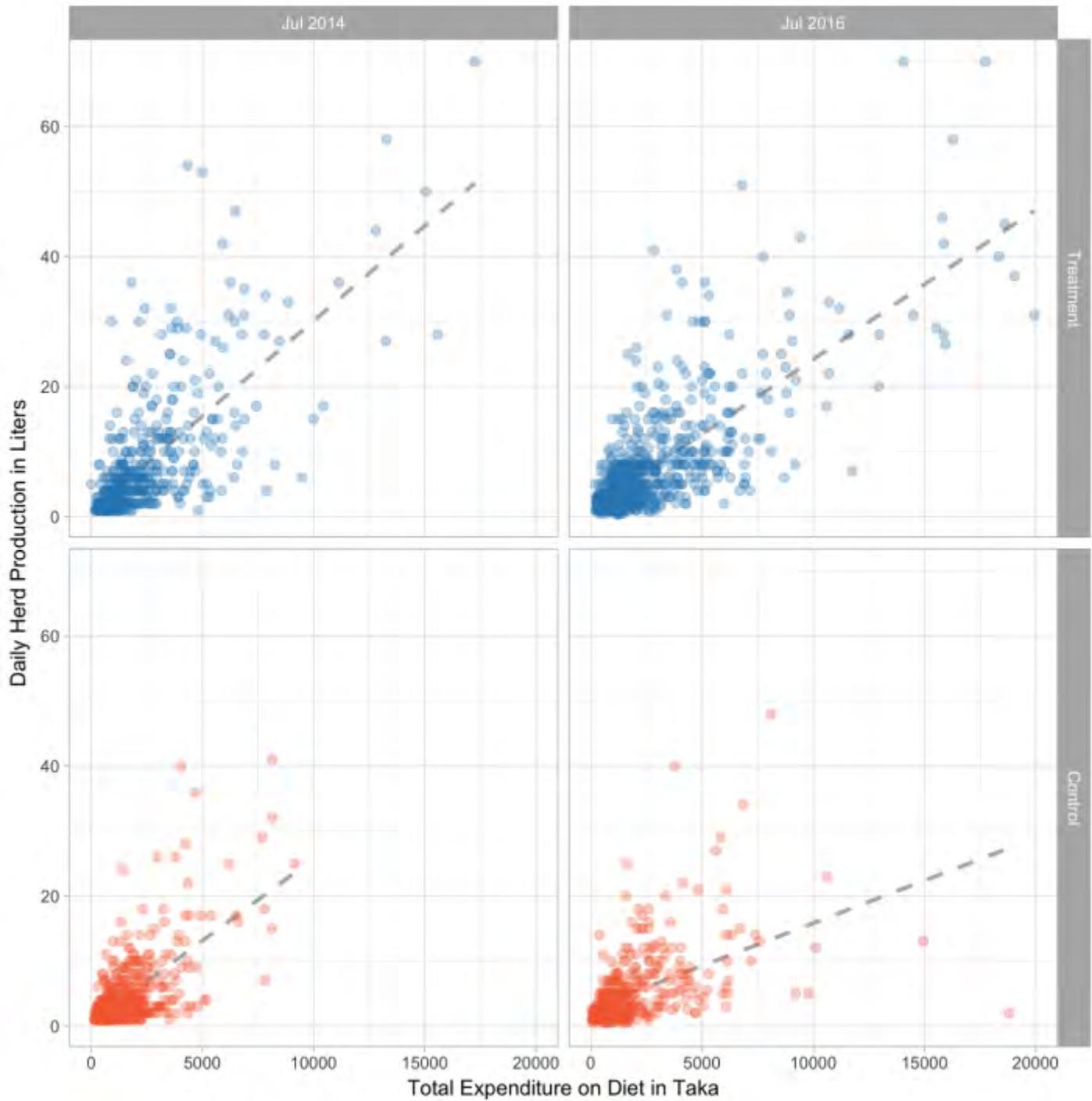
*Display 16 Diet of the herd
How many cows eat each of the 13 things?*



Dairy Practices Influence Herd Productivity

The relationship between how the farmers feed and care for their herds and the production of the herds is a key indicator for understanding the SDVC Phase 2. In the following displays, we can see that there is a highly significant and positive relationship between good nutrition and good productivity. It is a very good sign for the SDVC project that the rate of effectiveness for the SDVC producers is higher than for the control producers. This means that the SDVC producers are getting maximum value for the cost of their feed choices.

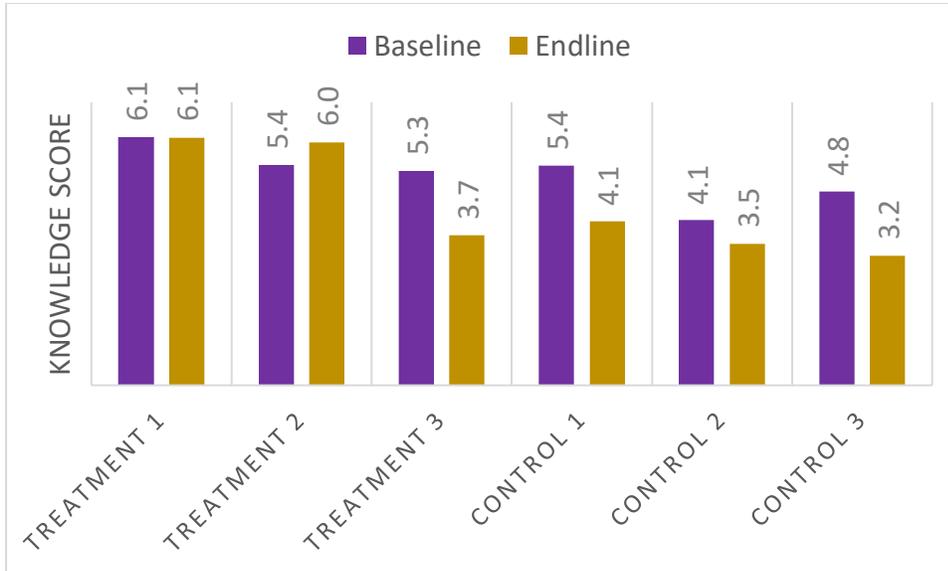
Display 17 Relationship between expenditure on cow diet and cow production levels
Dot for each herd: expenditure on diet vs. herd production (4 plots)



Knowledge and Practice Scores

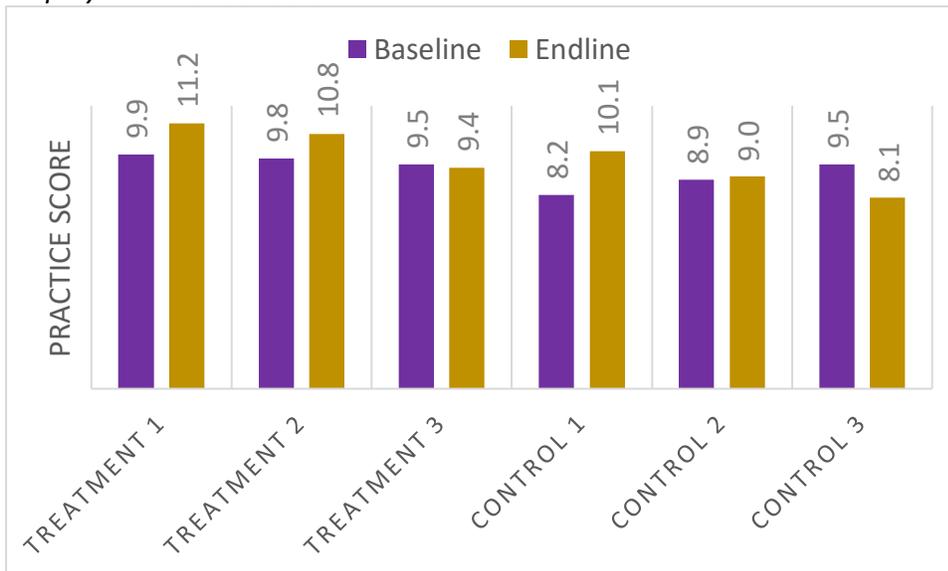
The SDVC Phase 2 has been tracking the general dairy knowledge score and practice score for individual households. This is an indicator of general awareness of best practices and optimal choices and their applications. Interestingly, the knowledge score for the SDVC farms has remained steady at 6 on a scale of 1 to 10. This is above average. The average non-SDVC farmer has a knowledge score of 4. A full two points lower than the average SDVC farmer. This is a good sign of success on a key aim of the project.

Display 18 Knowledge Scores



In addition, the practice score, which represents the level at which farmers actually implement the best practices they are aware of, is also a bit higher for SDVC producers than it is for non-SDVC producers.

Display 19 Practice Score



Gender and Dairy Practices

Women’s empowerment is one of the founding principles that the SDVC project is based on. This covers the types of dairy practices that women are involved in, the gender balance of assets and decision making, and women’s mobility.

In terms of how decisions are made around how to spend money that is earned, the SDVC producers have had significant increases in the proportion of decisions that are made by women themselves. In addition, there has been a significant increase in the proportion of decision made jointly between women and their husbands. Both of these are extremely positive signs.

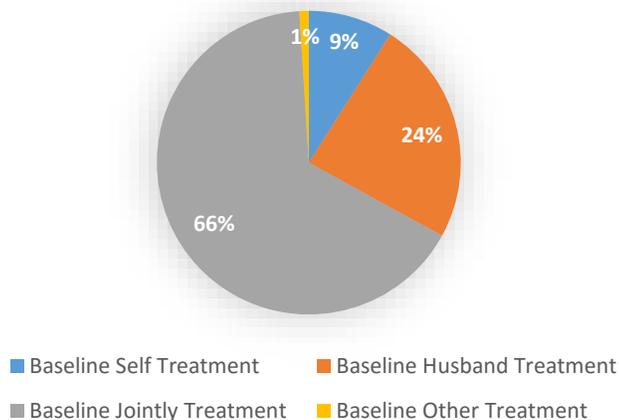
Decision Making

When looking closely at the trends in decision making every six months within the SDVC producers, we see that early in this phase more women started making decisions on their own. And once that empowerment had been established, the family started making decisions jointly. Given what we know about the preferences of most Bangladeshi households, this is an extremely good sign.

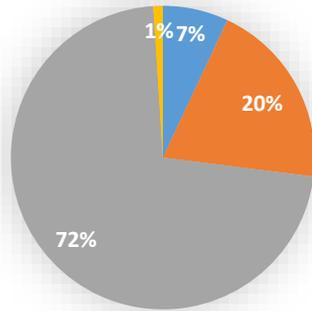
How the household decides to spend money earned from the sales of milk are similar to the trends on how households decide to spend money in general. Between 2014 and 2016 a significantly higher percentage of treatment households are making the spending decisions together. And fewer of the decisions are being made by the husbands alone. The control producers also experienced this trend – to a larger degree than the SDVC producers. So these changes cannot be attributed to the SDVC project alone.

Display 20 a,b,c,d Decision maker on how to use milk sales income

Who Decides Milk Income Use SDVC Baseline

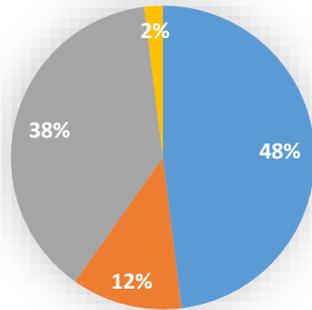


Who Decides Milk Income Use SDVC Endline



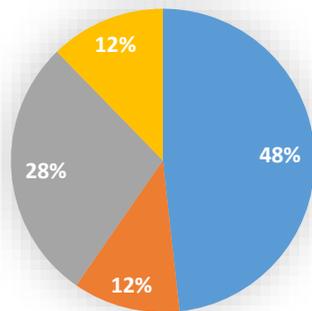
- Endline Self Treatment
- Endline Husband Treatment
- Endline Jointly Treatment
- Endline Other Treatment

Who Decides Milk Income Use Control Baseline



- Control Self Control
- Control Husband Control
- Control Jointly Control
- Control Other Treatment

Who Decides Milk Income Use Control Endline



- Baseline Self Control
- Baseline Husband Control
- Baseline Jointly Control
- Baseline Other Treatment

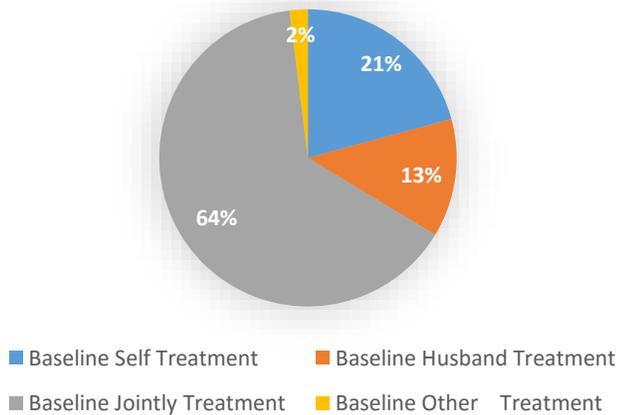
The trends in decision making within the household are not steady throughout the course of the project for SDVC producers. At the start and end of the project, the husbands are making more of the decisions. However, in the intervening years, the proportion of decisions that are made by the husbands alone are quite smaller. The detailed breakdown of these decision making trends are available in the Data Appendix.

