

Report on

# An in-depth study on Farmer's Behavior Change, Drivers and Barriers as well as 'Spontaneous' Impact on Family and Neighbors of SaFaL

Prepared for

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## ACRONYM/ GLOSSARY

AI	Artificial Insemination
BDT	Bangladeshi Taka
CPL	Consiglieri Private Limited
CLSP	Community Livestock Service Provider
CNV	Community Nutrition Volunteer
DAE	Department of Agriculture Extension
DAP	Di Ammonium Phosphate
DCP	Di-calcium Phosphate
FGD	Focused Group Discussion
HYV	High Yield Variety
IDI	In-Depth Interview
IGA	Income Generating Activities
LF	Lead Farmer
LSP	Local Service Providers
MOP	Muriate of Potash
NGO	Non-Government Organization
OHOF	One House One Farm
PG	Producer Group
p <sup>H</sup>	Power of Hydrogen
SaFaI	Sustainable Agriculture, Food Security and Linkages
TSP	Triple Super Phosphate

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## Executive Summery

### Background & Introduction

Solidaridad with the support from the Embassy of the Kingdom of Netherlands in Bangladesh has been implementing the Sustainable Agriculture, Food Security and Linkages (SaFaL) project from November 2102. The purposes are improving food and nutrition security for 50,000 farm households (project target), disadvantaged landless workers, and women in the southwest Bangladesh. Their intervention emphasizes on improved farming practices, market accessibility, access to technologies, certification to sustainability standards, access to inputs and financial services.

Solidaridad assigned Consiglieri Private Limited (CPL) to conduct an in-depth study on farmer's behavior change, drivers, and barriers as well as 'spontaneous' impact on family and neighbors. The specific objectives of the study are to assess the effectiveness of the adoption and adaptation of new technologies, analyzing the household level diversification of food behavior, and assess 'spontaneous' impact on family and neighbors. The study was conducted in the five districts of South-West Bangladesh (Khulna, Satkhira, Bagerhat, Jessore, and Narail) and on the three subsectors this project has been working with (horticulture, dairy, and aquaculture).

### Effectiveness, Adoption, and Adaptation of new Technologies and Services

#### ***Horticulture:***

There has been significant changes that took place in usage of chemical fertilizers. Vegetables producers stated, that due to increased usage of organic fertilizers and knowledge on proper usage, their expenditure on chemical fertilizers have decreased. Farmers are also using micro-nutrient contained fertilizers where there is deficiency in the soil for all appropriate places. Instead of raw cow dung, farmers now use vermi compost (76%), compost (62%) or quick compost (9%). In case of seeds, 49% respondents have claimed that producers have been increasingly using HYV seeds because of their experience of increased productivity and increased market price.

After project inception, there has been increased adoption of safe and environmentally friendly pest management technologies, for example, sex pheromone trap. It has significantly reduced their cost and increased product market price.

We have observed substantial changes in the post-harvest management practices among the horticulture producers. Most of the producers (97%) currently harvest vegetables as per buyer's demand, wash (74%), sort and grade (97%), keep on plastic mat in shaded place, and then pack them safely (47%) for transportation. We have also observed the use of plastic crates while transporting the crops in collection center based sales areas.

In case of work distribution in a horticulture household, adult male members were found to be heavily involved in seed and input purchase (80% and 95% respectively) and sales and marketing (86%). On the other hand, female members are found to be moderately involved in weeding (36%), harvesting (35%), sowing/seeding (36%), and post-harvest processes (30%).

### ***Aquaculture***

We have found noteworthy changes in case of pond preparation. After the intervention took place, they drain out the pond, apply lime, compost, urea, potash and other necessary project prescribed materials in the pond before the cultivation of fish. Most of the respondents (96%) claimed they now have a better knowledge about the source or have access to fish seeds. Consequently, they purchase better quality fish seeds (fries/fingerlings/PL). We have found substantial changes in producers' practice related to fish feeding. Now almost all fish farmers purchase fish feed now (basic concentrated feed or ready feed). Around 60% of the respondents are now mixing basic fish feeds (following project promoted prescriptions) at their home before applying those in their ponds. We also found that more than 90% of the fish producers are using probiotics since they help improve the overall health status of marine stock which in turn helps ensure higher yields and higher profits. More producers are testing pH level (76%, during pond preparation), water temperature (65%) and phyto and zoo plankton amount in water (58%) now. There also been change in reduced chemical use, cleanliness and pond hygiene maintenance. Many of them use fine meshed synthetic nets which protect the ponds/ghers against snakes, frogs and other harmful animals and insects.

In case of work distribution in a fish producing household, except for feed purchase, sales, and pond preparation, women are contributing almost equally to their male counterparts. In our qualitative findings, we have found out significant contribution in feeding (38% reported of female contribution in this activity), homemade feed preparation (38%), applying the medicines (26%), and fishing (34%).

### ***Dairy***

There has been notable change in the ownership of hybrid/ cross-bred cows in producer groups. While 72% of the respondents own at least one cross-bred/ hybrid cow, 54% own at least one local cow. 45% of the surveyed farmers were found to cultivate improved variety green grass for their cows. There has also been noteworthy change in homemade feed preparation. Almost all the farmers (98%) reported that after project inception their cows are producing more milks. Another noteworthy area where we found behavioral change is cow shed management (install well-pit and drainage system, use of lime and soda to clean their cowsheds, etc.).

After project facilitated relevant awareness building sessions, CLSP services and linkage development with local veterinary services, now significantly more producers are taking regular medication and regular health care services for their cows (vaccination, deworming, regular check-up, etc.). We have also observed significant change in milking process among dairy producers.. In our field visits we have witnessed that farmers now clean the mammary gland area with towels and wash hands properly before and after milking.

In case of household level work distribution, male members are predominantly involved only in cow purchase, cow sales, and cross breeding. On the other hand, women are mostly involved in all other production steps, including feed preparation, feeding, shed management, milk sales, and so on.

### Household level social and behavioral practices related to food security

The findings from the study show quite promising results in terms food consumption behavior, cooking and hygiene practice. Most of the households were found to consume items from more than four food groups which denotes more than acceptable household dietary diversity in program groups. Additionally, we have found positive changes in women's food consumption behavior. More than 50% of the respondents stated that women now eat vitamin A rich food (55%), eggs (62%), and dairy products (56%) regularly. Also, more women eat iron rich foods, legume and nuts on regular basis.

It was found that children are also increasingly consuming fresh food, eggs, and dairy products on a regular basis. 50% of the children had eaten protein at least twice in last 24 hours of the interviews. Also, as complementary food, children mostly eat boiled eggs (26%), khichuri (19%) and fruits (12%). Few respondents reported that their children drink milk though.

While further analysis was conducted, result presents that 63% of the respondents now wash their hands with soap after coming from toilet. Additionally, almost two-thirds of the respondents (69%) now wash their hands with soap before eating. It was also interesting to see, that around two-thirds of the respondents reported of women washing their hands before cooking (62%) and before cutting vegetables (74%).

### Status of women in agricultural production and their empowerment in household and society level

In horticulture, women are now more involved in in post-harvest activities (88%) and harvesting (70%). We also found that women's contribution in making decisions have increased, including decisions about food purchase for household members and children (89%), measures on taking care of herself and her children (97%) and savings (amount and frequency) (93%).

In aquaculture subsector, women are comparatively less influential in the PGs and also comparatively less involved different fish production activities. Women are moderately involved in home-based feed preparation (16%) and feeding (15%). Except these two activities, women were not found to be significantly involved in any other activities.

Dairy PGs were formed mainly with female members they showed remarkable performance over the project cycle. The result significantly indicated that women are actively involving in milk sales (85%; but that is because they mostly sell milk to neighbors or collectors who come at farmgate to purchase milk), feeding (82%), milking (74%), and feed preparation (70%).

### Sales, Finance and Saving Situation

#### **Sales Situation**

In horticulture, 70% of the respondents sell fish to local *arotdars*. Another 53% reported that they sell through collection points, while 46% respondents said that they sell their produce to distant traders. Producers who sell through collection points said that better price (85%), cash sales option (73%), guaranteed sales (65%) and less transaction time (60%) are the major benefits that they get from using this channel.

In aquaculture, around 90% of the respondents claimed that they sell more than 90% of their fish that they produce. 39% of them sell their fish to local *arotdars*, while 36% sell fish to distant arotders. Producers who sell through distant traders said that better price (70%), cash sales option (70%) and guaranteed sales (79%) are the major benefits that they get from using this channel.

In the dairy subsector, 67% of the respondents claimed that they sell more than 70% of the milk they produce daily. From the survey we have found that 44% sell milk to milk collectors and retailers and 21% to sweetshops and local buyers.

### ***Finance and Savings Situation***

50% of the respondents reported that they have access to MFIs, but not to the appropriate financial products they need. 62% of the loan receivers said that they take loan from MFIs and NGOs, while 24% reported to take loan from banks and government projects. However, regardless of the promotion of these financial institutions, 66% of the sample beneficiaries said they opt out for personal savings.

### **Local Service Producers: Agents for Community Level Behavioral Change**

Among all the actors that SaFal project introduced, **Lead farmers (LFs)** were found to be the most influential catalyst for group mobilization, technology adaptation and resulting behavioral changes. They are accessible and provide quality services on production related information, output and input market linkage, etc. **CLSP (Community Livestock Service Provider)** has been an important change maker in dairy subsector. They are accessible and provide cheap and quality services on deworming, regular health checkup, vaccination, preventive and corrective measures. **Vegetable Collectors** have been instrumental in bringing positive changes in vegetable production and management related behaviors, their business modalities with different market actors and promoting copying-in phenomenon among neighboring farmers. They have been disseminating market information to both PG members and other community members. **Community Nutrition Volunteer (CNV)** are the major actors in promoting health and nutrition in targeted communities. Most prominent services that producer households regularly take from CNVs include knowledge on improved food and consumption pattern (100%), and information on hygiene, nutrition and feeding practice (98%). Respondents also stated that CNVs regularly pay customary visits their homes and ask whereabouts (84% reported that) which they found really beneficial for their well-being and that created a strong bond in between.

### **Chapter Seven: ‘Spontaneous’ Impact on Family and Neighbors of SaFal**

In both our quantitative and qualitative analysis, we have found that there have been impressive changes in neighboring (non-program) producers’ and households’ production and consumption related behavior. This can be attributed largely to the program interventions. Neighboring households realized that the products and food they produce and consume, affect their own wellbeing and livelihood. We have found that while neighboring producers have been copying practices related to inputs usage, cultivation method, post-harvest management and sales, in the household level there has been change in consumption behavior.

## Chapter One: Background and Introduction

### 1.1 Background and Objective of this Study

With the focus of eradicating the hostile environment from these people's lives, Solidaridad with support from the Embassy of the Kingdom of Netherlands in Bangladesh has been implementing the Sustainable Agriculture, Food Security and Linkages (SaFaL) project from November 2102 for improving food and nutrition security for 50,000 farm households (project target), disadvantaged landless workers and women in the southwest Bangladesh. Their intervention emphasizes on improved farming practices, market accessibility, access to technologies, certification to sustainability standards, access to inputs and financial services. Additionally, their focus in ensuring gender equitable access to food and safe drinking water along with promoting hygiene practices. The keys to achieve these goals are improved and sustainable farming systems, sustainable farming value chain for crops and live stocks, nurturing the private sector and creating mass awareness of food security and safety. The program has been working work in rural communities of Bagherhat, Khulna, Jessore, Satkhira and Narial districts in the southwest Bangladesh targeting 250,000 smallholder farmers and landless workers, unable to curve out a decent livelihood from agriculture due to salinity of land, unsustainable agricultural practices and lack of access to markets. Here are some key facts about the SaFaL project:

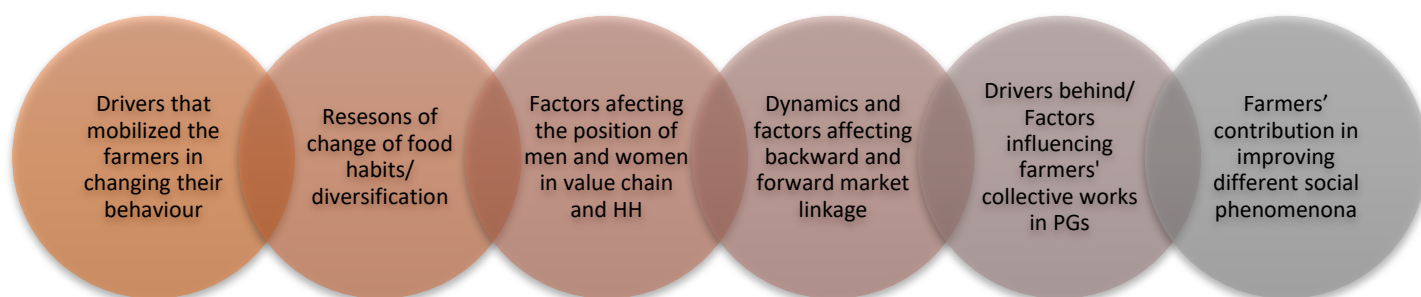
- **Geographic coverage:** Five districts in the Southwest Bangladesh (Satkhira, Khulna, Bagerhat, Jessore and Narail).
- **Horticulture:** Supporting 11,361 farmers with an annual production volume of 15,450 metric tons fruits and vegetables.
- **Dairy:** Supporting 17,406 farmers with an annual production volume of 1,44,82,314 liters milk.
- **Aquaculture:** Supporting 28,699 farmers with an annual production volume of 8,520 metric tons of fish.

Solidaridad assigned Consiglieri Private Limited (CPL) to conduct an in-depth study on farmer's behavior change, drivers and barriers as well as 'spontaneous' impact on family and neighbors. The purpose of the study is to examine the determinants of farmers' behavioral change with regard to agricultural practices, selection of crop varieties and adoption of technologies towards having self-organized impact on their food security and livelihoods. Solidaridad and EKN wants the consulting firm to critically analyze factors such as technical knowledge and capacity, gender differentiated choice, access to inputs and affordability of farming, market of produces, availability of land and water, including geographic isolation and climate change issues. Solidaridad also wants the study team to take into consideration of the dietary diversification for household nutritional outcomes.

Solidaridad wants the consulting firm to take opinions of producer groups and stakeholders and analyze how the project interventions are contributing to change the farmers behavior in terms of different factors including farming practices, nutritional food habits or food diversification, women involvement in productive agriculture, backward and forward market linkages, market barriers and challenges, farmers' collective and also others social phenomenon. The specific objectives of the study are:

- Assessing the effectiveness of the adoption and adaptation of new technologies
- Analyzing the household level diversification of food behavior and its impact
- Assessing the status of women in agricultural production and status of their empowerment in household and society
- Identifying the present state and need for backward and forward market linkages
- Assessing the household level social and behavioral practices related to food security

The following figure shows the key areas that this study intends to explore.



**Figure: Key Areas that this Study will intend to Explore**

## 1.2 Geographic Scope & Subsectors

The study was conducted in the five districts of South-West Bangladesh (Khulna, Satkhira, Bagerhat, Jessore and Narail). And because this project is working with horticulture, dairy and aquaculture subsectors, stakeholders of all three subsectors were targeted.





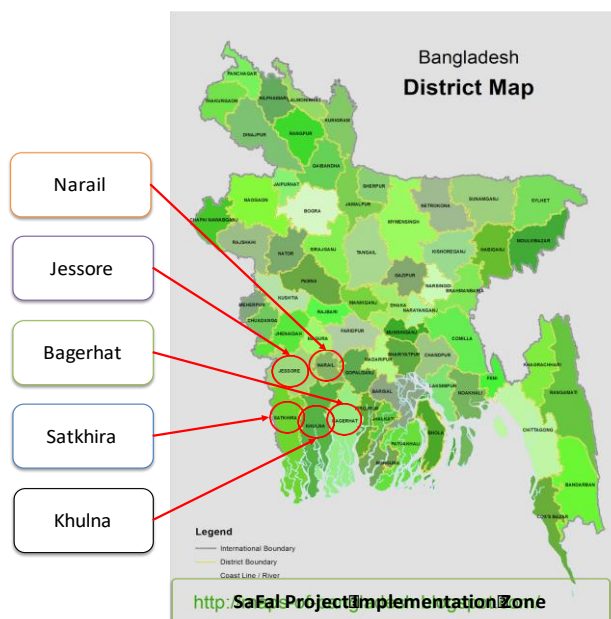
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## 1.3 Sampling Design

### Sample size and distribution for Survey

As per the ToR, SaFal project reached 57,466 direct beneficiaries so far under three subsectors, i.e., aquaculture, horticulture and dairy (which is the population for sample survey in this study). Here, this number is taken as the finite population size (10,000+). Considering this population size the sample size (i.e. the number of farmers to be covered by the questionnaire survey) was calculated using the following formula (a few references against the sample size calculation formula used here are given in the foot-note)<sup>1</sup>.

$$SS = [Z^2 * (p) * (1-p)] / c^2$$

Where,

SS = Initial Sample Size;

Z = Z value, which varies with the confidence level;

p = a dichotomous probability variable, for p = 50% the formula results in highest sample size;

C = Level of Precision.

<sup>1</sup> a) Glenn D. Israel, 2008, Determination of Sample Size, The Institute of Food and Agricultural Sciences (IFAS) Publication, University of Florida (<https://edis.ifas.ufl.edu/pdf/IFAS/PD/PD00600.pdf>);

b) Yamane, Taro. 1967. *Statistics: An Introductory Analysis*, 2nd Ed., New York: Harper and Row (<http://www.gbv.de/dms/zbw/252560191.pdf>);

c) Cochran, W. G. 1963. *Sampling Techniques*, 2nd Ed., New York: John Wiley and Sons, Inc (<http://onlinelibrary.wiley.com/doi/10.1002/bimj.19650070312/abstract>)



Considering 95% of Confidence level and 5% Level of Precision, the initial sample size SS stands equal to 385. For calculating the sample size for a finite population (57,466), the following formula was used:

$$n = SS / [1 + \{SS-1\}/Pop]$$

Where,

n = New sample size for finite sample;

SS = Initial sample size for infinite sample;

Pop = population size, which is assumed as 57,466 farmers.

Considering 95% of Confidence level and 5% Level of Precision, the new sample size against 57,466 farmers stands equal to 384.

The table below shows distribution of sample (384) across the three subsectors based on PG member concentration (or percentage) in those subsectors.

	Aquaculture	Dairy	Horticulture	Total
<b>Number of PG members involved</b>	28699	17406	11361	57466
<b>% of Involvement</b>	50%	30%	20%	100%
<b>Sample distribution (out of 384)</b>	<b>191.77</b>	<b>116.31</b>	<b>75.92</b>	<b>384</b>

Now by distributing these samples between male and female members, we got the figures presented in the table below.

	Aquaculture		Dairy		Horticulture	
	Male	Female	Male	Female	Male	Female
<b>% of male/ female involvement</b>	82%	18%	11%	89%	40%	60%
<b>Sample Distribution (M/F)</b>	157.25	34.52	12.79	103.51	30.37	45.55
<b>Sample distribution (out of 384)</b>	<b>191.77</b>		<b>116.31</b>		<b>75.92</b>	

The project is operating in 13 upazilas in five districts in the south-west region of Bangladesh. CPL wanted to collect primary data from one representative upazila from each of the five project districts (therefore, five upazilas in total). The following table shows the five districts that we selected for primary data collection and also sample distribution across those upazilas and different subsectors. During upazilas selection, we tried to prioritize the areas where PG groups working with different subsectors are present. For convenience, approximate figures were set; and the total survey sample stands to 400.

Upazila/ District Name	Aquaculture		Dairy		Horticulture		Total
	Male	Female	Male	Female	Male	Female	
<b>Chitolmari (Bagerhat)</b>	30	10	5	20	5	10	80
<b>Dumuria (Khulna)</b>	30	10	5	20	5	10	80
<b>Kalaroa (Satkira)</b>	30	10	5	20	5	10	80
<b>Manirampur (Jessore)</b>	30	10	5	20	5	10	80
<b>Narail Sadar</b>	30	10	5	20	5	10	80
<b>Total Survey Sample</b>	<b>200</b>		<b>125</b>		<b>75</b>		<b>400</b>

## Sample size and distribution for FGDs and KIIs

CPL conducted one FGD with the PG members of each subsector in each of the five selected upazilas (therefore, 3 FGDs with 3 PG groups of 3 subsectors in each upazila). Besides, the team conducted one FGD with the neighbors at each upazilas. Thus, the total number of FGDs is conducted is given in the table below. Approximately 10 farmers participated in each FGD.

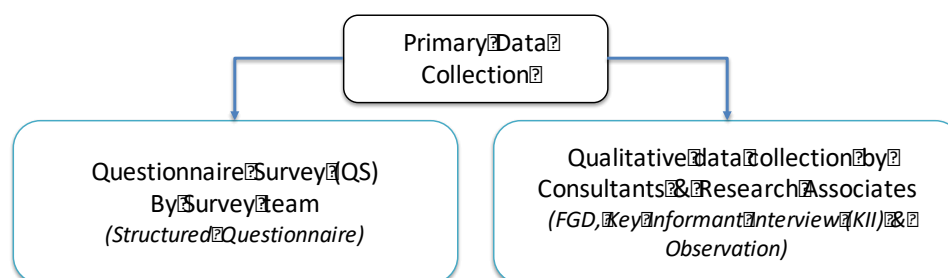
	Aquaculture	Dairy	Horticulture	Neighboring farmers	Number of PG members reached
<b>Chitolmari (Bagerhat)</b>	1	1	1	1	40
<b>Dumuria (Khulna)</b>	1	1	1	1	40
<b>Kalaroa (Satkhira)</b>	1	1	1	1	40
<b>Manirampur (Jessore)</b>	1	1	1	1	40
<b>Narail Sadar</b>	1	1	1	1	40
<b>Total number</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>200</b>

Study team also collected insights, perceptions and in-depth information from PG members, other relevant stakeholders and project staffs. Number of KIIs in different upazilas is tabulated below.

	Aquaculture Farmers	Dairy Farmers	Horticulture Farmers	Other Stakeholders <sup>1</sup>	Project staffs <sup>1</sup>
<b>Chitolmari (Bagerhat)</b>	1	1	1	5	5
<b>Dumuria (Khulna)</b>	1	1	1		
<b>Kalaroa (Satkhira)</b>	1	1	1		
<b>Manirampur (Jessore)</b>	1	1	1		
<b>Narail Sadar</b>	1	1	1		
<b>Total number</b>	<b>5</b>	<b>5</b>	<b>5</b>		

## 1.4 Data Collection Method

While the semi-structured survey was conducted by a team of surveyors and field investigators, a team of consultants and research associates used tools like FGD, IDI and observation methods for qualitative data collection.



## 1.5 Study Limitations

- Understanding the factors that motivate farmer behavior is complex. Behavioral pattern depends on so many **psychological factors** (objectives and goals in farming, social values and norms, attitude towards the traditional/ethical approach to farming, stress and the ability to cope with stress, satisfaction with and optimism about farming, attitudes to legislation, risk-taking, autonomy, management attitudes, risk perceptions, time preference, market conditions, quality and quantity of information, who is involved in the decision-making process, individual's ability to solve problems, aspects of their personality, "education" level of the farmer, etc.) and **socio-economic factors** (income, farm size (e.g., modern, large-scale, commercially-oriented farm businesses are likely to display characteristics that differ from small-scale, family run farm businesses, production system, etc.). It is difficult and to capture enough insights on behavioral patterns and underlying causes by talking to a farmer for sixty to ninety minutes.
- Analyzing behavioral change analysis has intrinsic anthropometric component in it which demands deep observation and open ended discussion with the study respondents. But in most cases, we had to limit ourselves with semi-structured interviews and group discussions.
- Although this study had both survey and qualitative data collection parts, but it was comparatively heavier on the survey part (400 samples) and a bit weaker on qualitative data collection part. We believe that in such behavioral analysis more prioritization should be given to qualitative data collection and analysis in future.

