MILK ROUTE 2012-2013 Social Performance Report

MYA
Growth Catalyst for Rural India

Written by: Jyotsna Taparia
& Sachi Shenoy

Produced by: UPAYA social ventures

About MYA

MokshaYug Access (MYA) is a commercial enterprise with a social conscience that strives to ensure income certainty for rural Indian farmers while delivering positive returns to shareholders. We achieve this by improving the productivity of small and marginal farmers, delivering high quality rural produce to consumers in urban markets, and ensuring the farmer realizes a larger portion of the end consumer price. Through our network of 1,014 villages in 23 village clusters, we are able to connect over 15,000 farmers with ready buyers across our 4,200 km transport network. With this infrastructure in place, we are able to facilitate much needed job creation and asset accumulation for the long-overlooked rural poor. For more information, please visit www.moksha-yug.in.

About Upaya Social Ventures

Upaya is building the businesses that will create jobs and improve quality of life for the ultra poor. We create jobs in two ways—supporting the growth of start-up enterprises through the *LiftUP Project* business incubator, and consulting with established organizations on innovative projects targeting deeply impoverished communities. With a presence in both India and the U.S., the Upaya team has over 20 years of experience in developing effective interventions for the world's poorest populations. For more information, please visit www.upayasv.org.

Authors

Jyotsna Taparia
Sachi Shenoy

Designer / Editor

Leonor Robles

Photographers

Emma Davies
Jyotsna Taparia

Table of Contents

Table of Tables

Table of Figures

Introduction

Founded in 2006, MokshaYug Access (MYA)[1] is a rural supply chain solutions company based in Karnataka, India. MYA's mission is to ensure income certainty and wealth creation for households that rely on agricultural activities for their livelihoods. The company has established a robust supply chain—called Milk Route—that focuses on supporting farmers in the 'first mile' through better infrastructure, fair and transparent pricing, and ancillary services to improve markets for dairy. MYA has more recently added a supply chain to source and market fruits and vegetables.

In 2012, MYA undertook a Social Performance Metrics (SPM) evaluation in order to measure and understand the social impact of its dairy business. MYA primarily wanted to assess whether its supply chain has indeed helped to increase and stabilise farmer incomes, and what other social benefits have resulted from Milk Route's presence in these villages.

To guide the effort, MYA partnered with Upaya Social Ventures[2]—a non-profit organisation based in the US and India—to construct the framework for the study, design the surveys, assist in data collection, and analyse the outcomes. This report showcases the findings, most of which are positive and mission affirming, along with interpretations of certain trends that were observed.

Over the course of four months in 2012, a total of 1,486 households were surveyed—including those who participated in the Milk Route supply chain and those who did not—across 269 villages in Karnataka. After controlling for most external factors, Milk Route households reported monthly incomes that were, on average, 24% higher than their counterparts. By virtue of being able to access high quality cattle feed and veterinary services, Milk Route households produced milk that consistently beat the industry's average yield parameters, as measured by percentage fat and non-fat solids. These higher yields provided an additional 10% in earnings per litre for participating households.

The SPM evaluation determined that thanks to increased, regular and transparent compensation—combined with an excellent support system that included access to training, high quality feed, and veterinary services—nearly half of all producers in the Milk Route supply chain now rely on dairy as their primary source of income. Before Milk Route was introduced to these villages, dairy provided the primary income for only a quarter of households. These households were also able to provide, on average, 5.5 more litres of milk per month to their children than households that were not suppliers of the Milk Route dairy.

The data also showed that Milk Route made higher quality cattle feed more affordable and accessible to its producers, and that farmers were able to increase the amount fed to their animals.

1 http://www.moksha-yug.in

2 http://www.upayasv.org

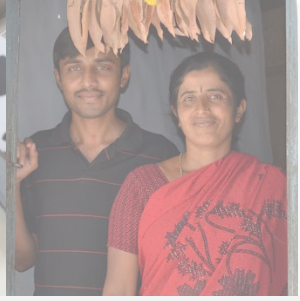
The study uncovered mixed results in other dimensions: there appeared to be little to no improvements in healthcare access, only marginal improvements in housing quality, and small gains made in households' overall purchasing power. MYA is committed to continuing to collect and report social metrics on a regular basis and hopes to see improvements in the aforementioned indicators over time. Better understanding its producers' needs and local outcomes will allow MYA to improve its services and deepen its commitment to wealth creation and empowerment of India's rural communities.

Structure of the Report

This report has been divided into four chapters. The first chapter provides a basic introduction to SPM and study design including coverage and sampling techniques. The second chapter focuses on analysis of the observed benefits accruing to the farmers *directly* as a result of MYA's core business activities—referred to as 'first order' benefits. The third chapter describes benefits that are more *indirectly* linked to the MYA supply chain itself—i.e., 'second order' benefits that occur as a result of increased income and other first order benefits. In both the second and third chapters, an attempt is made to conduct reasonable comparisons over a period of time and between different geographies and categories of respondents, to assess the extent of change that MYA has been able to effect.

The fourth and final chapter outlines general recommendations for how MYA can continually improve and refine the effectiveness of its successful operation. At the very end of the report, the Appendix contains stories from a number of farmers that are currently working in the Milk Route network. In their own words, they describe their experiences with dairy farming and their aspirations for their families.



Chapter 1 | Methodology

Yield, pricing, and profitability are well-known measures of a dairy company's financial health and efficiency. However, these indicators only tell half the story about the performance of the business. In order to objectively measure and analyse the social benefits that the business has generated—for example, improvements to farmer earnings, housing, nutrition, and other indicators of well-being—it is critical for the company to implement a system to track SPM.

When established mindfully, an SPM evaluation allows a company to efficiently assess whether it is meeting its stated social goals, and if not, what areas need to be improved. The metrics collected ought to include data around income, asset ownership, agricultural practices, and healthcare-seeking behaviour, among other things. For MYA, the SPM evaluation in 2012 helped the company understand not only the social impact of its business, but also its producers' behaviour and needs, with the intention of highlighting areas of service in need of improvement.

This chapter discusses the scope and methodology used for conducting the SPM surveys for MYA's Milk Route—the company's dairy supply chain and primary line of business. It describes the quantitative and qualitative tools and approaches used for data collection, and also explains the limitations of the evaluation.

1.1 Scope and Coverage

The data collection for Milk Route involved both quantitative and qualitative approaches and relied on the usage of standard survey tools to directly collect and assimilate data from farmers. The primary tool employed was a survey questionnaire, largely consisting of objective and observable indicators. Complementing the survey were in-depth unstructured interviews that were conducted with farmers and provided anecdotal evidence that helped formulate a deeper understanding of the sample group. These interviews added colour to the data collected, and are featured in the farmer profiles in the Appendix.

The SPM evaluation was carried out in three districts of Karnataka, namely Kolar, Mandya, and Tumkur. A total of 1,486 households were surveyed from 269 villages and fall into one of two groups: those who are suppliers of the Milk Route dairy and those who are not (hereby referred to as 'Control Group' households).

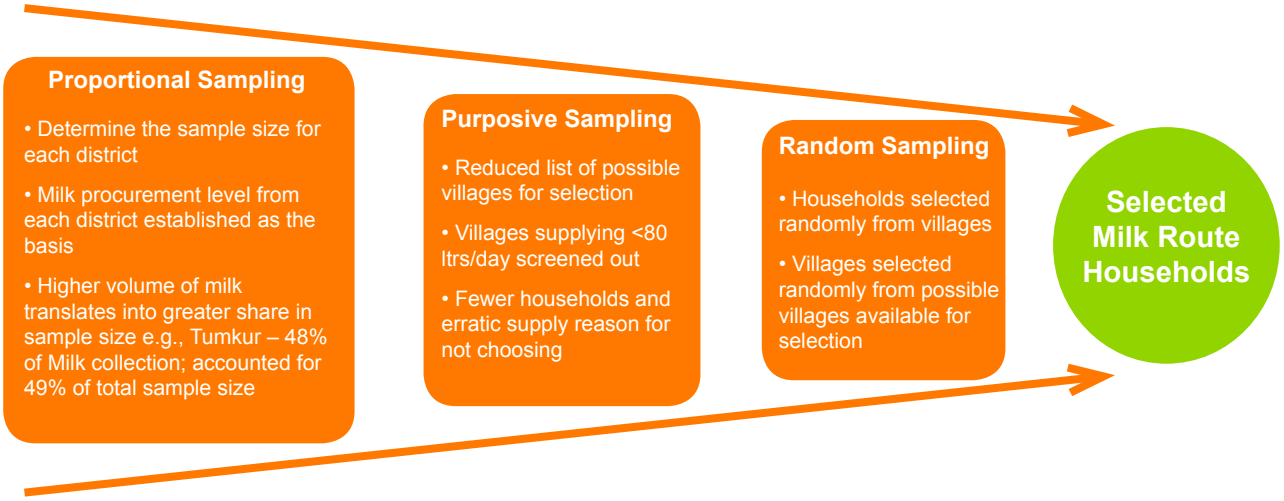
The process of narrowing down which Milk Route households to survey included three tiers of selection criteria. In the *first* tier, milk procurement estimates were taken for each district to help in the selection of Milk Route villages. Based on the percentage of milk procured from each district, a proportional number of sample villages were selected. Specifically, if a district comprised a higher percentage of milk procured for MYA, a larger number of villages

from that district were selected for the sample (a technique referred to as proportional sampling[3]). Thus, 49% of the Milk Route households were selected from Tumkur, 40% from Kolar, and 11% from Mandya, which roughly aligns with the fact that 48% of the total milk collected by Milk Route comes from Tumkur, 44% from Kolar, and 8% from Mandya.

In the *second* tier, the selection of individual villages was further qualified through purposive sampling,[4] a technique in which a sample is selected with a purpose in mind. The only villages eligible for selection were ones that provided over 80 litres of milk per day to MYA. This process deliberately excluded villages supplying less than 80 litres of milk per day, as they were generally deemed too small (with procurement volumes considered too erratic) to be included in the sample frame.

The *third* tier involved a random selection of households based on the short list of villages prepared through purposive sampling.

Figure 1.1: Sampling Process for Selecting Milk Route Households



Control Group villages were selected in order to establish a proxy baseline to aid and assist in comparison. The selection of Control Group villages was completed through a matching process. This exercise involved each Milk Route village being matched to a Control Group village based on key parameters such as economic activity, demographic profile, access to infrastructure, and distance to the nearest city.

The selection of Control Group households was also purposive, i.e. those who did not own cattle were screened out. This was done to ensure that comparisons drawn between Milk Route and Control Group households were as parallel as possible. The exercise identified only those members of the selected Control Group villages who owned one or more cows. Survey respondents were then randomly selected from this group.

A critical feature of this SPM exercise was its reliance on a Control Group as a benchmark to understand any change taking place as a result of the presence of the Milk Route supply chain. Such a comparison was only possible because the Control Group households were

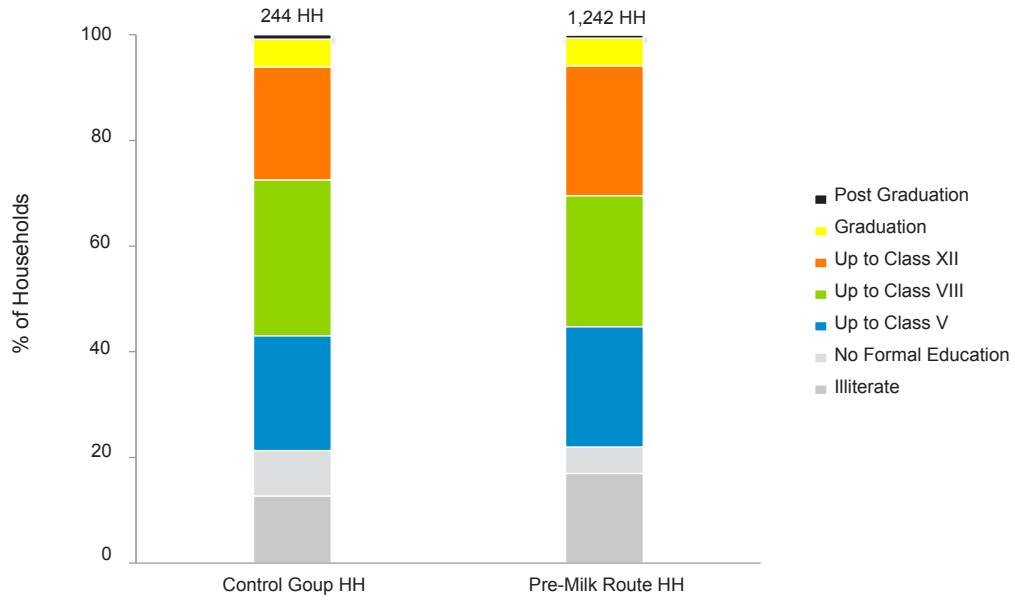
3 This sampling technique is also referred to as Probability Proportional to Size sampling. For a more detailed discussion on this sampling technique refer to http://www.jstor.org/discover/10.2307/2984047?uid=3738256&uid=2129&uid=2134&uid=2&uid=70&uid=4&sid=21102088873687, accessed on March 18, 2013

4 For an in depth understanding of purposive sampling as a tool in research, please refer to http://dissertation.laerd.com/purposive-sampling.php, accessed on March 18, 2013

comparable to the Milk Route households in terms of key demographic indicators. In order to isolate the benefits of participating in the Milk Route supply chain, it was important that all survey households be quite similar relative to their degree of poverty, level of education, and access to basic infrastructure. Surveys for both sets of households asked respondents to recall their conditions three-to-five years ago, before MYA set up operations in the area, to establish whether it was possible to control for certain basic traits and effectively isolate the effects of Milk Route.

The data show that Control Group households and Milk Route households had achieved roughly the same level of education (Fig. 1.2). Only 13% of Milk Route households and 17% of Control Group households fell into the category of not having received any formal education and were thus classified as illiterate. Over 51% of all Milk Route households had finished schooling up to Class VIII, compared to a similar 50% for Control Group households.

Figure 1.2: Educational Status Achieved by Milk Route and Control Group Households



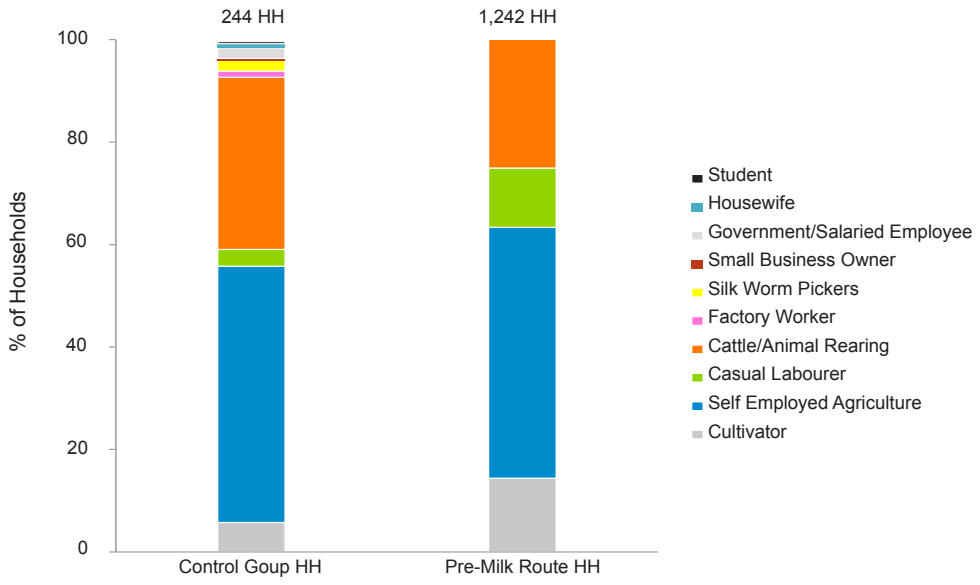
The majority of Milk Route households, before joining MYA (a period that is referred to as 'Pre-Milk Route' throughout this report), reported being employed in agricultural activities and owning the land that they cultivate. A similar proportion of Control Group households reported the same (Fig. 1.3).