Asset Decision Making

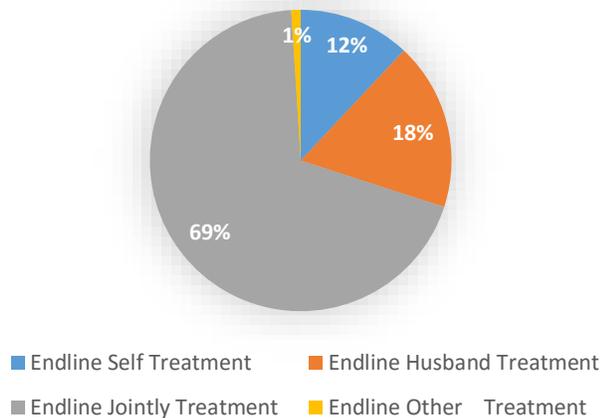
When the households purchase assets, the majority of the decisions are made either by the woman herself or jointly. Many more of the treatment households make the decision jointly by the end of the phase than the control households. This is a positive sign for the impact of the SDVC project.

Display 21 a,b,c,d Decision maker to purchase assets

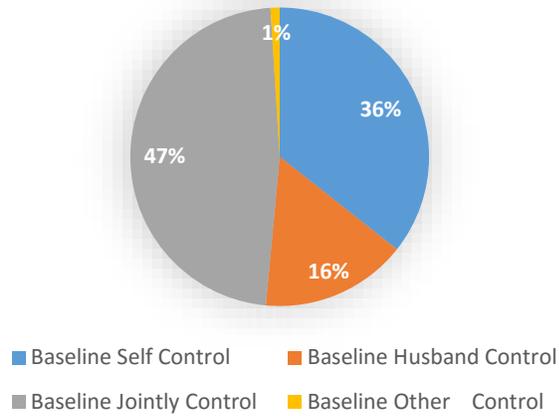
Who Decides to Purchase Assets SDVC Baseline



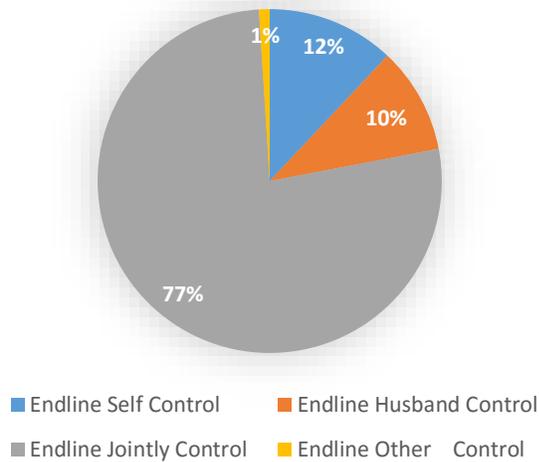
Who Decides to Purchase Assets SDVC Endline



Who Decides to Purchase Assets Control Baseline



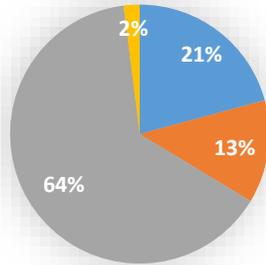
Who Decides to Purchase Assets Control Endline



Once the household obtains the asset, who within the household controls the asset is a key factor in gender equity within the household. For the SDVC households, these proportions did not change in a statistically significant way. Most of the assets are controlled jointly – with a smaller proportion being controlled either by the woman or man alone.

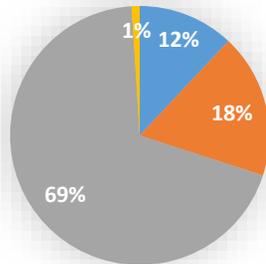
Display 22 a,b,c,d Person in control of assets

Who Controls Assets SDVC Baseline



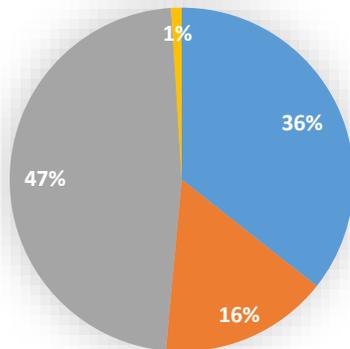
- Baseline Self Treatment
- Baseline Husband Treatment
- Baseline Jointly Treatment
- Baseline Other Treatment

Who Controls Assets SDVC Endline



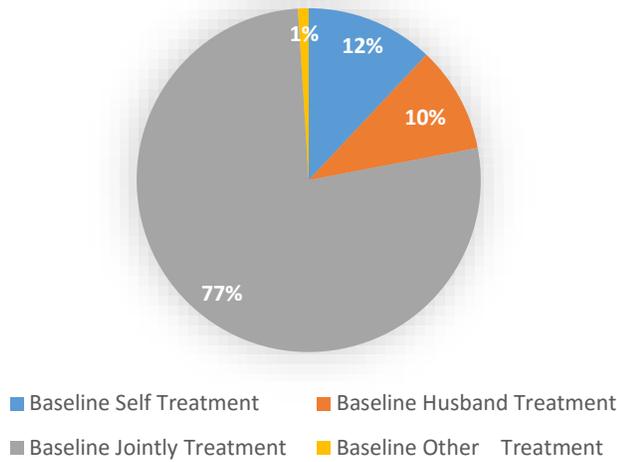
- Baseline Self Treatment
- Baseline Husband Treatment
- Baseline Jointly Treatment
- Baseline Other Treatment

Who Controls Assets Control Baseline



- Baseline Self Treatment
- Baseline Husband Treatment
- Baseline Jointly Treatment
- Baseline Other Treatment

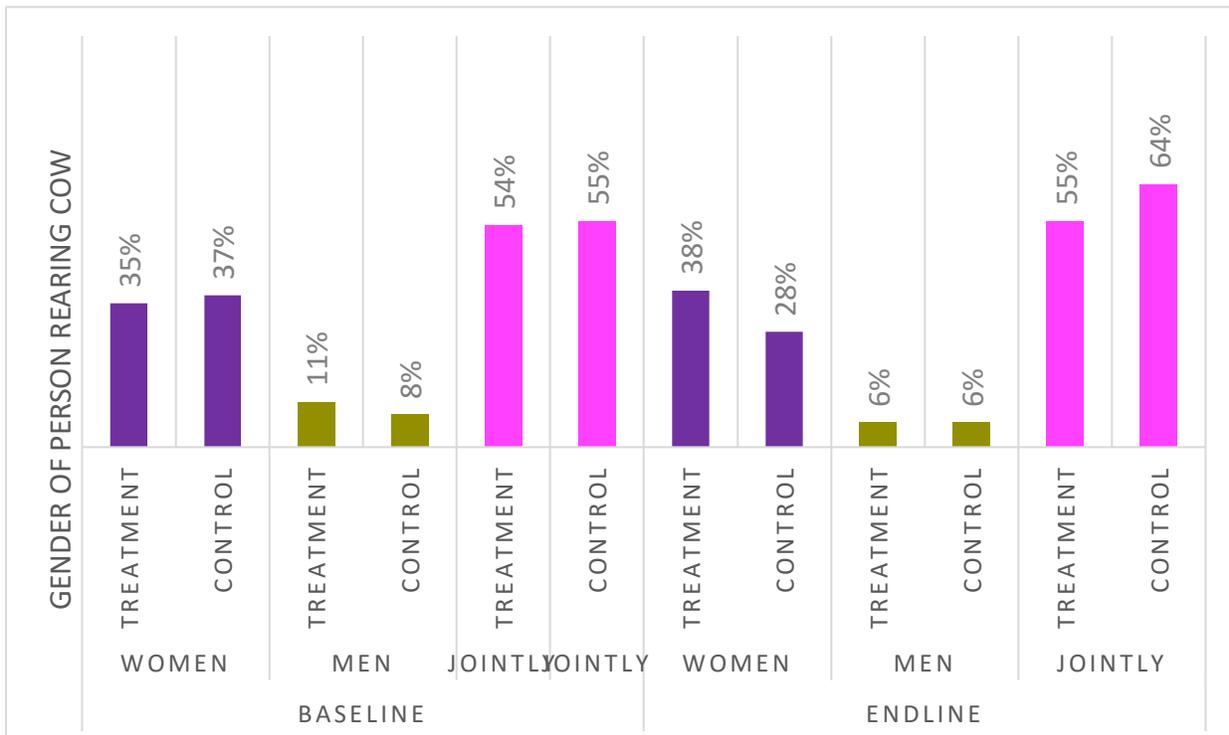
Who Controls Assets Control Endline



Gender and Raising Cattle

The gender of the person rearing the household's cattle has been shown to have an effect on the success of the dairy value chain. We see from the start of the phase to the final round that for SDVC households, more women are now caring for the household's cattle. This trend is reversed within the treatment households. Both types of household have the majority of cattle being cared for jointly.

Display 22: Gender of person rearing cattle



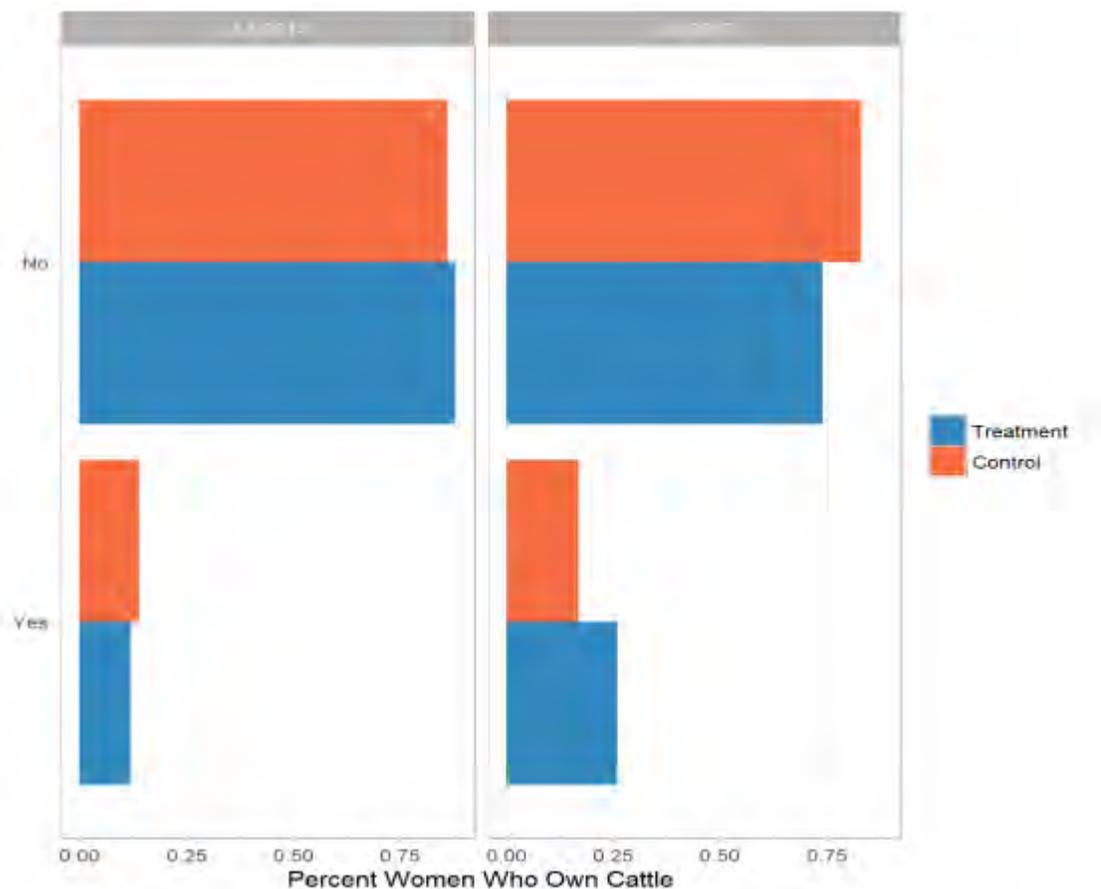
With much of the data on the gender of the person who is involved in dairy practices, there has not been significant change. This is also true for the gender of the person who is purchasing the cow. For both SDVC and control households, most of the cows are purchased jointly. However, for both types of households have seen an increase in the proportion of men alone purchasing cows.