## Chapter Two: Effectiveness, Adoption, and Adaptation of new Technologies and Services

### 2.1 Technology Adoption and Adaptation in Horticulture Subsector

#### 2.1.1 Use of Chemical fertilizers

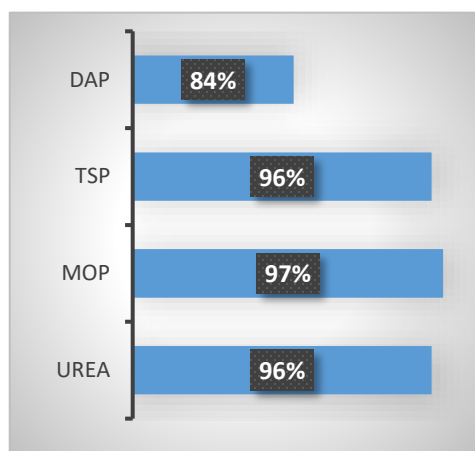
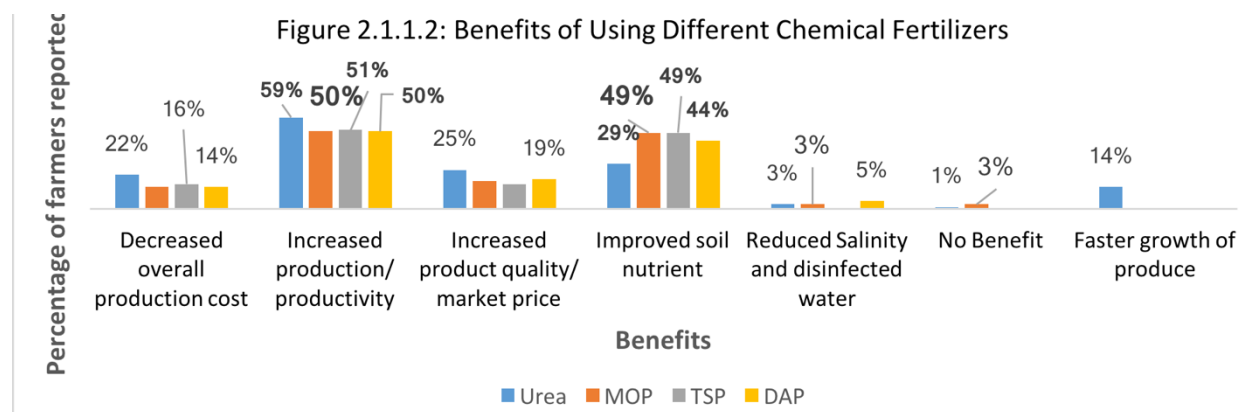


Figure 2.1.1.1: Farmers reporting different chemical fertilizers

SaFal project tried to reduce the usage of chemical fertilizers among the users. The most used kinds of chemical ones are Urea, MOP, TSP, and DAP. According to Figure 2.1.1.1, there is significant use of different chemical fertilizers including urea (96%), MOP (97%), TSP (96%) and DAP (84%). However, FGDs and IDIs have revealed that the change has mostly been in the right usage and dosage of different chemical fertilizers. Before, they had a misconception that the more they would use, the better the yield would be. But, after the PG trainings now they try to follow the recommended doses in their crops. Therefore, their cost for chemical fertilizers has significantly decreased.

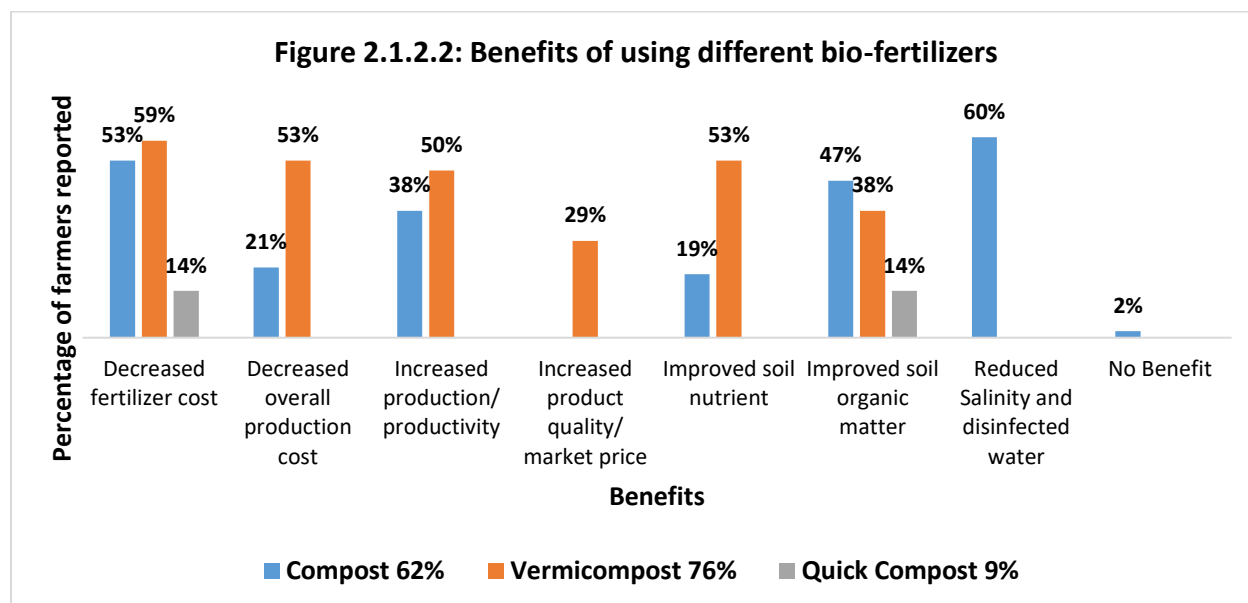
We have tried to identify what benefits they had received from appropriate usage of chemical fertilizers. Here in the graph in Figure 2.1.1.2, we have calculated the percentage of farmers reporting different benefits of using different chemical fertilizers. For example, 49% of the MOP users said that using it has improved their soil nutrient. In case of Urea, TSP, and DAP, respectively 29%, 49% and 44% have accounted for this benefit. Likewise, in relation to increasing production /productivity, 59% of the urea users said that it helped them. Similarly, 50% of the MOP and DAP users claimed the same benefit and 51% accounted for TSP. Additionally, 14% of urea users claimed that the fertilizers helped their crop grow faster. In case of increasing product quality, most farmers said that urea helped (25%). It should be noted that, the responses have been taken in multiple choice-multiple answers format. This format allowed respondents to choose multiple options as part of their answer.



## 2.1.2 Use of Composts

The program introduced composts or organic fertilizers to PG members in order to improve soil health, enhance soil conservation, decrease production cost and enhance productivity in the long run. Previously use of compost was very minimum. Those who used to apply it, mostly spread raw or semi-dried cow dung only.

SaFal introduced three kinds of composts to its beneficiaries: conventional compost (mixture of processed cow-dung, leaves and other plants), vermicompost, and quick compost (processed cow-dung). Almost all the respondents reported that they are using at least either one of these three types of compost.



**Figure 2.1.2.2: Benefits of using different bio-fertilizers**

In figure 2.1.2.2, we have summarized the responses by the farmers against different benefits. The column chart represents multiple choice-multiple answers format.

From the survey, it was found that while 62% of the respondents use traditional (cow dung and leaves), 76% use vermicompost, and 9% have been using quick compost (processed cow dung). The main improvement was observed in terms of vermicomposting. Also, use of quick compost (processed cow dung) has also decreased.

Increased promotion of vermin compost has made farmers more aware of the benefits of using it. The Project introduced vermicompost producer at community level, who sells both compost

and worms to producers. This way, producers can produce compost by themselves at household level. From our FGDs and IDIs, we have also found that many producers are either purchasing vermicompost from local vermicompost producer or producing it themselves.

Additionally, we have tried to identify what benefits they had received from the appropriate usage of organic fertilizers. As we can see in the figure above (Figure 2.1.2.2), vermicompost usage has decreased 59% farmers' fertilizer cost. In addition, 53% of the respondents have reported that their overall production cost came down because of using it. Increased productivity was also identified as one of the major drivers for using vermicompost by 50% of the respondents. Behind the increased use of other types of compost, 53% have reported that decreased expenses for fertilization was identified as the major cause. Traditional compost (that is homemade processed cow dung) is capable of neutralizing water salinity. Since salinity has been a major problem in a large part of the project areas, 60% of the respondents reported that they use traditional compost as it neutralizes salinity in water.

### 2.1.3 Use of Micronutrients

Micronutrients are essential for plant growth and play an important role in balanced crop nutrition. They are important to plant nutrition though plants do not require them much. A lack of any one of the micronutrients in the soil can limit growth, even when all other nutrients are present in adequate amounts.

However, micro-nutrient is only required if there is any deficiency; otherwise it is not necessary. SaFal project introduced knowledge on the usage and benefits of different micronutrients (gypsum, boron, magnesium, and sulfur) to its PG members.

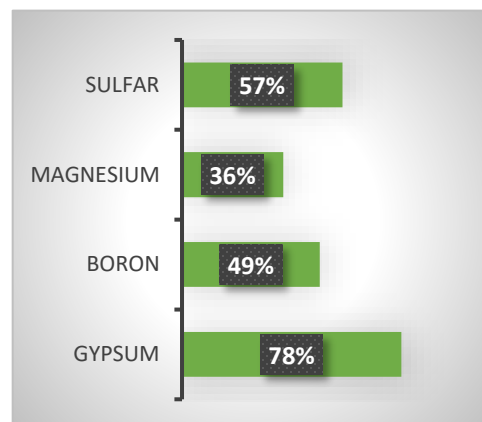
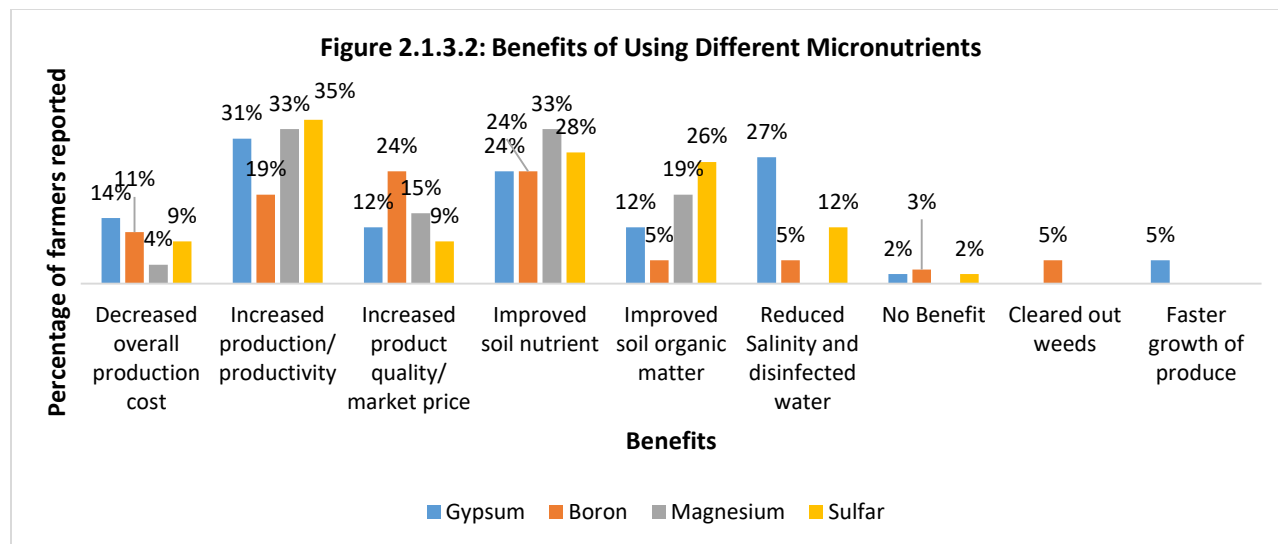


Figure 2.1.3.1: percentage of farmers using different types of micronutrients

We have found moderate level of spread in micronutrient use among farmers. Before the project started, use of micronutrients was quite small. As we can see in Figure 2.1.3.1, more than half of the respondents said that they have been using different types of micronutrients including gypsum, Sulphur and Boron.

In addition, we have tried to identify why users have been using micronutrients for vegetable cultivation. The graph in Figure 2.1.3.2 illustrates the percentages of farmers accounting for different benefits. As we can see below (Figure 2.1.3.2), that magnesium serves good purpose in terms of increasing production and improving soil nutrients. 33% of the respondents have accounted for this micronutrient regarding these benefits. Sulfur gives the most increased production than any other micronutrients. 35% of the respondents said that sulfur helped them the most in escalating their production. Additionally, 26% of the informers said that sulfur also improved their soil's organic matter the most.

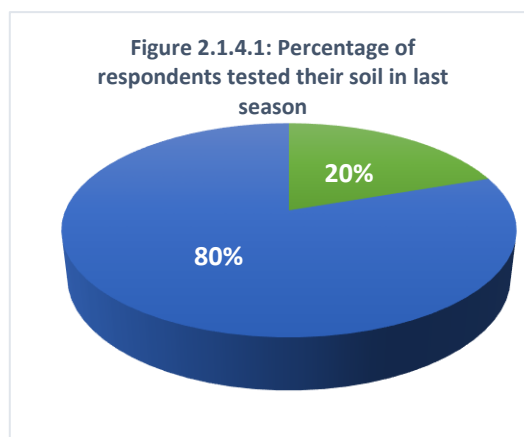
Although nutrient deficiency is the only reason for using micronutrients, out FGD and IDI findings denote that farmers are using it without testing their soil. They have a misconception that usage of additional micronutrients might give them additional yield. Better access to soil testing service might improve regarding practice in this case.



## 2.1.4 Soil testing

The first step for an ideal vegetable producer is to test the soil before planting the seeds or saplings. The analysis consists of checking the nutrients in the soil, level of acidity (pH level), and evaluating potential deficiencies.

However, soil testing has not been a usual practice among farmers in Bangladesh (alike other practices like fertilization) and this project recently has started their work on bringing changes regarding this behavior. Till date, the project has demonstrated the impact of soil testing in productivity to some PG members.



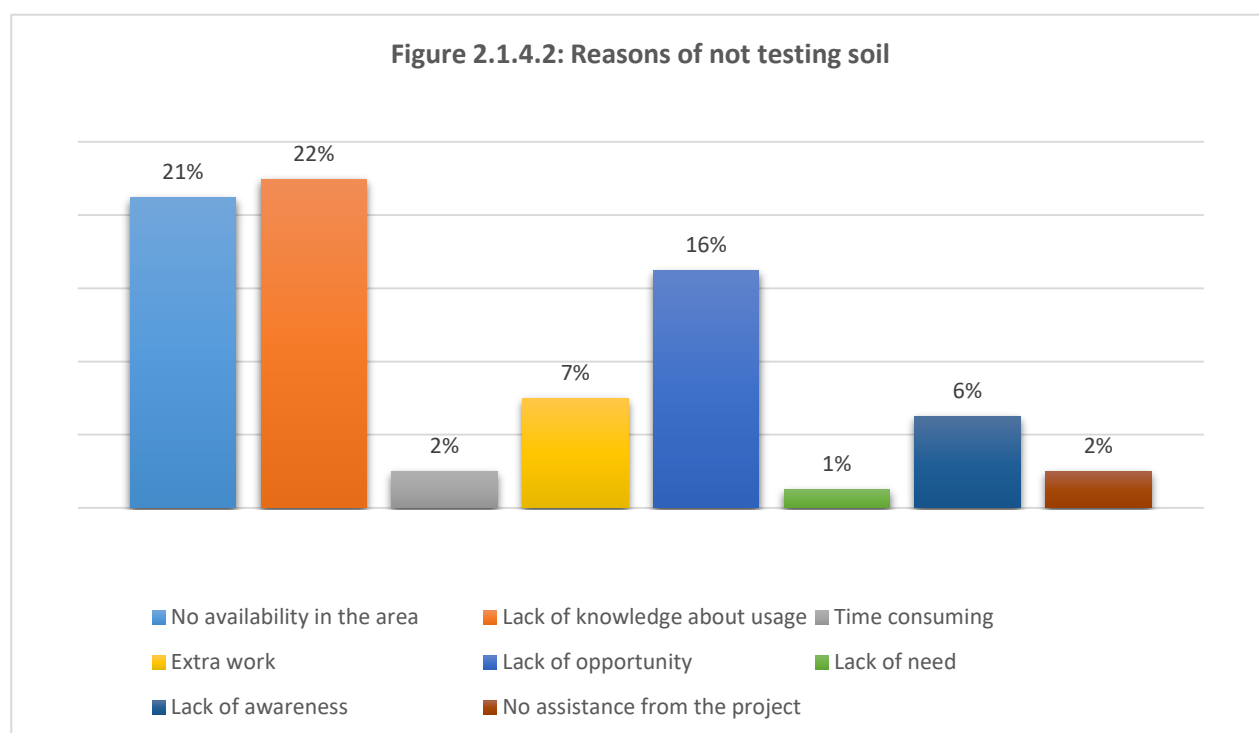
In our survey, 20% of the sample beneficiaries were found to have had their soil tested (figure 2.1.4.1). So, there is a lot of potential for the SaFal program to spread this practice such way that the farmers adopt this technology more.

Respondents identified different reasons for not adopting this technology yet. From our qualitative part (FGD and IDI) we have found that it was not a very familiar or known technology for the producers. DAE (Department of Agricultural Extension) is still the major service provider in this regard and they do not have this facility in every upazilas. Besides, the soil submitted in the upazilas agricultural office has to be sent to district laboratory for testing. This is a quiet time

consuming process. Consequentially, the producers' service experience was not found very pleasant.

Besides, the program did not train and promote relevant local service providers (LSP) for providing soil-testing service like they did for other value chain processes (e.g., vegetable seller or collector, vermicompost producer, etc.).

In some places, even though the soil testing facilities were available, farmers did not test their soil. We tried to figure out the reasons behind this. When asked why they (non-users) have not tested their soil, major reasons they stated include non-availability of the service in nearby



locality (21%), lack of knowledge about procedure (22%), and lack of access to existing service providers (16%) (Figure 2.1.4.2). There is an opportunity for the program to train these actors, so that the beneficiaries practice it more.

The project, in general, promotes use of recommended fertilizers based on Union wise Fertilizer Recommendation Guideline developed by SRDI. In addition, project also initiated a piloting with Grameen Intel to create easier and affordable access to soil testing facilities for the farmers. The project plans to work further on improving farmer behavior regarding soil testing in coming days.

### 2.1.5 Use of lime

Lime is commonly used as a pH-regulating agent and acid neutralizer in soil and water. This allows for faster growth of crops by aiding the intake of nutrients and nitrogen by vegetation growing in the soil. It helps preserve stored fruits and vegetables when placed nearby in bags. The bags

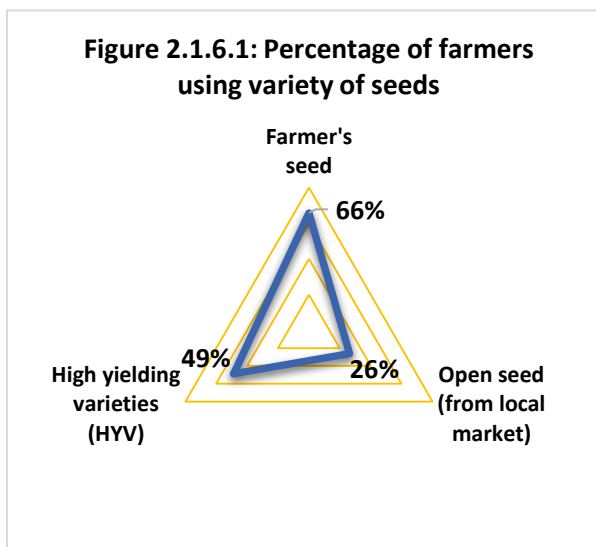


absorb carbon dioxide emitted by the fruits and vegetables, regulating oxygen levels which prolongs their freshness.

We have found that farmers mostly use Calcium Oxide or Calcium Carbonate (Pathure Chune) as the pH regulating agent. Our FGD and IDI findings show that the horticulture PG members are aware of the importance of using lime. Nevertheless, they cannot deduce how much lime they have to apply in their lands, since they do not have access to soil testing facilities. The lime dosage amount depends on the pH and other acid amount in the soil.

### 2.1.6 Usage of Improved Seed varieties

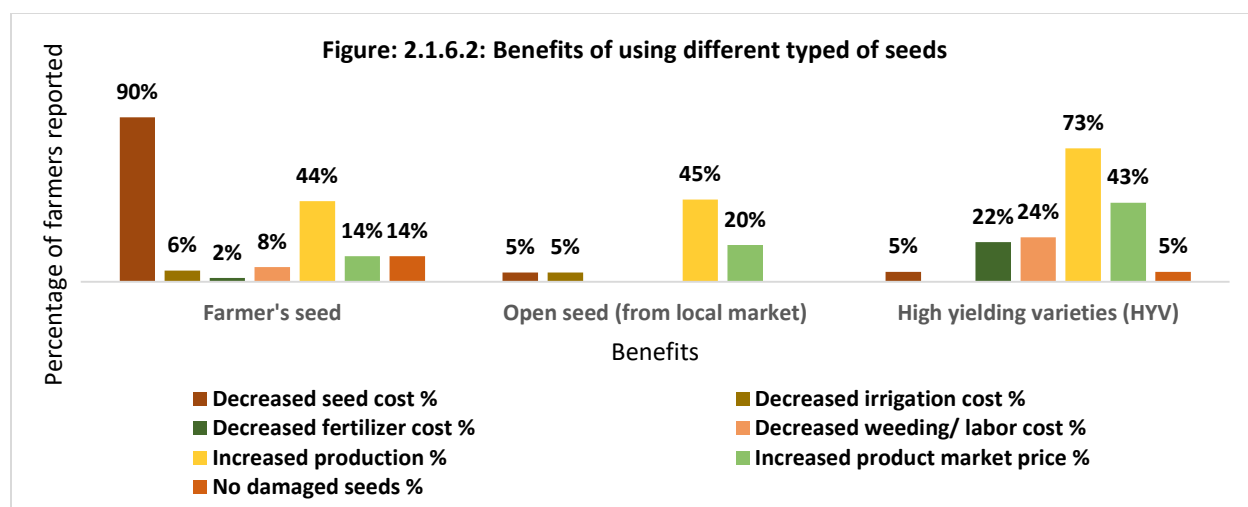
The key to produce high quality crops is to use high quality seeds. Interestingly, it was found in the FGDs and IDIs that, even though SaFal introduced the usage of high quality seeds to its beneficiaries, more than 50% the farmers opt out for using the seeds they save from last season. Figure 2.1.6.1 signifies the percentage of horticulture farmers responding affirmatively of using each type of seeds. It should be noted that, the responses have been taken in multiple choice-multiple answers format. This format allowed respondents to choose multiple options as part of their answer.



Altogether, majority of our respondents claimed they still use their own produced seeds (66%) or local seeds (26%) for production. Farmers claimed that according to them, these seeds are more resilient and have delivered good yield. Nonetheless, they have increased the usage of HYV seeds. 49% of the respondents claimed that they have used HYV seeds in their fields.

We have found that producers have been increasingly using HYV seeds because of their experience of increased productivity (73%) and increased market price (Figure 2.1.6.2). Users of local/ own seeds claimed that they use this seed type because of its low cost, resilience against salinity and other climatic impacts, coupled with moderate yield level (Figure 2.1.6.2).

Lack of trust on present open market retailers and seed companies has been one of the major reasons behind slow adoption of HYV seeds. There remains scope of improving this trust component in coming months.



## 2.1.7 Irrigation/ Water management

Irrigation is one of the most crucial steps in cultivation process. It was found in the survey that almost all of the PG respondent (99%) irrigates their vegetable beds for cultivation. From FGDs and IDIs, we have found that there has been a significant change in the quality of water that they use currently for irrigation. Previously, they had a misconception that rotten water or water from closed bodies (like marsh or swamp), is better for irrigation as it might contain micro-organisms. However, from the project they have learned about the disadvantages of using such water. Now they mostly use underground water or open surface water.

Technology name	Yes	
	n	%
Pheromone traps	62	82
Light traps	9	12
Bio-pesticide	38	50
Other	5	7

## 2.1.8 Pest management

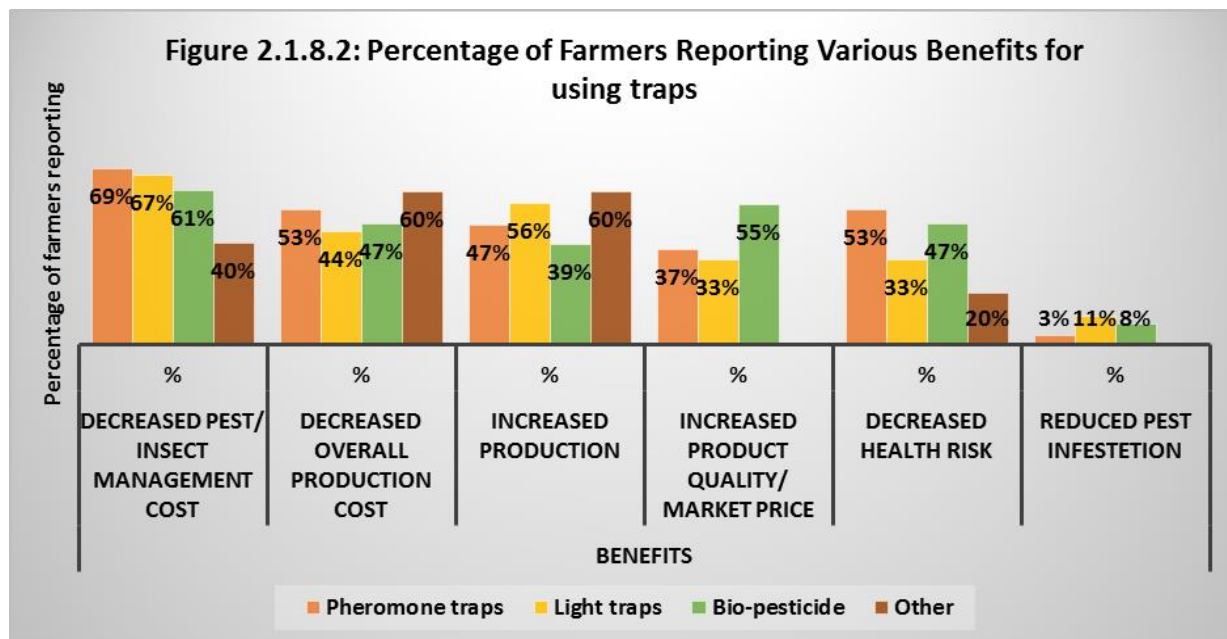
There have been significant changes in pest management practices and relevant costs across all the project districts. Previously, most of the PG members heavily used chemical agents as pesticides and it comprised the largest chunk in input expenses. From our qualitative data, it was revealed that usage of pesticides was so high that producers often did not use vegetables of their own land for household consumption.

After project inception, there has been increased adoption of safe and natural pest management technologies, for example, sex pheromone trap and different types of bio pesticides.