The percentage of households undertaking manual labour as their primary occupation constituted only 3% of Pre-Milk Route households and 12% of Control Group households. The percentage of households relying on dairy as their primary source of income was also similar, with 34% of the Pre-Milk Route households involved in cattle rearing and 27% of Control Group households. As occupation is often a reflection of a household's general economic well-being, one can tentatively conclude that prior to Milk Route's entry into these villages, no group was significantly more affluent than the other, as both sets of households exhibited similar characteristics and pursued similar livelihood activities.

Throughout this report, efforts were made to analyse changes over a period of time, primarily by comparing respondents' circumstances in the Pre-Milk Route period with their responses regarding household conditions at the time of the survey. In the surveys, questions were

structured to objectively assess changes in income, purchasing power, and other indicators of well-being. Comparisons between Control Group and Milk Route households were made only when a time-based analysis was not possible. In these cases, the recall period either was too long and therefore unreliable or there were no available objective data for the reference period.

Figure 1.3: Distribution of Primary Source of Income between Pre-Milk Route and Control Group Households



1.2 Survey Tools

The survey tool used for this study was a household questionnaire with associated standard codes for ready reference. A total of 79 questions were included in the questionnaire, administered to both Control Group and Milk Route households. On average, each survey took 35 to 40 minutes to administer. Recall was used to establish changes in Milk Route households' economic condition since they joined MYA, with respect to income, access to services, and other quality of life indicators.

For an assessment of productivity measures and others that involved specific numeric quantities—where recall was weak, or could have been biased—farmers' responses were cross-checked with data collected by Milk Route staff through the course of regular operations, and then compared to the Control Group responses in order to establish change. Such productivity measures included milk yields and volumes. MYA's standard practice was to measure and report on milk yields as the 'total solids' that comprised the milk. Total solids, expressed in kilograms, included measures of both fat and 'solid non-fat' (SNF) levels in the milk. Only milk that met and exceeded the average industry standards for fat and SNF levels was considered acceptable and was advanced within the supply chain. The number of litres of milk generated per day was referred to as milk volume.

The household surveys were administered between August and November 2012, with data collection undertaken by MYA's field staff. A member of the Upaya Social Ventures team supervised the process. Training was provided to the staff in order to prepare them to pose

questions properly, troubleshoot during the course of the survey if necessary, and correctly interpret and record the responses.

1.3 Limitations of the Evaluation

The SPM evaluation for Milk Route was undertaken for the first time by MYA in 2012 to assess the social impact of its business. Due to the small scale of the evaluation, the study design had the following limitations:

- The SPM evaluation used a sample of 1,242 Milk Route households based on two sampling techniques—proportional sampling and purposive sampling. However, Milk Route collects milk from over 15,000 farmers each day across three districts in Karnataka. Using purposive sampling, villages supplying smaller volumes of milk (less than 80 litres a day) were screened out. This criterion may have excluded households who were functioning on a smaller scale with fewer numbers of cows and lower volumes.

- The small proportion of Control Group (244 households) to Milk Route (1,242) farmers may have reduced the ability of the sample to accurately represent the larger population.

- Data collection was undertaken by MYA's field staff, which may have led to some bias in reporting. While care was taken to ensure field staff were assigned areas for surveying that were not under their regular purview, the element of bias was difficult to eliminate completely.

Chapter 2 | First Order Benefits

MYA is first and foremost a rural supply chain company, one that hopes to bring about greater prosperity to India's rural populations by opening new, efficient markets for agricultural products such as milk, fruit, and vegetables. When classifying MYA's social impact, it is important to first identify the benefits that have accrued to its farmers as a direct result of the company's presence. These are referred to as 'first order benefits.'

Specifically in the case of Milk Route, first order benefits are defined as the outcomes that result directly from the presence of the supply chain in these particular villages and districts. In other words, by virtue of having the Milk Route infrastructure and processes in place, how have Milk Route households benefitted? For example, has Milk Route been able to increase and provide more stable and predictable income, improve cattle yields, establish better maintenance practices and care of the animals, and overall, create a better employment alternative for households in rural Karnataka?

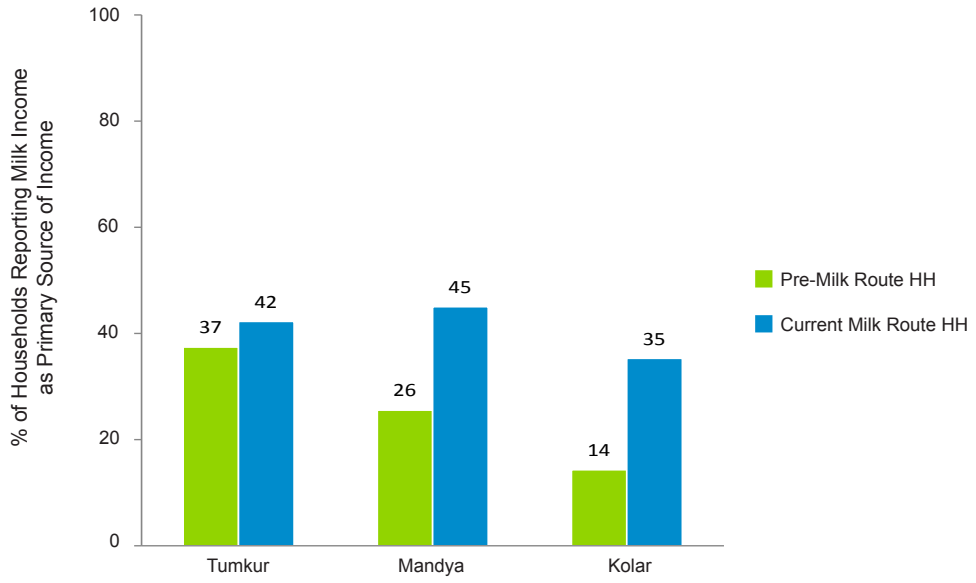
In this chapter, indicators such as income changes, patterns of cattle ownership, cattle nutrition, and ancillary services availed by milk farmers are analysed in greater depth in order to gauge the direct benefits that MYA's Milk Route has produced.

2.1 The Income Effect

For MYA to best achieve its mission, it is critical that the presence of the supply chain helps dairy farmers stabilise and increase their incomes. This increase in income is most meaningful for the poor when it is stable, predictable, and above all, transparent. Once these conditions are met, it is natural for households to gravitate towards the most lucrative livelihood opportunity. The study, therefore, assessed what percentage of households reported dairy as their primary livelihood before and after participation in the Milk Route program. If the Milk Route supply chain was effective, one would expect to see a shift towards dairy activities.

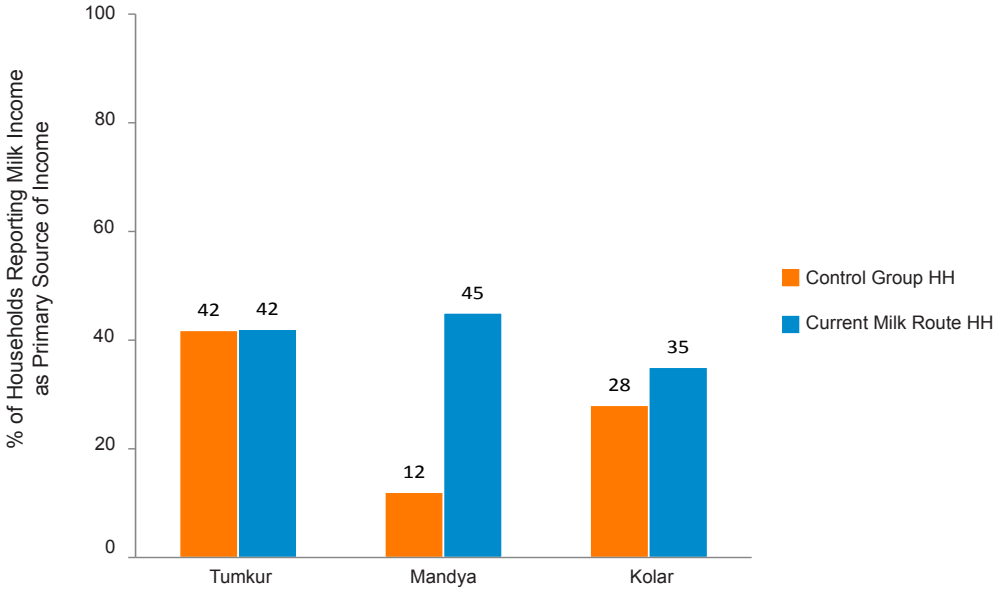
Of the 1,242 Milk Route respondents surveyed, 41% of current Milk Route households reported income earned from the sale of milk to be their primary source of income. In comparison, only 25% of these households relied on milk income before joining MYA. This shows that, over time, the Milk Route supply chain and services resulted in more farmers engaging in dairy farming as their primary income generating activity. As seen from Figure 2.1, Kolar district experienced the largest increase of 21 percentage points in the number of dairy farmers relying on milk income, followed by Mandya district.

Figure 2.1: Distribution of Households with Milk Income as Primary Source of Income Over Time by District



A comparison drawn between Milk Route and Control Group households showed that, on average, a higher percentage of Milk Route households relied on the sale of milk as their primary source of income when compared to Control Group households (Fig. 2.2). Only 27% of the 244 Control Group respondents reported the sale of milk as their primary source of income. The difference between Milk Route and Control Group was most pronounced in the Mandya district; in this location, the only competitor Milk Route faced was the government-run Karnataka Milk Federation. Given the lack of dairy options, it is possible that the 33 percentage point difference in favour of Milk Route stems from Milk Route's ability to provide income that is reportedly more reliable, stable, and transparent to its farmers. In the other two districts, Milk Route faced a larger number of competitors, but appeared to have gained good traction as a preferred dairy outlet for local farmers.

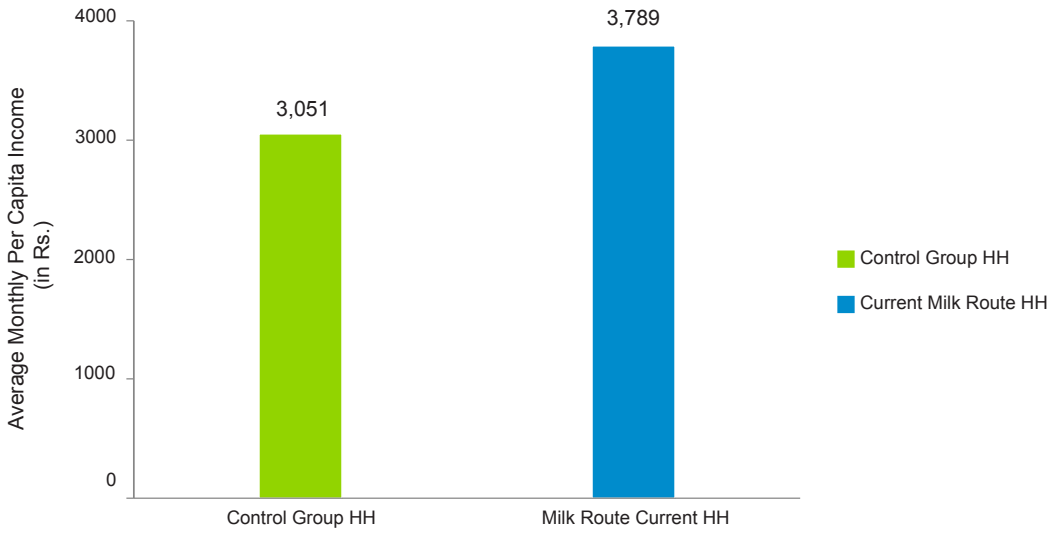
Figure 2.2: Distribution of Control Group and Milk Route Households with Milk as Primary Source of Income by District



To put these findings into perspective, it is useful to understand how the sale of milk as a primary source of income fares in other parts of the country. In a study conducted across five southern states in India by Rao et.al. (2006) to better understand reliance on dairy farming as a source of income among landless women, the authors concluded that the contribution of dairy income to the total income of the family was quite significant. They found that 49% of families from the sample relied upon dairy income as their main source of income.[5]

Milk Route households have also reported higher average monthly per capita income (AMPCI) than their Control Group counterparts by 24% across all three survey districts. While reported AMPCI for Control Group households is Rs. 3,051, the corresponding value for Milk Route households is higher at Rs. 3,789.

Figure 2.3: Average Monthly Per Capita Income between Milk Route and Control Group



Looking at a district-specific breakdown, the difference in AMPCI between the two categories of respondents was most pronounced in the Kolar district (Fig. 2.4). There was a jump of 21 percentage points amongst respondents from the Kolar district who cited milk sales as their primary source of income after joining MYA (from Fig. 2.1). Kolar is considered a 'milk rich' belt in Karnataka, and thanks to historic infrastructure and the prevalence of dairy farming, it may have been easier for households in the Kolar district to move into milk production and benefit quickly from the healthy local markets for milk. At the time of the survey, 44% of MYA's total milk procurement came from the Kolar district.[6]

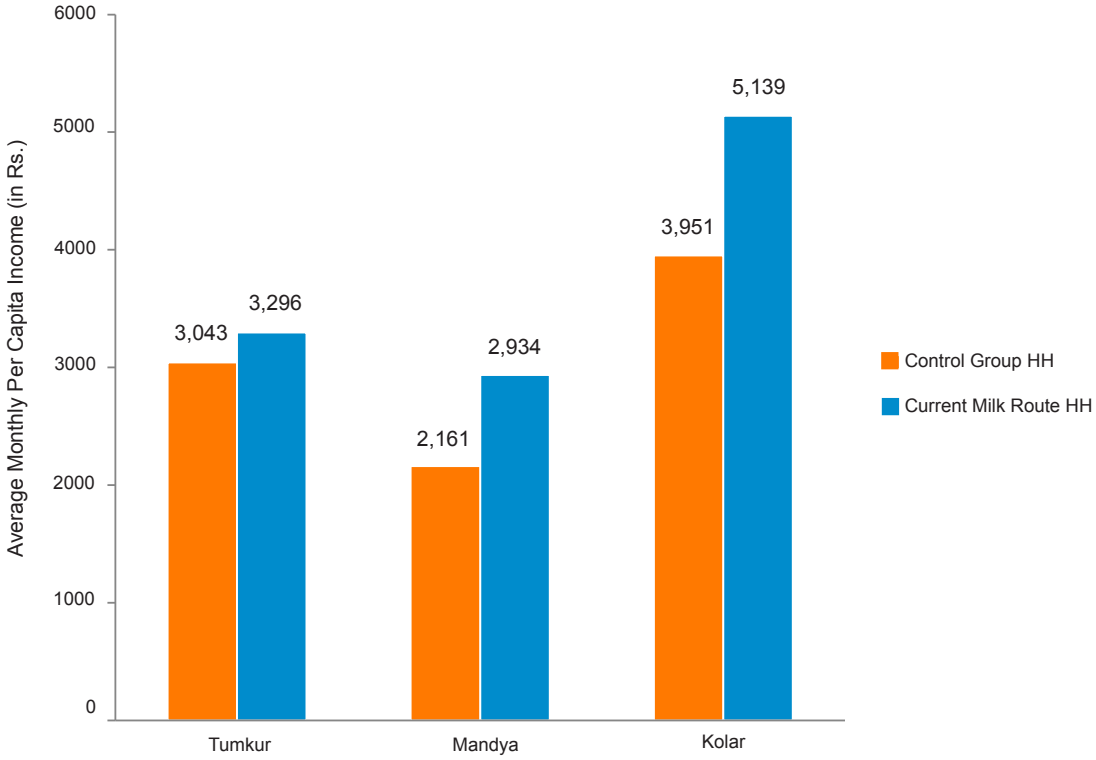
Income from the sale of milk was consistently higher for Milk Route households when compared to Control Group across all districts (Fig. 2.4). Theoretically, this trend could be attributed to increased productivity of their cattle. The support provided by the Milk Route supply chain—such as provision of higher quality cattle feed and other ancillary services (disease screening and other vet services)—may have helped improve the resulting milk yields and volumes. The quality of milk determined the variable pay for the farmers: they

5 Rao et al. (2002), Dairy Farming by Landless Women in Southern States of India; http://www.fao.org/AG/againfo/programmes/en/pplpi/docarc/LSP303.pdf, accessed on February 19, 2013.