The trend for who is involved in selling the cow is identical to what we see above. Most sales are made jointly. However, both SDVC and control households have seen significant increases in men making the sale alone.

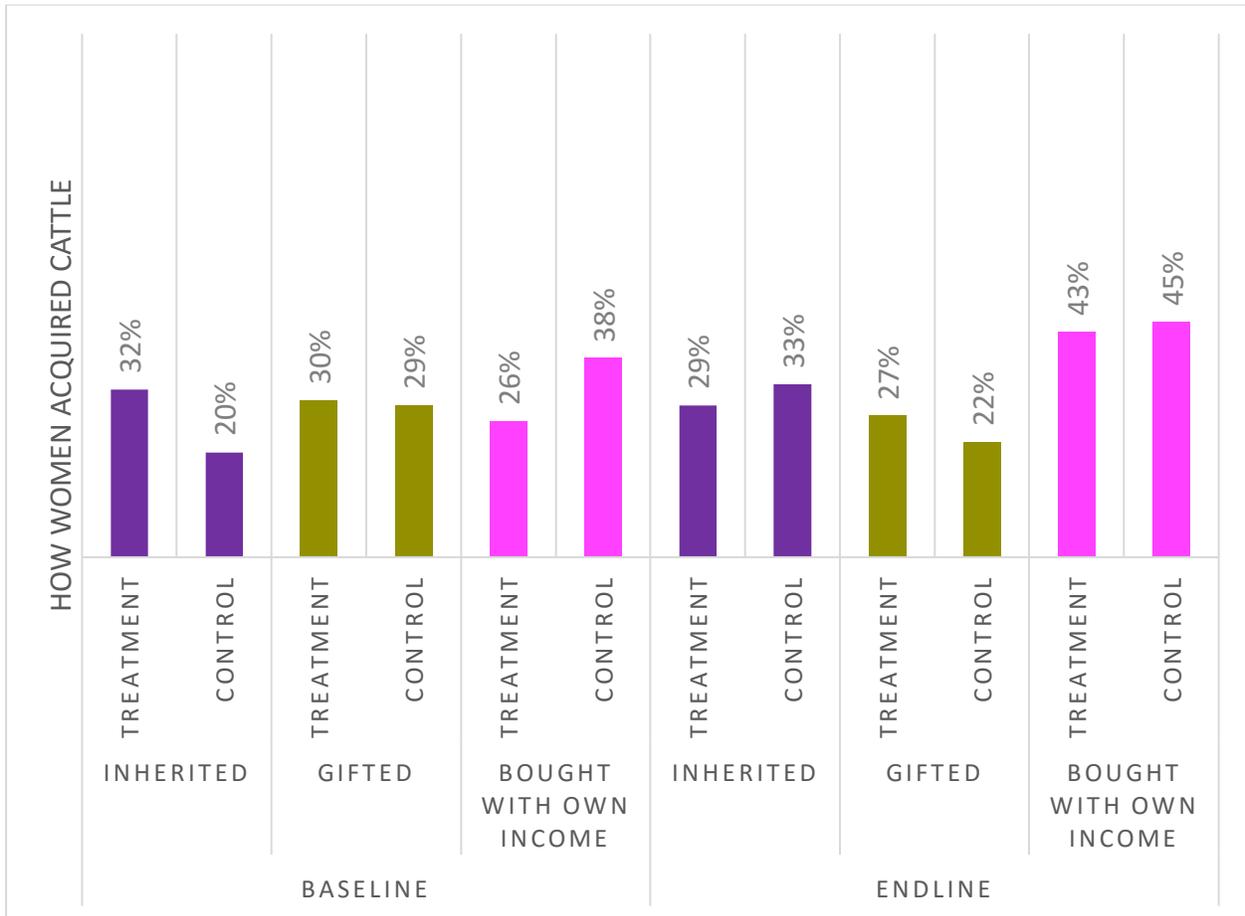
There have been significant changes in who is milking the cows. For the SDVC producers, at the beginning of the phase, women were mostly milking the cows and by the end of the phase it was being done jointly. This is a very good sign for an equitable distribution of labour within the household.

There has been a significant increase in the proportion of SDVC women who own their own cattle. This is a positive indication of the impact of the SDVC phase 2. Additionally, the fact that most of these cows were purchased with their own money is even a better sign.

Display 23 Women Who Own Cattle



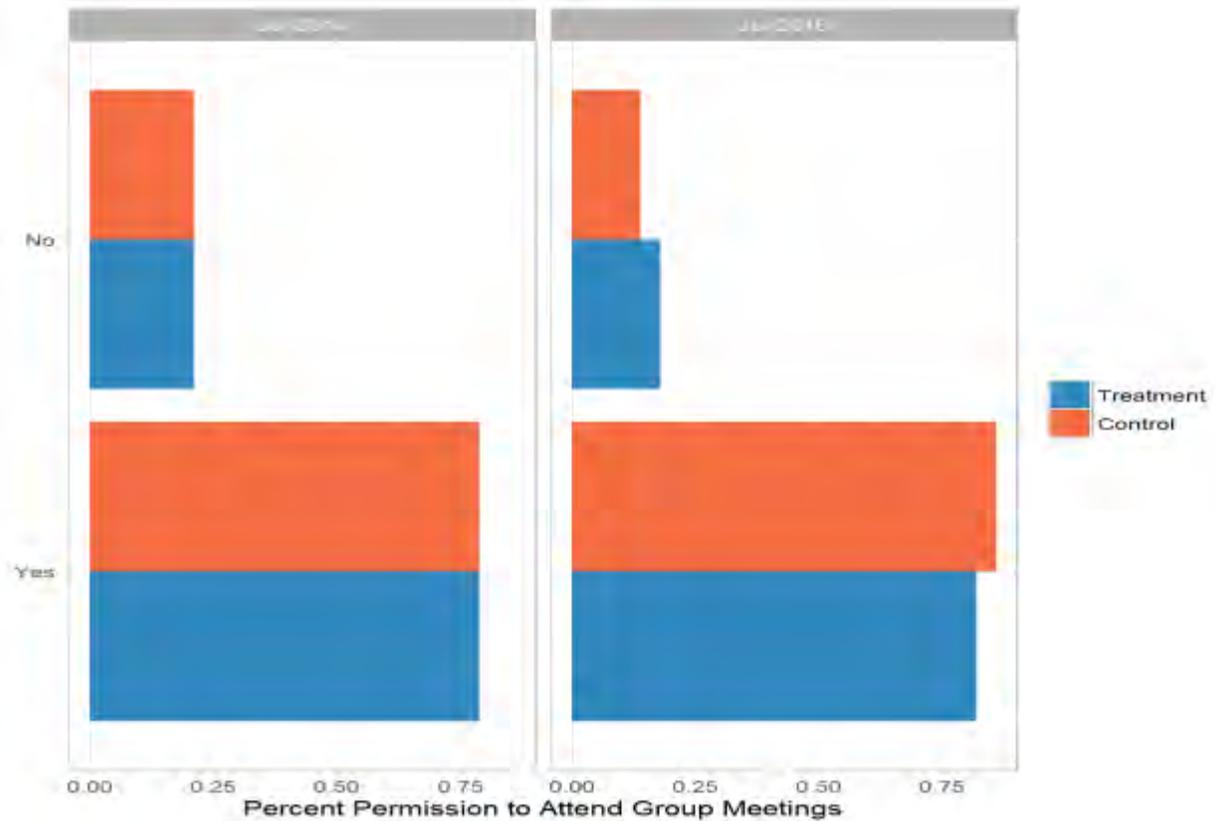
Display 24: How Women Acquired Cattle



Women's Mobility

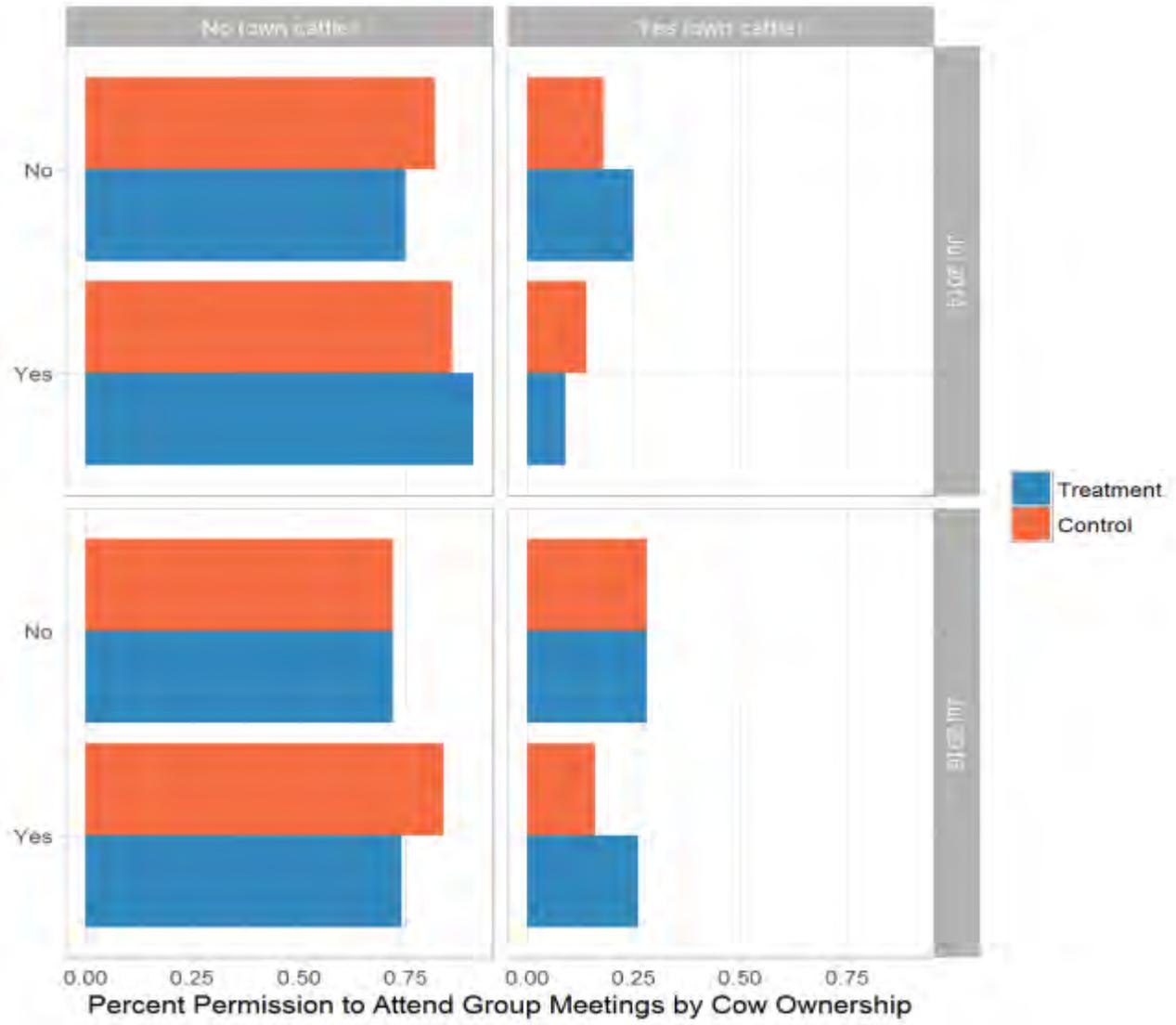
Many of the women in our households need permission to travel outside of their home. The majority of women need permission to travel. There has been very little change in the mobility status of women over the course of this phase of the SDVC project. The majority of women in both types of households need permission to attend group meetings.