**Sex pheromone trap:** Use of sex pheromone trap was very limited in the project area before. After the inception, as we can see in figure 2.1.8.1, 82% of the respondents now have been using sex pheromone traps. Figure 2.1.8.2 describes different benefits that producers enjoyed from using different kinds of pest management technologies. As it is illustrated in the figure, decreased pest pesticide and overall production cost, and decreased health risks (as they are consuming a part of the produce)

**Table 2.1.8.1: Percentage of farmers using different types of pest management techniques**

are the major benefits they have observed so far. PG members have access to these technologies, which are affordable to them.



**Bio pesticide/natural pesticide:** SaFal also introduced the use of different types of environment friendly pest management techniques to the PG groups. These include mahogany cake or oil, neem extract and other local plants, using a mixture of detergent powder and molasses, etc. for pest control. FGDs and IDIs suggest that respondents are quite impressed by the cost-effectiveness of these natural pesticides. Survey data suggests similar findings. As we can see in figure 2.1.8.1, 50% of the sample beneficiaries currently use natural pesticides. As major benefits they have identified decreased cost (more than 60% response), decreased health risks (47%), and increased productivity and/ or product quality (55%). These solutions are cheap and easily available by PG members.

### 2.1.9 Post-harvest Management

The study team has observed significant changes in post-harvest management practices among the respondents. We have found that previously they undertook minimum measures in between harvesting and sales. They usually used to harvest all the vegetables together (or when they needed cash), and dumped those on their soil-yard under bare sunlight. After keeping the vegetables there for several hours, they used to take those to nearby haats using basket, van, or sacks for sales.

After project inception, major changes in post-harvest processes include harvesting at mature stage. 97% of the respondents said that they have been doing that. IN case of sorting, washing, and using crates for carrying amount to respectively 97%, 74%, and 67% of the respondents.

Post-harvest management practices	Percentage of farmers practicing
Harvesting at maturing stage	97%
Washing	74%
Sorting	97%
Grading	39%
Packaging	47%
Carrying in plastic crate	67%

**Table 2.1.9.1: Percentage of farmers reporting practicing different post-harvest activities**

Besides the program facilitated knowledge building initiatives, service providers like Vegetable Sellers or Collectors (promoted by SaFal) played an instrumental role in bringing rapid behavioral change among farmers. Vegetable sellers who are linked with different large or institutional traders and retailers, have been disseminating buyer side

information to farmers. These information include what to produce; what is the desired quality; when to produce; what should be the post-harvest measures; and so on. This market information pushed the farmers to adopt improved practices in a more cost-efficient way, because of a direct price incentive for relevant behavioral change. Change dynamics behind different practices are briefly described below.

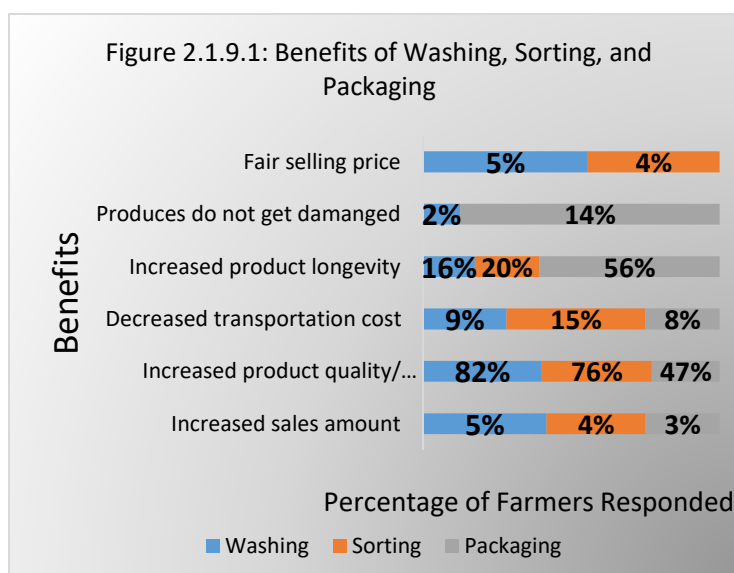
**Harvesting at the right time:** Before the project inception, farmers used to harvest vegetables either all together or whenever they needed cash. 97% of the respondents in this survey reported that they harvest now as per buyer demand. Receiving higher market price was identified as the major reason behind this behavioral change with 80% of the respondents' opinion (Table 2.1.9.2).

Activities	Increased production amount	Increased product quality/ market price	Decreased transportation cost	Increased product longevity	Fair selling price
Harvesting at maturing stage	46%	80%	11%	1%	1%

**Table 1.1.9.2: Benefits of harvesting at maturing age**

### **Washing, sorting, and packaging:**

PG farmers received detail training on post-harvest management processes for vegetables. According to the FGD and IDI findings, before they used to dump the harvested vegetables on their soil-yard and keep these there under bare sunlight for several hours. They did not use to wash or properly packed those for sales. But, now they usually keep the harvested vegetables on plastic mat, in a shaded place. They wash, dry, and then pack them before taking to the markets.



*Figure 2.9.1.1: Benefits of Washing, Sorting, and packaging*

Figure 2.1.9.1 illustrates the scenario of the survey where portions of respondents replied in affirmative for going through washing, sorting, and packaging stages reported different benefits of these stages. As illustrated, enjoying benefits like increased product quality was the major reason that farmers adopted these practices.

**Grading:** Grading is very important step in post-harvest processing since different quality types buyers or traders set different market prices. The overall market price decreases if a lot has mixed quality products in it. Before the project launch, we have found that most of the PG members did not use to grade their harvests on regular basis. Rather, they were accustomed to sell all quality types all together. Around 40% (Table 2.1.9.1) of the respondents stated that they now grade their products before marketing and thus they receive better market price. However, most of the respondents said, that they do not have to grade (around 60%) their products as quality does not vary that much.

**Crate usage:** SaFal has provided collection points with crates to load the vegetables from farmers' fields so that they remain clean and spotless. Both farmers and collection point committee members said that using crates has increased product price as vegetables remain spotless and fresh. Producers also put paper in between vegetables (figure 2.1.9.2). These papers reduce the friction between vegetables and thus keep those spotless.



Figure 2.1.9.2: Use of Crates

We tried to identify why users have been enthusiastic about using plastic crates for transportation. Figure 2.9.1.3 demonstrates percentages of farmers claiming different benefits. As the bar chart illustrates, decreased transportation cost was identified as the major reason behind this.

However, as stated above, most of the crates were provided by the project and managed by the collection point committee. SaFal distributed some crates to the Collection Centers as a hand holding support and to demonstrate the effectiveness of using these in reducing post-harvest loss. Some market actors

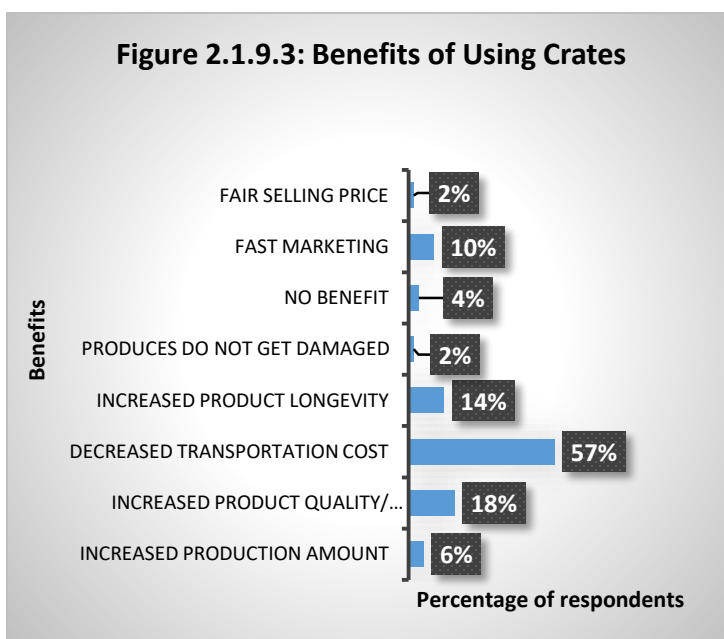


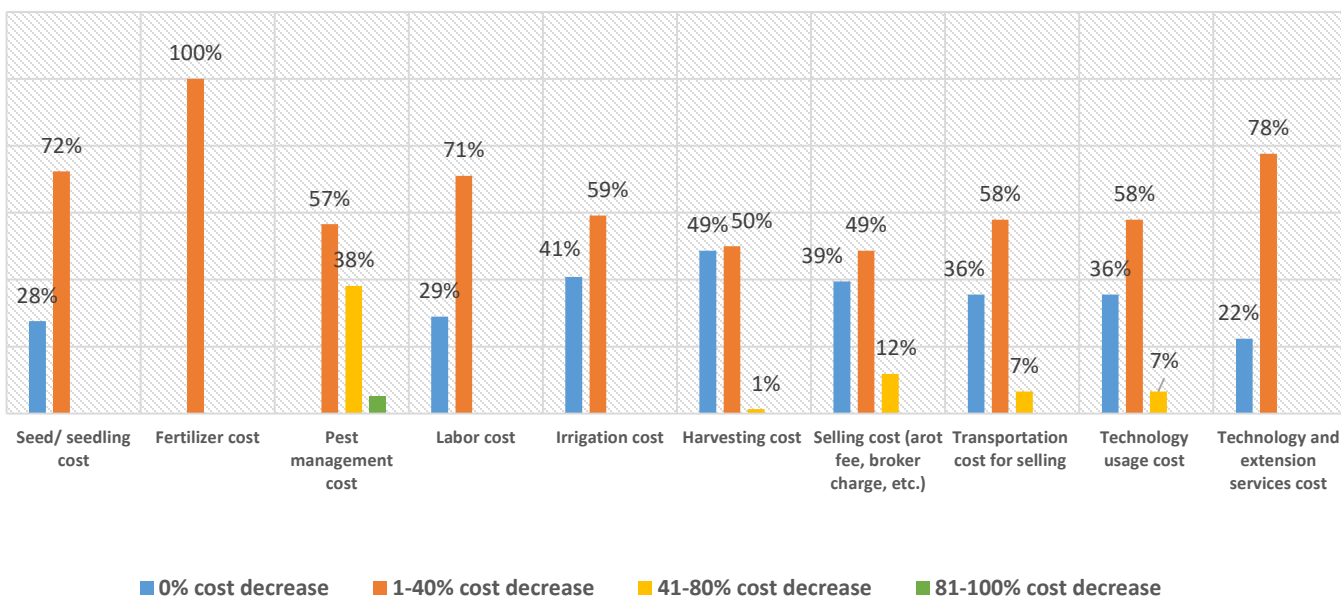
Figure 2.1.9.3: Benefits of Using Crates

(Faria, Arotdar) were found to be using crates in the entire process from harvesting to retailing.

However, all the producers did not get this facility and we did not find any relevant business plan to promote this technology.

### 2.1.10 Production cost

**Figure 2.1.10.1: Percentage of Farmers Reporting Reduced Production Costs**



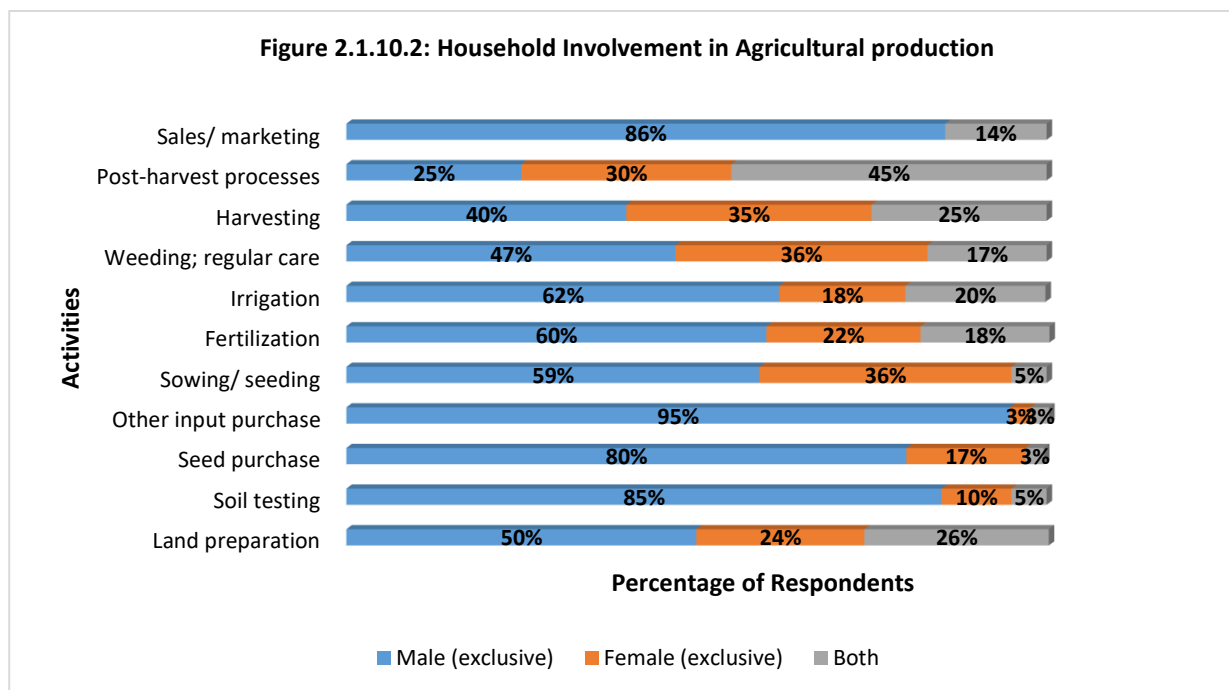
The CPL team also ran an assessment for all the sectors regarding how much new technologies have helped them reducing their expenses in different agricultural steps. Figure 2.1.10.1 illustrates the percentages of farmers reporting reduced costs in terms of different steps of agricultural production. In the horizontal axis, different production steps are summarized. In the vertical axis, the percentage of farmers responding to different production steps are depicted. The legends denote the different percentages of cost decrease. For instance, if we take the first column as an example, it means 28% of the 75 horticulture respondents told us that there seed/seedling costs have decreased by 0%. Meaning, there costs did not decrease at all. Here, the responses have been taken in multiple choice-multiple answers format.

In the horticulture sector, as illustrated in figure 2.1.10.1, about 40% of the respondents experienced up to 40% cost reduction in fertilizers, while another 38% experienced up to 80% cost reduction in terms of pesticide use. Up to 40% cost decrease was also experienced by 71% respondents in terms of labor use, 78% cost decrease in terms of extension services, around 60% cost decrease in transportation and irrigation, and 57% cost decrease in pest management.

On the other hand, 30-40% respondents reported that they did not experience major cost decrease in areas like irrigation, harvesting, transportation, seed, etc. cost decrease was less in terms of harvesting. Cost decrease was also less in terms of harvesting.



### 2.1.11 Household Involvement in Agricultural production



**Figure 2.1.10.2: Household Involvement in Agricultural production**

As discussed in previous sections, with behavioral changes occurred almost in all the production related areas, involvement of male and female members in production related activities also have increased (and changed in some cases) in the last few years. In case of work distribution in a horticulture household, adult male members were found to be heavily involved in almost all vegetable farming tasks, especially seed and input purchase (80% and 95% respectively), sales and marketing (86%), and soil testing (85%). On the other hand, female members are found to be moderately involved in weeding (36%), harvesting (35%), sowing/seeding (36%), and post-harvest processes (30%).

The underlying reasons are many. We found that cooking was by far the most prioritized task conducted by women in all areas followed by cleaning, child care, and other PG related tasks. The important finding here was that the respective PG-related tasks do not get priority over other usual household chores like cooking, cleaning and child care. Nonetheless, although women are heavily engaged in activities related to enterprises, remarkably, they do not label those chores as economic activities, but rather term them as regular household chores.

### 2.1.12 Other Findings

In terms of intercropping, we found the practice in different project zones through our field visits. From the FGDs and IDIs, we have found that some farmers have started the routine of intercropping. As a benefit, they have pointed that they can get extra sources of income. However, we have not found this in every project zones.

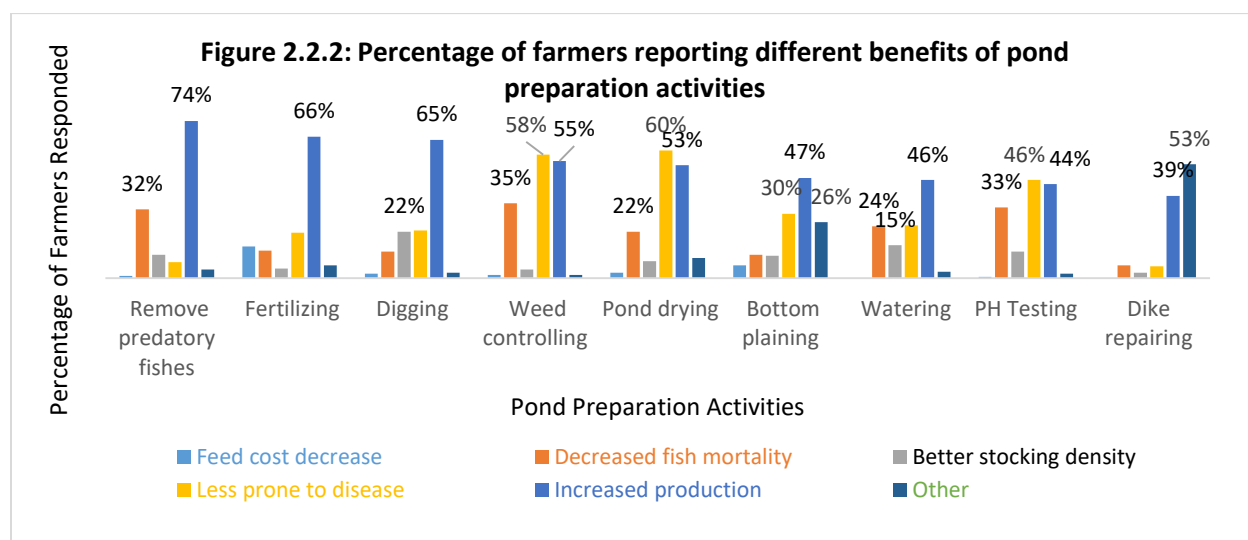
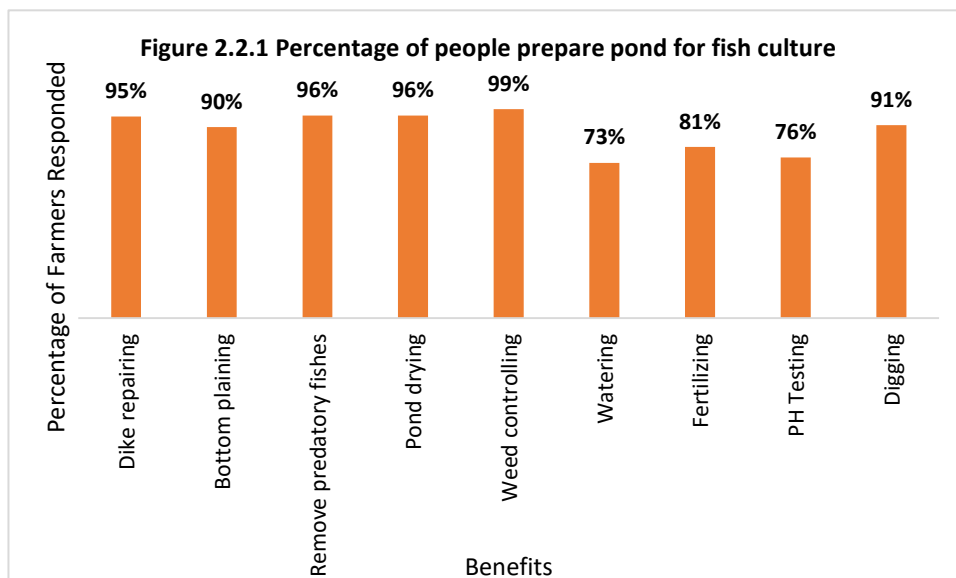
## 2.2 Technology Adoption and Adaptation in Aquaculture Subsector

### 2.2.1 Behavioral Changes in Pond / “Gher” preparation

Preparing the pond consists of learning about it and taking adequate steps in order to make it perfect for fish cultivation. We found remarkable change in case of pond preparation. Before the project inception, few farmers used to know about the importance of pond preparation and what implications it

might have on overall production and profitability. Now, they drain out the pond, apply necessary project prescribed materials in the pond before the cultivation of fish.

The column chart above (Figure 2.2.1) describes what percentage of sample beneficiaries responded in affirmative in terms of adopting different new practices regarding pond preparation. At least 73% of the sample beneficiaries (in most cases it was more than 90%) reported adopting some sort of new activities or practices regarding pond preparation before stocking fish seed in their ponds.



CPL tried to explore the underlying reasons behind this behavioral change. The figure above (Figure 2.2.2) describes the portion of sample beneficiaries claiming benefits for each newly



adopted practice regarding pond preparation. It has pond preparation activities in horizontal axis, and percentage of farmers reporting benefits against different activities are illustrated on the vertical axis. Different colored columns signify different benefits which are elaborated in the legend area of the chart. Like all the other charts, the data reflect multiple choice- multiple answers response format.

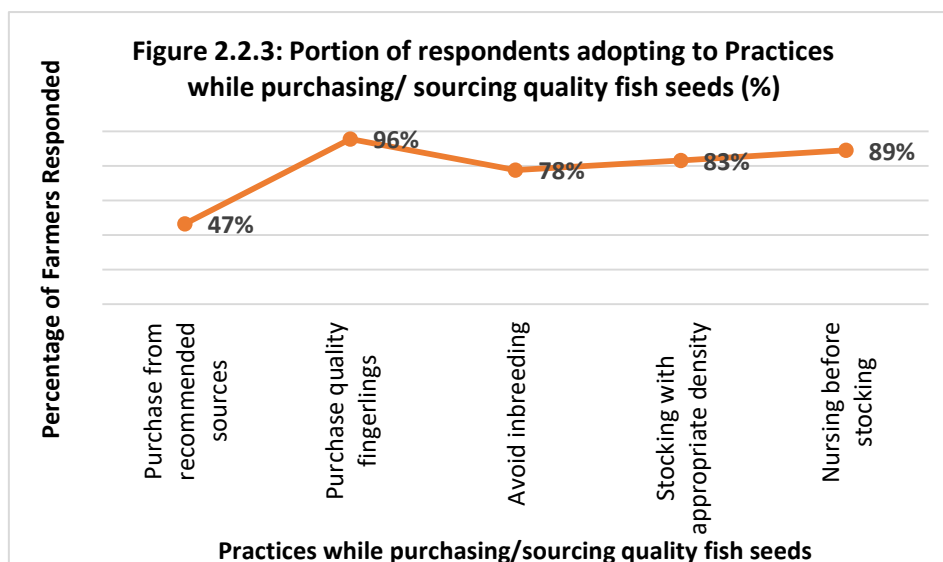
As it is shown here, about 74% of the respondents said that their production has increased due to the removal of predatory fish from the ponds. Before, the predatory fishes ate many fingerlings and thus farmers used to have decreased fish production. Practices like fertilizing, digging, weed controlling, bottom plaining, watering, PH testing, and so on have resulted in increased fish production, reduced fish mortality and less disease. From the qualitative findings, we have figured out that the respondents additionally apply lime twice or thrice annually and after drying up the pond.

Some of the farmers used to use poisoned oil before SaFal was launched, but they stopped that after the project trained them about the harmful impacts of such practice. They also started drying up the pond before cultivation. From there, 60% of the farmers reported of increased production and 53% of them reported of less diseases. Additionally, they started to clean the weeds around pond and make sure that the pond gets adequate amount of sunlight throughout the day. 45% claimed that this practice gave them increased production.

## 2.2.2 Behavioral Changes in Fish Seed Purchase/ Sourcing

Previously the aqua farmers did not have any proper access to input market, especially to quality fish seeds (fries/fingerlings/PL). They did not know from where to get the better breed of fish seeds. After the project started, most of the respondents claimed that, they currently have a better knowledge about the source or access to fish seeds and purchase better quality fish seeds (96%). While 83% of the respondents said that now they use stocking with appropriate density, around 90% claimed that they provide nursing before stocking. Besides, 83% of the respondents reported that they currently avoid the purchase or collect inbred fish seeds.

They said that at present, they buy fish seeds after careful checking; they make sure that those are moving and lively. They also now make sure that the brood stock of the fish seeds are large in



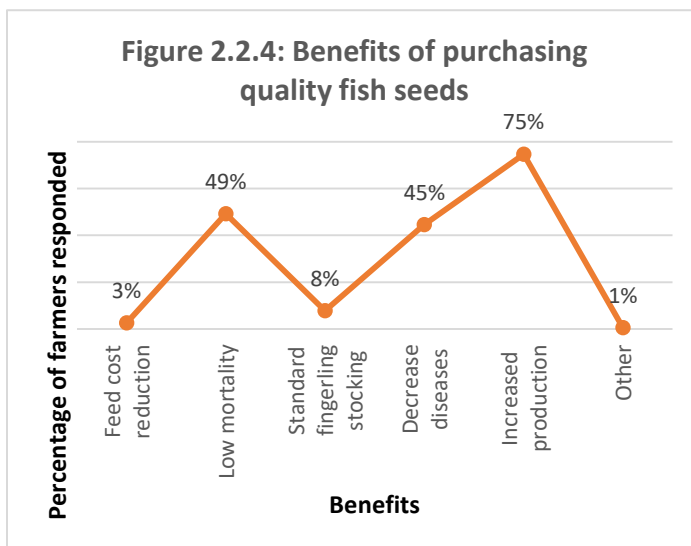
size and healthy. In some areas, it was found that the farmers consult with the NGO workers before buying fish seeds. They even sometimes go to distant hatcheries or nurseries or sources to purchase quality fish seeds.