6 Source: Milk Collection Centre records for MYA

received a better price with higher fat and SNF levels in the milk. The productivity measures' contribution to increased farmer incomes will be explored in more detail in the following sections.

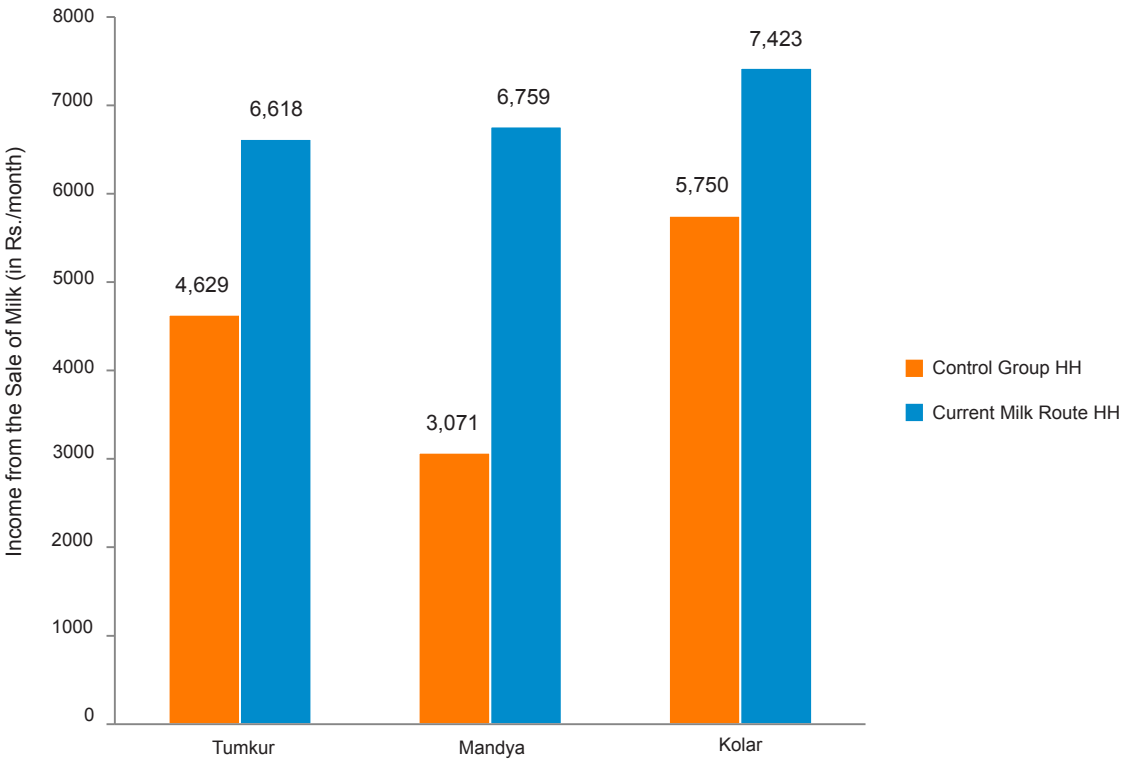
Figure 2.4: Distribution of Average Monthly Per Capita Income between Milk Route and Control Group by District



At this juncture, it is important to be aware of a certain bias in the self-reporting of monthly income. Farmers with lower incomes had an incentive to report higher income estimates to paint a socially presentable financial condition of the household. Farmers with higher income tended to under-report their earnings out of fear of being excluded from welfare benefits that may have accrued to low-income families. In the survey process, to help counter this bias, questions around monthly household expenses were asked to see if reported incomes (inflows) were roughly in line with monthly outflows. In the few cases where a big mismatch was observed, surveyors were trained to surmise an income estimate through other indirect questions.

The data shows that Kolar Milk Route farmers earn the highest amount from the sale of milk at Rs. 7,423 per month, in contrast to the highest amount for Control Group farmers, who sold milk at the price of Rs. 5,750 per month (Fig 2.5). The difference between earnings was the lowest in Tumkur where Control Group farmers earned Rs. 4,629 per month while Milk Route farmers earned Rs. 6,618 per month.

Figure 2.5: Income from Sale of Milk between Milk Route and Control Group



2.2 Animal Nutrition

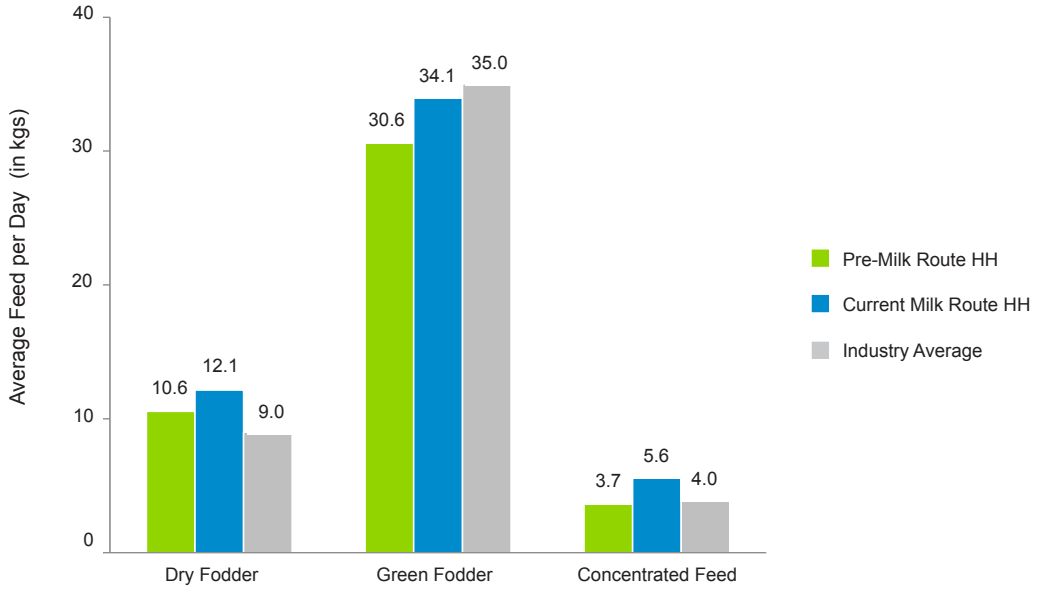
For any dairy animal, the most critical factor to improving its productivity is regular provision of high quality, nutritious feed. Imbalanced feeding leads to an excess of some nutrients and a deficiency of others. This not only reduces milk production and increases costs per kg of milk, but also affects various physiological functions including long-term animal health, fertility, and yield of the cow.

There are three kinds of feed that have typically been given in varying proportions based on the breed, age, and weight of the cow:

- **Green Fodder:** Ideal feeding pattern 30-40 kgs per day
- **Dry Fodder:** Ideal feeding pattern 8-10 kgs per day
- **Concentrated Feed:** Ideal feeding pattern 4-5 kgs per day

It has been observed from the data presented in Fig. 2.6 that over a period of time, animal nutrition improved significantly among Milk Route households, with an increase in the amount of feed given to cattle. An increase was registered across all varieties of fodder available, with the highest jump of 3.5 kgs per day in green fodder over a period of time.

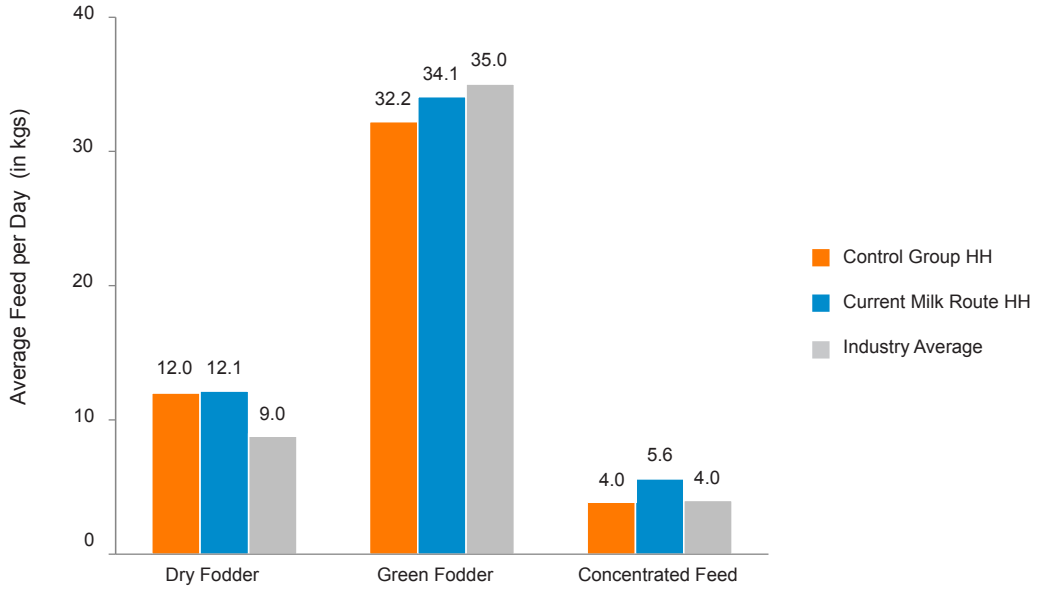
Figure 2.6: Cattle Fodder Feeding Pattern among Milk Route Households Over Time



Milk Route households also fed their cattle more than the Control Group households. On an average, the daily consumption of green fodder was higher by 1.9 kgs, and concentrated feed by 1.6 kgs, for cattle among Milk Route households.

It was also interesting to note that Pre-Milk Route levels of feed were similar to Control Group households. Fig. 2.6 and Fig. 2.7 show that Pre-Milk Route households gave 3.7 kgs of concentrated feed each day and Control Group households provided 4 kgs.

Figure 2.7: Cattle Fodder Feeding Pattern between Milk Route and Control Group Households



The training that MYA imparted to all of its dairy farmers played a role in the improved feeding practices. Adequate quantity of feed, proper mix of feed, and frequency of feeding were some of the issues addressed by the MYA field staff as part of their effort to provide knowledge support. This was beneficial in changing common, yet ill-informed, practices such as feeding the cattle multiple times a day, substituting higher amounts of dry feed

in order to compensate for green fodder when it was not available, and the limited use of concentrated feed.

While it appeared Milk Route households had taken the MYA training to heart, the farmers have not moved towards purchasing the more expensive feed (green fodder and concentrated cattle feed) in larger quantities. The data show that farmers understood the importance of better feed and incrementally increased their investment, but not in the quantities that would ensure a substantial jump in yield per cow. This area has warranted further investigation by MYA: is affordability the critical barrier, is there a need for additional training, or a combination of both?

2.3 Assessing the Yield

The improved feeding practices resulted in higher yields produced by Milk Route farmers. As shown in Table 1.1, Milk Route milk beat industry standards for fat and SNF levels in every district.

As was alluded to in the previous section, it is important that concentrated feed comprise a portion of a cow's diet. This is an item that has traditionally been very expensive and difficult to find in many rural settings. The Milk Route operation introduced concentrated cattle feed to every village it operated in. As MYA controlled the production and distribution of this feed through its own channels, it also made it more affordable. This concentrated feed was exclusively produced for Milk Route farmers and was priced at Rs. 850 per bag. On average, each cow was fed two bags per month. The feed has likely helped to increase the cattle's milk productivity and improve the fat and SNF levels in the milk.

The data in Table 1.1 relied on milk collection centre (MCC) records in each district and not self-reported figures from respondents. Farmers did not have the means by which to measure and ascertain the fat and SNF levels in the milk they poured. The measurement and analysis of these levels is carried out at a later stage in the Milk Route supply chain, after milk has been collected in aggregate at the village level. The Upaya team gathered these records in order to calculate an average by district.

Table 1.1: Milk Yield and Additional Earnings

District	Fat	SNF	Additional earnings for farmer (per litre)
Tumkur	4.00	8.05	Rs. 1.70
Mandya	4.20	8.00	Rs. 1.40
Kolar	3.97	8.11	Rs. 1.50
Industry Average	3.80	7.18	

The data clearly indicated that the milk yields in Milk Route households were significantly higher than the industry average, validating the role played by concentrated feed on productivity. For those farmers who supplied milk with higher fat and SNF levels, the reward was a higher price of Rs. 1.60 received per litre. This translated into a 10% increase in the price per litre received by the farmer.

Better-than-average fat and SNF levels in the milk also translated into commercial benefits for Milk Route by improving profitability. Higher fat in the milk (above the required 3%) was sold as additional fat content to third party vendors. These vendors would then use this fat for producing butter and other such goods. This market linkage resulted in MYA getting a higher price realization and allowed the company to directly increase its revenues. In addition, high levels of SNF in the milk procured allowed MYA to reduce the amount of skimmed milk powder that needed to be added into the milk it sold, thereby reducing production costs. Thus, it can be concluded that higher quality milk directly impacted MYA's bottom line by not just adding a source of revenue but also through cost savings.

2.4 Cattle Ownership Patterns and Milk Volumes

The rural poor depend heavily on livestock for their livelihoods. A Government of India report (2006) stated that in 2006, 90% of the country's livestock was owned by the rural poor.[7] Among livestock, dairy cattle play a fundamental role in livelihood activities since they provide regular income, serve as a productive asset over many years, and require no formal education and little training to rear. Cattle ownership is still viewed as a symbol of social status in rural India: the more cattle a family owns, the more affluent they are thought to be. Therefore it is natural to expect that higher incomes would lead rural households to purchase more cattle. The increase in cattle ownership would then lead to a boost in the total milk volume produced by the farmer.

The survey process recorded the total number of cows owned by each household. In the process of noting these numbers, a trend emerged: a herd size could be broadly classified into four categories that directly corresponded to a households' general level of affluence and experience in dairy farming. The study thus assigned all respondents to the following categories:

- **Cattle-sharing:** This category of farmer owned no cattle but tended to them on behalf of the owner. S/he was then entitled to a share of the profits received from the activity, which was paid either in cash or in-kind.

- **Marginal/Small farmer:** These farmers owned one-to-two cows or buffaloes but no other dairy assets such as milking machines, cow sheds, etc. Income from cattle rearing supplemented the income earned from agricultural activities or manual labour. There was less dependency on grazing among this group, and the cows were given cheaper feed options such as dry fodder and vegetable peels, instead of the more expensive green fodder and concentrated feed.