Display 25 Permission to attend group meetings



The rate at which women need permission to attend their group meetings is influenced by whether or not they own cattle. The women who own their own cattle do not need the same levels of permission to travel.

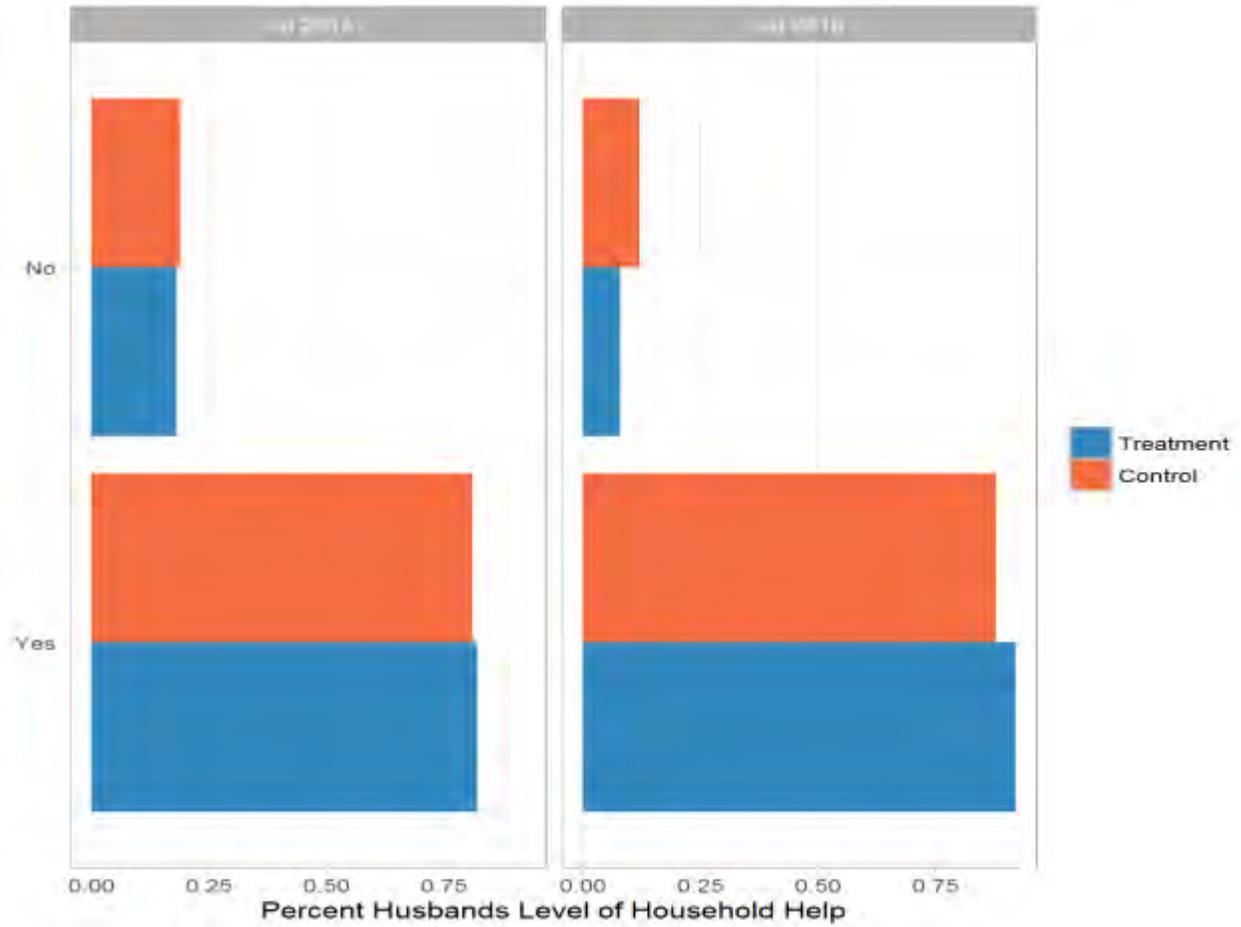
Display 26 Permission to attend group meetings by Cow



Household Labor by Gender

The gender equity of chores and labor within the households is key. There has been a significant increase in the level of husbands who help around the household for both SDVC and control households. The rate of increase has been slightly higher for SDVC households.

Display 27: Husbands' Level of Household Help



Household Economics

The project has been tracking the economics of the households over the past years. The data shows that the vast majority of households fund their dairy activities from their savings. Among the households that do have loans for their dairy activities, the size of the loan has stayed relatively steady over time – at about 25,000 taka. Further details are available in the Data Appendix.

Display 28 Size of loans

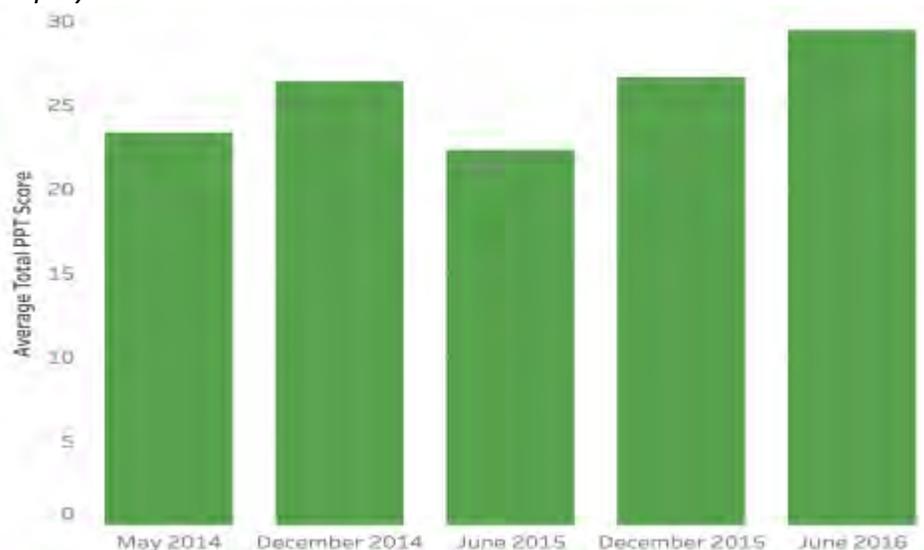
Round of Data Collection	Treatment/Control	Median Size of Loan in Taka
Baseline	Treatment	20000
	Control	15000
Endline	Treatment	30000
	Control	20000

Group Performance

The maturation of the learning groups is a key source of success of the SDVC project. The success and adoption rate of key practices have been tracked over the course of the SDVC phase 2.

Overall, the groups have increased in maturity over the phase. The data shows a slight dip in performance in 2015 but this is due to the fact that many new groups were added that year. We can see from Display 30 that these new groups quickly matured with the support of SDVC learning programs.

Display 29 Overall PPT score



Display 30 Total PPT Score by group type

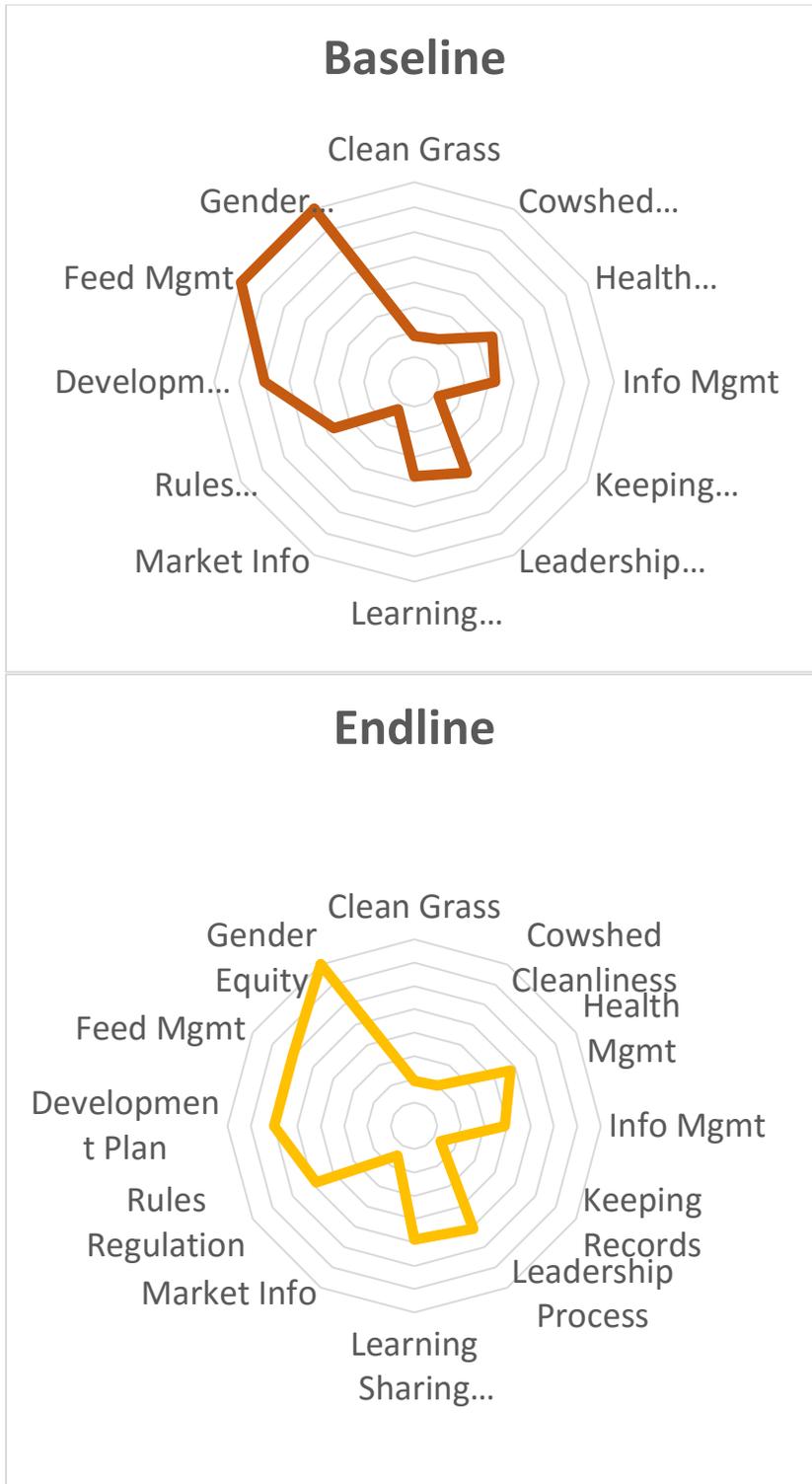


When looking at the specific ways the groups matured over the course of the phase 2 of the SDVC project, the biggest improvements occurred in the areas of Breed Development, Rules and Regulations, Development Plan, Health Management, Learning Sharing Space, and Leadership Process.

The groups experienced a moderate amount of improvement in Milk Marketing, Information Management, and Cowshed Management.

There was no significant improvement for the groups in the dimensions of Keeping Records, Proper Milking, Clean Grass, and Cowshed Cleanliness.