Figure 2.2.3 depicts the portions of aquaculture respondents adhering to opting different practices while purchasing/sourcing quality fish seeds. The responded have been taken in multiple choice-multiple answers format. The line chart shows that increased production happened from purchasing quality fish seeds from recommended sources (71% and 75%).

### ***Benefits of Purchasing Quality Fish Seeds:***

Figure 2.2.4 shows the data of the percentage of aquaculture farmers reporting for different benefits of purchasing quality fish seeds.

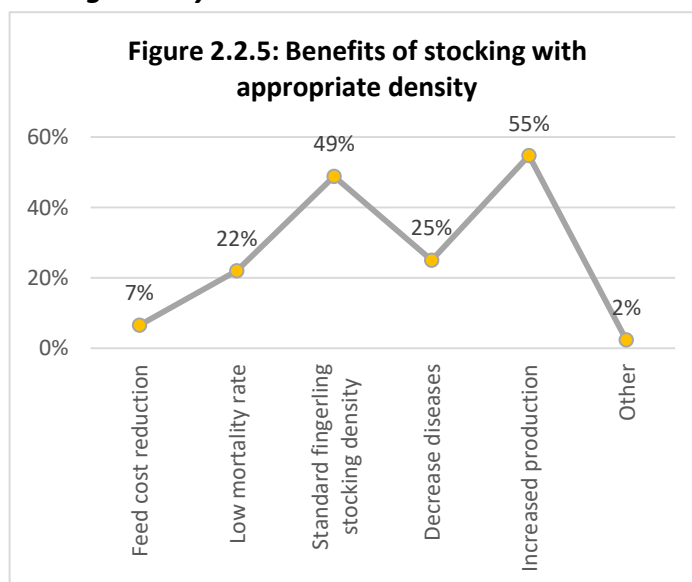
Increased production amount (75%) and low mortality rate (50%) were identified as the major benefits the aquaculture farmers have been experiencing after they started to attribute to their improved fish seed purchase behavior. According to them, these impacts have been significant and therefore, they wish to continue this practice in the coming days.



However, their fish seed (fries/fingerlings/PL) purchase cost has increased a bit which is ultimately traded-off by increased production.

### ***Benefits of Stocking fish seeds with appropriate Stocking Density:***

After the project launch, PG members started cultivating fish in two seasons in a year (previously which was one) depending on species. Moreover, farmers also practice nursery for fries/fingerlings/PL and culture them for marketable sizes. There is a certain level for stocking density which they abide by now. As said before, 83% of the respondents said that now they use stocking with project prescribed density (Figure: 2.2.3). In addition, they use a special kind of fine synthetic net for protection, so that frogs, snakes, and predatory fish cannot go near them.



In some areas, it was found that the farmers did not use to nurse the fries in net before. But, after project inception, they have started nursing them in net. After stocking for three to four months, they put the fish seeds in the original pond. The farmers then use a floating net and put fish seeds in the net for seven to eight days. Knowing the density is very crucial because it makes sure the fish seeds are comfortable enough to move around. Figure 2.2.5 shows the data of the percentage of aquaculture farmers reporting for different benefits of stocking with appropriate density. 55% of the surveyed fish farmers stated that because of stocking in appropriate density their fish production has increased (Figure 2.2.5).

**Benefits of Acclimatization before stocking:** The producer groups now start acclimatization 30 minutes after stocking the fish seeds. They mostly used flour as fingerling/fry/PL feed. In some places, the farmers used to feed flour before, now the farmers use feed. It was found that some farmers have acclimatization ponds in which they keep the fish seeds for nursing. More than 50% of the surveyed respondents stated that this practice has reduced the mortality rate and therefore resulting in increased their fish production (Figure: 2.2.5).

### 2.2.3 Behavioral Changes in Improved Feeding Practice

Appropriate usage and dosage of different kinds of fish feed is very important. Both excessive and short feeding is harmful for fish health because fish is quite sensitive to food. In addition, it could change the ecosystem under the water and might have long-term impact. Before the project launch, most of the fish farmers did not know about the appropriate usage and dosage of different types of fish feed. They mostly relied on conventional knowledge and experience in this regard. They did not have any set rules for it.

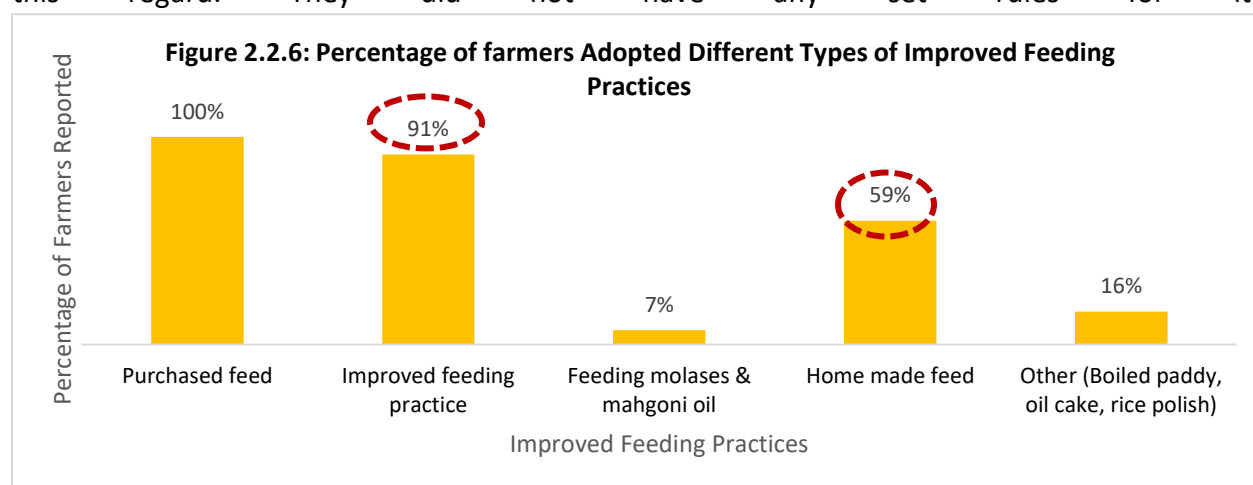
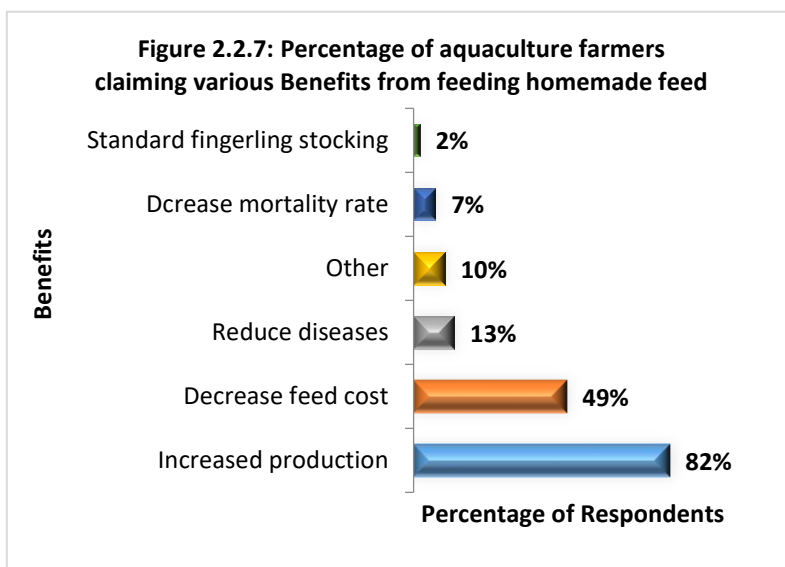


Figure 2.2.6 pictures the scenario of how many respondents have adopted various new feeding practices. After project inception, as the figure above (Figure 2.2.6) suggests, almost all fish farmers purchase fish feed now (basic concentrated feed or ready feed). More than 90% of the

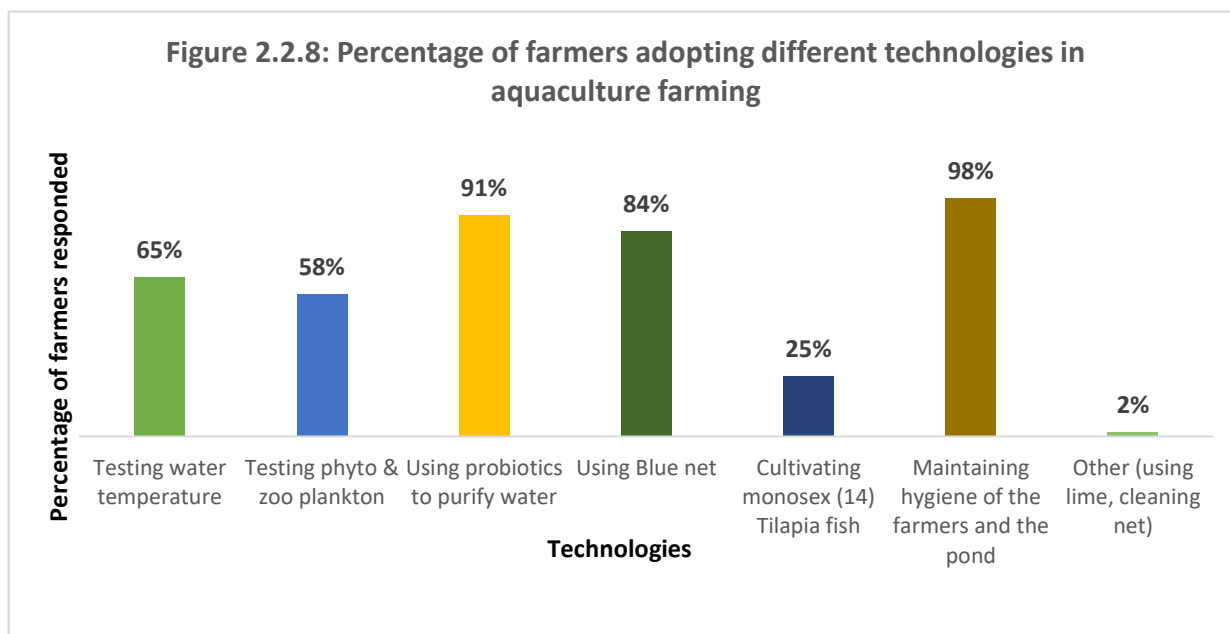
farmers have adopted improved feeding practice (e.g., now they provide feed at a particular time in a day; feed dosage has been changed; they have also changed fish seeds feed from flour to boiled snails; etc.). Also, around 60% respondents are using home-made feeds. However, magnitude of these changes varies from farmer to farmer, based on their financial capability and access to finance.

It is to be noted that behavioral change across feeding molasses, mahogany oil, boiled paddy or oil cake have been quite limited. Our FGD and IDI findings suggested that using these components to fish have been quite new to them and it might take additional time for the beneficiaries to adopt those.

The bar chart in figure 2.2.7 indicates how many respondents have reported towards different benefits from feeding homemade feed. As figure 2.2.7 indicates, fish farmers have been enjoying major benefits due to adopting improved feeding practice. These benefits include increased production amount (more than 50% of the respondents reported it) and reduced feed cost (around one-third reported it).



## 2.2.4 Behavioral Change in Using Other Technologies



As figure 2.2.8 suggests, there has been significant behavioral changes in different areas. 98% have claimed that they currently maintain hygiene of the farmers and the ponds. Additionally, 91% use probiotics to maintain good water quality. 84% claimed to be using synthetic net for fencing. Furthermore, 65% regularly test the water temperature and 58% said they periodically test the phyto and zoo plankton.

**Usage of Probiotics:** More than 90% of the surveyed aquaculture PG members were found to be using probiotics since it helps improving the overall health status of marine stock. This practice in turn helps ensure higher yields and higher profits. Aquaculture probiotics are basically just beneficial bacteria, that when consumed, occupy the space that would otherwise be occupied by harmful bacteria. This results in a reduced incidence of disease and infection in aquaculture, higher yields, and more returns on the investment. The good bacteria protects fish stocks from the harmful actions of bad bacteria through competitive exclusion, which means that they prevent the breeding of bad bacteria by increasing their own population.

**Figure 2.2.9: Benefits from using technologies/ processes farmers usually get**

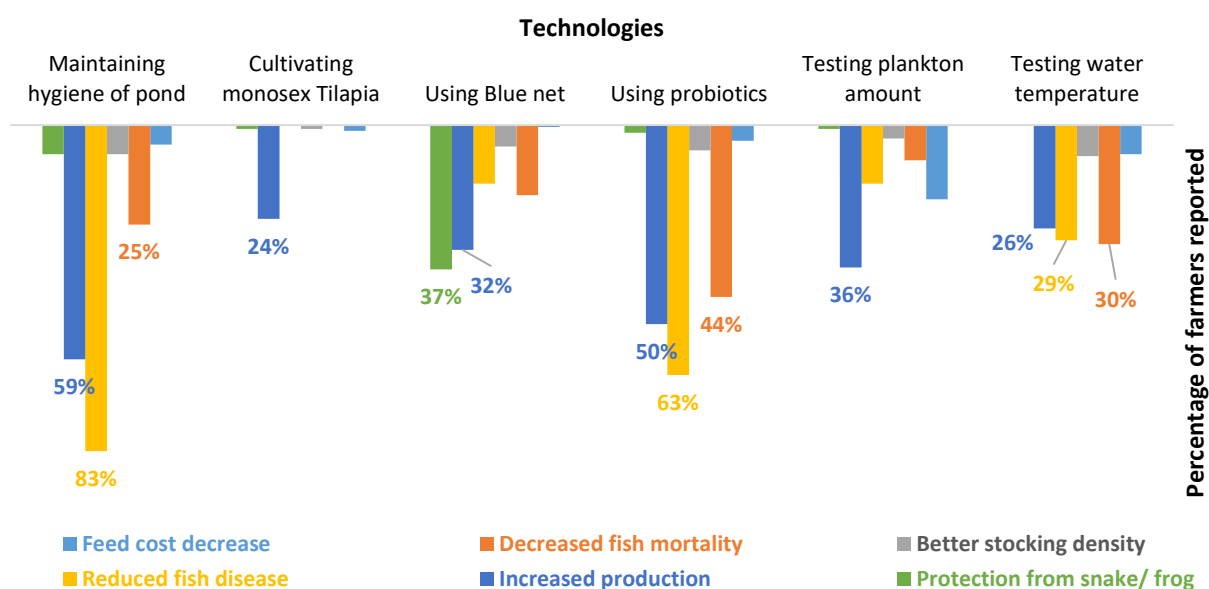


Figure 2.2.9 demonstrates a picture where aquaculture respondents have claimed different benefits towards using various technologies. The responses have been taken in multiple choice-multiple answers format. The major benefits that farmers have been enjoying after using probiotics were found as reduced fish disease (63% of the relevant beneficiary reported this), increased production (50%) and decreased fish mortality (44%) (Figure 2.2.9).

**Water and soil testing:** Testing the water and soil is very crucial because it tells the farmer what kind of nutrients and deficiencies his pond water and soil have. This information narrows down his choice about food and medicine to put in the pond. Ponds with a pH less than the required amount may result in stunted and reduced fish populations.

As we can see in Figure 2.2.1 and Figure 2.2.8, a significant number of farmers have been testing the pH level (76%, during pond preparation), water temperature (65%), and phyto and zoo plankton amount in water (58%). Major benefits that they have been enjoying include increased production and decreased fish mortality.

Interestingly, we have found that Lead Farmers play an important role in farmer behavioral change. We have observed that in places where lead farmers are more active, influential, and supportive to the farmers. In those areas, farmers had adopted better technologies and practices more heavily and rapidly than in the other places. Please see chapter 5 where we have tried to provide profile of a successful Lead Farmer.

**Reduced usage of Chemicals:** Modern technology comes with a package of good and bad impacts or side effects. Inappropriate or unplanned use of chemicals is considered quite harmful and hazardous in aquaculture subsector. One of the key purposes of the SaFaL project was to reduce the use of chemicals in the pond. In order to do that, they introduced many natural and eco-friendly alternatives to those chemicals. It was found that due to usage of probiotics and water/soil testing technologies, the farmers already had an idea of what agents and chemicals their soil or pond water actually needed. This knowledge in turn reduced the use of different chemicals in fish cultivation. In many places, now they have stopped using chicken waste, cow dung and some other agents that they had used before.

**Keeping the pond clean and maintaining pond hygiene:** As mentioned before, almost all of the respondents (98%) stated that due to project interventions, there have been changes in their pond hygiene maintenance related behaviors (Figure 2.2.8). These behaviors have significantly decreased fish diseases and relevant costs (83% and 59% respectively) (Figure 2.2.9). From our FGDs and IDIs we have found that many PG members are now fencing the fish culture area with synthetic net. This way the frogs, snakes, and predatory fishes, harmful animals and insects stay out of that part of the pond.

**Fish harvesting and marketing:** The study team has observed significant changes in fish harvesting behavior. Before the project inception, in most cases, farmers used to catch all the fish in a pond at one go where all the big and small/ young fishes were extracted and sold together. But, now farmers harvest the fish after a certain period regularly and only catch the matured ones (throw back the small ones in the pond). Because they now sell only matured fish, their overall production and sales volume have increased significantly. Additionally, they have started to use trays for marketing, which ensures that the fish would not be physically damage. In case of white fish, the PG members who have easier access to collection points or output markets were found enjoying comparatively higher profit (due to less transportation cost and increased accessibility). For shrimps, traders usually come to Farmgate (gher owners) and purchase shrimp from there. These traders are linked with distant large traders and exporters.

SaFaL has been assisting the local fish farmers by linking them with potential buyers from regional and national markets. The buyers were invited to visit the farms of SaFaL fish farmers. Some

buyers have become interested to buy fishes seeing the quality and volume. The fishes are now being supplied to other regional markets like Faridpur, Pirojpur, Zhalkathi, Patuakhali, Madaripur, Dhaka and Khulna. In different PGs buyers are currently directly contacting the farmers and collecting fish. As a result, the aquaculture farmers of some PGs have been able to extend the markets far and wide, while getting good prices for their produce.

**Usage of fine meshed synthetic net:** The synthetic net stands out in water, which appears as a threat to snakes, frogs, and other predatory fish. The SaFal project has this technology among fish farmers and around 84% of the fish farmers households were found to be using it. Protection from snakes, frogs and other harmful animals, and insects was identified as one of the major benefits of using the net according to the farmers (Figure 2.2.9).

**Mono-sex (14) Tilapia cultivation:** The SaFal project has introduced the cultivation of mono-sex (F-14) Tilapia. The special feature of this fish is that they 1) grow fast, 2) are fleshy, 3) can be cultivated with using probiotics and natural feed, and 4) require reduced usage of packaged feed. However, only one-fourth (25%) of the fish producers were found to have had adopted this technology yet. Our FGD and IDI findings reveal that lack of access to quality mono-sex (F-14) Tilapia fingerlings and not being so familiar with the production practices or success of this particular technology were identified as the major reasons behind the low percentage. It was observed that in the rural level due to risk factor, farmers usually adopt a technology more rapidly with which they are more familiar with and have had observed its success directly.

### 2.2.5 Work distribution in an Aquaculture producing household

As have discussed in previous sections, with behavioral changes occurred almost in all the production related areas, involvement of male and female members in households also have increased (and changed in some cases) in the last few years.

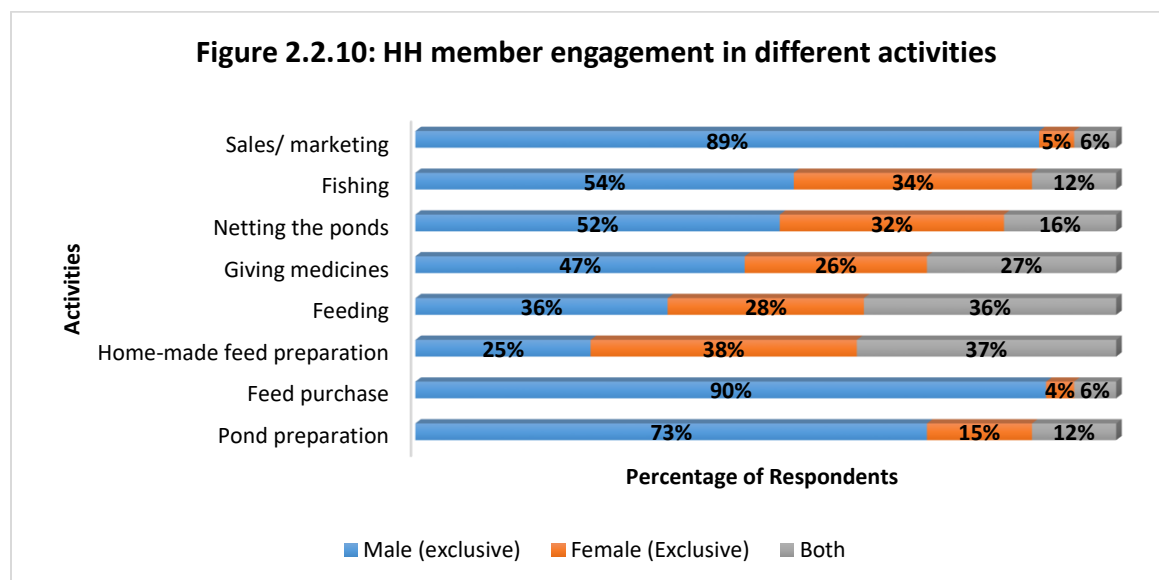


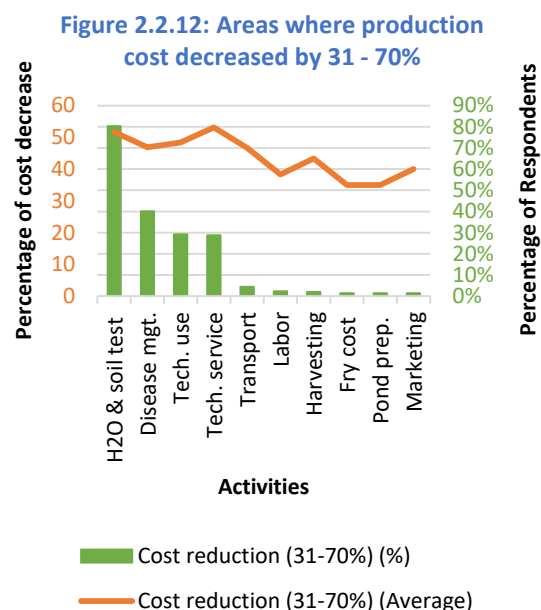
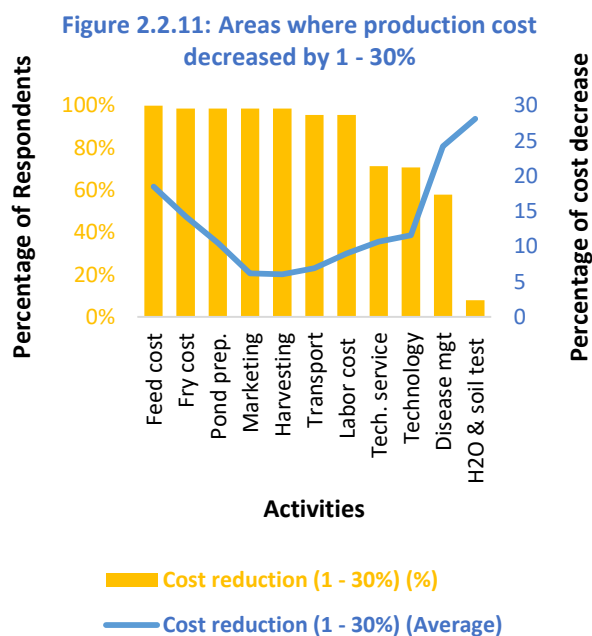


Figure 2.2.10 depicts a scenario where value chain activity distribution of an aquaculture household is provided. The three main groups are: male (exclusive), female (exclusive), and both. The responses have been taken in multiple choice-multiple answers format. As we can see here, most of the activities are predominantly done by the males of the household. However, we can see increased percentages of female involvement as well. Except for feed purchase, sales, and pond preparation, women are contributing almost equally to their male counterparts. In our qualitative findings, we have found out significant contribution in feeding (38% reported of female contribution in this activity), homemade feed preparation (38%), applying the medicines (26%), and fishing (34%).

## 2.2.6 Production Cost Decrease

Figures 2.2.11 and 2.2.12 illustrate two ranges of cost reduction across various aquaculture production steps. 2.2.11 shows decreased cost up to 30% and 2.2.12 shows decreased cost from 31-70%. The vertical axis with the percentage signs denote the percentage of farmers responding. The one without the signs denote the percentage of cost decrease. The columns signify percentage of cost reduction and the line denote average cost decrease.

In Figures 2.2.11 and 2.2.12, it is apparent that there has been significant cost reduction in areas including disease management (around half of the respondents reported around 47% cost reduction), water and soil testing (around 80% of the respondents reported more than 50% cost decrease), and technology use and technical services (almost 50% cost decrease in both cases). However, few respondents reported cost decrease in areas like feed purchase, fingerling/fry/PL cost, pond preparation, and fishing. In fact, due to behavioral change and adoption of new technologies and practices, in most cases farmers now spend more in those areas.