7 GoI (2006). Livestock Ownership Across Operational Land Holding Classes in India, 2002-2003.

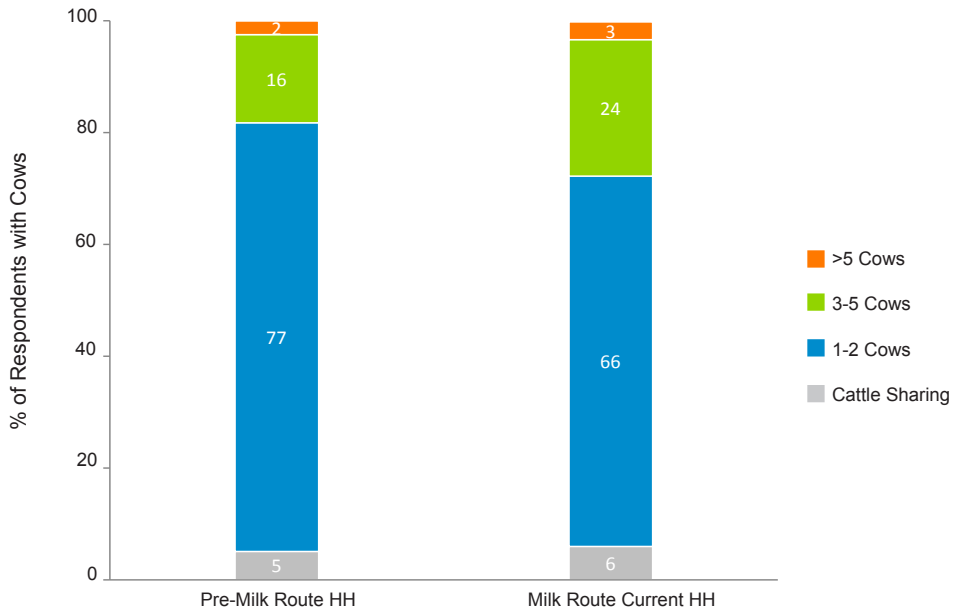
- **Medium farmer:** These farmers owned three-to-five cows or buffaloes and may also have owned a few dairy assets such as a cattle shed. The task of tending to the cattle was distributed among household members. Dairy farming may or may not be the primary source of livelihood and could have been undertaken to supplement household income.

- **Large farmer:** Such farmers owned more than five cows or buffaloes and typically ran a cattle farm. Cattle rearing was the main source of income for the household. These farmers may also have owned other dairy assets like a milking machine, cans for carrying milk, measuring cups, etc. High quality of feed (such as concentrated feed) was provided in order to maximise the yield from each cow. These farmers may also have hired outside help to tend to the cattle.

Such classifications helped build an understanding of the scale each farmer operated at and the various activities typically associated with that scale. It also provided insight into the marketable surplus of milk, as well as some of the costs associated with rearing cattle. For example, a farmer who owned more than five cows has probably undertaken cattle rearing to sell milk to commercial establishments. This implies that the farmer also likely provided more nutritious and more expensive forms of feed.

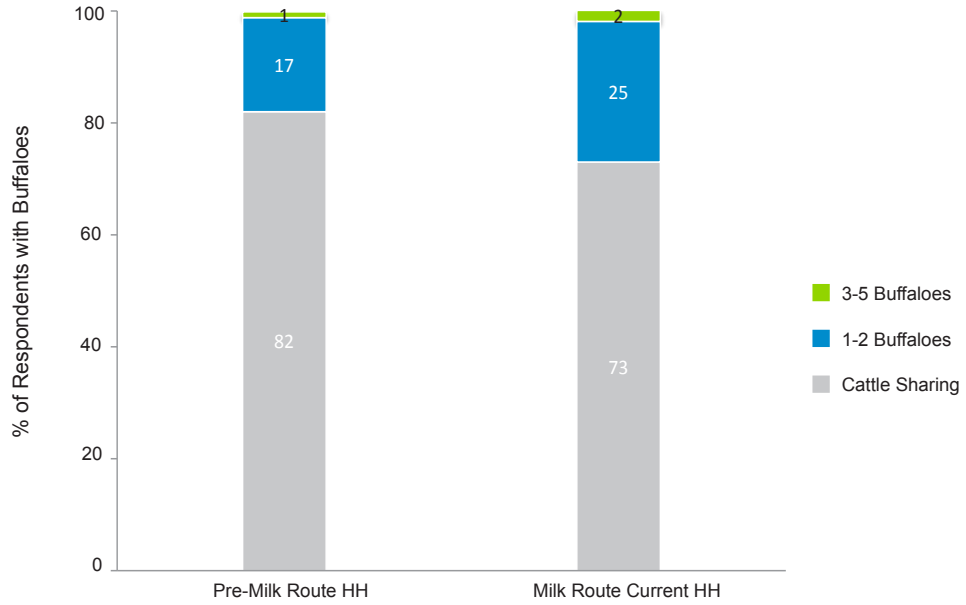
As seen in Fig. 2.8a, the data showed an eight percentage point jump in cow ownership in the category of medium-sized farmers and a marginal one percentage point increase in the number of large cattle farmers amongst Milk Route respondents over a period of time.[8] In conjunction with these increases, there was a decline of 11 percentage points in marginal/small farmers. This indicates that Milk Route producers have been purchasing additional cattle as their incomes have increased. The increase in cattle ownership may also be the reason why aggregate income from the sale of milk has increased for Milk Route households, as volumes have increased.

Figure 2.8a: Changes in *Cattle* Ownership Patterns among Milk Route Households



8 Page A-2 in the Appendix presents the story of Mahadev and his experience related to owning a large cattle farm.

Figure 2.8b: Changes in *Buffalo* Ownership Patterns among Milk Route Households



It is worth noting that the cattle ownership patterns between the Control Group and Pre-Milk Route respondents were similar (Figures 2.8a and 2.9a). While 81% of the Control Group respondents fell under the category of marginal/small farmer, the corresponding figure for Pre-Milk Route respondents was 82%. Over time, however, this percentage fell among Milk Route households as the number of medium-sized farmers increased.

Figure 2.9a: Changes in *Cattle* Ownership Patterns between Milk Route and Control Group Households

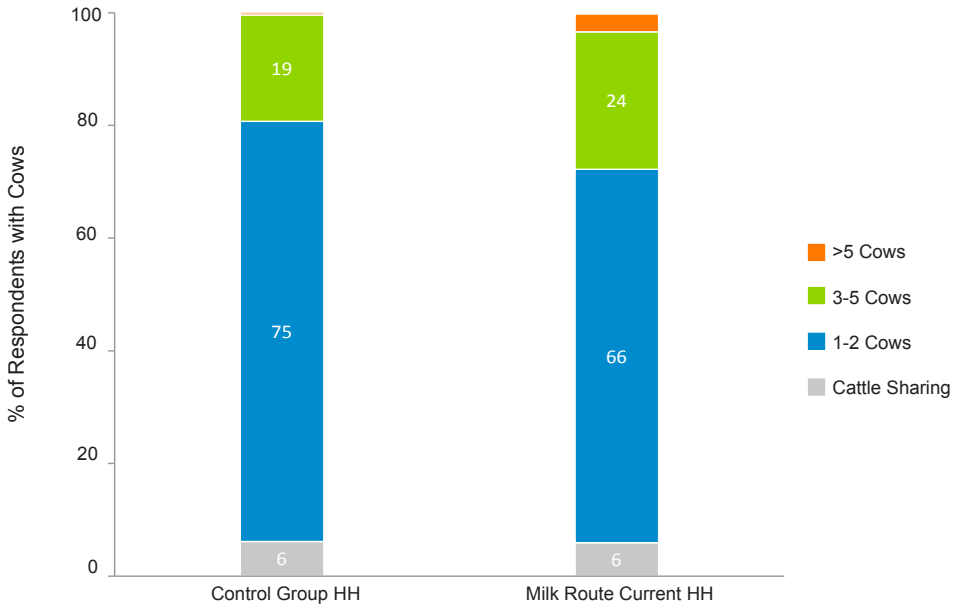
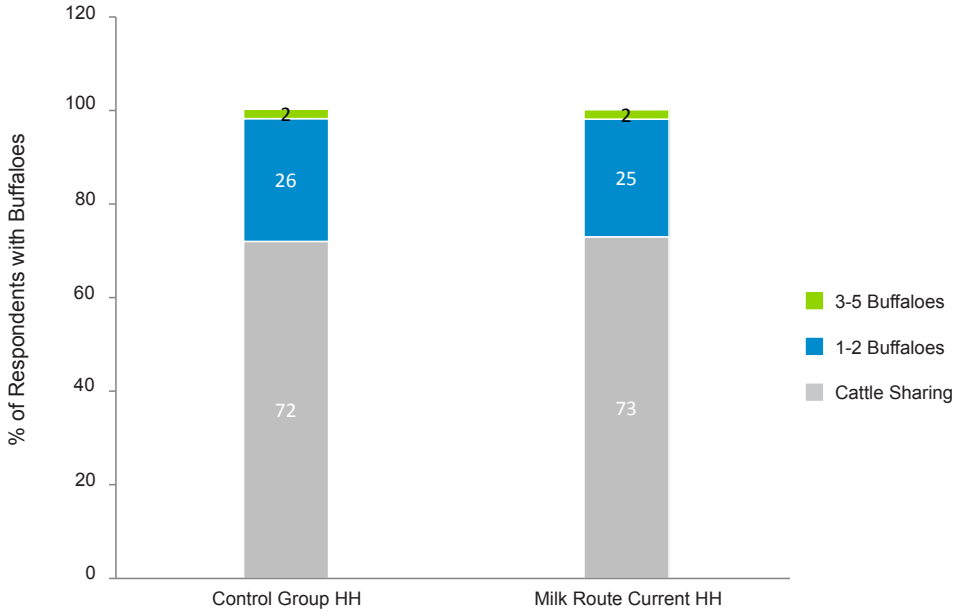


Figure 2.9b: Changes in *Buffalo* Ownership Patterns between Milk Route and Control Group Households



Among most of the Control Group households it appears that, over time, there was no substantive change in the availability of a dairy supply chain similar to MYA's Milk Route. Therefore, it has been difficult to establish how many cattle these households owned in a 'before and after' period equivalent to the Milk Route households. That said, the surveys showed that any increase in cattle ownership happened at a slower pace among Control Group households.

The household survey also included questions regarding milk volumes, and attempted to ascertain the average number of litres of milk produced by each cow each day. It was difficult, however, to draw conclusions from the responses as they varied widely. The number of litres produced by a cow each day varied with the season and fluctuations in the outside temperature. It was also highly likely that a farmer that owned more than one cow observed a range of volumes from animal to animal. Given these factors, it was understandably difficult for farmers to provide a reliable estimate of average milk volumes per cow.

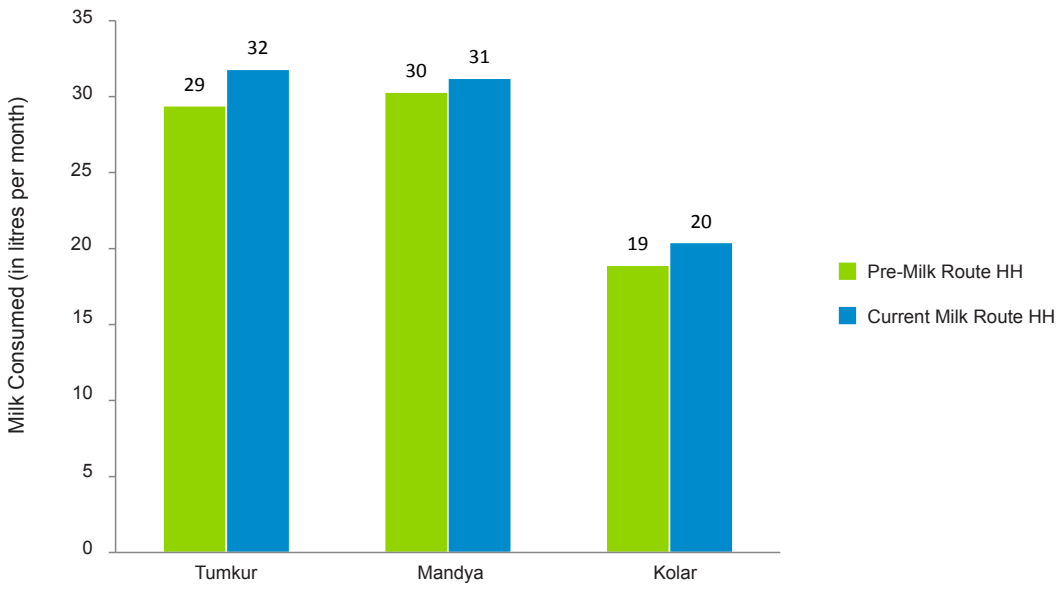
While the data regarding milk volume per cow was inconclusive, it can be safely concluded that volumes *per household* were increasing over time as herd size steadily increased. The purchase of cattle was a preferred form of investment for a majority of farmers in both Control Group and Milk Route households. These farmers tended to focus on increasing the size of their herd, not necessarily on optimising the productivity per cow to make their operations more economically efficient. This was perhaps due to the inherent nature of cattle as a source of investment: the depreciation in the value of cattle was offset by the profits derived from the milk sold. In contrast, increasing the herd's efficiency required greater investment in the same cattle over a period of time covering their feed, health, hygiene, and care. A small or a medium size farmer may have perceived such an investment to be risky—would the up-front costs to purchase better feed and care quickly result in higher yields? Survey responses and longer interviews indicated that he or she would rather put the funds towards the purchase of a new animal altogether.

2.5 Milk Consumption and Opportunity Cost

Household nutrition was an extremely important barometer to gauge the impact of increased income on a household. It was assumed that with higher levels of income, households would more frequently access nutritionally superior food. Milk, with its rich source of vitamins and protein, should have been an integral part of the diet, especially for children. However, it was observed that even though households owned cattle and earned a living through dairy farming, only a small fraction of the total milk sourced was kept for household consumption.

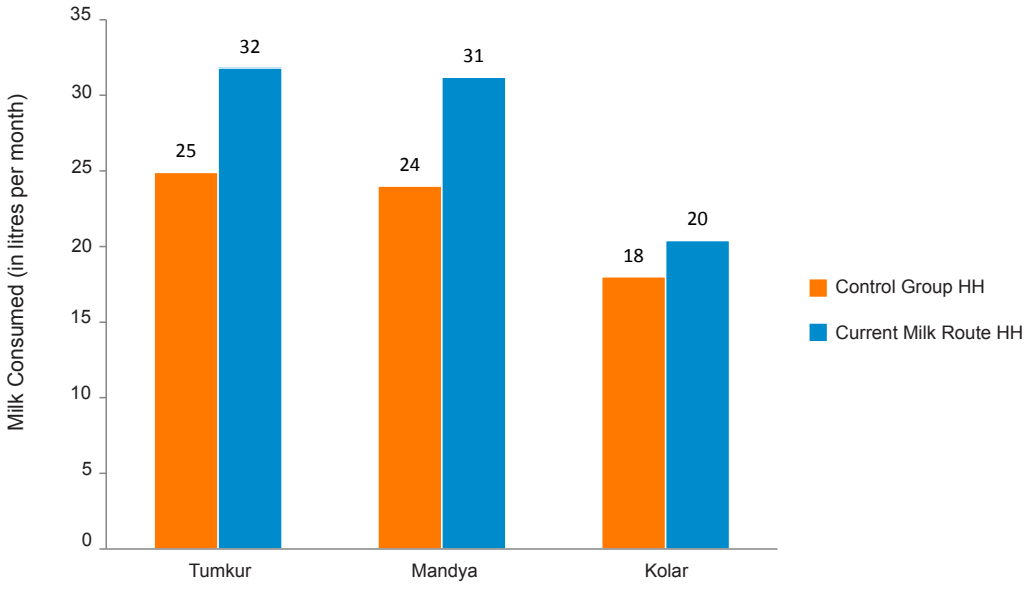
The reason for this paradoxical situation can be best explained by the opportunity cost associated with the consumption of milk. Any milk surplus kept for household purposes was a loss of income that could have been otherwise realised by selling the milk. The survey data showed that on average Pre-Milk Route households chose to sell 90% of the total milk produced.