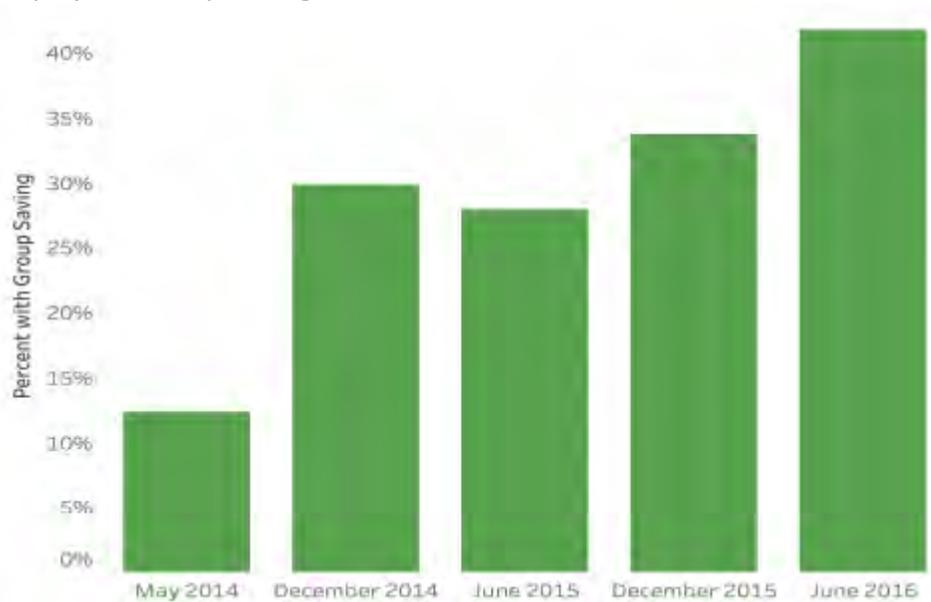
Display 31 a,b Distribution of Group Performance in Specific Domains



Group Savings

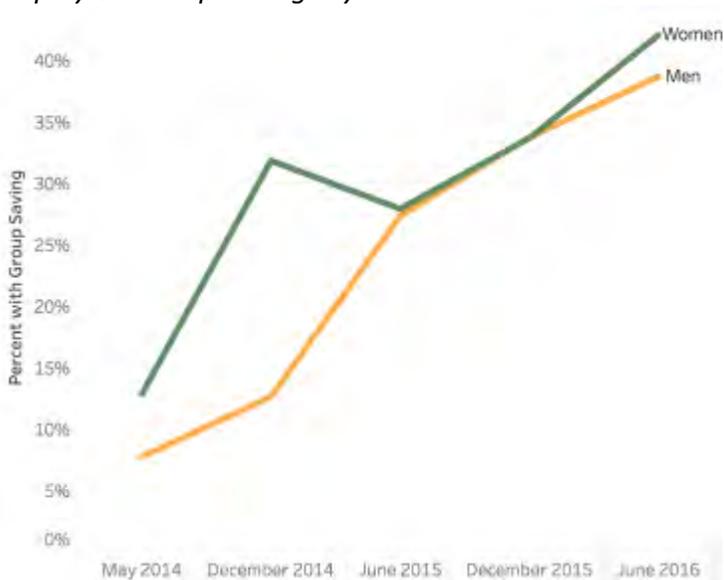
The level of group savings has been consistently increasing over the second phase of the SDVC. We have seen highly significant increases in the proportion of the group who have savings between 2014 and 2016.

Display 32: Group Savings

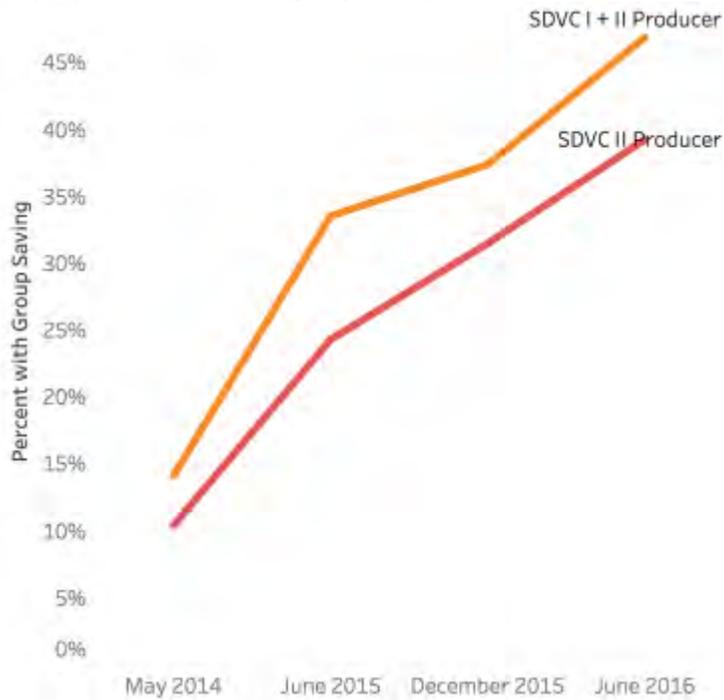


The increase in female producers with savings has been less steady than the male trajectory. However, the overall increase has been faster for women and for men. The increase in savings rates has been even for both types of producers in SDVC II.

Display 33 Group Savings by Gender



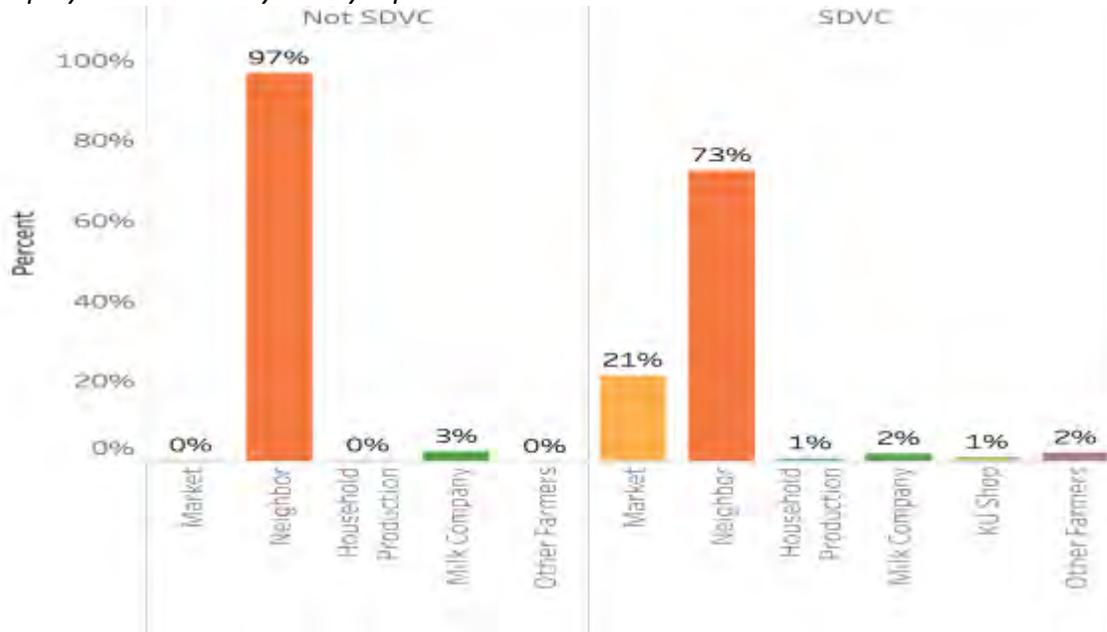
Display 34 Group Savings by Group Status



Inputs Experiences (KU Shop)

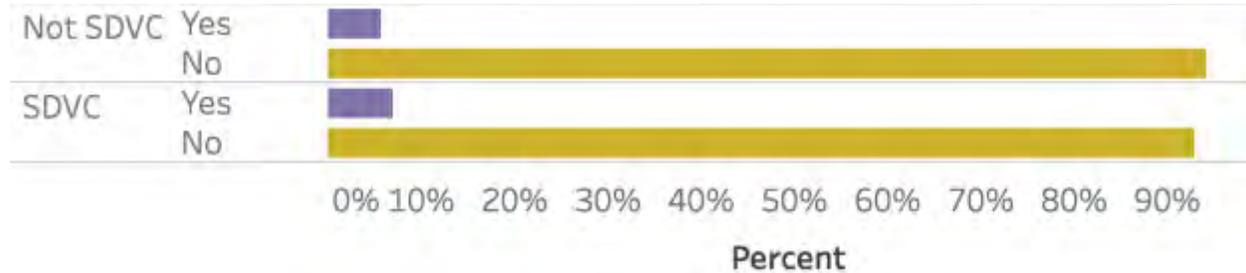
The majority of producers get their inputs from their neighbors. However, a much higher percentage of SDVC producers also purchase their inputs from the market – compared to almost none of the control producers.

Display 35 Where do you buy inputs



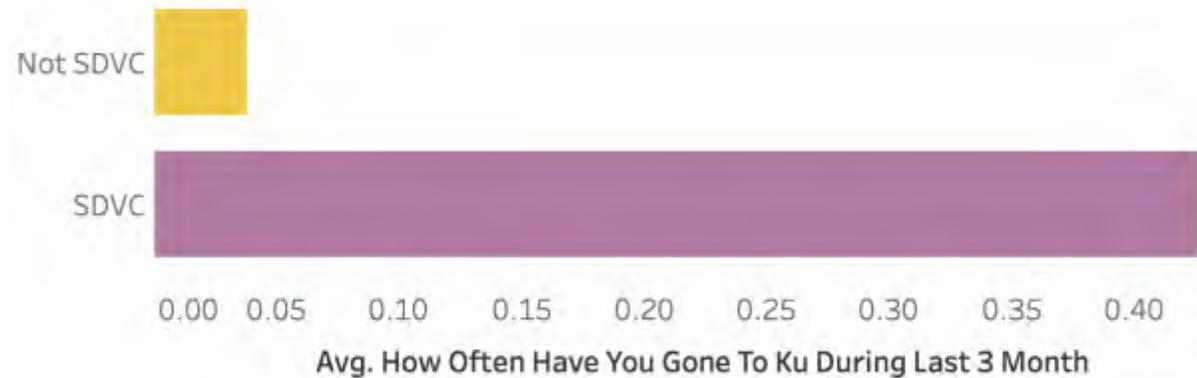
The vast majority of the producers did not change where they purchased their inputs between 2014 and 2016.

Display 36: Did you change where you buy inputs



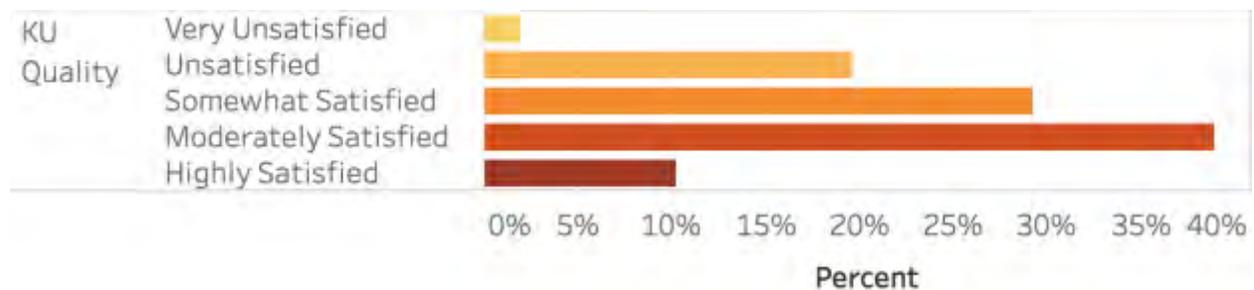
Many of the SDVC producers visit the KU shops – at most once a month. The control producers almost never visit the KU shops.

Display 37: Frequency of purchasing from KU Shops

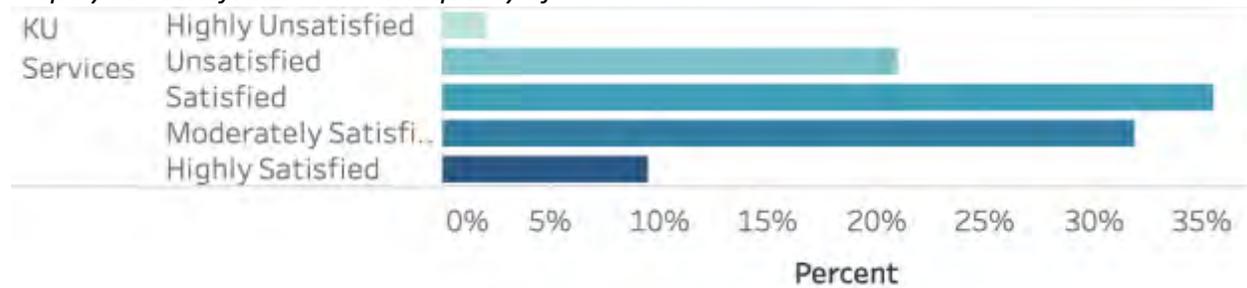


Overall, the producers are satisfied and moderately satisfied with the quality of products and services at the KU input shops. Less than 10% are highly satisfied. And less than 5% are highly unsatisfied.