## 2.3 Technology Adoption and Adaptation in Dairy Subsector

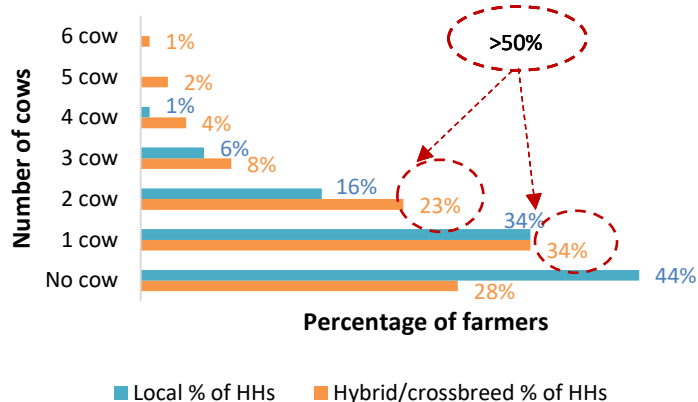
### 2.3.1 Number and Type of Cows

There has been a notable change in the ownership of hybrid/ cross-bred cows in producer groups. Figure 2.3.1.1 illustrates, the number of hybrid/crossbreed and local cow that are owned by farmers. The orange bars illustrate the percentage of respondents reporting having hybrid/crossbreed cows. Likewise, the blue bars indicate percentage of respondents reported having local cows. The result shows that

while 72% of the respondents own at least one cross-bred/ hybrid cow, 54% own at least one local cow. Very small number of HHs (15%) have 3 or more hybrid/ cross-bred cows. If a farmer owns 3 or more cows, the data also implies that at least one of the cows of those are hybrid/crossbred cows.

The result also indicates that a percentage of the respondents might be close to poverty line as a large number (28%) of them reported of having no hybrid cows. It is also noticeable that hybrid cows are becoming more acceptable than the local ones among the PG members.

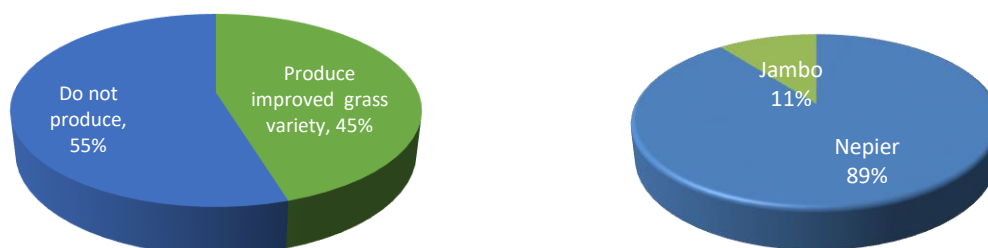
**Figure 2.3.1.1: Percentage of respondents reporting number and type of cows they own**



### 2.3.2 Behavioral changes in adopting cultivation of improved grass

The figure below (2.3.2.1) illustrates what kind of improved green grass they are producing after project inception. 45% of the surveyed farmers were found to be cultivating improved variety of green grass for their cows. No farmer was found to be producing the Alfa Alfa variety.

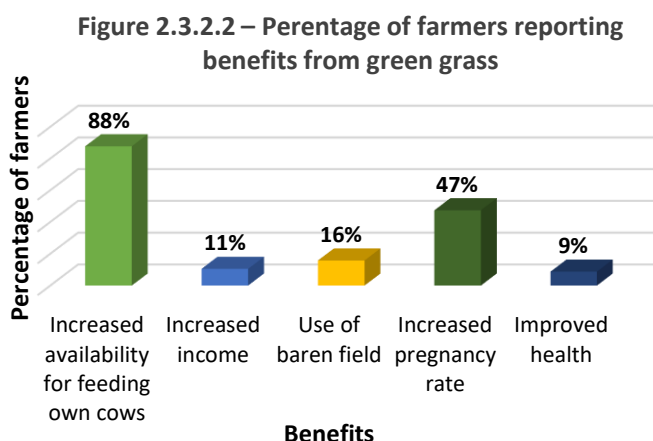
Although, more than 50% are not producing green grass, the picture still looks promising, because previously fewer producers were involved with improved grass production. Previously, they mostly fed their cows straw and green grass from open fields or common resource pool, as roughage.



**Figure 2.3.2.1 – Percentage of HHs produce improved grass varieties**

Also, there is always the scope that non-producers will purchase the surplus grass from the producers. Farmers are mostly producing Napier (predominant; 89%) and Jambo (11%) varieties.

Improved grass producers have identified a number of benefits and advantages of green grass production. From FGDs and IDIs we have found that the farmers are quite enthusiastic about continuing and expanding green grass production in coming days. The following graph (figure 2.3.2.2) shows producers' experience of green grass production.



Increased availability of green grass for feeding their cows (88% response) and increased pregnancy rate (47%) were identified as the major benefits they enjoyed.

In FGDs, the participants said that according to their experience, improved green grass significantly increased milk production amount and fat content. They also said that from project facilitated training sessions they became more aware of

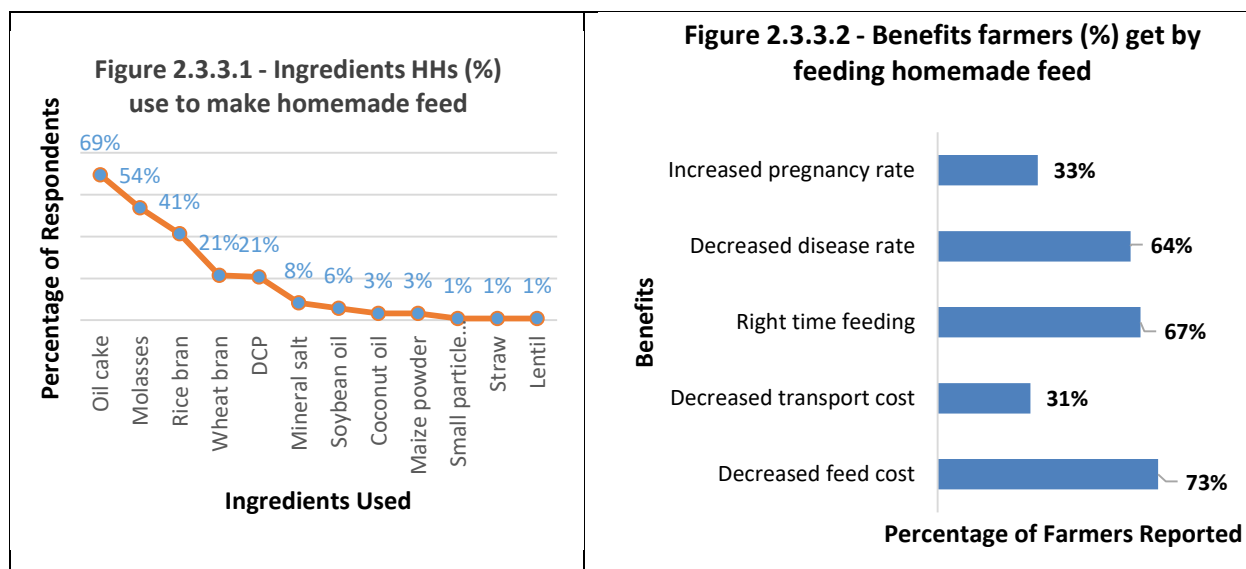
the bacteria and diseases that are contained in local field grass. This is another reason that many of them nowadays are preferring improved grass as their cow feed.

### 2.3.3 Behavioral changes in perception of homemade feed

There has also been a noteworthy change in homemade feed preparation. Farmers did not use to know the nutrient amount of different feed ingredients and the proportions for making a notorious mix for their cows. Project facilitated training sessions have helped them gaining that knowledge. Currently, almost all the producers are making that at home.

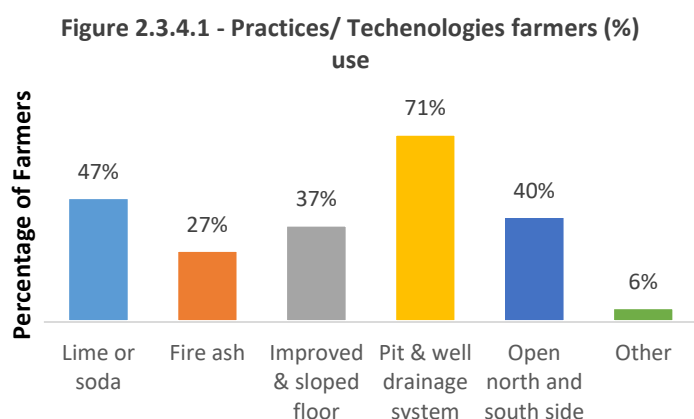
As Figure 2.3.3.1 suggests, most preferred ingredient in preparing homemade feed are oilcake, molasses, rice bran, and wheat bran. Other ingredients are used infrequently and in small amounts.

And as figure 2.3.3.2 illustrates, decreased feed costs (73%), ability to feed cow at appropriate times (67%), decreased disease rate (64%), and decreased transportation cost (31%) were identified as the major benefits that they enjoyed. They were also found to be the major reasons for wanting to continue with this practice in future.



### 2.3.4 Behavioral Changes in Improved Shed Management

The project also intervened on improving producers' cow shed management practice to sustain cow health and improve productivity. The diagram at the right side (Figure 2.3.4.1) is showing the change in practices among dairy producers regarding shed management. As we can see in the diagram, more than two third of the respondents (71%) claimed that they have installed well pit and drainage system for their cows.



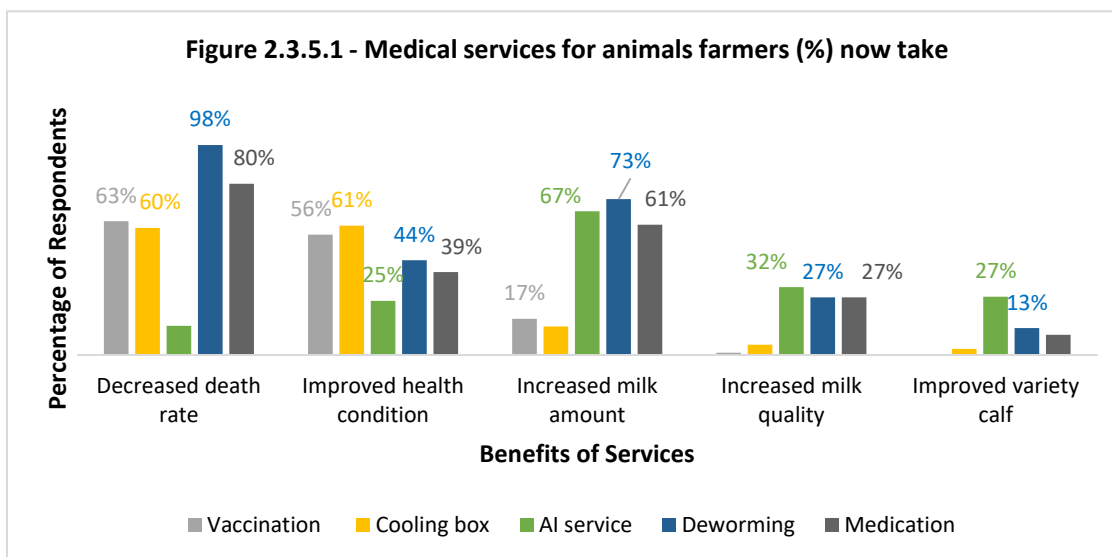
Near about half of the survey farmers (47%) now use lime and soda to clean their cowsheds, while 40% have their sheds open at north and south both sides. Other changes on shed management like improved and sloped floor (37%), bricked floor, use of mosquito spray, bleaching powder and so on were also reported by many respondents.

### 2.3.5 Behavioral changes in disease management

**Deworming:** Worm attack used to be a major problem for the dairy producers before the project inception. As they reported, their cows used to be malnourished and sick. They used to produce low amount of milk before because of frequent attacks. They did not know about the importance or significance of taking deworming service regularly before. They also did not have the access to

the deworming services at their locality. After the project provided training on potential risks of worms in cows and promoted CLSP (Community Livestock Service Providers) services at the community level, producers started to purchase deworming service on regular basis (deworming capsule after every four months).

As figure 2.3.5.1 suggests, decreased mortality rate and increased amount of milk were identified as the major benefits of deworming by 98% and 73% of the respondents respectively. Those are also the reasons that they want to continue with this practice in future.



**Vaccination:** Aside from worms, cows are also prone to many other germs and diseases for which vaccination and proper medication is necessary. Before project inception, few farmers knew about different vaccines that they should arrange for their cows. They also did not have the proper access to the government facilities. After project facilitations (with awareness building training, CLSP service, and linkage with relevant public services), currently more producers are significantly vaccinating their cows in proper times.

Additionally, we investigated the major incentives of farmers for this behavioral change. As figure 2.3.5.1 suggests, decreased mortality rate (63%) and improved health condition (56%) were identified as the major benefits of vaccination. Those are also the reasons that they want to continue with this practice in future.

**Medication and Regular Health checkup:** We have found significant changes regarding medication and regular health checkup for cows. Dairy producers hardly used to conduct medical health checkup before the project had launched. Awareness on preventive or corrective cattle medication was limited. Their access to local veterinary service was also used to be limited.

After the project facilitated relevant awareness building sessions, CLSP services and linkage development with local veterinary services, more producers are now taking significantly regular medication and health care services.

Promoting the CLSPs has been one of the major driving forces behind this change. From FGDs and IDIs we have found that they are accessible and cheap and provide quality services.

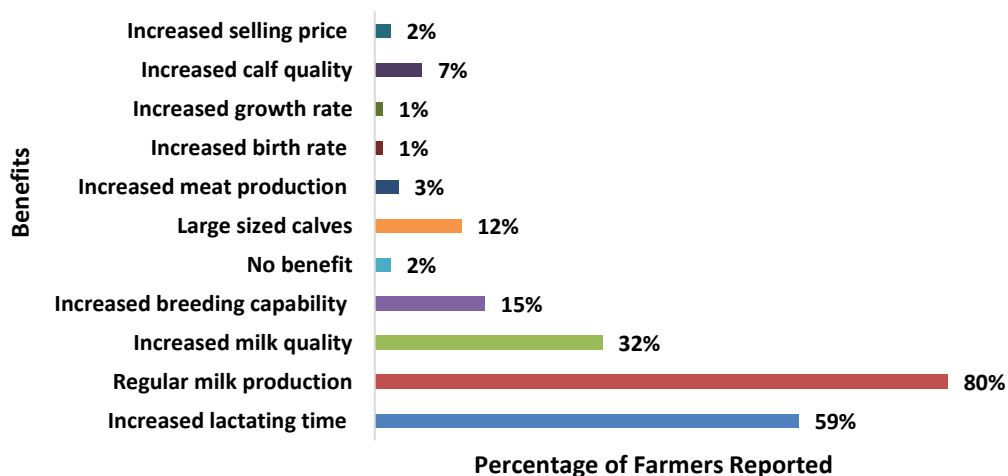
### 2.3.6 Behavioral changes in taking Artificial Insemination (AI) service

A cross-bred cow produce more milk and has increased lactation period than that of a local cow. But, most of the producers previously used to rear local cows. They had limited knowledge on cross breeding process and limited access to relevant service providers. Therefore, to increase milk production, Safal promoted artificial insemination technology among PG members. PG members mostly take this service now from respective upazila's Department of Livestock [DLS] office.

However, from FGDs and IDIs, we have found that most of the producers are not satisfied with existing public cross breeding service (from DLS). They have stated that the DLS do not supply quality semen as they promise. Additionally, according to them, these cows produce more milk than local cows, but not as much as a proper cross-bred should produce. Some respondents also said that this is one of the major reasons for many of them not taking this service yet.

But instead of these constraints, as we saw in figure 2.3.1.1, at present more than 70% of the producers has at least one cross-bred cow, which has been a significant achievement. Some of them have purchased cross-bred cow, but most of them used cross breeding service to have these.

**Figure 2.3.6.1 - Percentage of farmers reporting different benenits of hybrid cattle**



As we can see in Figure2.3.6.1, almost all the respondents have reported increased milk production and regular milk production as the major benefits they experienced from their cross-bred cows. Almost 60% respondents also said that the lactation period of their cross-bred cow is comparatively higher than that of local cows. These are also the reasons that they want to continue with this practice in future.

### 2.3.7 Hygienic Milking Process

There has been a significant change in milking process among dairy producers. It is very important to maintain hygiene while milking a cow. If proper hygiene is not maintained, diseases like mastitis takes place. It is a potential fatal mammary gland infection that often used to occur in cows before project inception. This stops milk production and causes economic loss of the farmers.

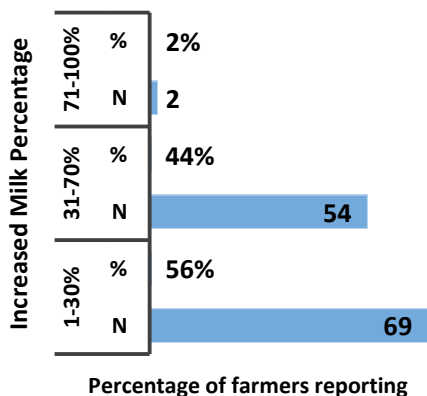
The project made producers aware about the hygiene requirements during milking. In our field visits we have observed that farmers now clean the mammary gland area with towels and wash hands properly before and after milking. They also practice a technique where they give the cow food so that it keeps standing. This way it gives the mammary gland enough time to close and hence stop getting infected when the cow sits down. We have also found that in some areas where farmers milk their cows with the *ghosh*, producers ensure that the *ghosh* at least washes his hands properly before and after milking.

### 2.3.8 Changes in Milk Production Amount

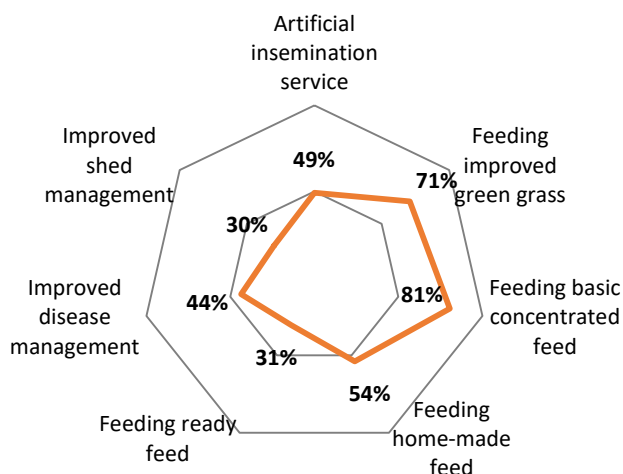
Almost all the farmers (98%) reported that after project inception their cows are producing more milk. As we can see in figure 2.3.8.1, 56% off the respondents said that they are enjoying up to 30% increase in the milk production of their cows. Another 44% reported that this increase is up to 70%.

The farmers think the main reasons behind this increased milk production include feeding cow basic concentrated feed (81%), improved green grass (71%), homemade feeds (54%), taking cross breeding service (49%), and adopting improved disease management system (44%).

**Figure 2.3.8.1 - How much has the milk production increased?**

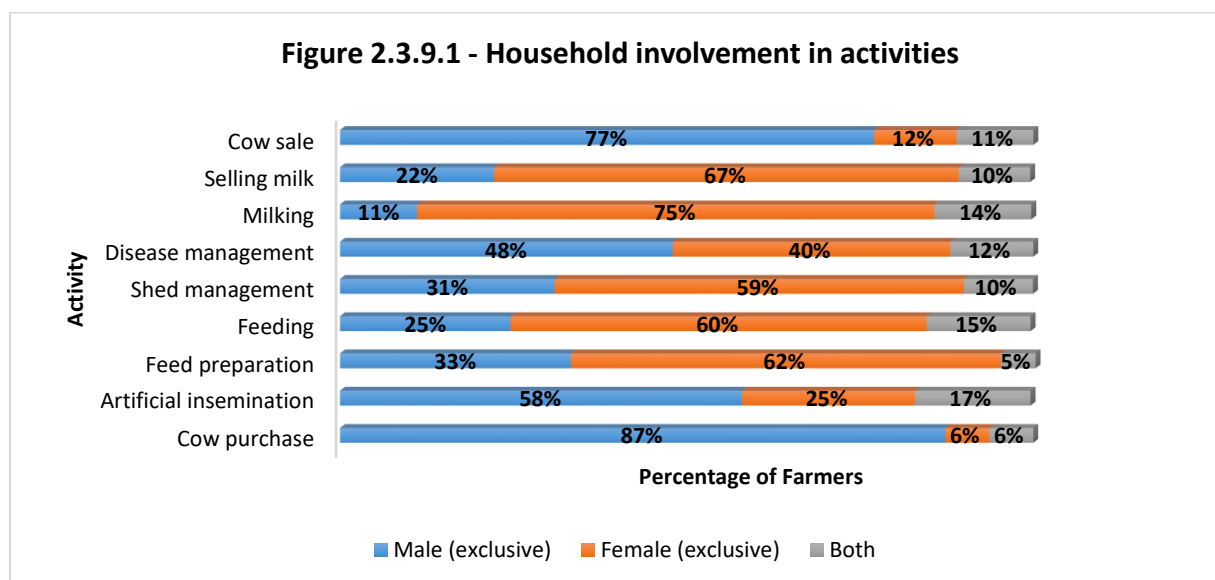


**Figure 2.3.8.2 - Reasons for increased quantity of milk**



### 2.3.9 Work distribution in Dairy Farming Households

We found that in dairy subsector the female members are more involved in different production steps than women involvement in other subsectors (horticulture and aquaculture). Figure 2.3.9.1 depicts a scenario where value chain activity distribution of a dairy household is provided. The three main groups are: male (exclusive), female (exclusive), and both. The responses have been taken in multiple choice-multiple answers format. As we can see in the bar chart, male members are predominantly involved only in cow purchase, cow sales, and artificial insemination. On the other hand, women are mostly involved in all other production steps, including feed preparation, feeding, shed management, milk sales, and so on.



### 2.3.10 Other Findings

From our field visits we have also found some practices like use of silage & hay, diversified food, use of UMS where grass is not available, as cattle feed. Additionally, Manger for 24 hours water availability, taking care about pregnant & lactating cows to reduce milk fever, using chopping straw after half an hour wetting in the water for easy digestion were also found in dairy farmers in the assessment.



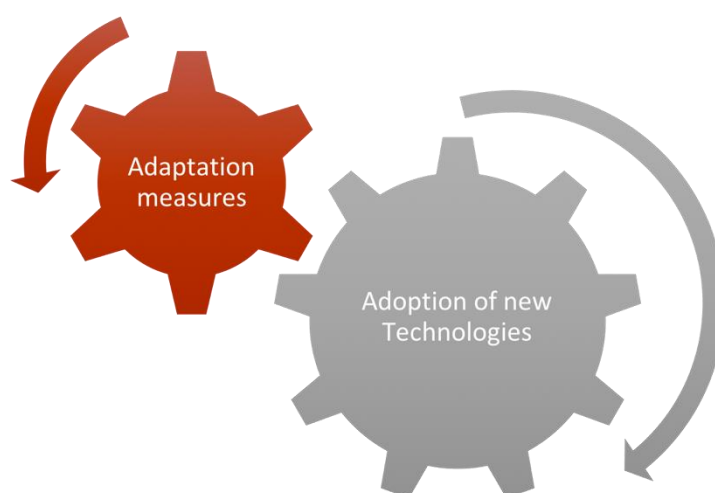
## 2.4 Technology Adoption vs Adaptation Measures

Adapt means to change for a new situation. Adopt usually means to take something legally as your own.

Adopt is taking something and accepting it as one's own. Adoption means choosing and following; as of technologies, new ideas, policies, strategies or plans.

On the other hand, adapt is taking something and changing it to suit one's requirements. Adaptation also refers to the act of altering something to make it suitable for some new practices or behavior. For example, households can adapt their food consumption to the available food resources.

We have observed both adoption and adaptation around different project promoted technologies among project beneficiaries and community households or neighbors. We have found that adoption of different technologies by project stakeholders demanded adaptation in different on-farm and off-farm areas. The producers have been enthusiastically taking up those adaptation measures (which at the end paid off their adoption measures). The figure on the right describes this process.



Therefore, adoption and adaptation are two sides of a coin. Adoption took places as farmers and other stakeholders adapted to their conventional practices. Some major areas that we have observed are tabulated below.