Figure 2.10: Milk Consumption Level among Milk Route Households Over Time



However, with increased income, this trade-off between consumption and revenue became less marked. Thus, over a period of time, average milk consumption for Milk Route households increased from 26.2 litres per month (before joining MYA) to 27.8 litres per month. Average milk consumption in Control Group households was significantly lower at 22.3 litres per month, indicating that Milk Route households consumed on an average 5.5 more litres of milk per month than their Control Group counterparts.

Figure 2.11: Milk Consumption Level between Milk Route and Control Group Households



2.6 Ancillary Services

Milk Route offered its farmers a wide array of support services to meet the demands of cattle farmers and promote health and hygiene for cattle. These services included artificial insemination, vaccination, concentrated cattle feed, disease screening/de-worming, pregnancy diagnosis, and other veterinary services.

As mentioned earlier, Milk Route made higher quality cattle feed more easily available and affordable. Thus, it came as no surprise to see in Fig. 2.12 that the rate of Milk Route farmers using provided concentrated feed was 94%, compared to the Pre-Milk Route period when only 70% of the households purchased and regularly used concentrated feed. Milk Route households demonstrated higher levels of utilisation than Control Group households as well, who showed only a 79% utilisation rate in this area (Fig. 2.13).

Another service that was used by almost all farmers was artificial insemination for the cattle. This service was particularly useful as it provided access to better breeds of bulls and improved the genetic make-up of the offspring. Artificial insemination also helped prevent the spread of disease among cattle and was cost effective when compared to the cost of maintaining a bull for the purposes of natural breeding. The utilisation rates improved to 96% from 92% in the Pre-Milk Route period. This was almost on par with the uptake shown among Control Group households, which was 98% as seen in Fig. 2.13. Milk Route's provision of the artificial insemination service was relatively expensive compared to other options. This may explain why there was not 100% uptake among farmers. However, it is still impressive that Milk Route farmers availed of this service even when other cheaper options were available.

Services such as de-worming, vaccination, and pregnancy diagnostics were introduced only recently and were priced higher in comparison to other existing local services. This caused a sluggish increase in the utilisation rate for these services, as was seen when compared to both the Pre-Milk Route period and the Control Group households.

In the case of pregnancy diagnostics, the farmer had to incur not only the cost of services but also bear the transportation cost to the MYA service centre. Consequently, lower utilization rates were observed.

Figure 2.12: Uptake of Ancillary Services among Milk Route Households Over Time

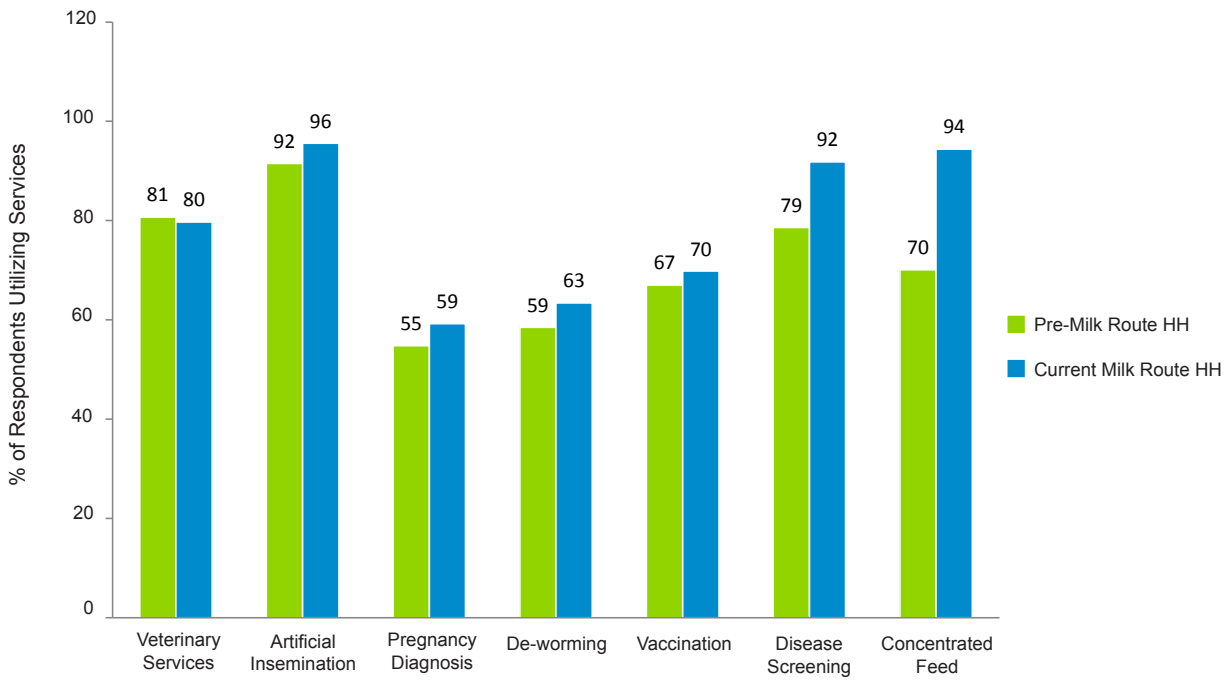
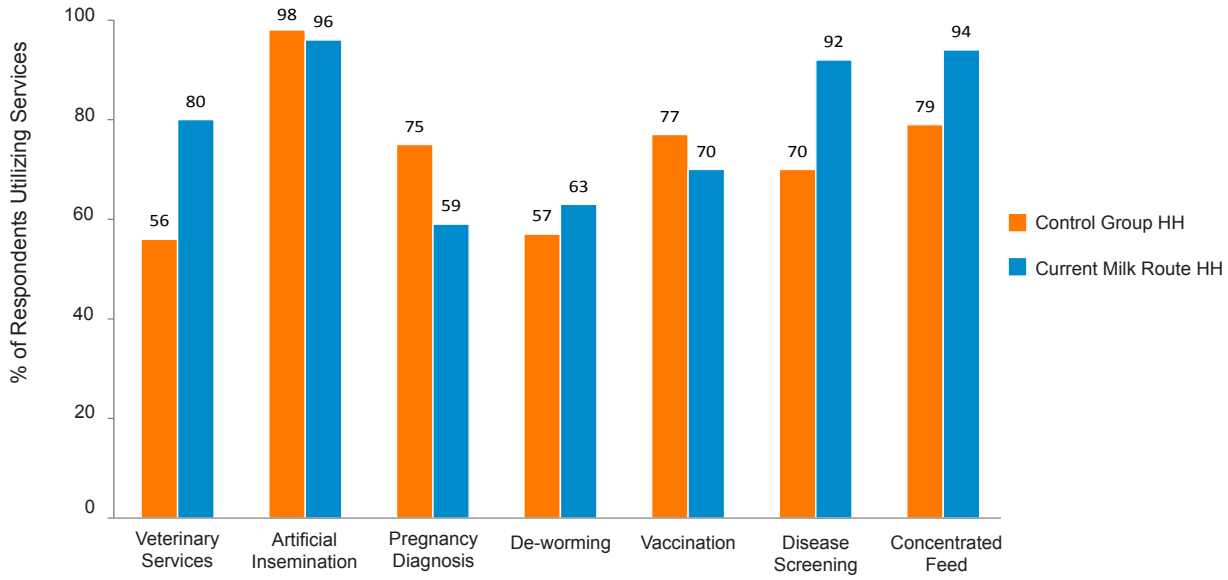


Figure 2.13: Uptake of Ancillary Services between Control Group and Milk Route Households



2.7 Summary

In conclusion, some of the key findings from the SPM evaluation, with respect to direct or first order benefits to the dairy farmers, can be summarised as:

- Milk Route households were more likely to rely on dairy farming as their primary source of income. Nearly 41% of all Milk Route households reported dairy as their primary livelihood versus 25% of households before Milk Route was introduced.

- Milk Route households reported a 24% higher average per capita income when compared to Control Group households.

- The data showed that Milk Route households provided more expensive and nutritionally superior feed, such as green fodder and concentrated cattle feed to their herds, compared to Pre-Milk Route and Control Group households. The daily consumption of green fodder improved by 1.9 kgs and concentrated feed by 1.6 kgs. Dry fodder, which was considered to be an inferior form of feed, showed no changes.

- The increase in nutritionally superior feed likely translated into an improvement in the milk yields generated by Milk Route households, increasing the earning of the farmer by Rs. 1.60 per litre, and providing a 10% jump in total earnings. The fat and SNF levels of the milk were tested and recorded daily by the Milk Route staff to ensure the quality met and exceeded industry standards.

- Milk Route households demonstrated a greater propensity to purchase more cows when they were economically able, compared to their Control Group counterparts. Cattle ownership patterns showed movement from the category of small farmer to medium size farmer. Therefore, Milk Route farmers, on average, were able to produce more milk per household, which helped to boost earnings further and create a virtuous cycle.

- Milk Route households also chose to keep more milk for household consumption. The survey data showed that these households consumed 5.5 litres more than their Control Group counterparts each month. The choice to consume more at home versus selling the milk demonstrated greater income security in general.

- Ancillary services such as cattle feed and artificial insemination were popular and had near-unanimous uptake by farmers. Over time, MYA will assess whether other services such as pregnancy diagnostics, de-worming, vaccinations, and other veterinary services are also availed, or if the relatively higher prices continue to act as a deterrent for Milk Route households.

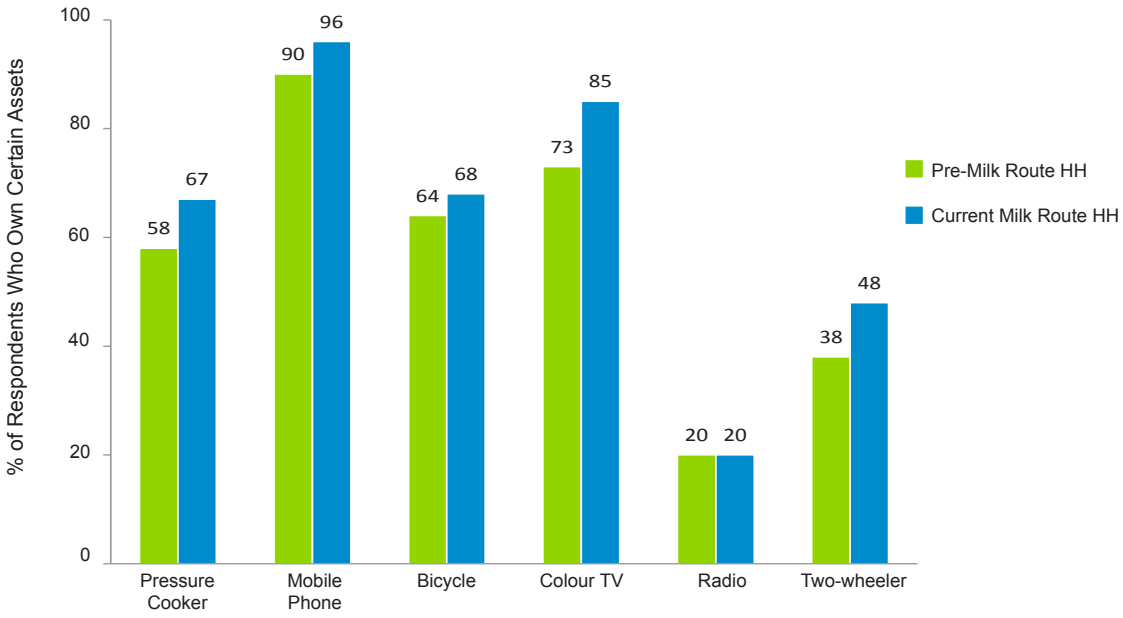
Chapter 3 | Second Order Benefits

MYA's emphasis on providing a stable and predictable stream of income to its dairy farmers in the most transparent manner possible, ensured that their dairy farmers were able to think beyond meeting their immediate needs and expenses, and plan for the future. The benefits of income security also percolated down to the household in other forms like increased purchasing power leading to increased asset ownership, changes in housing quality, and an overall improvement in welfare, etc. These constitute what can be termed as 'second order benefits,' or increase in the households' well-being due to an increase in the total income earned.

3.1 Asset Ownership

Asset ownership was strongly associated with income and consumption levels. Household assets typically can be organised into three categories based on their usage: (a) utility purposes, (b) income generation, and (c) recreational purposes. Milk Route households demonstrated an increase in the ownership of utility assets (pressure cookers, mobile phones) and assets for recreational purposes (TVs) over a period of time. The largest increase was seen in the ownership of television sets, with a jump of 12 percentage points, followed by two-wheelers, with a reported increase of 10 percentage points (Fig. 3.1).

Figure 3.1: Time-based Changes in Asset Ownership among Milk Route Households

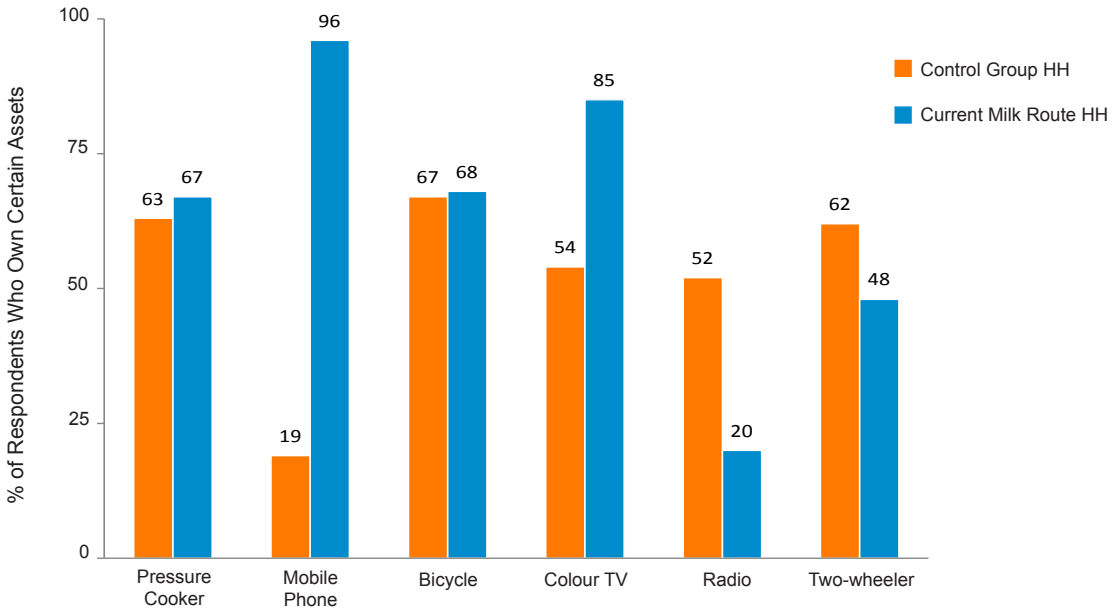


The increase in television ownership was an interesting phenomenon studied by economists Abhijit Banerjee and Esther Duflo in their book, 'Poor Economics' (2011). The authors explained the importance of a television in a rural setting. They postulated that with relatively few employment options and no other source of entertainment, television became an important pastime, connecting households to current events and information, and giving them a much-needed escape.[9]

In a rural setting, where connectivity through public transport is poor at best, and amenities such as healthcare centres, schools, and other educational centres are far away from one's residence, ownership of bicycles and two-wheelers has become very important. Anecdotal evidence supported the hypothesis that these assets were very much in demand. However, the survey results showed only a 10-percentage-point increase in two-wheelers and a 4-percentage-point increase in bicycle ownership. Perhaps a larger uptake was not possible given the high cost associated with the assets. While Milk Route households were more income secure, it is likely they will need to continue to earn and save before they feel comfortable making such large purchases.