Display 38: Satisfaction with the quality of KU products



Display 39: Satisfaction with the quality of KU services



Digital Fat Testing

The current milk collection system in Bangladesh lacks transparency and fairness. It puts power in the hands of dishonest milk collectors who aggregate and dilute milk, distorting prices paid to farmers. Further, the milk-fat percentage analysis performed by dairy processing companies is performed at a chilling plant far away from the dairy farmers and is based on the milk aggregated from a number of farmers rather than on the milk each individual supplies. Given that milk-fat percentage is the main factor in determining the price of milk in Bangladesh, the current process of testing aggregated milk clearly provides strong disincentives for honest small holding farmers and favors those who adulterate their milk. CARE Bangladesh plans to introduce the use of digital milk fat testing machines at village-level collection points as a means by which to improve milk collection fairness and transparency, improving farmer incomes and increasing the supply of good quality milk to the formal market. The DFT piloting initiative was taken aiming to:

- Improve transparency and fairness to the milk collection process
- Increase milk-selling income of the dairy producer through individual pricing and fairer purchasing systems.
- Individual and fair pricing structure would encourage greater uptake of improved cow nutrition and management practices
- Reduce corruption and collusion that occurs between milk collectors and chilling plant milk receivers

In Bangladesh the formal sector milk procurement system provides disincentives to producers to invest in improvements in milk quality and to supply to formal markets. Dilution of milk, by milk collectors, is commonplace and erodes producer trust and prices. Furthermore, chilling plants continue to rely upon inaccurate, chemical methods to ascertain milk fat quantity (the Gerber method), meaning that farmers are frequently underpaid for their milk. Furthermore, current milk collection systems aggregate milk, meaning that farmers' efforts to improve milk quality are not reflected in price (they are paid based on the aggregated milk fat level). In order to improve this situation, BRAC Dairy and CARE BD SDVC project implemented a piloting of Digital Fat Testing (DFT) Initiative in 16 collection points around 4 chilling plants, where the

SDVC producer's milk was tested by DFT machines in order to ensure the fair remuneration of dairy producers and the consistent supply of high quality milk.

Under the proposed agreement between BRAC Dairy and SDVC II project of CARE Bangladesh, Digital Fat Testing machines will be installed at collection points and chilling plants. At the collection point, individual farmers' milk will be tested and farmers will be issued with a receipt (printed automatically using a handheld printer) denoting the milk fat content. Milk will then be aggregated and transported in padlocked milk bottles to the chilling plant. Milk will be tested at the chilling plant to ensure that the aggregated milk fat content reflected the average fat content of the combined farmers' milk. Farmers will then be paid on the basis of the fat content of their own milk.

Currently, few farmers are as of yet selling their milk directly to the DFT points. However, the ones that report an increase in income, have an increase in trust of the milk selling process, and are getting a better price for their milk.

Among the producers who are selling milk at DFT collection points, the majority are members of the SDVC project. The relative percentage has remained stable over time. This is an interesting trend meaning that as the absolute number of SDVC producers grows, the number of non-SDVC producers using the collection points is also growing. This can be interpreted as a positive sign for the popularity and effectiveness of the DFT machines. Producers across the board seems to like them.

General Use of DFT Sites

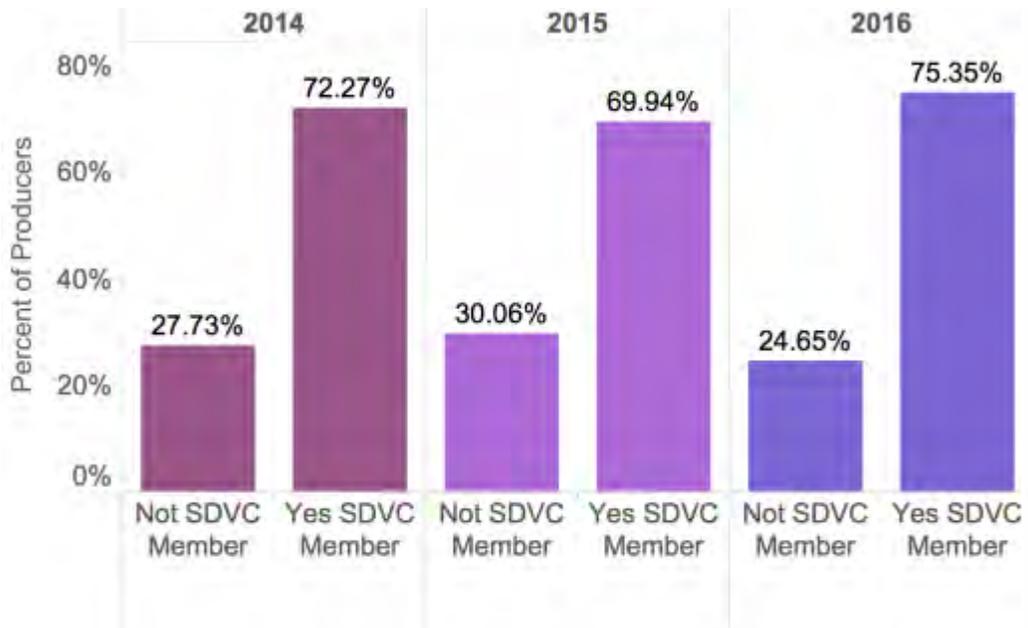
Display 40: Percentage of SDVC producers who use the DFT collection points



Display 41: Percentage of SDVC producers who use the DFT collection points by gender

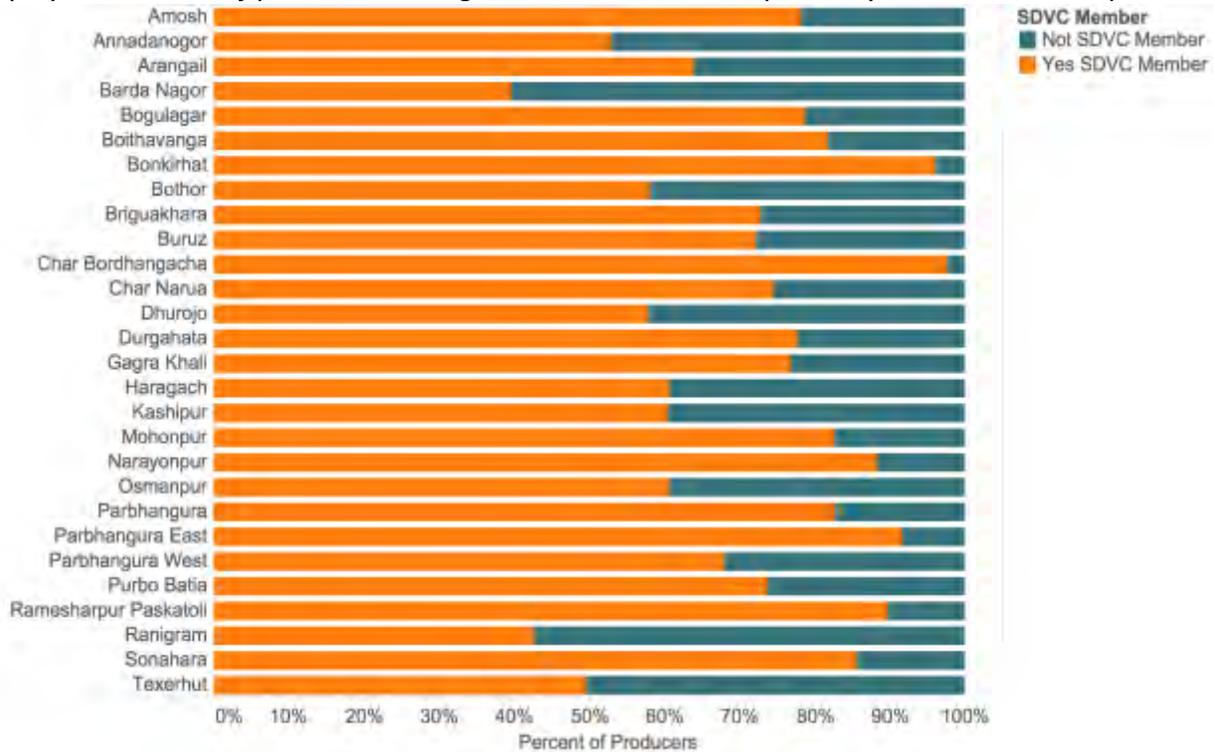


Display 42: Percent of producers selling milk to DFT collection points by SDVC membership



Display 42 shows the relative distribution of SDVC producers to non-SDVC producers. There is a wide variation in the relative proportion of producers. This is largely attributable to the geographic location of the collection points, the size and maturity of the SDVC groups in the area. And the strength of the dairy economy in each community. The collection points displayed here and in chart 4 include all the collection points in which the Check-in/Check-out survey collected reliable data over time. These are not all the collection points in existence.

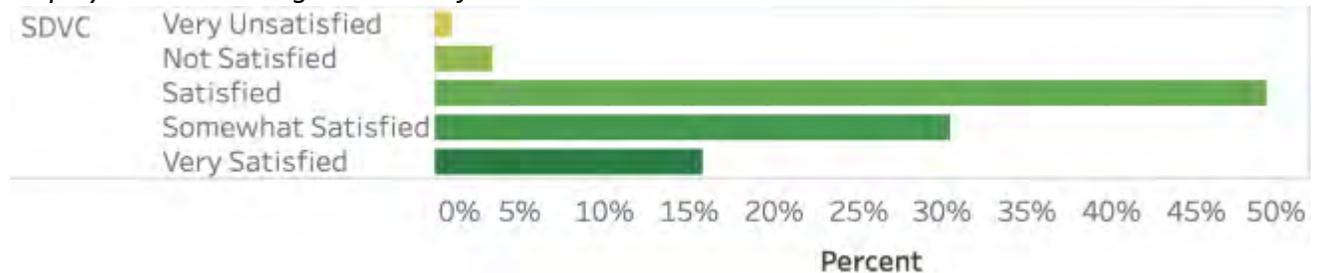
Display 43: Percent of producers selling milk to DFT collection points by SDVC membership



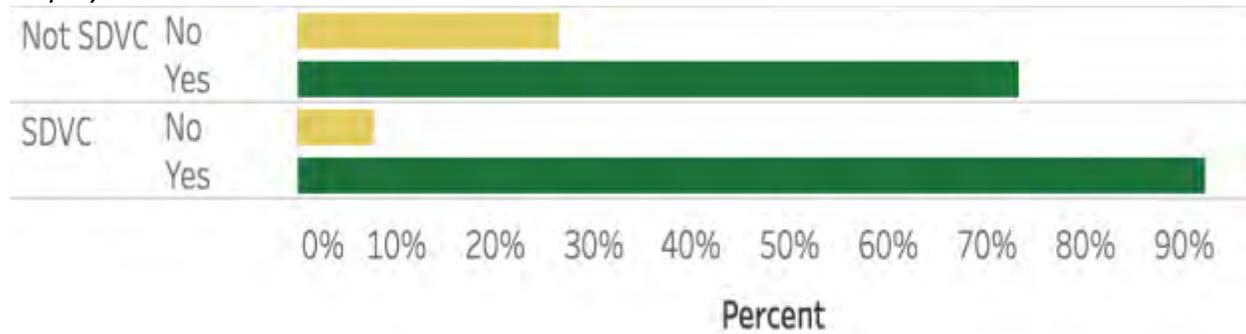
Satisfaction with DFT Services

In a trend similar to the producer’s opinions about the KU shops, most of the producers are satisfied with the management of the DFT collection points. And most of them believe that the milk assessment is fair.

Display 44: DFT Management Satisfaction

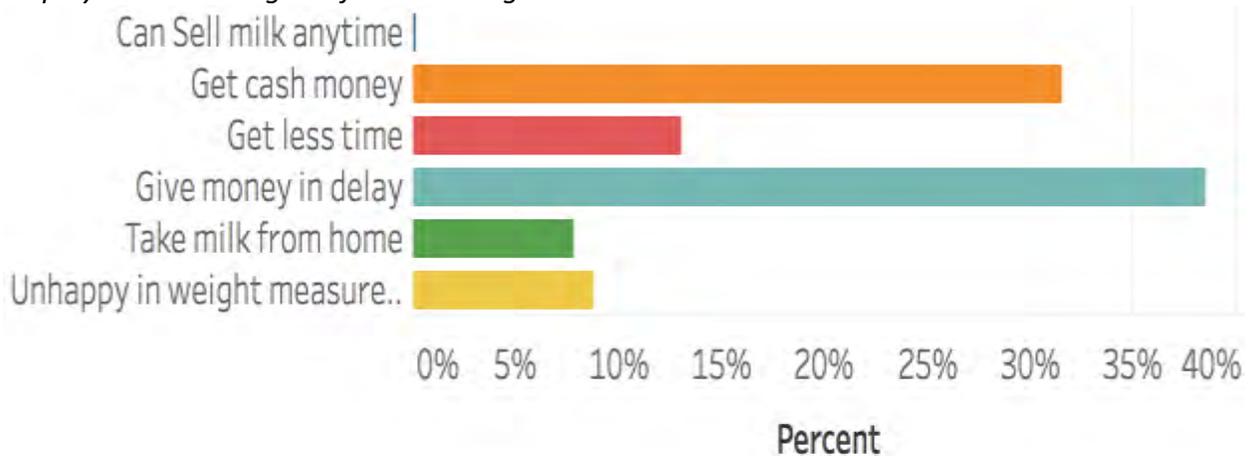


Display 45: DFT Milk Assessment is Fair



Among the SDVC producers who do have access to DFT collection points but do not use them, the primary reasons given for not selling at the DFT site is to give money in delay and to get cash money.