	Adoption of technologies	Adaptation Measures
Horticulture	<ul style="list-style-type: none"> <li>- Better use of chemical fertilizers (dosage and usage)</li> <li>- Use of high yielding seed varieties</li> <li>- Use of micronutrients (in cases where there is any deficiency)</li> <li>- Use of bio-fertilizers (vermin compost; conventional compost; quick compost)</li> <li>- Use of improved seed varieties</li> <li>- Better pest management (reduced use of chemical pests; increased use of natural pest management technologies; improved dosage)</li> </ul>	<ul style="list-style-type: none"> <li>- Change in expenditure pattern in chemical fertilizers, bio-fertilizers and pest management technologies</li> <li>- Shifting from own seed varieties (local varieties) to HYV or hybrid seed varieties</li> <li>- Shifting from overwhelming chemical pest usage to natural pest management practices</li> <li>- Using fresh ground or surface water instead of water from closed sources</li> <li>- Using/ managing cow-dung and other biodegradable materials for producing compost</li> </ul>

	Adoption of technologies	Adaptation Measures
	<ul style="list-style-type: none"> <li>- Better irrigation practice</li> <li>- Improved post-harvest management practice (harvesting; grading; washing; sorting; packaging; transportation; crate usage)</li> <li>- Sales practice (as per buyers' demand)</li> </ul>	<ul style="list-style-type: none"> <li>- Increased involvement and work-hour allocation in post-harvest processes (especially of women)</li> <li>- Increased expenditure in post-harvest activities, packaging and transportation</li> </ul>
Aquaculture	<ul style="list-style-type: none"> <li>- Better pond/<i>gher</i> preparation practices (dike repairing; bottom plaining; removing predatory fishes; pond drying; weed controlling; etc.)</li> <li>- Use of good quality fish seeds</li> <li>- Improved stocking density</li> <li>- Improved feeding practice</li> <li>- Increased use of probiotics</li> <li>- Water and soil testing</li> <li>- Reduced usage of chemical agents</li> <li>- Usage of fine mesh synthetic net</li> <li>- Improved pond hygiene management practice</li> </ul>	<ul style="list-style-type: none"> <li>- Increased expenditure in pond preparation</li> <li>- Increased expenditure in fish feeds, probiotics, soil/ water testing, synthetic nets</li> <li>- Increased involvement and work-hour allocation in homemade feed preparation, feeding and pond hygiene management (especially of women)</li> <li>- Increased collaboration with the Lead Farmer for access to information and technologies</li> </ul>
Dairy	<ul style="list-style-type: none"> <li>- Production of improved green grass</li> <li>- Improved feeding practice (roughage and concentrated feeds)</li> <li>- Improved disease management practices (deworming; vaccination; preventive and curative measures)</li> <li>- Improved use of AI services</li> <li>- Improved shed management practices</li> <li>- Improved milking practices</li> <li>- Improved sales practices (selling according to fat content)</li> </ul>	<ul style="list-style-type: none"> <li>- Increased expenditure on improved green grass production</li> <li>- Increased expenditure on feeding</li> <li>- Increased expenditure in disease management</li> <li>- Increased expenditure in shed management</li> <li>- Increased involvement and work-hour allocation in green grass production, homemade feed preparation, feeding, disease management and shed management (especially of women)</li> </ul>

## Chapter Three: Household level social and behavioral practices related to food security

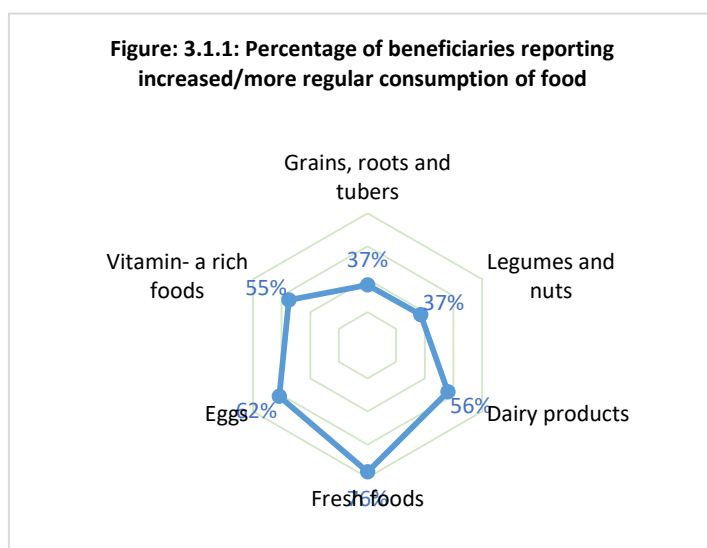
The findings from the study show quite promising results in terms food consumption behavior, cooking and hygiene practice. Most of the households were found to be consuming items from more than four food groups which denotes more than acceptable household dietary diversity in program groups. Higher proportion of children is consuming four or more food groups which is an achievement of SaFaL program. Mothers are following recommended feeding practices of young children, and accessing pregnancy care services which in turn contributing towards improved nutritional status. Most of the mothers are feeding their children by themselves. In addition responsive feeding is practiced by majority mothers to adopt optimal feeding behaviors. Hand washing with soap has become a popular practice among the respondents during five critical times but physical availability of soap and water at designated hand washing place was found to be comparatively low. CNVs have been playing a pivotal role in this success.

However, girls and women are still consuming less than the males. This might need to be explored to address any cultural or social norms related to feeding pattern by female children in the program.

This section represents a discourse of whether the SaFaL project were successful in their respective zones in terms of nutrition and health.

### 3.1 Consumption Behavior of Women

In terms of nutrition and health, the project has been more focused on women, pregnant and lactating women, adolescent girls, and children. The idea about focusing on women and children is that because of our patriarchal norms. Women generally consume comparatively the least (if not equal) amount of food in a household. Therefore, if it is found that women are healthy and consuming nutritious food daily, it suggests that the other household members are consuming at least that amount if not more.



Therefore, CPL has looked into the food consumption patterns of women (especially pregnant and lactating women) to figure out whether there has been any change, especially in terms of

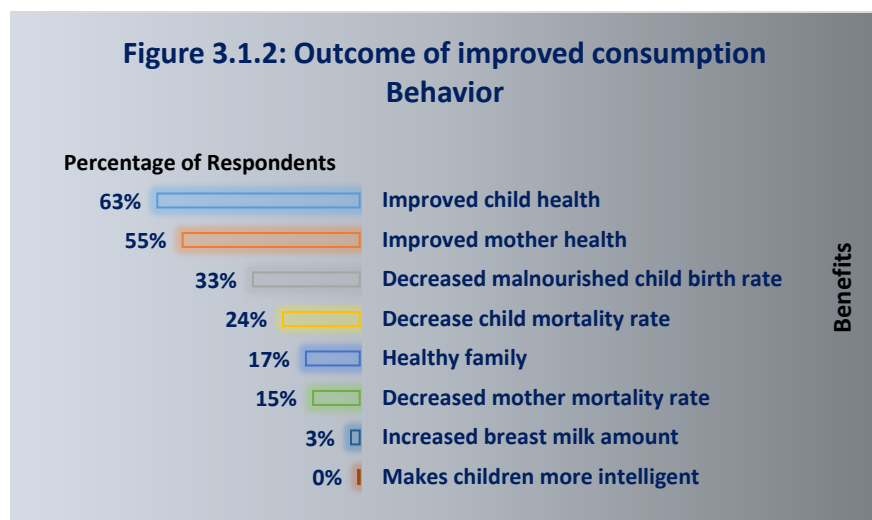
consumption pattern of high quality protein and iron rich food every day. Because women go through certain transitions through their pregnancy period, protein is very crucial for healthy growth of their babies.

In our survey, all the respondents stated that there has been change in their food consumption behavior. Figure 3.1.1 illustrates the percentage of beneficiaries reporting increased amount of a particular food or more regular intake of a particular food. Therefore, in figure 3.1.1 we can see that more than 50% of the respondents stated that women now eat vitamin A rich food (55%), eggs (62%), and dairy products (56%) more regularly or in an increased amount.

Previously women used to eat stale food. SaFal has provided them training on harms of consuming stale food and benefits of fresh food consumption. From the assessment it has appeared that 76% women now consume fresh food more regularly or in an increased amount. Also, more women eat iron rich foods, legume and nuts on regular basis or in an increased amount.

All the respondents have said that they are really happy with their changed consumption behavior and are happy to continue this.

We explored the reasons behind this change and whether these changes are sustainable. The study team has found that respondents are happy with this change and keen on keeping on practicing improved consumption behavior. As most of the households consume food from six dietary groups, the issue of access and availability to food and their consumption were not found as serious problems. From our quantitative findings, we have summarized them in the figure below (figure 3.1.2).



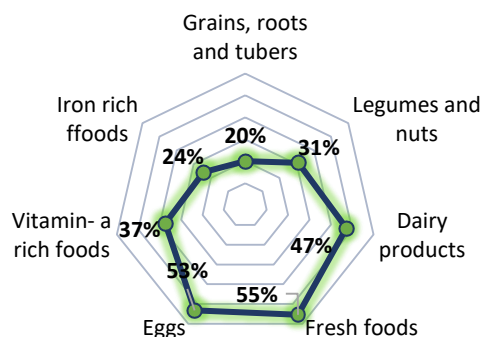
Since eating nutritious food ensures a healthy mother, the baby of a well-fed pregnant and a lactating woman will automatically become healthy. Additionally, since the mother is healthy, chances are that the baby will not be born as malnourished, which in turn reduces the possibility of child

mortality. One mixed signal from this graph is, even if it says more than 50% of women believe this new food behavior has changed improved mothers' health, only 17% think that it ensures a healthy family. Therefore, even if the findings provide a clear idea about the reasons regarding mother and child health, it clearly has some varied indications which implies contradiction.

## 3.2 Consumption Behavior of Children

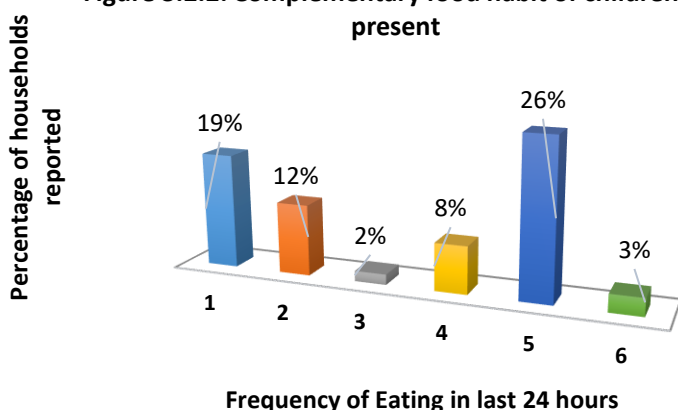
Besides women, SaFal also targeted on improving health situation of children. Findings on children consumption behavior are pretty similar with the one regarding women. It was found that children are also increasingly consuming fresh food, eggs, and dairy products on a regular basis. The least percentage went into grains, roots, and tubers (Figure 3.2.1). These similar findings between the mother and children health actually resonates with the logic that if the mother is healthy, she tends to feed her kids healthy meals. And as we will see in the women empowerment section, females now can make better expenditure decisions about health of her family now, which is clearly depicted in this picture.

**Figure: 3.2.1: Current Eating habit of children**



Also, we can interpret from the following table and figure (Figure 3.2.2) that more than 50% of the children had eaten protein at least twice in the last 24 hours prior to the interviews. Also, as complementary food, children mostly eat boiled eggs (26%), khichuri (19%), and fruits (12%). Few respondents reported that their children drink milk though.

**Figure 3.2.2: Complementary food habit of children at present**



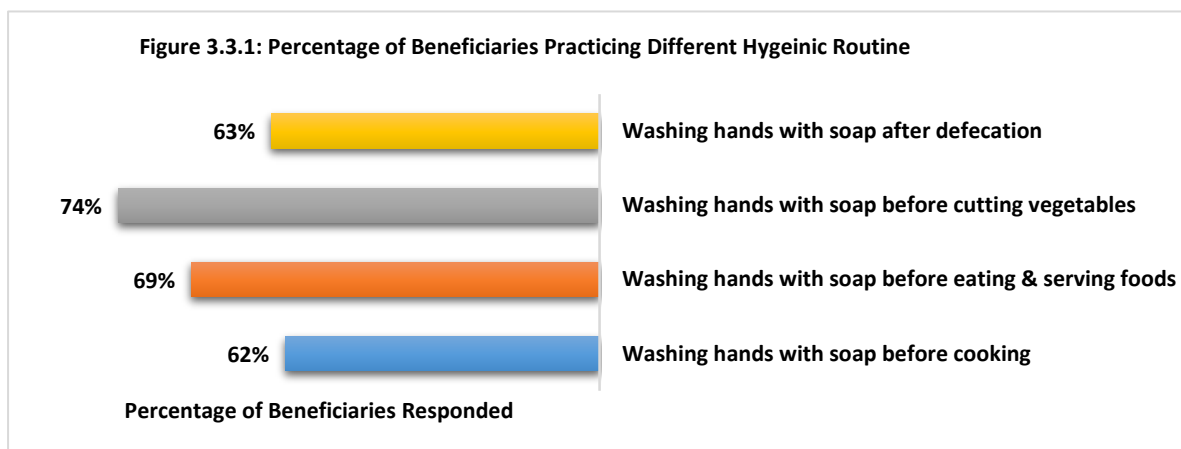
**Percentage of HHs whose children have eaten milk/ fish/ meat/ chicken in last 24 hours**

Frequency of Eating	% of HH
0	19%
1	5%
2	32%
3	20%

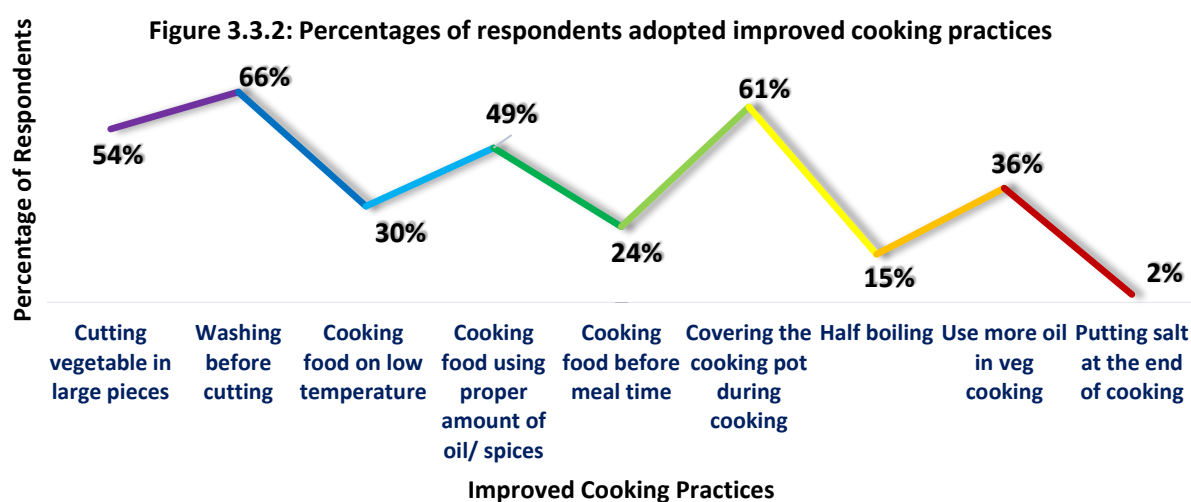
## 3.3 Change in Hygiene Practice

Hand washing with soap is an essential individual behavior to protect children from the two biggest pediatric killers: diarrhea and lower respiratory infection. These diseases kill more than 3.5 million children globally every year. The promoters for hand washing are societal norms, availability of water, soap, reminders of hand washing during critical time, knowledge and

awareness. These are considered as promoters while absence of any of those might interrupt the desired behavior on time.



While further analysis was conducted, result presents that 63% of the respondents now wash their hands with soap after coming from toilet (Figure 3.3.1). Additionally, almost two-thirds of the respondents (69%) now wash their hands with soap before eating. It was also interesting to see, that around two-thirds of the respondents reported of women washing their hands before cooking (62%) and before cutting vegetables (74%). It is visible that change in hygiene behavior is more apparent among women. CNVs and their awareness sessions played a pivotal role in this success. This plays a crucial role in terms of setting the premise of a healthy household, because cleanliness after releasing waste prevents diseases.

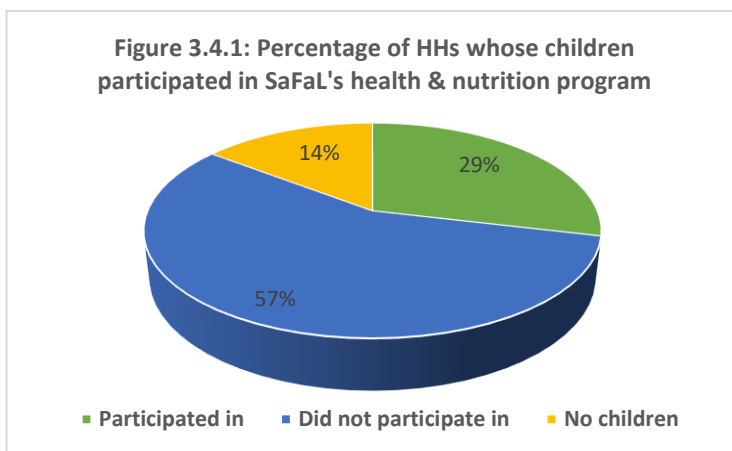


We also wanted to know whether there has been any change among households regarding safe cooking practices. The project trained its beneficiaries about the pre-cooking and post-cooking measures, to-do's, and not-to-do's so that they can follow healthy life choices. We have found that 66% of the respondents are now washing vegetables, fish, and meat before cooking (which they did not use do regularly o appropriately before). Another 61% reported that now they cover the cooking pot during cooking. Almost 50% of the respondents also said that now they use

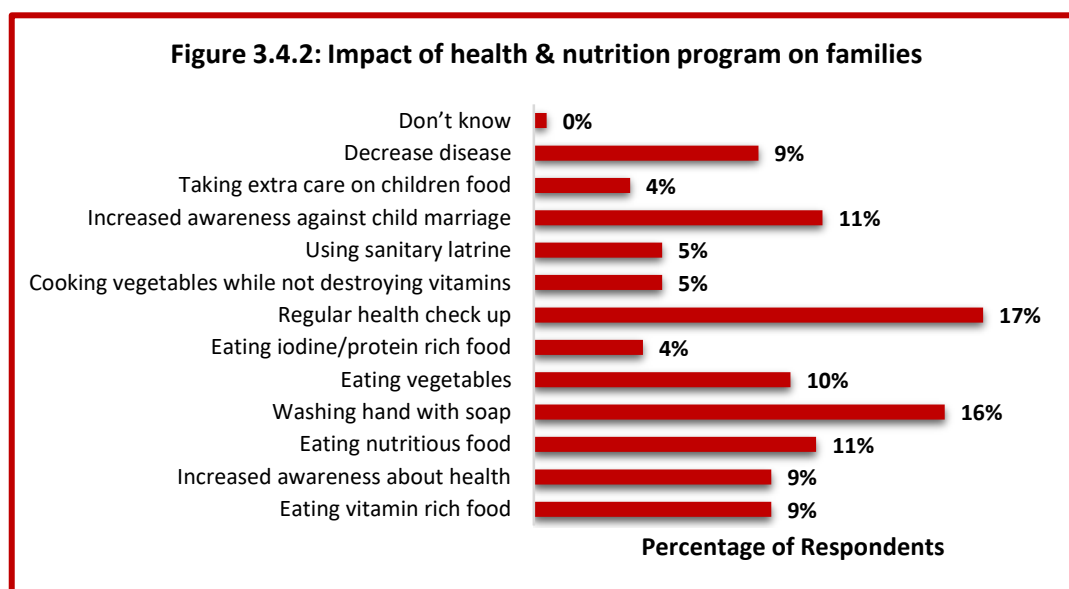
proper amount of oil and spices in their food (which was usually comparatively less before). Now they cut vegetables in large pieces (54%) and use more oil during cooking vegetables (36%). Around one-third of the respondents also reported that now they cook in lower temperature and before meal time. Before, they usually used to cook once in a day which used to become stale during the second or third meal).

### 3.4 Impact of SaFal's Health and Nutrition program with Children

SaFal introduced a health and nutrition program for the children which teaches them about different aspects of personal hygiene, cleanliness, and food consumption behavior. This program ensures that the next generation knows about nutrition and hygiene requirements and how to take care of themselves. As we can see in Figure 3.4.1, only 29% took part in the program until the survey was conducted. Since the participation rate is not that high by



to date, the impact of this program against the indicators is not that high either (Figure 3.4.2). However, interestingly, some respondents stated that children who participated in those sessions are now more aware and keen about regular health checkups (17%) and washing hands (16%). Therefore, if SaFal can engage more children in this program, there is a great potential for the next generation to be more aware of health, nutrition, and cleanliness.





## Chapter Four: Status of women in agricultural production and their empowerment in household and society level

### 4.1 Qualitative Research (FGD and IDI) Findings

Assessing women's empowerment and intra-household and intra-PG gender dynamics has been an important objective of this study. This section discusses different aspects in these areas.

We have found that cooking was by far the most prioritized task conducted by women in all areas followed by cleaning, child care, and other PG related tasks. The important finding here is that the respective PG-related tasks do not get priority over other usual household chores like cooking, cleaning and child care. Nonetheless, women are heavily engaged in activities related to enterprises. Remarkably, they do not label them as economic activities, but rather term them as regular household chores.

#### Decision Making and Women's Empowerment

In the qualitative study part, we have assessed different aspects of women's empowerment, e.g., decision making authority, getting help, respect, and support from the family members, control of savings, and so forth. We have found that most of the women reported to have the decision-making authorities regarding daily cooking, children's education and rearing. In case of taking decision about children's education most of them consult with their husbands. However, in most of the households both husband and wife can discuss on the serious family issues with women.

#### Decision Influencing Capability

Reasons behind these positive changes can be attributed to the participation in the SaFaL project which in turn has brought money to the household and the women and made noteworthy differences. They can give money to their children to buy some food while in the school. They can also buy simple necessities of the households when husbands are away.

Though their income and overall decision-making authority and mobility have increased and that increase has been attributed to SaFaL, the land and property ownership of women has not increased that much. Ownership of properties or land is a big issue and it would take quite some time to see any impact in this regard.

Women were found quite comfortable going to the local markets but most of them have to take permission before going to these places. This is an aspect which cannot be changed overnight. In the patriarchal society, it is a norm that the women take permission before going to other places. Nevertheless, changes are happening and the women in program areas have been progressing slowly but steadily. In most program areas, women can go alone to local market, upazila sadar market, and Upazila Health Complex on their own.

## **PG Involvements**

In our qualitative part of the study, it was found that dairy PG respondents are more satisfied with their participation in the PG activities. Not surprisingly, women were found to be more influential members than the males in most dairy PGs, whereas few aquaculture PGs had them. The cause behind this less number of female members in the aquaculture PGs as stated by different stakeholders is that the aquaculture enterprises (ponds/ghers) are far away from the households. It is not suitable for women to take care of fishes on regular basis (except preparing home-made fish feed). But, this assertion might not be true as we observed that many women were working in fish ponds. Another reason for such low participation of women in aquaculture PGs is that these PGs consist of those farmers who own at least 10 decimal of the land.

On the other hand, horticulture PGs have got almost equal participation from male and female. Also, since women are mainly engaged in household activities majority of them are directly involved in livestock of the households. Therefore, the dairy PGs are mainly composed of female members.

Also, in different PG activities (e.g., group meetings) women showed remarkable performance. Female members are very regular in those group meeting and sessions.

Though in some areas it was found that both male and female were active participants in PG meetings the male members had major role in decision making in the PG in most cases. However, as women members are most in number in dairy and horticulture PGs, women's contributions are observed most in these PGs. Women's participation in supply chain is very low though. In dairy PG households, women are more involved in sales but that is because they can sell their products from their household/farm. They do not have to go to the market places to sell the products.

## **4.2 Survey Findings**

### **4.2.1 Women Involvement and Decision Making Capabilities in Horticulture**

As we can see in figure 4.2.1.1, women in horticulture PGs are now more involved in post-harvest activities (88%) and harvesting (70%). The qualitative data also suggests that women are extensively involved in shading, washing, grading, and packing the produces after they are harvested from the farm land. 68% of the respondents said that women involvement in sales is growing, which is a crucial factor in terms of female empowerment. Other areas where involvement increased include weeding (70%), irrigation (62%), and fertilization (63%). In case of harvesting, weeding, irrigation, and fertilization, women involvement is more apparent in comparatively smaller farms and less in commercial farms.

However, increased women involvement does not always indicate increased women empowerment always, as there might be an overall increase of farm activities due to project

interventions which might have also increased women involvement (alike male involvement in parallel) in different production processes.