It is also interesting to note the difference between Milk Route and Control Group households with respect to television and radio. While Milk Route households outnumbered the Control Group with respect to televisions by 31 percentage points, the trend reversed when it came to radio ownership, with a 32-percentage-point difference between Control Group and Milk Route respondents. This implies that Control Group households had a lower rate of ownership of more expensive recreational assets.

Figure 3.2: Asset Ownership Patterns between Milk Route and Control Group



Milk Route households also had a significantly higher penetration of mobile phone ownership when compared to the Control Group. The phones allowed for speedy communication with the MYA field staff to report problems or complaints and follow up on their requirements. This increased their access to services and allowed for smoother running of daily operations.

9 Banerjee and Duflo, (2011). Poor Economics - A Radical Rethinking of the Way to Fight Global Poverty

Mobile phones were also the cheapest assets in the set of assets analysed. Mobiles can be purchased for as little as Rs. 1,000 and therefore, even with small increases in income, households were able to purchase them.

3.2 Quality of Housing

Overall housing quality and structure is indicative of lasting changes in the household. It is often a high priority of the rural poor, but is seen as a long-term investment, undertaken over a long period of time. The quality of housing is usually a lagging indicator relative to change in income. In the districts where MYA operates, one must also be mindful of various government-sponsored schemes such as the Indira Awas Yojna, which provides materials and assistance to poor households in order to help improve the quality of their homes. It can be said that an increase in income is a necessary, but not sufficient, condition for better housing. The corollary is also true, that changes in housing structures are not necessarily due to changes in income levels.

Housing structures, found in rural parts of the country can be broadly classified into three categories:

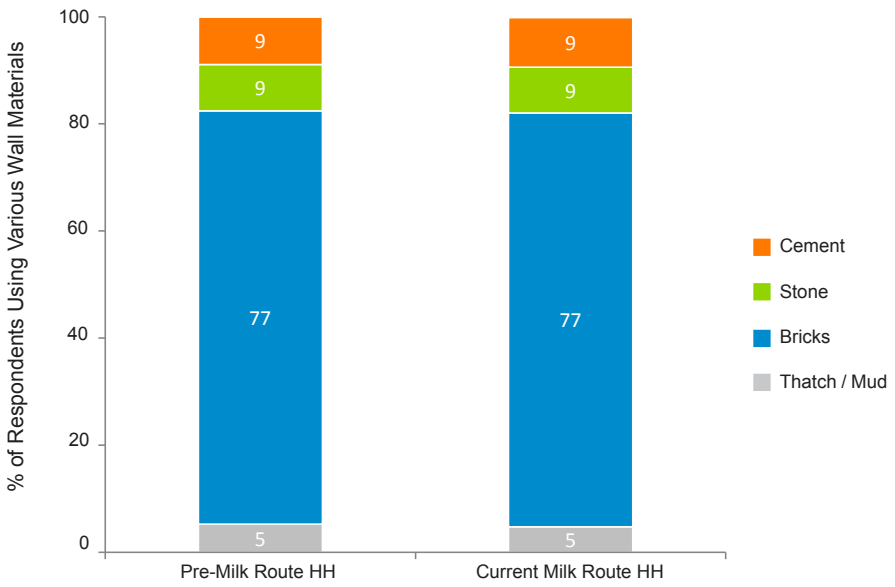
- *Kutcha* House (Unstable): This type of structure uses materials that are not long lasting, such as bamboo, mud, grass, thatch, etc. These materials are also the cheapest and most commonly available, and therefore preferred by those who cannot afford to spend any part of the household income on building quality housing.

- *Pucca* House (Sturdy): These structures are made out of cement, brick, stone, metal sheets, asbestos or PVC and, therefore, are among the most stable and durable. The cost associated with such structures is also the highest due to the cost of materials.

- *Semi-Pucca* House (Semi-Stable): These structures combine features of *kutcha* and *pucca* houses. The roofing of these houses may be made of *pucca* materials whereas the wall is made of *kutcha* materials or vice versa. These are the most commonly found structures in rural villages, and their owners work to make the structure more and more *pucca* over time.

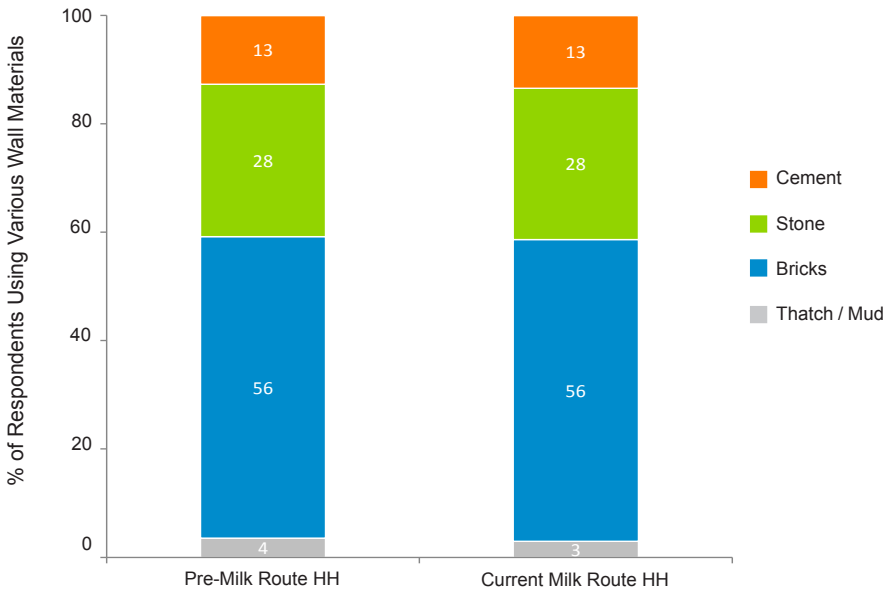
When changes in the quality of houses among Milk Route households were observed, it was evident that only a tiny fraction of these households improved the quality of walls. The highest increase was observed in the use of cement, at the rate of 0.5 percentage points (Fig. 3.3). Over the same period, respondents' use of inferior quality wall material, such as thatch/mud, was reduced by 0.4 percentage points. Brick emerged as the preferred choice of wall material for Milk Route households, accounting for 77% of total wall materials.

Figure 3.3: Temporal Changes in Quality of Wall Material among Milk Route Households



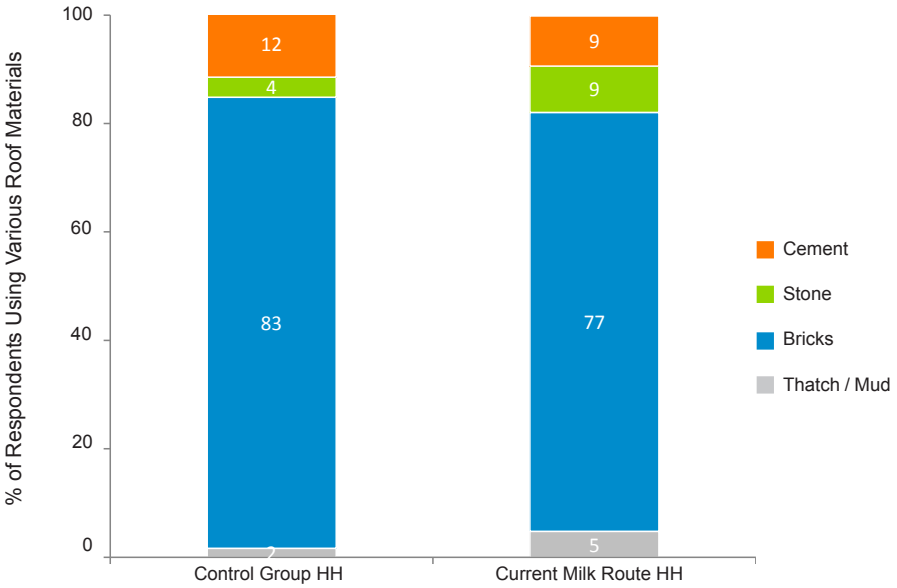
Similarly, little change was observed in the roofing patterns exhibited by Milk Route households, with only a marginal increase (0.8 percentage points) in the number of households using cement for roofing purposes. The amount of Milk Route households using thatch/mud roofing material was reduced by 0.5 percentage points (Fig. 3.4).

Figure 3.4: Changes in Roof Material Over Time



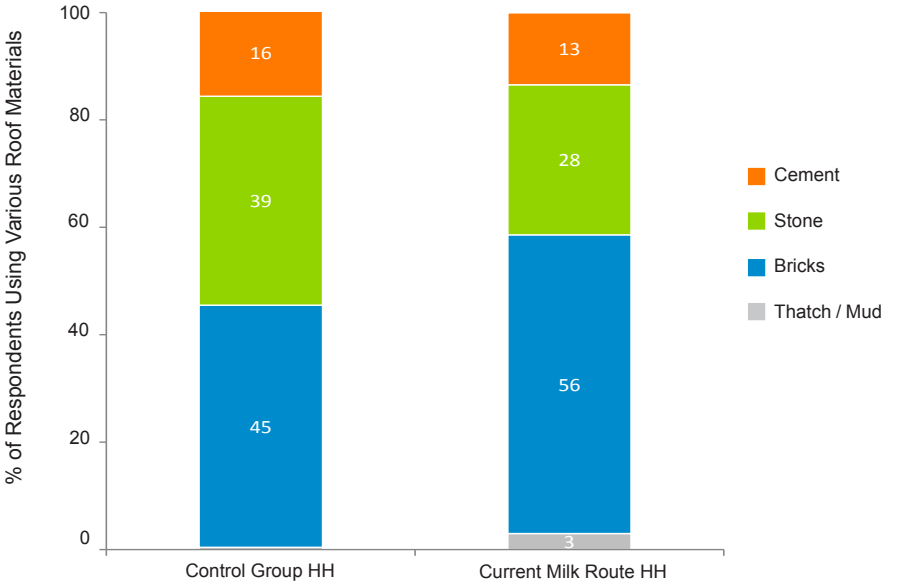
It is interesting to note that the Control Group showed a greater percentage of households using superior quality wall material, with brick and cement constituting approximately 95% of the total houses. Stone and thatch make up the remaining 5% (Fig. 3.5).

Figure 3.5: Comparison of Wall Material between Milk Route and Control Group



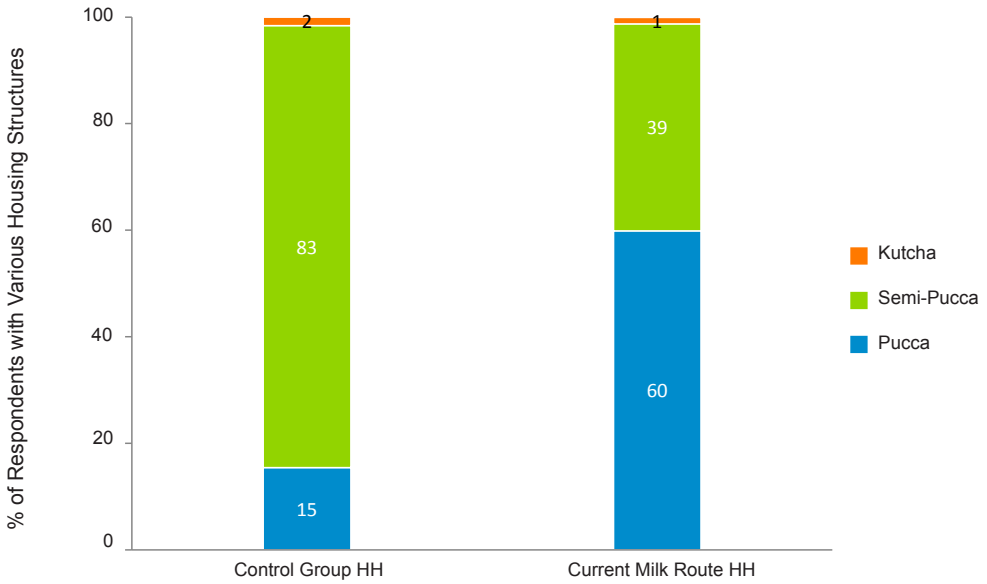
Control Group households also reported having better quality roofing material, with 55% using stone and cement. Thatch, which is considered to be the most inferior material for roofing, made up less than 1% of total Control Group households, as seen in Fig. 3.6.

Figure 3.6: Comparison of Roof Material between Milk Route and Control Group



The better wall and roofing material, however, did not result in higher quality homes for the Control Group. On average, Milk Route households lived in sturdier homes compared to Control Group households. Almost 60% of Milk Route households lived in *pucca* houses, in contrast to 15% of the Control Group households. A larger share of Control Group houses was *semi-pucca* in nature (83%) when compared to Milk Route (39%). Only a small fraction of households between both groups lived in *kutcha* houses: 2% of the Control Group and 1% of Milk Route households (Fig. 3.7).

Figure 3.7: Types of Housing Structures



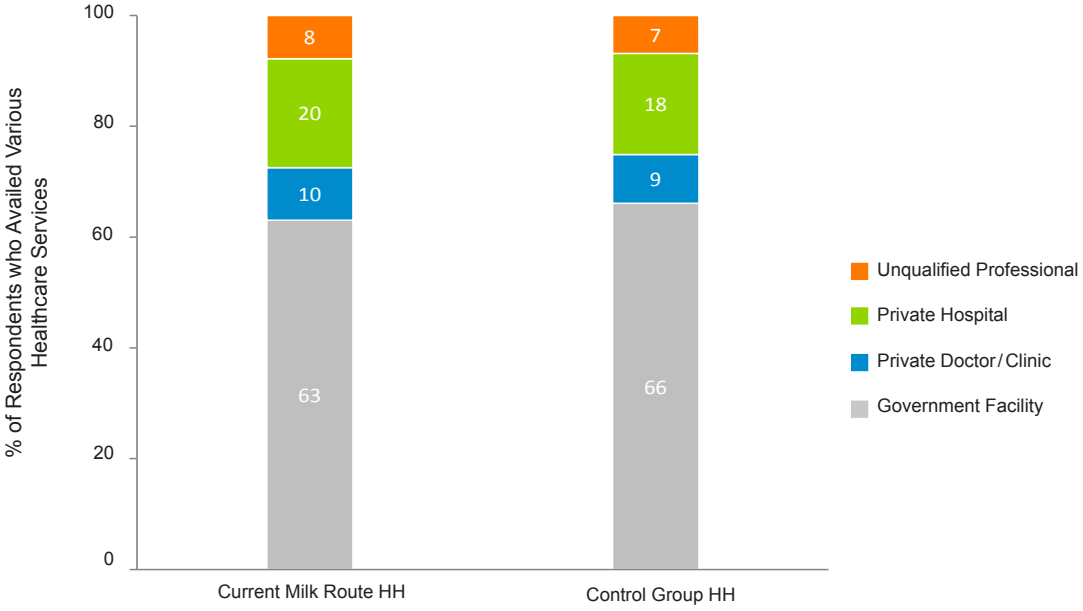
It can be postulated from the trends that Control Group households make piecemeal changes to their houses as their savings permit. For example, with some additional income they may choose to improve the roof, but cannot afford to fix the walls at the same time. Conversely, Milk Route households may take some more time in upgrading materials but choose longer term, more substantial improvements to their homes when they do.