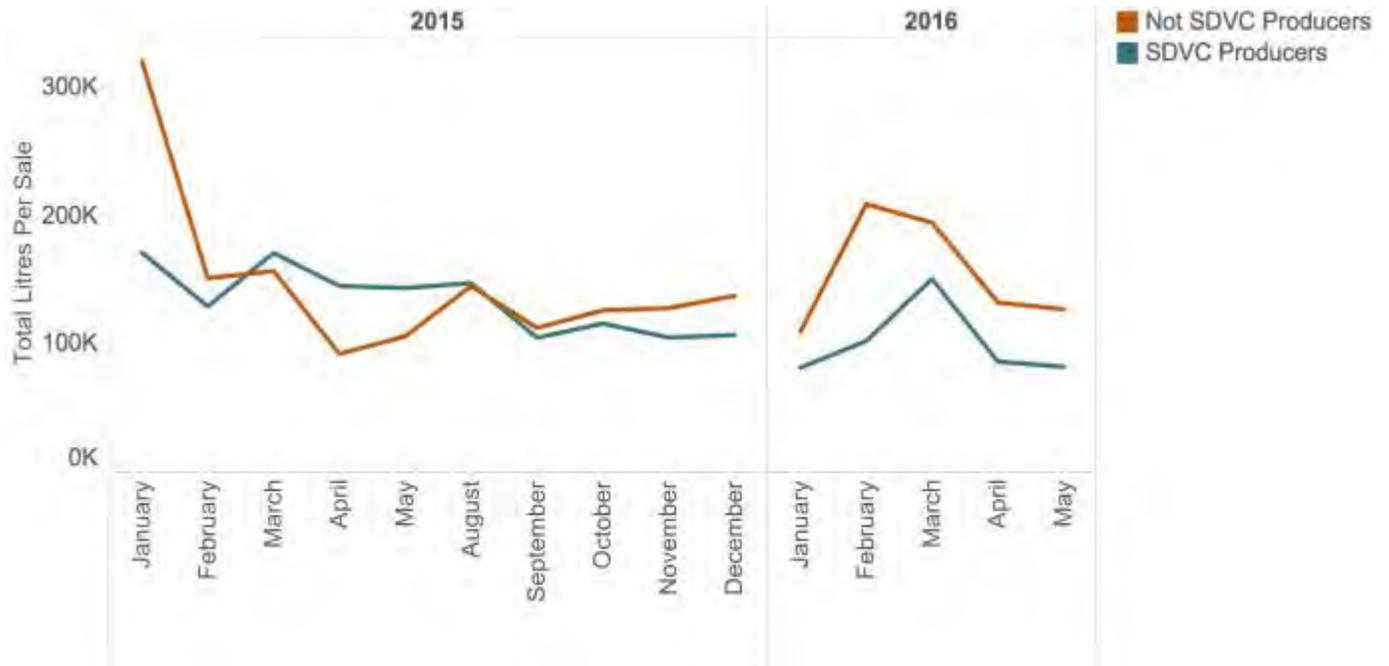
Display 46: Reasons given for not selling at DFT



Quantity of Milk at DFT Sites

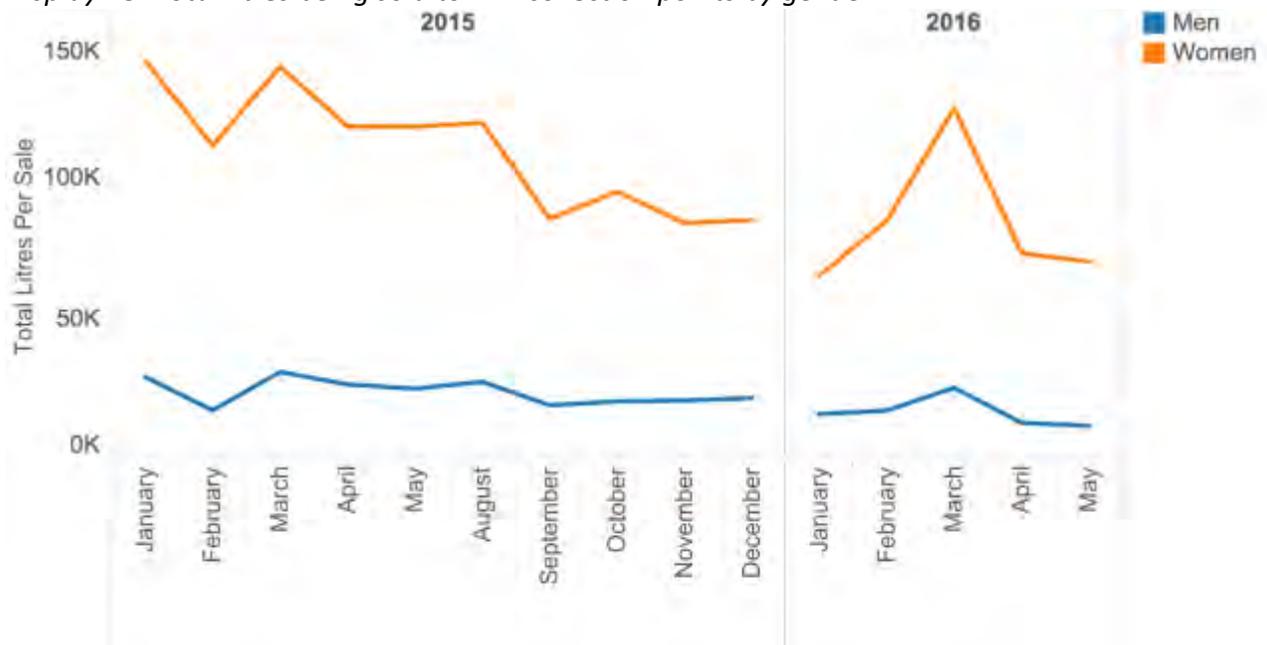
In addition to the number of producers selling milk at DFT collection points, we explore the amount of milk that these producers are selling to the collection points. The total number of litres being sold to the collection points by all producers, both SDVC and non-SDVC has been variable over time. The variation is cyclical with seasonal trends affecting sales. Recently there seems to be a slight decline has been the same for the producers involved in the SDVC project and other producers. Display 199 shows the relative rate of change of the total litres of milk being sold to the DFT sites. The fact that both groups of producers are declining indicates that this drop is not attributable to the SDVC project, but rather is indicative of something that is happening in the relationship between all dairy farmers and the collection points.

Display 47: Total litres being sold to DFT collection points by SDVC status



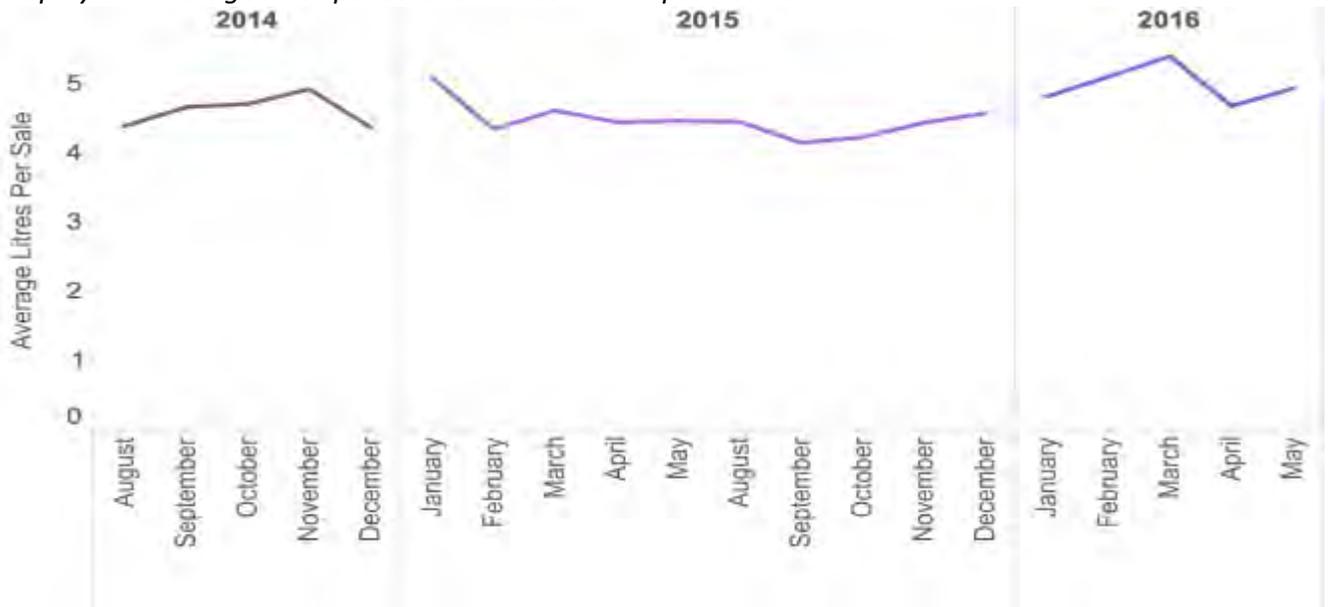
However, if we look at the rate of decline in overall sales by gender, we find that there are significant changes by gender. At the early phase of the project, women were selling much more total milk to the collection points and this level has dropped significantly over time. The quantitative data does not supply an explanation for this trend.

Display 48: Total litres being sold to DFT collection points by gender

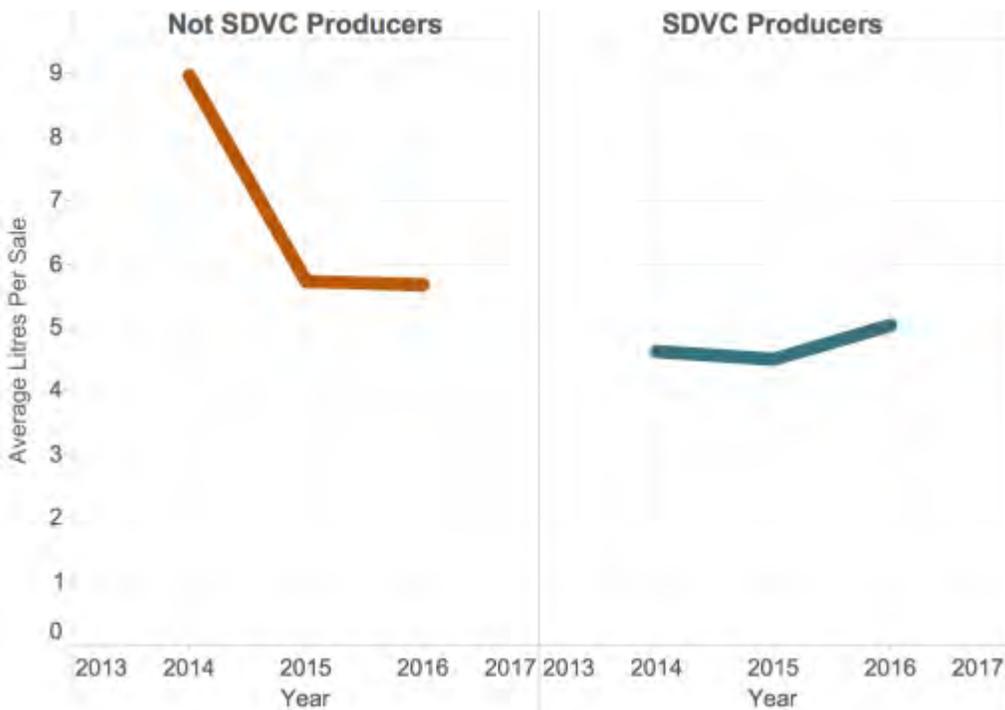


The stability of the DFT sales volume is quite steady. It has not changes significantly over time. The volume provided by the SDVC producers has been much more steady than the volume provided by the control producers.