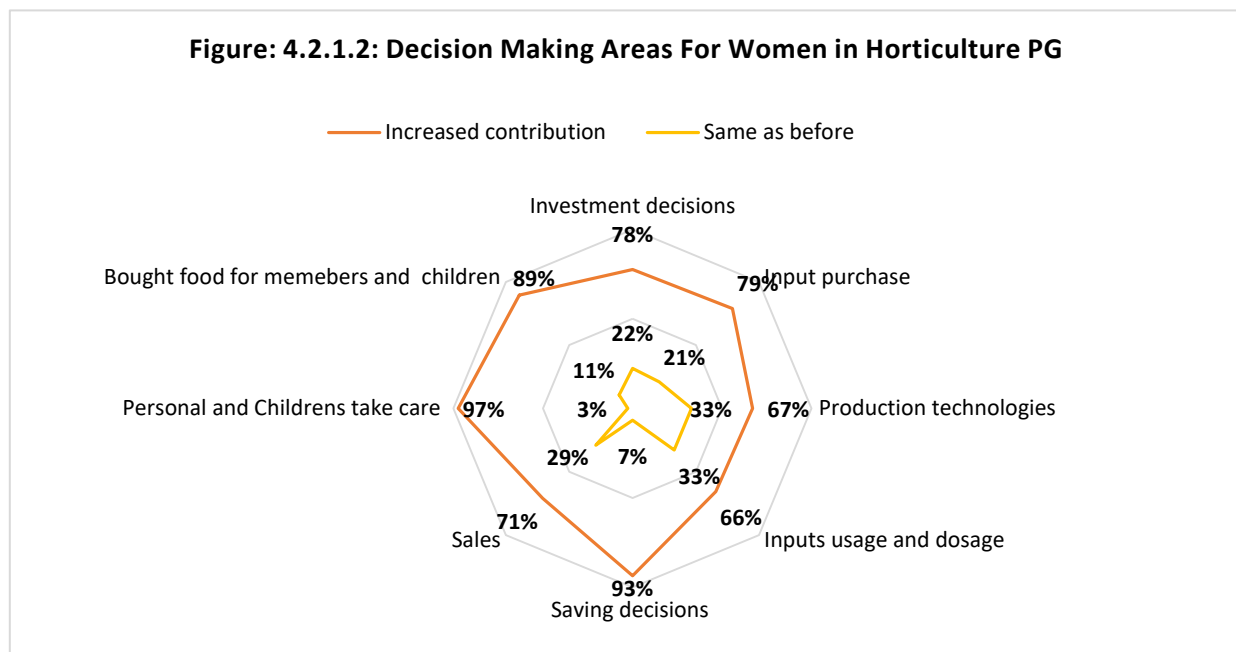


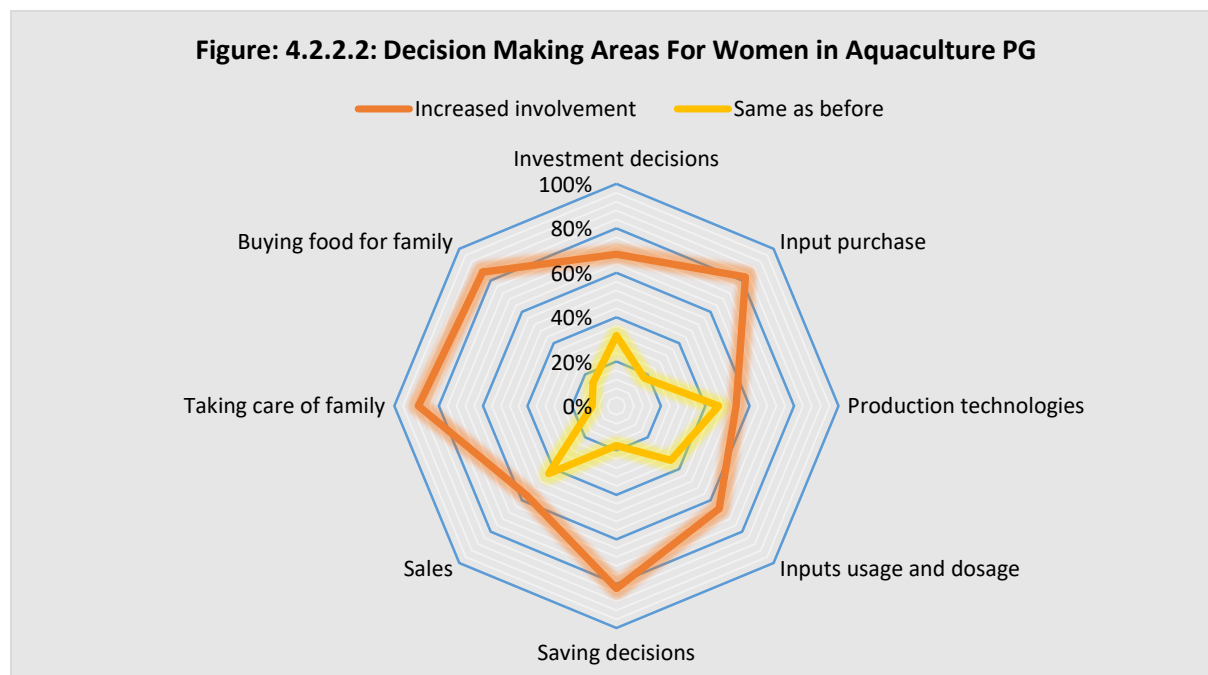
Figure 4.2.1.2 describes the percentage of women being able to make decisions on their own in certain areas in the horticulture value chain. We can see that in most of the areas, women's contribution in making decisions have increased, including decisions about food purchase for household members and children (89%), measures on taking care of herself and her children (97%), and savings (amount and frequency) (93%).

The reason for change in both aspects is pretty apparent. As we have found in our qualitative study part, increased money gave women more to spend on those areas and also a stronger voice in relevant family issues.

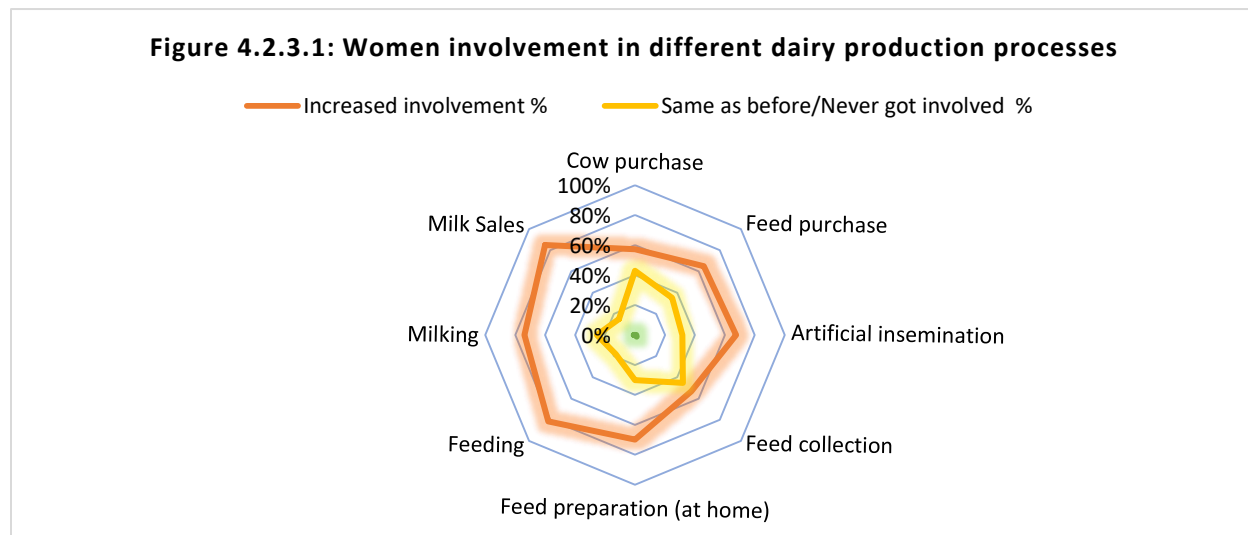
However, some not-so-improved areas for women's decision making capability include input purchase, output sales, input usage, and decisions on fish cultivation technologies. As we have found in our FGDs and IDIs, although women are quite comfortable going to the local markets, most of them have to take permission before going to these places. This is an aspect which cannot be changed overnight.

#### 4.2.2 Women Involvement and Decision Making Capabilities in Aquaculture

As Figure 4.2.2.2 suggests, women's decision taking capability increased in some areas like decisions about food purchase for household members and children (85%), measures on taking care of herself and her children (89%) and savings (amount and frequency) (82%).



#### 4.2.3 Women Involvement and Decision Making Capabilities in Dairy



Since women are mainly engaged in household activities, majority of them are directly involved in maintaining livestock of the households. Therefore, dairy PGs were formed mainly with female members. Their involvement and contribution were found to be increased in PG groups in the last few years after project inception.

The above figure depicts the active involvement area of women as an influence of project. The team asked the beneficiaries directly if they thought women involvement has increased, decreased, or remained same as before across different activities of dairy farming. The result shows that in every area women involvement has increased in varied ways based on districts features, dynamics, and characteristics. The data shows that women involvement in dairy PGs has increased more than in other sub sectoral groups. The result significantly indicates that women are actively involved in milk sales (85%), but that is because they can sell their products from their household/farm; they do not have to go to the market places to sell the products). Areas like feeding (82%), milking (74%), and feed preparation (70%) also have respondents who think women involvement has increased.

However, our qualitative (IDIs and FGDs) and survey findings conflict here in case of feed purchase, cow purchase, and artificial insemination (AI). In our FGDs and IDIs we have found that these activities are still mostly handled by male household members. We have also found that women participation is highly concentrated in household areas. When it comes to Activities like cross breeding or cow purchase, they require mobility-which is still is difficult thing to manage for women. Arguably, each community has its own character and feature, which might influence the involvement of women in this area.

Reasons behind these positive changes can be attributed to increased money flow from milk sales which is mostly controlled by women (unlike other subsectors where male members mostly control the sales). In terms of financial decision, now they can spend some of their income on their children's education. They can also buy simple necessities of the households when the husbands are away.

## Chapter Five: Sales, Finance and Saving Situation

### 5.1 Sales Situation

#### 5.1.1 Sales Situation in Horticulture Subsector

##### *Selling and Consumption Behavior of Vegetable Farmers*

We have assessed how much the horticulture farmers consume by themselves and how much they sell. As figure 5.1.1.1 illustrates, 46% of the respondents claimed that they sell more than 80% of their produce.

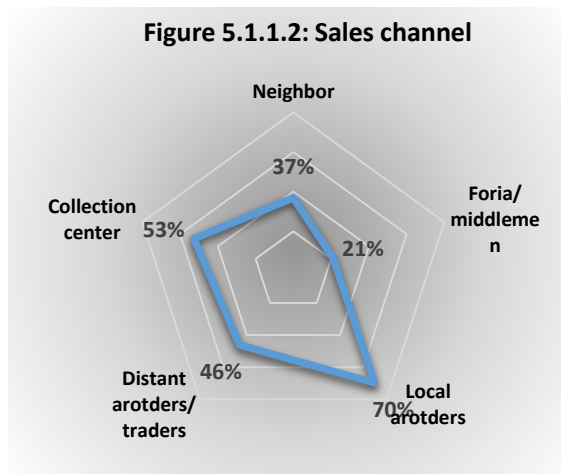
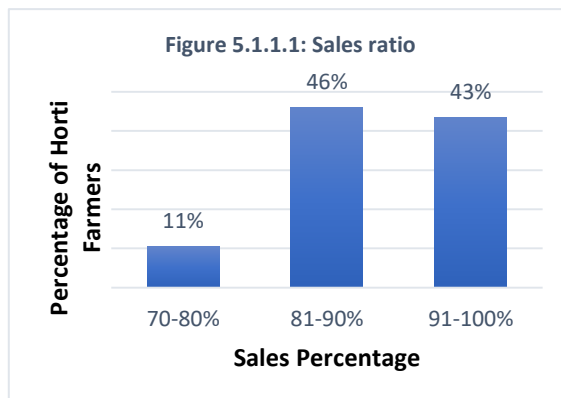
##### *Major vegetables Sales Channels*

As figure 5.1.1.2 suggests, 70% of the respondents sell to local *arotdars*. Another 53% reported that they sell through collection points. From FGDs and IDIs, we have learned that producers can sell through collection points only in the communities where Safal established collection centers.

46% respondents said that they sell their produce to distant traders. From qualitative study part, we have learned that in bazaar days many distant traders come to the moderately big and large haats. Producers try to sell their vegetables to them on those days as they get comparatively higher price.

Only 21% stated that they sell directly to Farias (who come to farm-gate), which, according to them, were quite high even before project inception, when they had limited linkage with forward market channels.

Producers who sell through collection points said that better price (85%), cash sales option (73%), guaranteed sales (65%), and less transaction time (60%) are the major benefits that they get from using this channel. Producers who sell to local traders are usually the ones who cannot sell their produce through collection centers (as no collection centers has been established in those areas yet) and therefore sell produce to local traders at nearby haats/ bazaars instead. Low transaction time and cash sales were the major benefits identified by the respondents.



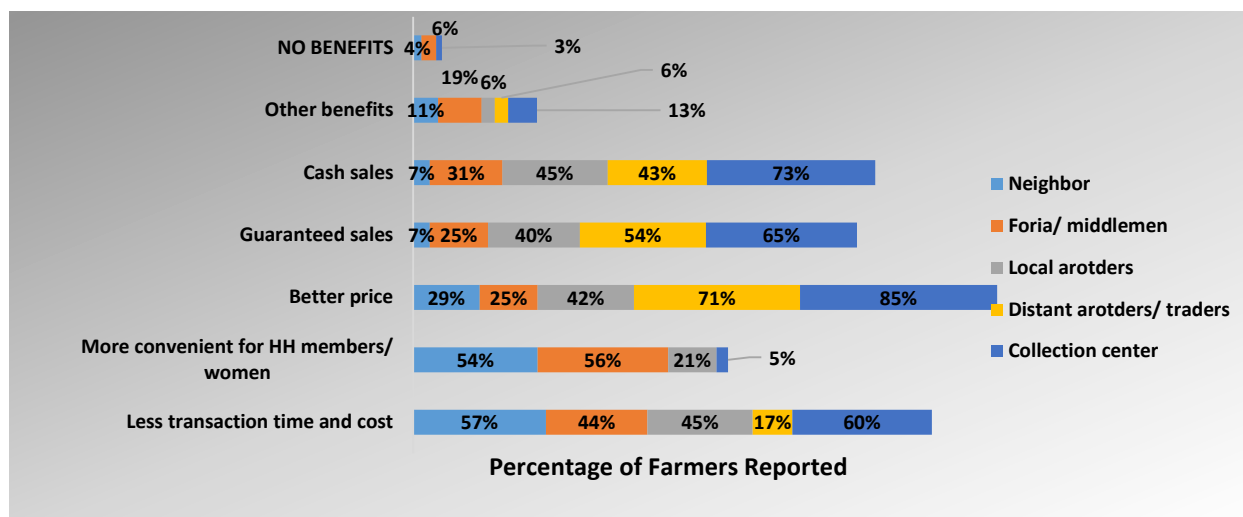
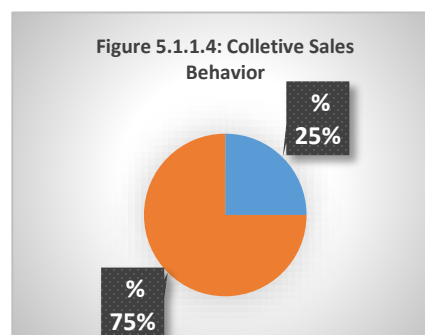


Figure 5.1.1.3: Benefits of using different channels

### Collective Sales Practice of Vegetable farmers

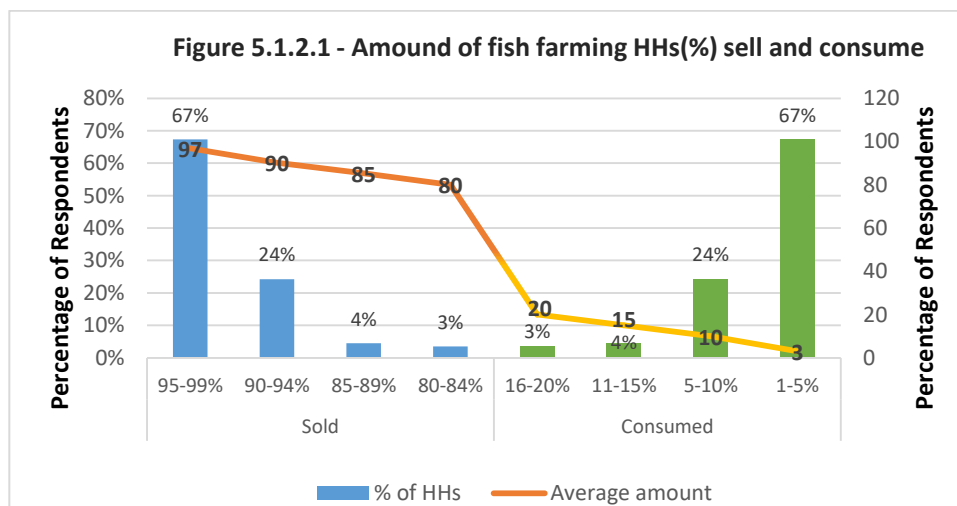
Only 25% of the respondents told that they sell vegetables collectively. Better price was identified the major reason (100% response rate) behind collective sales practice.

Because many producers sell their produce through project promoted collection center or vegetables sellers, they do not have to sell collectively for better price. Collective sales practice was observed mostly in areas where these facilities/ services were not that active.



## 5.1.2 Sales Situation in Aquaculture Subsector

### Selling and Consumption behavior of Fish farmers





We have also assessed how much of aquaculture farmers consume by themselves and how much they sell. As illustrated in the figure 5.1.2.1, around 90% of the respondents have claimed that they sell more than 90% of their fish that they produce. The orange - yellow line in the above diagram shows the average portion farmers sell and consume. It is important to note that farmer's consumption portion includes their self-family consumption, gifting to neighbors and relatives, rotten fish etc.

### Major Fish Sales Channels

Figure 5.1.2.2 - Sales channel

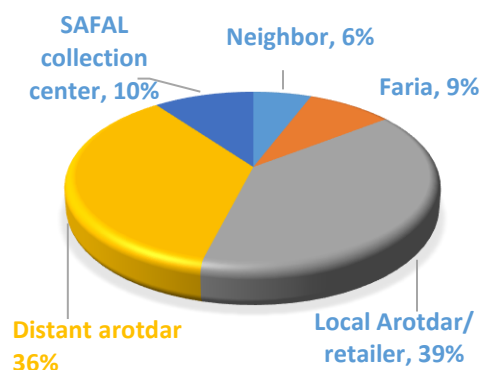
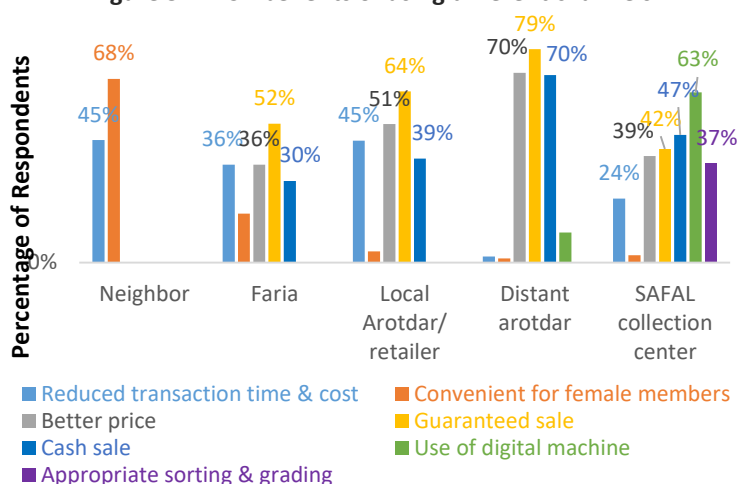


Figure 5.1.2.3 - benefits of using different channels



As figure 5.1.2.2 suggests, while 39% of the respondents sell their fish to local *arottdars*, 36% sell fish to distant arottdars. From IDIs and FGDs we have found that shrimps are usually sold to the distant arottdars who come to the local haats or at farm-gate to purchase fish directly from *gher*. White fish (fin fishes) is usually sold to the local arottdars. Only 10% of the respondents reported that they sell fish through collection centers. Like vegetables sales, popularizing fish sales through collection centers is another area where the project should work on in future.

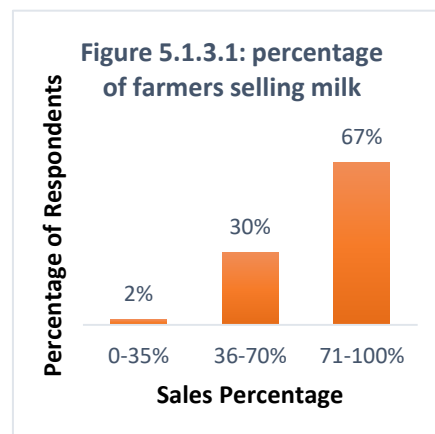
Producers who sell through distant traders said that better price (70%), cash sales option (70%), and guaranteed sales (79%) are the major benefits that they get from using this channel. On the other hand, producers who sell to local traders said that guaranteed sales (64%), cash sales (51%), and less transaction time and cost (45%) are the major incentives for selling fish local arottdars.

### 5.1.3 Sales Situation in Dairy Subsector

#### *Selling and Consumption behavior of dairy farmers*

We have assessed how much milk the dairy farmers consume by themselves (and their families) and how much they sell. As illustrated in figure 5.1.3.1, 67% of the respondents claimed that they sell more than 70% of the milk they produce daily. Around one-third of the respondents said that they consume on an average of 36% to 70%.

Usually, the cross-bred cows produce more milk as compared to that of local ones. Therefore, producers with cross-bred cows usually can spare comparatively more share for self/ household consumption.



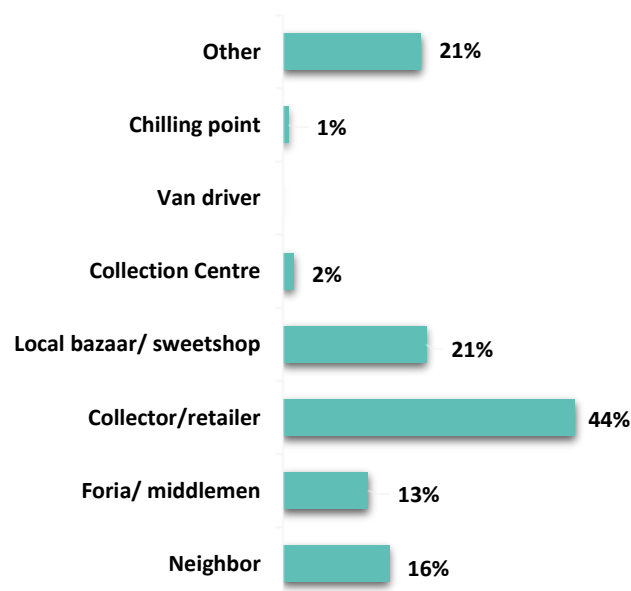
#### *Milk Sales Channels*

From our FGDs and IDIs, we got the impression that they mostly sell their milk to local sweet shops or to collectors (there was multiple response option).

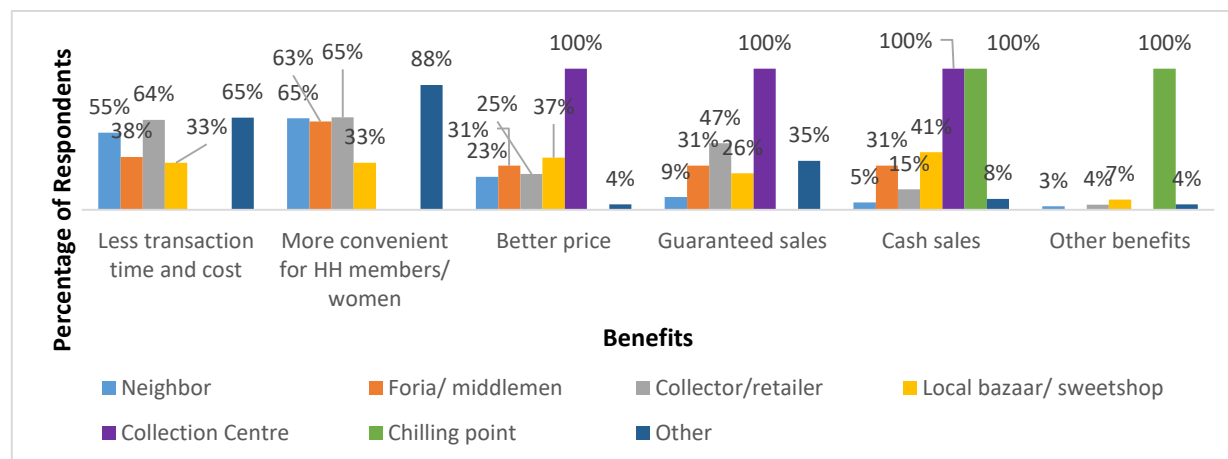
From the survey we have found that 44% sell milk to collectors and retailers and 21% to sweetshops and local bazaars. Only 2% have the access to the collection points where they sold milk. From FGDs and IDIs we have found that number of chilling points is small and few community members have access to those, although they provide the best market price.

We wanted to know why they are selling milk to any particular output market channel. We have found that most of the respondents (61%) are selling milk to their neighbors because it is convenient for them and saves their transportation time and cost. As we saw in section 2.3.9, it is women who are mostly involved in milk sales. But because they have limited scope of mobility in this social context, that might be a reason that most of the milk they are selling is to their neighbors, although the market price is comparatively low there (Figure 5.1.3.3).

**Figure 5.1.3.2: Milk sales channels**



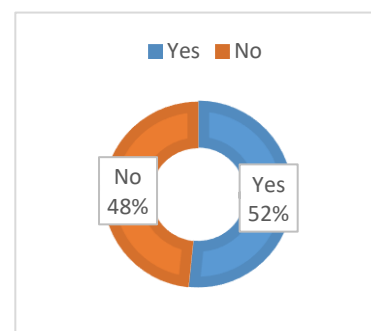
Those who are selling milk to collectors said that better price, guaranteed sales, and cash sales are the major benefits they have enjoyed from their transaction with them. In case of selling to the sweetshops, they said that it reduces their transportation time and cost. Also this option is more convenient for the women as *ghosh* (agents of sweetshops) come to their home for milking and milk collection (Figure 5.1.3.3).