3.3 Access to Healthcare

From the survey data, it can be discerned that seeking health care remains largely in the public sector domain for both Milk Route and Control Group households; with 63% of the Milk Route households opting for government-run health care centres and hospitals and 66% of Control Group households choosing the same (Fig. 3.8). Private health care providers such as private hospitals, clinics, and doctors constitute a viable option for only 30% of Milk Route and 27% of Control Group households.

Patterns for healthcare-seeking behaviour were a function of various contributing factors such as availability, cost, and access. Due to the high costs associated with private health care, households tended to prefer the government-run facilities, which were free of charge. It does not appear that the Milk Route household incomes increased to the extent that households could access the private options; over time the percentage availing of government-run facilities remained largely the same.

Figure 3.8: Healthcare Services Availed by Milk Route and Control Group Households



3.4 Agricultural Productivity

Agriculture is the largest industry and serves as a primary source of livelihood for rural India, employing 60% of its total rural workforce and contributing 17% to the national GDP.[10] The villages surveyed exhibited similar patterns of livelihood and employment for both categories of households. Over time, Milk Route suppliers began to rely less heavily on farming, as income from sale of milk became their primary source of income (refer to Section 2.1). Even then, agriculture employed 85% of Milk Route households and 86% of Control Group Households either as their primary or secondary livelihood activity.
It is worthwhile to note that there is a high degree of negative correlation between employment in cattle rearing and agriculture among Milk Route households. The coefficient of correlation (r) was a high -0.91, implying that as employment in agriculture decreased an almost equivalent increase took place in cattle rearing. This suggests that cattle rearing replaced agriculture as a source of livelihood among many Milk Route households.

Milk Route and Control Group households cultivated a vast myriad of crops, ranging from cereals, pulses and grains, to cash crops like sugarcane, silk, coconut, fruits, and vegetables. Productivity figures for these crops can be understood by factoring the average land holding patterns for both Milk Route and Control Group farmers.

Typically, small landholdings have lower output per acre for various reasons: *first*, the small size of the farm does not allow for the use of machines or production techniques, *second*, farmers do not have enough resources to purchase inputs such as fertilisers, high yield variety seeds, etc. And *lastly*, farmers must rely on rainwater instead of modern irrigation techniques.[11]

10 Mahadevan, R. (2006). Productivity Growth in Indian Agriculture- The Role of Globalization and Economic Reform. http://www.unescap.org/pdd/publications/apdj_10_2/mahadevan.pdf accessed on March 18, 2013

11 Ibid

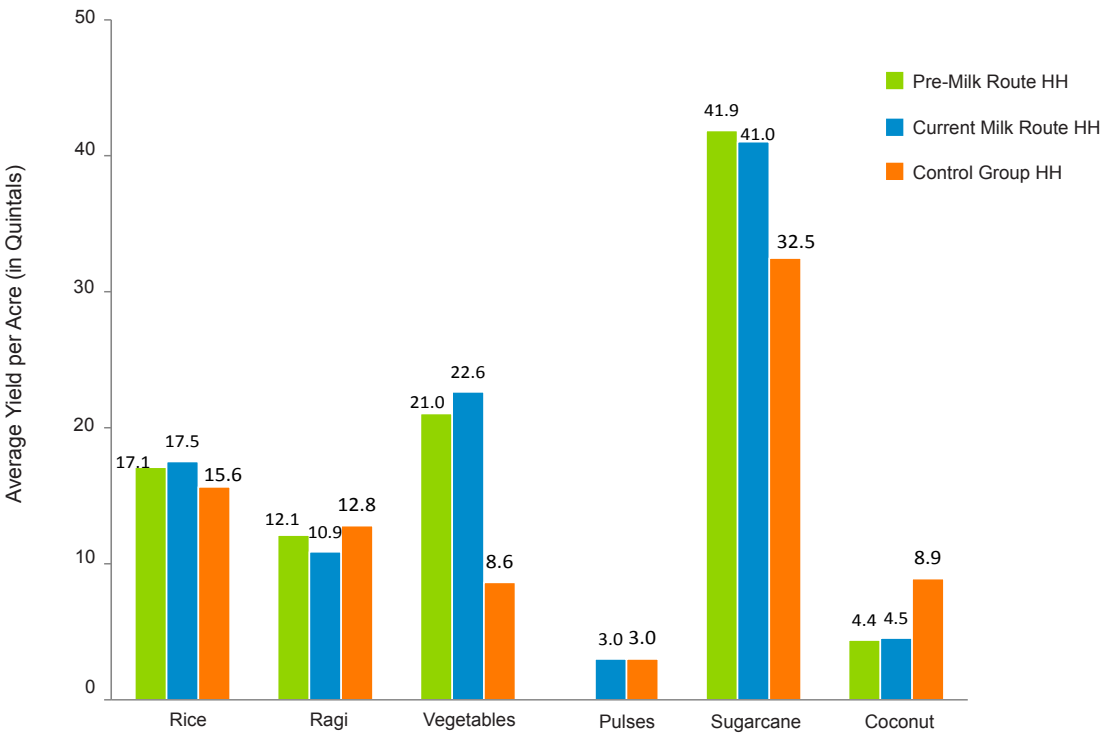
Based on the average land size seen in the survey villages, farmers can be identified under three broad categories:

- **Small/ Marginal Farmer:** Land holding for such farmers is less than two acres
- **Medium Farmer:** Land holding is between two and five acres
- **Large Farmer:** Land holding is greater than five acres.

Land holding patterns revealed that a vast majority, 57% of Milk Route farmers and 62% of Control Group farmers, fell into the category of marginal/small farmer. The percentage of large farmers with land holdings of five acres and above were few with only 12% from the Milk Route households and 14% from Control Group households. Agriculture practiced in both Milk Route and Control Group villages was on small tracts of land and riddled with inefficient production techniques.

Milk Route farmers were unable to increase agricultural productivity significantly over a period of time and all productivity estimates fell into the same category as the Control Group, with the exception of pulses, sugarcane, and coconut. With respect to sugarcane it was observed that Milk Route households had a higher yield per acre estimate at 41 quintals in comparison to 32.5 quintals per acre for the Control Group. On the other hand, Control Group households had higher yields for coconut averaging 9 quintals per acre against 4.5 quintals per acre for Milk Route households. Pulses was the only category in which Milk Route households demonstrated a turnaround over a period of time, with productivity increasing from 0 to 3 quintals per acre (Fig. 3.9).

Figure 3.9: Agricultural Productivity between Milk Route and Control Group Households



3.5 Nutrition

Household nutrition can be understood through a number of different indicators: the quantity and quality of food eaten, access to food, and households' estimation of food security. This survey relied on various data points to understand household nutrition status:

- **Household Food Insecurity Access Scale** (HFIAS): This tool helps in understanding households' perceptions of uncertainty around availability, quality, and quantity of food.[12] Reduction in the HFIAS score implies a more 'food secure' household. Food secure households can be understood as those that do not show anxiety around quantity, quality, and frequency of food available for the family. A high HFIAS score implies that the household deems itself food insecure.

When correlating HFIAS scores with average monthly per capita income (AMPCI) for Milk Route households, the coefficient of correlation (r) was found to be -0.04. This implies that with any increase in the AMPCI experienced by the households, the HFIAS score decreased. However, the amount of change reported was extremely small. While these numbers may look uninspiring, it is important to understand the contributing factors that drove the HFIAS score. *First*, the HFIAS scorecard was based on household perceptions of food insecurity rather than actual reporting of food deficit in the households. *Second*, traditional diets in rural Karnataka consist of coarse cereals like *ragi* (millet) and *jowar* (sorghum) along with pulses and vegetables.[13] These cereals, while nutritionally superior, are considered to be inferior goods when compared to staples like rice and wheat.

Therefore, it is possible that these Milk Route households were eating a nutritionally balanced diet but their perception of a 'good diet' may have skewed the HFIAS score towards 'food insecure.'

- **Monthly Food Expenditure**: An important expense in the household basket of consumption is its food expenditure. While a household living on $1.25/day spends almost 40% of its income on food expenses, this percentage share declines as income increases, due to an increase in consumption of other services like health, education, etc.[14] It was found that, on average, Milk Route households spent 23% of their total expenditures on food. A correlation drawn between percentage of food expenses to monthly expenses and AMPCI, showed that the coefficient of correlation (r) was -0.041. This implies that an increase in income actually reduced the percentage that households spent on food.

12 For a more in depth discussion on HFIAS refer to http://www.fantaproject.org/downloads/pdfs/HFIAS_v3_Aug07.pdf, accessed on April 1, 2013.

13 From the survey data it was reported that all households consumed at least *ragi* as one cereal in their meal.

14 A richer discussion of this subject can be found on http://naldc.nal.usda.gov/download/34238/PDF, accessed on April 1, 2013.

3.6 Summary

To summarise this chapter, the major trends that emerged from the analysis of second order benefits were as follows:

- There was a higher incidence of ownership of assets such as mobile phones and TV sets among Milk Route households, than Control Group households. The data showed smaller percentage increases in the ownership of more expensive assets such as bicycles and two-wheelers among Milk Route households.

- Of the Milk Route households surveyed, 60% lived in *pucca* houses, as compared to 15% of Control Group households. The percentage of households living in *kutcha* houses was less than 2% in both categories of respondents.

- Control Group households appeared to change the quality of their housing in a piecemeal manner when their financial condition allowed it. Milk Route households, in contrast, invested in long-term changes to their houses and undertook more substantial improvements at one time.

- Patterns of healthcare-seeking behaviour exhibited by both categories of respondents were extremely similar. Government-run facilities emerged as the preferred choice for all households.

- A majority of both the Milk Route and Control Group populations engaged in agriculture for primary or secondary sources of income. There existed a high degree of negative correlation between employment in agriculture and cattle rearing activities.

- The data showed that households' understanding of nutrition and food insecurity may have been skewed due to commonly held perceptions of what constitutes a 'good diet.'



Chapter 4 | Takeaways

The survey data from the SPM evaluation was extremely useful in assessing the impact that MYA, through its Milk Route dairy supply chain, has had on the lives of the people it works with. The outcomes were largely positive and prove that the supply chain has indeed ushered in many benefits to the rural households it serves, such as a steady income and support with dairy livelihoods. Before closing, however, it is important to identify trends that have emerged from the data that warrant closer examination by the MYA team.

One finding of this SPM evaluation was that respondents appeared to not have a good understanding of the yields—important parameters such as fat and SNF levels—generated by their cattle each day. The equipment that is used to measure fat and SNF levels is relatively expensive, and to date, has only been deployed in Milk Route's bulk milk chilling (BMC) centres. Each BMC serves between 15-20 villages, aggregates milk from the MCCs that serve each village, and stores and chills the raw milk until it is transported to processing plants. At the time of writing, MYA was investing in the research and development of more cost-effective methods in order to make testing available at the MCC level. If testing occurs at the villages, the measures of total solids and other components can be communicated easily to each farmer. Better knowledge of daily yields can allow farmers to better manage feeding patterns, assess whether they are optimizing the yields, and also spot early signs of any issues relating to the health of their cattle.

MYA can also investigate the reasons for why households were not purchasing a higher amount of the better quality feed and assess whether these products can be made more affordable. It is possible that households were simply unaware they were not providing an optimal amount of feed. Again, knowledge of any fluctuations in yield can help farmers monitor progress and health. MYA through its Operation Milk Rich program is also now working to make sure farmers are aware of the right ratios and practices for feeding their cows.

The study also showed that there was a higher propensity to purchase cows and increase the herd size rather than maximise the productivity of the existing cattle. Though the data on yields showed higher-than-average levels of fat and SNF levels, and the data on volumes was inconclusive, it is likely that room exists for farmers to improve cattle productivity before they purchase new animals. This non-optimal utilisation of resources can be corrected by spreading awareness regarding the economics of cattle rearing and encouraging farmers to keep their own records to track improvements in the productivity.

MYA should also consider making ancillary services, such as pregnancy diagnostics, more convenient—for example, it could explore a mobile solution—and affordable in order to encourage greater uptake. This would be doubly beneficial, as it would not only increase the utilisation rate of services provided by MYA, but at the same time eliminate transportation costs for the farmers.

Agricultural productivity, especially for fruits and vegetables, may be improved by providing farmers with marketing linkages at remunerative prices, imparting knowledge on crop care, irrigation techniques, and more efficient use of inputs (fertilisers, superior quality seeds, etc.). Making agricultural activity easier for farmers may help soften the trade-off that currently exists between dairy and agriculture, and allow households to lucratively pursue both as livelihoods.

Appendix | Farmer Profiles

Mahadev

Srinivasapura
Mandya District

Early in his life, Mahadev decided that he would rather be a cattle farmer than an agriculturist. As he milks his cows in Channapanadoddi village, his bright smile affirms that he made the right choice.

For many years Mahadev supplied milk to Karnataka Milk Federation (KMF) and was happy with the price he received for his produce. However, as local politics changed the way the co-operative was run in his area, his experience soured and he decided to partner with MYA instead.

Now a Milk Route producer for over 13 months, he has continually expanded his herd from eight to 21 cows and is now able to supply 140 litres of milk every day. His wife, Nalina, is also the village milk collection centre supervisor, and Mahadev is very supportive of her role. 'I feel happy and proud that my wife is an equal and earning member of the family,' he says, 'and by saving income from her supervisory role, Nalina has been able to purchase some gold as well!'

Mahadev feels that there is a noticeable difference in the experiences of supplying milk to KMF and MYA. He points out that the field staff at MYA are more approachable and pleasant to interact with. He also believes the cattle feed is of excellent quality and appreciates its on-time delivery. Operation Milk Rich—MYA's initiative to help farmers improve dairy yields—has benefitted him tremendously by providing education on feeding practices. 'Earlier we would just go and dump food in front of the cow, but now we know how much should be fed based on the weight of the cow,' he said, noting that this change in practice has also helped him save on veterinary costs.

Mahadev is not without his concerns, and fears that any drop in prices will make it impossible to cover more advanced costs like artificial insemination and more nutrient rich cattle feeds. If that were to happen, he is afraid that falling prices will force him to sell his cows—a very tough decision for a man who, many years ago, followed his calling to become a dairy farmer.

Sandeep

Srinivasapura
Mandya District

Ever since their father went missing six years ago, life has not been easy for 22-year-old Sandeep, his mother, Sakkamma, and his younger siblings. They made it through these difficult times thanks to their sheer determination. Today they grow paddy, sugarcane, and *'ragi'* (millet) on their four acres of land, and their four cows produce a bountiful 40-45 litres of milk per day.

However, their financial situation has not always been so stable. Three years ago, the family took a sizeable loan to construct a *'pucca'* (permanent) house, pay for their sister's wedding, and send the youngest son, Harish, to engineering college in Bangalore. These heavy financial burdens forced Sandeep to sell milk to a dairy company that he felt took advantage of him. The company rarely paid on time and Sandeep worried for the future.