Display 49: Average litres per sale to DFT collection points over time



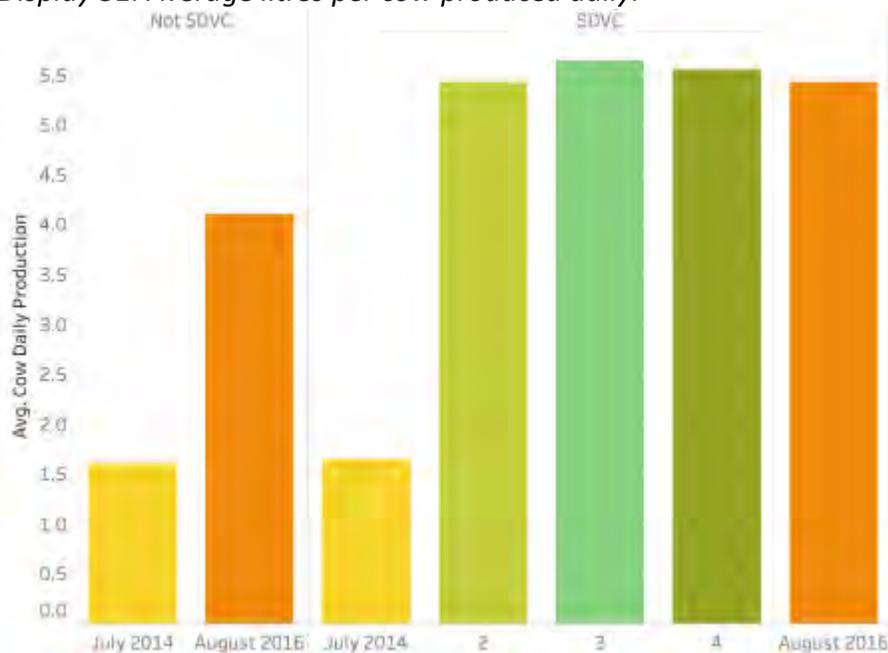
Display 50: Average litres per sale to DFT collection points by SDVC producer status



Resiliency and consistency of supply chain

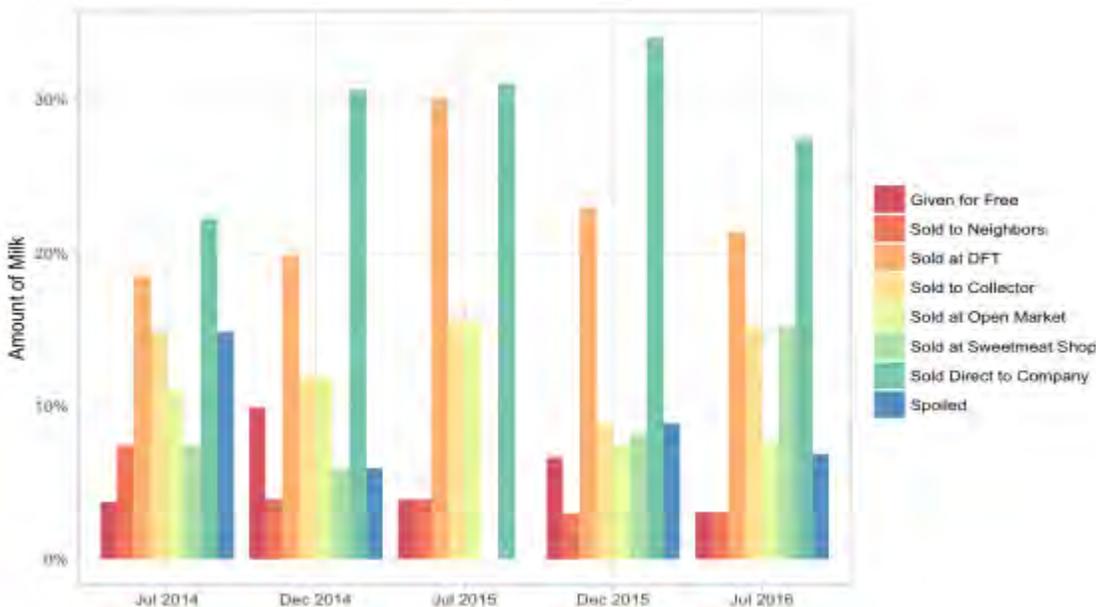
The consistency and resiliency of the supply chain is a key focus of the Phase 2 of the SDVC project. And our data indicates that this next scale of the endeavor has been quite successful along these dimensions. The average daily production for the SDVC producers increased quite rapidly at the outset of the learning and then became quite steady at that high level. This points to the producers being able to sustain the new practices beyond their immediate training.

Display 51: Average litres per cow produced daily.



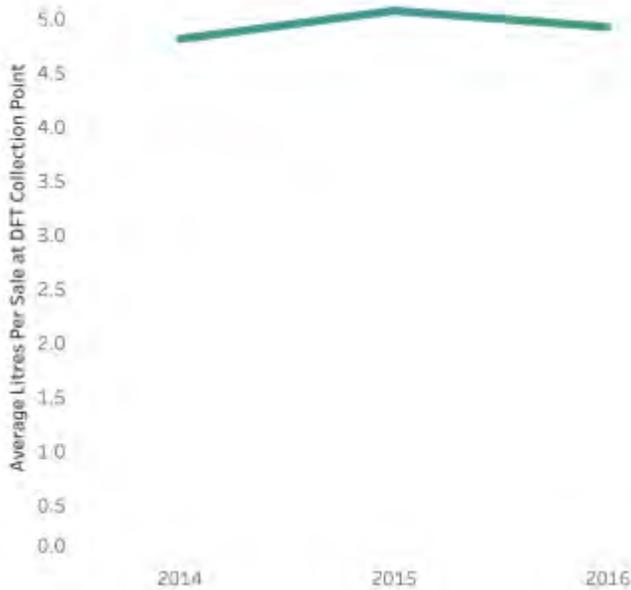
As well, the rate of spoilage has decreased significantly over the course of the project.

Display 52: Milk Distribution Patterns – percentages

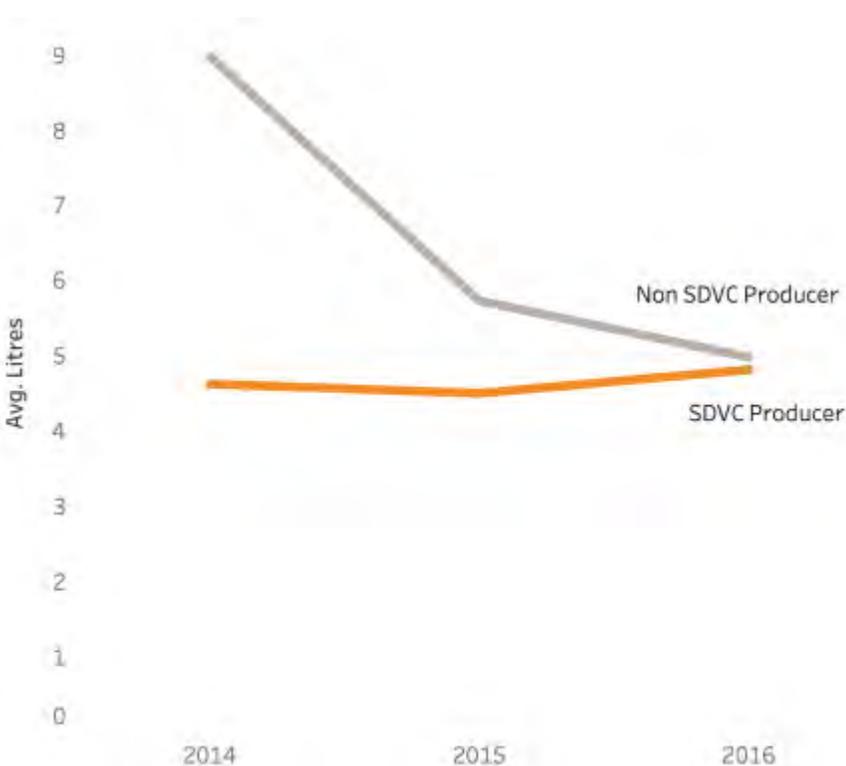


Another indication of the success of the sustainability of the SDVC learning groups is the steady rate of sales to the DFT collection points. Overall, the levels of average litres per sale have not changed at all. And this steadiness is entirely driven by the SDVC producers while the control producers have been much more unsteady in their supply.

Display 53: Average litres per sale to DFT Collection Points



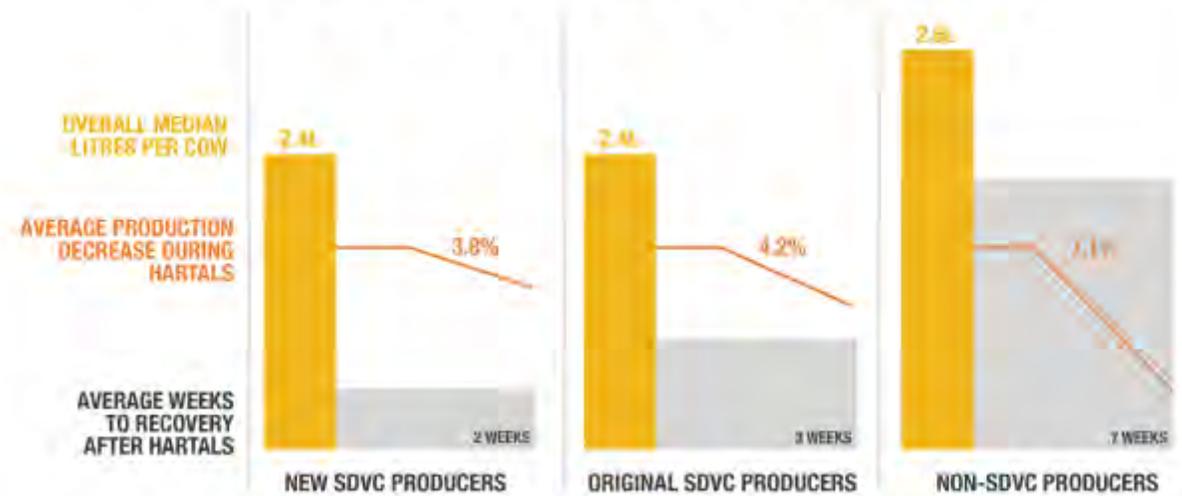
Display 54: Average litres per sale to DFT Collection Points by Type



The Phase 2 of the SDVC project has taken place at a time of much political instability within the project regions. This has given us the opportunity to measure how resilient the producers are to extreme supply chain disruption. Our data shows us that SDVC producers are more resilient to extreme shock than other types of producers.

Display 55: Hartal resiliency

HARTAL RESILIENCY



Summary of Findings along the Primary Objectives of the SDVC

To conclude, our data analysis finds that the SDVC II has been successful in many of its primary objectives.

In the area of increased volume, currently, the producers that are involved in the SDVC-II project tend to have more cross breed cows than the average dairy farmer, and these cows tend to have a higher value than comparable farmers, even among those with cross breed cows. The average cross breed cow of the SDVC-II farmers is also producing more milk on a daily basis than the average non-SDVC farmers'. The earnings per cow for SDVC-II farmers is also currently significantly higher than comparable farmers.

In terms of improving fair pricing through DFT testing, currently more SDVC-II farmers are using the DFT collection points than comparable farmers. The farmers who are using the DFT points are reporting an increased trust of the milk sales process and are getting more money for their milk. However, this level of satisfaction is not steady and has decreased.

SDVC-II farmers currently seem to be accessing many of the recommended dairy practices and are reporting an increased access to input shops, vets and milk collectors. The producers list geographic locations, convenience, reliability and the payment of bonuses as the most important factors in accessing quality farming inputs and services.

he SDVC-II project is in the process of establishing a complex Dairy Hub that includes effective and efficient connections between producers, milk sales points, input shops and livestock health workers. We can see from the available data, that the level and quality of the milk being produced by these groups is more steady, stable and high quality than producers who are not benefitting from these networks.

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