MYA offered Sandeep and his family an opportunity for financial stability. With MYA's high quality cattle feed and education about the best ways to increase long-run productivity, Sandeep estimates that his cows' milk output has increased by at least 1.5 litres per day.

An agriculturist at heart, he still sees cattle rearing only as a supplementary source of income and prefers working the land to provide stable income for the household. Nevertheless, after joining MYA 13 months ago, he has been able to purchase two additional cows to bring the total count to four, and has paid off more than half of the family's debts. Sandeep's ambition to see a better life for himself and his family has already allowed them to overcome great obstacles and put them back on the path to stability.

Manjuamma

Jodi Krishnapura
Kolar District

Two years ago, Belluru village resident, Manjuamma, was forced to work as a manual labourer to pay for her daughter Yashodaya's education. Illiterate herself, it was the only job Manjuamma could find, and she was determined to see her children go to college and have better career options. Although she and her family owned four cows, they did not produce enough milk for dairy income to be reliable in a way that allowed Manjuamma to pay school fees up front. Manjuamma remembers the constant trade-offs she would have to make: paying school fees sometimes meant forgoing food for her family. Week after week, she would hope to make ends meet through a combination of income from milk sales and manual labour.

All of this changed after Manjuamma and her family started working with Milk Route. Thanks to the MYA staff's expert advice and access to high quality cattle feed, Manjuamma's cattle dramatically increased their dairy yield—so much so that the family has earned enough to buy a fifth cow. Manjuamma has now gladly given up the coolie job and spends her time washing, feeding, and milking the family's cows. She is happy that dairy is her primary livelihood and that it has given her a steady income.

Now 21, Yashodaya has completed her B.Ed degree and shall soon start teaching in a private school in a nearby village. Manjuamma is now also sending her son to school and is encouraging him to concentrate on subjects that will open new opportunities for him. While not forthcoming about her own personal aspirations, she says she is very happy working with Milk Route and proud that it has given her the ability to support her children's dreams.

Dilshaad

Vemgal
Kolar District

Despite facing tremendous difficulties in her life, Dilshaad's unwavering faith has kept her strong in the face of adversity. Her husband, Muhammad, has been disabled for the last 15 years, and ever since his accident, the 60 year-old woman has shouldered the responsibility of raising 11 children and three grandchildren. The large family lives in a three-room house funded through a local government program. Dilshaad has supported the family by doing odd jobs such as manual labour, silkworm picking, and maize cutting on nearby farms. However, she only finds work 10 to 15 days a month, and is paid Rs. 100 for a day's work. Her two older sons—a carpenter and a welder—earn enough so that the family can scrape by.

Fifteen months ago, Dilshaad started working with Milk Route. She is atypical of the farmers in the area and owns only one buffalo. The buffalo gives a meagre five litres of milk each day, all of which she sells at the nearby collection centre. She says that the MYA team has taught her about feeding practices, and has made special feed available to her. If she consistently gave her buffalo this feed, it would likely increase the amount of milk produced. Dilshaad, however, is wary of spending any more than she has to in order to care for the animal. Right now, she is content selling the milk to MYA and this income has helped to supplement the household's earnings and brought a little added security to a critical situation.

Though she never went to school herself, Dilshaad believes education is the key to a bright future and is determined that all her children receive a good education. She wishes to continue working with Milk Route and gradually earn more money. 'With more money I can educate my children and get them married,' she said. 'I have no other wish.'

Nagarathamma

Jodi Krishnapura
Kolar District

At 42, Nagarathamma is a woman who is very content with what she has. Her family owns approximately five acres of irrigated land near Belluru, where they grow a large variety of seasonal fruits and vegetables. She has three children attending schools that she can afford, and she is hopeful about their futures.

Nagarathamma has not always been so content. For many years, her family supplied milk from their six cows to Karnataka Milk Federation, the only dairy company in her area at the time. The family, however, was frequently frustrated by the political interference and delay in payments. When Milk Route moved into her area, Nagarathamma quickly opted to sell milk into this new system.

She has now been with MYA for two years. Not only is she pleased with MYA's straightforward and timely payments, she feels that MYA's support services have helped her family improve their cattle feeding practices. Thanks to a mix of knowledge sharing and on-site training by MYA field staff, Nagarathamma has seen her cows increase their productivity to the current levels of 65 litres of milk per day.

Though the family is primarily reliant upon fruit and vegetable farming for the bulk of its income, the seasonality of the sales make it difficult to rely solely on this income stream throughout the year. Nagarathamma says that the money received from the sale of milk steadies their finances so they are able to save for bigger agricultural expenses such as buying seeds, fertilizers, and renting tractors. She is very grateful for these opportunities and hopes to expand her agricultural activities in the future.

Varalaxmi

Bangarpet
Kolar District

Varalaxmi is a farmer who lives in the Jyotinhalli village of Kolar, Karnataka. Before she started working in MYA's Milk Route network 15 months ago, Varalaxmi, her husband—Naryanappa, and her two children—Archana and Prashant, lived uncomfortably in a house with a straw and thatch roof. The family owned three cows, but struggled to sell the milk to a cooperative that was located more than 1 kilometre from their village. Often, Naryanappa would make the trek to the collection centre, with milk in hand, but the centre would keep unpredictable hours and many times would be closed. Even on the days it was open, Naryanappa felt he wasn't being compensated fairly. It was difficult for the family to count on milk production as a steady source of income.

Since they have started selling milk to Milk Route, the family's monthly income has increased by 25%. Varalaxmi and Naryanappa now bring home Rs. 8,400 for the household each month. Varalaxmi also works as a cook and brings home an additional Rs. 1,000 per month. Together they are earning more for their family than they had previously dreamed.

Varalaxmi now happily reports that the dairy activity is the household's primary livelihood. MYA's milk collection centre is located in the village, and is much more easily accessible. Varalaxmi says she is treated well by the centre staff. Since switching over to Milk Route, 'cattle rearing has become more profitable for us, and now we would like to buy more cows,' Naryanappa says. The family has been steadily saving, and hopes to purchase more cows in the coming months.

With the extra income, Naryanappa fixed up the house: the family now lives in a three-room house with brick walls and a cement roof. Varalaxmi is quick to point out that her house now has an electricity connection! They also regularly buy seeds and fertilizer to grow potato, tomato, and *'ragi'* (millet) crops, as another source of income. Prashant and Archana are now regularly attending school—9th and 11th standards, respectively—and have hopes of pursuing higher education.

Munniyappa and Munnivenkatamma

Bangarpet
Kolar District

Munniyappa and Munnivenkatamma, a middle-aged couple, live on five acres of land in Jyotinhalli where they grow *'ragi'* (millet) and green fodder to eat and feed their cattle. Scarce water in the area makes it tough to grow cash crops such as rice or vegetables, leaving them solely dependent on their cattle for their livelihood. However, as the owners of two cows pouring an average 22 litres of milk each day, their status as farmers in MYA's network has given them an opportunity to pursue a viable livelihood.

Before selling to MYA, Munniyappa and Munnivenkatamma sold their milk to a private dairy for Rs. 17.5 per litre. The harboured a bitterness toward the only buyer in their area, feeling that they were regularly taken advantage of by the company. Each month they estimated they were not paid for at least 16 litres of milk due to inaccurate reporting or faulty measurement at the chilling plant. Consequently, they were excited when MYA appeared in their area with a commitment to on-time payments and honest pricing that paid Rs. 19.5 per litre. Munnivenkatamma was blunt in her assessment of the difference. 'MYA provides better support to us, and their payment is transparent,' she said.

MYA not only pays more per litre of milk, but also provides other benefits such as veterinary services and high quality cattle feed. Munniyappa saw their cows increase milk production by two litres a day after they began eating the higher quality cattle feed made available through MYA.

Since beginning to work with MYA a year-and-a-half ago, Munniyappa and Munnivenkatamma's total monthly income has grown to Rs. 12,870—enough for them to save and invest in their farm. Along with the money their only child, Venkatraju, occasionally sends home from his factory job, the couple can say for the first time that they are living comfortably and can truly plan for a better future.

Lakshamma

Bangarpet
Kolar District

Lakshamma, a 38 year-old widow in Sanganhalli, a village in rural Karnataka, struggled for years to support her three children on her income from cattle rearing. Since she does not receive any widow pension from the government, her family depends solely on the cattle for their regular income.

Her daily routine involved trudging 1.5 kilometres each morning to sell milk to the Karnataka Milk Federation (KMF) milk collection centre (MCC), but she often felt she was short-changed. The MCC frequently weighed the milk inaccurately, especially when the electricity was out. KMF paid her, at most, Rs. 16.5 per litre, and payment was often delayed by three-to-four days. Lakshamma also complained that it was difficult to go to the MCC while taking care of her young children. 'The MCC was far, and I couldn't leave my kids at home alone. It was especially difficult when it rained,' she said.

A little over a year ago, Lakshamma had the chance to begin selling milk to MYA and she jumped at the opportunity. MYA pays her Rs. 19.5 per litre, and Lakshamma feels the payments are fair and timely. Lakshamma now feeds her cow and calf the high quality MYA cattle feed, and she's noticed her cow has increased milk production by one to two litres a day. The cow produces eight litres of milk a day, and Lakshamma's income has risen to Rs. 4,800 per month.

MYA's other services have also helped Lakshamma a great deal. She finds the veterinary services particularly useful and she has taken an advance of Rs. 3,000 to 5,000 to help her cover her expenses. 'Earlier there was no vet here. Sometimes government vets would come from Bangarpet, which is 20 kilometres away,' she explained. Now Lakshamma has consistent and easy access to veterinary services.

Lakshamma and her children currently live in a mud house with a tiled roof, and have very few possessions. On three acres of land, she grows *'ragi'* (millet) and green fodder for household consumption, and occasionally can make a little extra income if there is any leftover green fodder she can sell. However, working with MYA has allowed Lakshamma to dream big for her children: 13 year-old Bhuvanesh, seven year-old Kavya, and five year-old Bhargavi. Lakshamma is determined to give a good education to her children, and they all attend the local government school. When asked what she plans to do with her increased income from MYA, she muses, 'Maybe I'll build a *'pucca'* (permanent) house and buy gold to give my daughters for their weddings. I'll also make sure my son goes on to higher studies.'

Gowramma

Nagavalli
Tumkur District

Gowramma, who lives in a small house in Banavara village with her husband, son, daughter, and parents, is proud to contribute to the family's income through her work with MYA. The family owns two cows and used to sell milk to another local dairy but they were never happy with the company. When Gowramma learned of MYA's Milk Route operation two years ago, she immediately signed up.

She now earns a reasonable income selling around 25 litres of milk a day to Milk Route. Gowramma also acts as a milk collection centre (MCC) supervisor for MYA, and though it means additional responsibilities, she loves the role. Every day she oversees the local MCC by aggregating milk from her neighbours, noting the milk quantity and quality, checking the milk temperature, and maintaining the equipment. She also ensures that her neighbours are fairly and reliably compensated.

'The job of an MCC supervisor allows me to earn more for my family, which is a great source of satisfaction. I am content and happy with this role,' she says, smiling. She had been a little apprehensive at first because she felt that her neighbours may treat her differently. Would the role of supervisor strain her friendships? Thankfully, however, her entire community has been supportive, and she assures us that she is given no special treatment in her village.

Gowramma's experience with MYA has been very different from the other dairy, she says. The MYA staff go above and beyond, and have trained her on the best milking and milk storage practices, as well as taught her how to properly care for and feed her cows. Gowramma has passed this knowledge on to her neighbours, which has positioned her as an expert in her village.

After her promotion to supervisor, she used her additional income to buy an electric mixer for the kitchen and is considering buying a new sari and a few more cooking vessels. First, however, she is committed to paying for her children's education. Her experience with Milk Route has made Gowramma more optimistic about the future. While the younger generation used to dream of moving away from villages and into the cities, she insists that her own two children stay right here and contribute to the well-being of the village. She believes they can earn a healthy living from farming activities and lead a comfortable life.

HP Sidharaju

Nagavalli
Tumkur District

Like many of the farmers that supply milk into the Milk Route operation, Sidharaju is very pleased with the attentive service he receives from MYA's staff.

'In the past, I sold milk to two other local dairies,' says Sidharaju. 'Milk Route has given us the best service. If my milk output is less than usual for a few days, somebody from MYA immediately gets in touch with me and asks if they can help diagnose a problem.' Since partnering with Milk Route one year ago, Sidharaju has benefited greatly from MYA's service and has used his additional income to purchase new clothes for his wife, son, and parents, and has also purchased a colour television and dish antenna. It means a lot to him that the MYA staff seem to genuinely care about his livelihood and well-being.

MYA's presence in his village has not only improved his dairy livelihood, it has also helped Sidharaju enhance the productivity of his land. The family owns two acres of land on which he and his wife, Mamata, grow *'ragi'* (millet), paddy, betel nut, coconut, banana, and maize. The Milk Route bulk milk chilling facility sits about 12 kilometres away and runs on three-phased power. The facility transmits the electricity to nearby fields to help out local farmers.

'The three-phase power from this facility provides 24 hours of electricity to my farm, and we never had access like this before,' says Sidharaju. 'There is no voltage fluctuation and it runs smoothly. We can even use it at night for irrigating our farms.'

Income from the sale of milk, fruits, and vegetables has allowed Sidharaju to better plan for the family's future. He once worried about how he would take care of his aging parents—who are illiterate and do not work—and his infant son, Ulhaas. With MYA's continued support, he is confident that he can make a good living as a farmer and also afford creature comforts that, until recently, seemed so far out of reach.

Sheila

Srinivaspura
Tumkur District

Besides giving her a stable job, Sheila credits MYA's Milk Route with allowing her son, Anil, to obtain a Master's degree in agricultural sciences. She beams with pride as she talks about his achievement. Sheila herself only studied until the 10th standard, after which she got married and had to work to support her family. She worked hard with the hope that Anil and his younger brother, Praveen, could get a higher education.

Steady work was always elusive, and two years ago it seemed likely that Anil would have to drop out of college and also work. The family struggled to pay the tuition and fees, and Anil felt guilty about pursuing his education. At the time, the family owned two cows, but they did not provide a reliable supply of milk each day so could not be counted on for income. Then MYA came into town.

Thanks to MYA's support and close guidance, Sheila learned about cattle feed, green fodder, and efficient milking practices that have resulted in an increase in output of 7 to 8 litres per day on average. MYA's guidance greatly helped to stabilize the family's income, reducing the financial stress that Sheila and her husband, Soamanna, constantly felt. She also says, smiling, that they found MYA just in time: the steady source of income from milk sales meant that Anil could finish college and even enrol in a Master's degree program. Anil decided to focus on agricultural sciences, so that one day he too could give back to his community.

Praveen has also recently graduated with an ITI (vocational) diploma, and is looking to start his own business in the village. After paying for her sons' education, Sheila used her earnings to fix up the home: what was once a mud house now has a cement floor and several sections of tiled roofing. She also bought a third cow in order to increase her milk sales.

Sheila is grateful to MYA, not only for her stable income, but also because the company seems to have the farmers' best interests in mind. 'Before, if we had to sell milk to a dairy there was no collection centre near our village,' she said. 'The nearest one was 4 kilometres away, and it was hard to walk to. If I had to return during the evenings I used to feel unsafe. It was also very difficult to reach in the rain. MYA has made things easier for us.'

MILK ROUTE