**Figure 5.1.3.3: Benefits of using different channels reported by the aquaculture farmers**

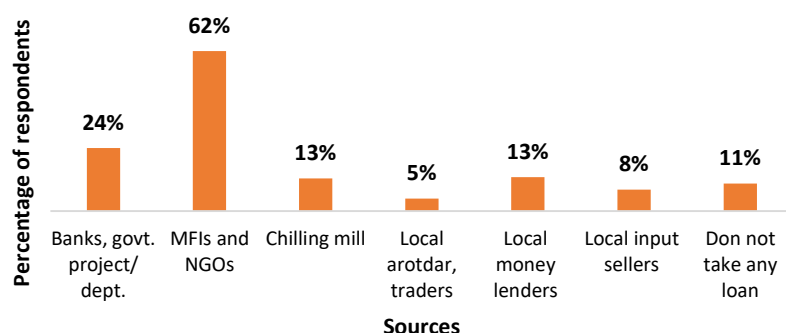
## 5.2 Finance and Savings Situation

Investment is the key to grow any business or farm. In order to invest money in any business, a producer either needs to have that amount of money or should have access to appropriate financial services which offer appropriate financial product according to his/ her needs (amount; interest rate; collateral conditions; payment period and other modalities). Advantages like better knowledge of production practices, access to agro services, access to output market can be counter-balanced if there is lack of access



**Figure 5.2.1: % of Respondents have access to appropriate financial services**

**Figure 5.2.2: Categories of financial services sources**



that they need (that offers the right interest rate and installment system) (Figure 5.4.1). Figure

to financial services. Since inception, SaFal has been trying to establish a linkage between its PG members and different financial service providers.

We have found that almost 50% of the respondents reported that they have access to MFIs, but do not have access to the appropriate financial product

5.4.2 illustrates different categories of financial services that the respondents presently have access to. As we can see, altogether almost 90% of the respondents take loans from MFIs (62%) and public and commercial banks (24%).

The CPL team has also tried to categorize the sources of the credit or loan in terms of most usage. According to the respondents who said yes to the availability of financial assistance, 62% of them said that MFIs and NGOs help them the most in terms of it. 11% of them said they do not take any loans from anyone. The second most use resource in terms of financial aid is banks and government projects (24%).

### **5.2.1 How much do they save?**

In any economy, individuals have two ways to use income: spending or saving. Saving is the setting aside of income for future use and is undertaken by both individuals and institutions.

Investment, therefore, is primarily the activity of businesses and is a way of using the money that comes from saving. The act of investing uses resources that have been freed from current consumption to develop goods or assets that will produce earnings or add to production in the future.

Savings theories traditionally predict that current consumption is related not to current income, but to a longer-term estimate of income. The life-cycle hypothesis (Modigliani 1966)<sup>2</sup> predicts that individuals hold their consumption constant over their lifetime; they save during their working years and draw down their savings during retirement. One implication of the life-cycle hypothesis is that a program such as social security, which supplements income for retirement, will reduce saving by workers since they no longer need to save as much for retirement. The permanent income hypothesis (Friedman 1954)<sup>3</sup> argues that consumption is proportional to a consumer's estimate of permanent income. The permanent-income theory implies that consumers do not respond equally to all income changes. If a particular change in income appears to be permanent, people are likely to consume a large fraction of the increase in income and hence, save less.

We have also investigated how much our respondents saved last year and this year. We believe that this comparison will help the client understand about change in producers' savings behavior.

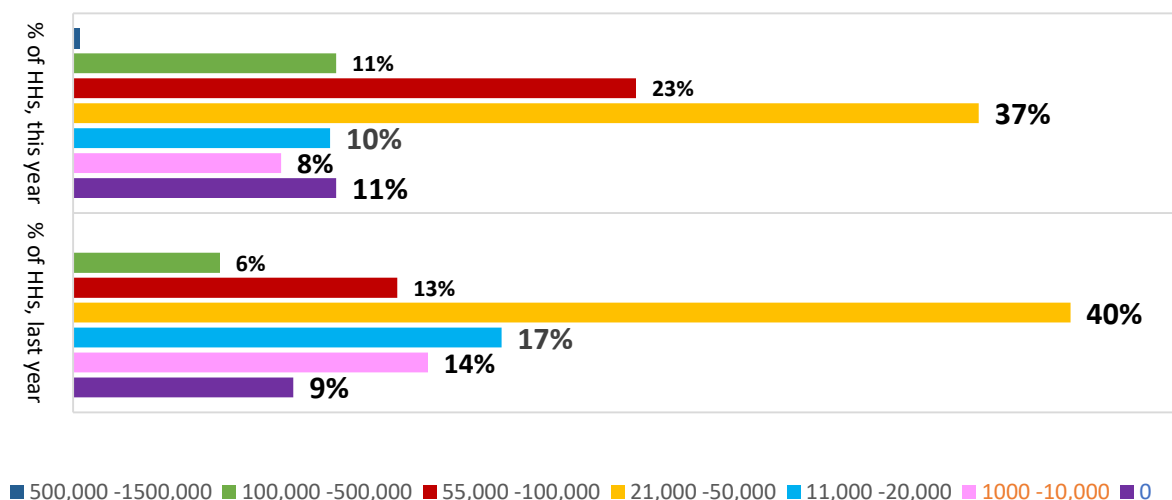
As we can see from the figure 5.2.2.1, most of the people saved around BDT 21000-50000 last year and this year. However, the rate of saving this amount have decreased to 37% from 40% last year. 10% more respondents saved BDT 55,000 to BDT 100,000 this year. Also, while 11% of the respondents said that BDT 100,000 to BDT 500,000 this year, only 6% respondents saved that amount last year.

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<sup>2</sup> [http://www.ppge.ufrgs.br/giacomo/arquivos/eco02273/The\\_life.pdf](http://www.ppge.ufrgs.br/giacomo/arquivos/eco02273/The_life.pdf)

<sup>3</sup> <http://www.ifs.org.uk/wps/wp0401.pdf>

**Figure 5.2.1.1: Saving Patterns in HHs**



### 5.2.3 Where do they save?

Recently lots of financial institutions have been established so that the farmers can save and get loan without any hassle. There are many organizations which assist the farmers in saving their cash or assets. Regardless of the promotion of these financial institutions, 66% of the sample beneficiaries said they opt out for personal savings.

The second most used infrastructure in case of saving money was found to be the banks. 33% of them now save money in the bank most because of the interest they accumulate over their deposits over the years.

*Ekti Bari Ekti Khamar* (One House One Farm (OHOF)) has been a widely popular poverty alleviation program in rural areas run by the government of Bangladesh. The goal of the project is poverty alleviation through e-financial inclusion (i.e. fund mobilization) followed by family farming livelihood and income generation of the under privileged and smallholders of the country. Only 1% of the sample beneficiaries were found saving in this e-financial platform.

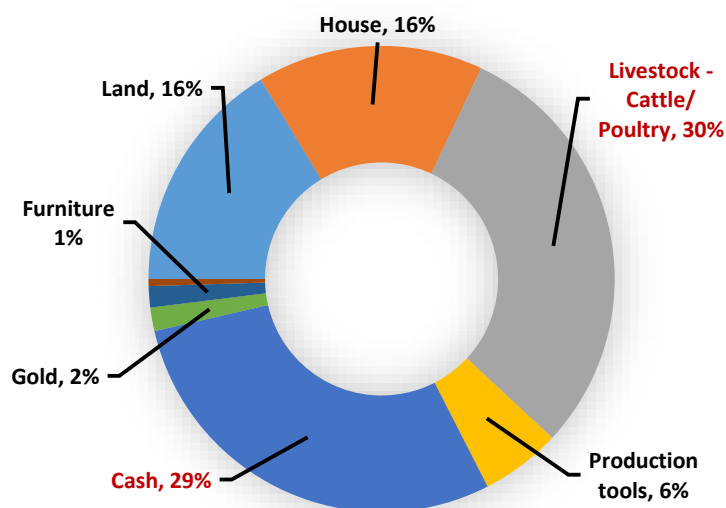
## 5.2.4 Has there been any increase in their assets?

Table: Percentage of Farmers whose assets increased

Percentage of HHs who have increased assets	
Yes	No
90%	10%

The savings patterns have reflected on their assets as well. It turns out that 90% of the sample beneficiaries have increased their assets. Out of them 30% stated that they have purchased more livestock (cattle and poultry). By investing in cow and poultry purchase, they have also increased their regular earnings (with milk and egg supply). Second largest kind of asset is cash, which accounts for 29% of the sample beneficiaries. As we found in our qualitative data, most of the transactions are held in cash, and therefore, it is normal to have a large amount of cash as savings. For example, in aquaculture PG groups, most of the fish farmers purchase fish seeds and fish feeds and sell fish in cash.

Figure 5..2.4.1: % of HH have increased assets



## Chapter Six:

### Local Service Producers: Agents for Community Level Behavioral Change

SaFaL project developed small entrepreneurs and skill laborers in the targeted sectors in order to trigger change across households and communities. These service providers include Lead farmers (LF), Community Nutrition Volunteer (CNV), Vegetables Collector or Seller, Community Livestock Service Provider (CLSP), milk transportation van, fish feed processor, vermi-compost producer, agro-input shops, agro-machinery maintenance service provider, vegetable transporter, mobile input seller, and so forth. A list of project promoted service providers and skilled laborers are tabulated below.

**Table 6.1: Types of entrepreneurs and skill labor developed by SaFaL**

Type of Entrepreneurs/ Enterprises/ Skill laborers
Lead Farmer (LF)
Cool Vans for transportation (Fish)
Milk Transportation Van (Dairy)
Collectors and Sellers (Horticulture)
Organic Fertilizer/ Vermi-compost producer
Homemade fish feed production/ producer
Agro Input shop
Fodder and silage preparation
Development of Mobile Agro-Inputs Sellers
Small input sellers in Hat bazar
Nursery development (Horticulture)
Vegetables production van for horticulture
Community Livestock Service Provider (CLSP)
Agro-machinery maintenance
Fish Processing (post-harvest handling, grading, packaging)
Skill development as agricultural labor

It was found in this study that these service providers have been instrumental in bringing positive changes in farmer's behavior, private sector transactions, business modalities, market governance, and most importantly, spreading or disseminating good practices among neighboring farmers. We have found that PG members who have access to different relevant service providers, have better market information, and better knowledge about market demand and price. Also, they are producing according to market requirements and are getting comparatively better price for their products.

Key contributions and characteristics of some major service providers are discussed below.



## 6.1 Lead farmer

The beneficiaries were found to get different types of services from the lead farmers depending on the sectors. The table below shows which types of services producers have taken the most and the least from LFs. We found that producers mostly received services from lead farmers in areas like updating record books (91%), access to quality inputs (81%), technical support on farm management (81%), developing business plans (68%) and assistance on conducting EC meeting (67%).

**Table 6.1.1: Type of Service received by producers from Lead Farmers**

Service Type	Received Services	Have not received services
Supporting in demo plotting/piloting	23%	77%
Updating record book	91%	9%
Assisting in developing business plan	68%	32%
Water & soil testing service	33%	67%
Linkage with private & public bodies	51%	49%
Access to quality inputs	81%	19%
Technical support on farm management	81%	19%
Sales intermediary service	21%	79%
Assistance on conducting EC meeting in PG	67%	33%

In case of benefits that producers enjoyed from LF services, most of the producers stated that they received improved information from lead farmers on different aspects including production and farm management technologies and practices, output and input market linkage, access to quality inputs, and so on.

**Table 6.1.2: Benefits of LF services to farmers**

Activities	Production cost decreased due to LF services	Received information service	Increased production due to LF services	Improved crop/ cow/ fish health due to LF services	Enhanced linkage service (input and output market)
Supporting in demo plotting/piloting	33%	86%	5%	5%	2%
Updating record book	7%	20%	7%	4%	10%
Assisting in developing business plan	51%	71%	28%	7%	10%
Water & soil testing service	16%	100%	31%	16%	11%
Linkage with private & public bodies	12%	57%	20%	14%	13%

Ensuring availability of quality inputs	25%	76%	25%	11%	13%
Technical support on farm management	45%	100%	31%	15%	4%
Sales intermediary service	23%	21%	21%	5%	13%
Assisting for conducting EC meeting in PG	17%	43%	22%	10%	7%

Among all the actors that SaFal project introduced, Lear farmers (LFs) were found to be the most influential catalyst for group mobilization, technology adaptation and the resulting behavioral changes. Each producer group has a lead farmer who manages the group, receives capacity building training from the projects, organizes learning sessions, and disseminates the knowledge



**Figure 6.1.1: Profile of a Successful Lead Farmer**

to PG members. He also provides relevant services, links local service providers with PG members, provides information service when needed, and overall works as a change agent in the community. The group members elect one of them as their own lead farmer.

From our qualitative analysis in the project area, we have observed some interesting phenomena which make some LFs successful (as per project objectives) and some not. In the following

paragraphs, we have reasoned some qualities that a lead farmer should have to be a change maker in the PG or community. Figure 6.1.1 shows some essential characteristics of a successful LF. Not necessarily a LF should possess all these qualities, but according to our observation, in most cases we have found that prominent lead farmers have at least several of these characteristics, if not all.

As the diagram above illustrates (Figure 6.1.1), effective LFs are usually socially respected and have social credibility. Community people usually like them and they are quite neighborly or friendly, approachable and communicative in their nature. We have also found leadership as a common quality in many LFs. In many cases LFs are driven by social incentives where they seek out for social respect and/ or power (some also have political incentives, like want to become a part of the local government in near future). We similarly found that LFs who have input or similar business are working enthusiastically with farmers so that their customer or client base increase (direct incentive to their business). Also, lead farmers are usually more knowledgeable on production practices and have better linkage to service and regulatory market actors. Moreover, most of the lead farmers we interviewed or observed were moderately solvent. In most cases, they do not have to invest all their time in their own business/ production and thus can spend those extra hours for producer group development purpose.

Existence of these qualities has made the lead farmers more credible, approachable and accessible to farmers. These attributes have made him/ her a better leader, effective information service provider, community/ group mobilizer and more importantly, an important change maker in the project design.

LFs who can leverage their popularity and access to community farmers in their own businesses in coming days, or have enough incentives to continue their services, would undoubtedly be more sustainable actors in the market system.

## **6.2 CLSP (Community Livestock Service Provider)**

A CLSP (Community Livestock Service Provider) is a project trained vet who provides different sorts of vet services to dairy producers including vaccination, deworming, preventive medication, corrective/ restorative medication, and so on. Project trained them to provide the necessary veterinary services to dairy producers so that farm productivity and producer income increases. Simultaneously, CLSPs will enjoy enough monetary incentives from their services so that they continue and expand their business in coming days.

From our qualitative analysis in the project area, we have found that while some CLSPs have been doing quite well (moderate to high monthly income; increasing business coverage and customer number), some have been suffering from lower income and low client number. In the following diagram, we have reasoned some qualities that a CLSP should have to be successful and sustainable in the project promoted market and social system. Not necessarily a CLSP should

possess all these qualities, but according to our observation, in most cases we found that promising CLSPs have at least several of these characteristics, if not all.

As the diagram beside illustrates (Figure 6.2.1), promising CLSPs usually are well-trained (received training with integrity), literate (at least up to HSC level), neighborly, approachable and communicative, and spontaneously goes door to door (dairy producers' households) for customary visits. Most importantly, they charge for their services and have a plan or strategy to expand their business.

On the other hand, CLSPs who lacked business incentives or a proper strategy for their business and had not started taking appropriate charge for their services yet, are not supposed to sustain in the market system and be a change maker.



Figure 6.2.1: Profile of a Successful CLSP

### 6.3 Vegetable Collector or Seller

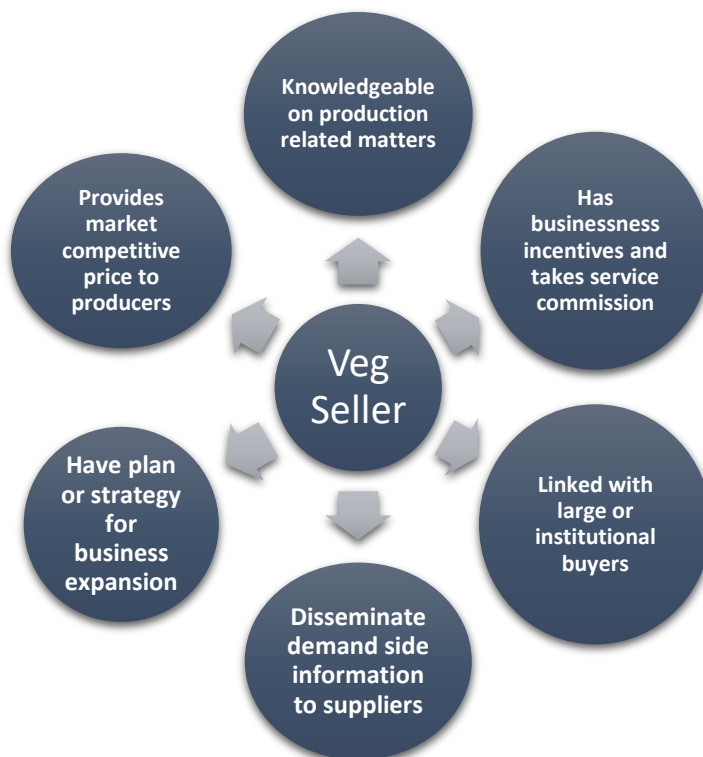
Vegetable collectors or sellers purchase the produce from the farmers and then sell those to the next actor in the value chain (big or distant traders, large or institutional buyers). They enjoy a commission from their sales. SaFal created this intermediary in order to link horticulture farmers with the output market so that their income increases.

It was found in this study that vegetable collectors have been instrumental in bringing positive changes in horticulture production and management related behaviors, their business modalities with different market actors and promoting copying-in phenomenon among neighboring farmers.

For example, from our FGDs and IDIs we have found that between two similar horticulture PG groups (in both cases members of these two groups received same training, have energetic lead farmers, have access to quality inputs, pest management and post-harvest services), PG members who have access to a functioning vegetable seller who is linked with large or

institutional buyers(s), are showing significantly better performance in case of inputs and pesticide use, post-harvest practices, yield/ production and product price. It was found that these collectors have been disseminating market information to both PG members and other community members (what to produce; what is desired quality; when to produce; what should be the post-harvest measures; etc.). And this demand and price information pushed the farmers to adopt project promoted production practices in a more effective way.

From our FGDs and IDIs, we identified some qualities or characteristics that we think a profitable and successful vegetable sellers or collectors should have for their business or service sustainability. Not necessarily a seller or collector should possess all these qualities, but according to our observation, in most cases we found that promising sellers or collectors have at least several of these characteristics, if not all. The diagram below (Fig 6.3.1) shows those usual characteristics of a successful vegetable seller.



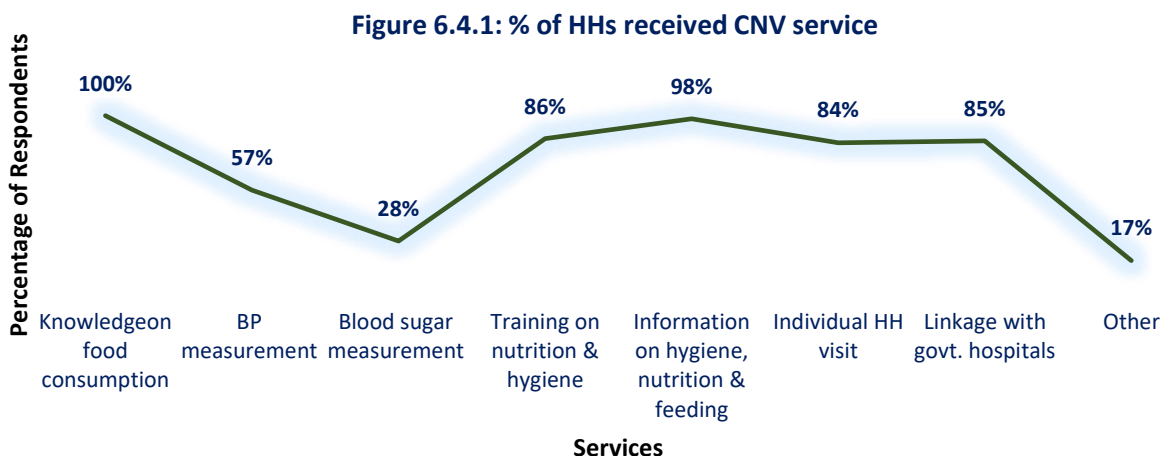
**Figure 6.3.1: Profile of a Successful Vegetable seller**

## 6.4 Community Nutrition Volunteer (CNV)

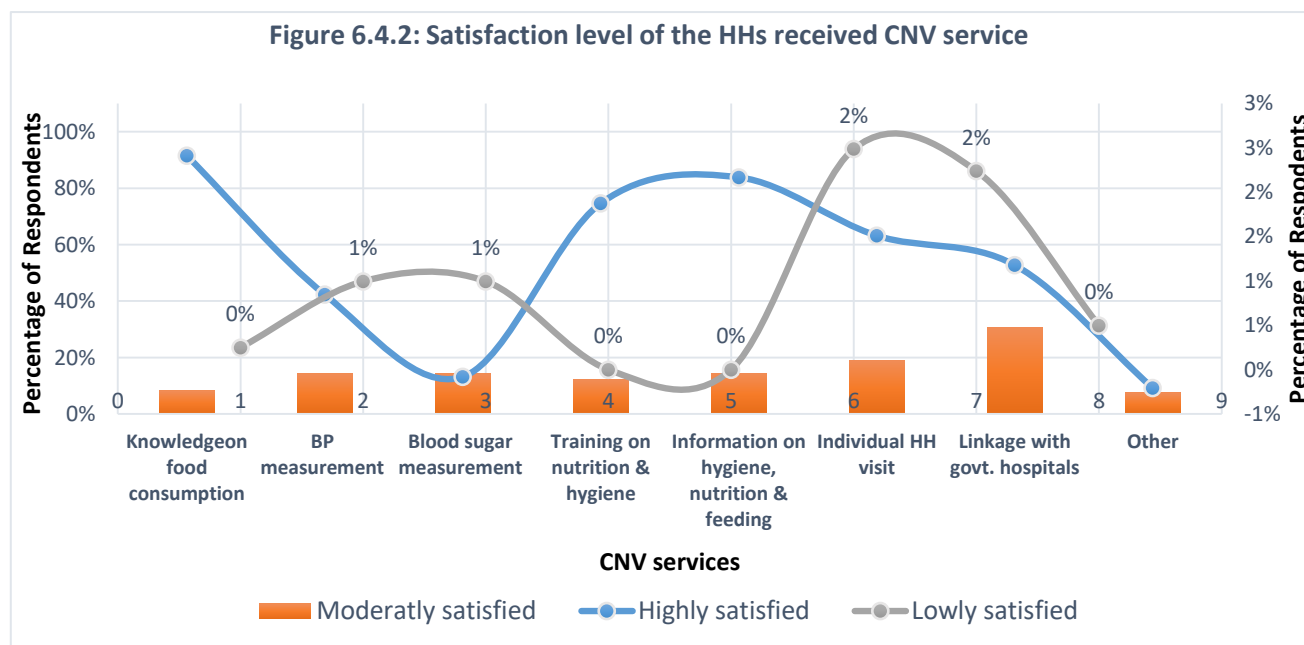
The Community Nutrition Volunteers (CNVs) are the major actors in promoting health and nutrition in targeted communities. However, the study reveals that the program areas also have frontline health and nutrition workers from both NGOs and government who also work in health and nutrition promotion activities. These field workers disseminate similar kinds of information and provide similar kinds of services to the communities. The presence of similar services in both program and comparison areas makes it difficult to identify project's attribution by comparing the CNV related results received from comparison and program areas. Nonetheless, the research revealed that SaFaL CNVs provide door-to-door services more frequently than that of other health and nutrition workers. The quality of SaFaL CNV services was also found better than their counterparts in comparison areas.

Regarding food security, change in consumption pattern and nutrition behavior, we found Community Nutrition Volunteers (CNVs) as one of the most significant change makers in SaFaL market system. We found them instrumental in food consumption related behavior change. This

is reflected in the previous sections where we saw that women and children's food consumption behavior has improved drastically because of SaFal project.



As illustrated in the figure above (Figure 6.4.1), project households received different kinds of services from Community Nutrition Volunteers (CNVs). Most prominent services that producer households regularly take from CNVs include knowledge on improved food and consumption pattern (100%), and information on hygiene, nutrition and feeding practice (98%). Respondents also stated that CNVs regularly pay customary visits their homes and ask whereabouts (84% reported that) which they found really beneficial for their well-being and that created a strong bond in between as often household women do not get time to travel and visit CNVs. Besides, 85% of the respondents also stated that CNVs often link them with government hospitals for major illness.



Household members' overall satisfaction level over CNV services was also found quite high. Respondents said that they are quite happy with different services provided by CNVs, including knowledge on improved food and consumption pattern (92% said that they are satisfied with this service), information on hygiene, child nutrition, care for pregnant women, and breastfeeding practice (84%) and CNV's door-to-door service provision (63%).

From our FGDs and IDIs, we found similar results. We found that household members are quite impressed about the changes in the last few years, Households members have observed significant changes regarding food consumption behavior (especially of children, pregnant mother and adult women), pregnant mother and neonatal care and medication.

Nonetheless, the qualitative results also reveal that elderly women of the community hold on to traditional beliefs and affect behavior changes adversely. Awareness among this group of people is also necessary.

However, we observed another interesting change that took place which to some extent can be attributed to the works CNVs in the project areas. Previously, before project inception, household members did not eat enough vegetables, although they were producing vegetables on commercial basis. One reason was the lack of knowledge about nutritional importance of eating vegetables, but another reason was because they were using lots of chemical pesticides in their crops and they want to eat those by themselves. However, after getting aware about the benefits of adding vegetables in their diet chart (in training sessions from CNVs), and simultaneous capacity building on vegetable production techniques with using natural pesticides, they are now producing vegetables using natural pests and eating more vegetables.

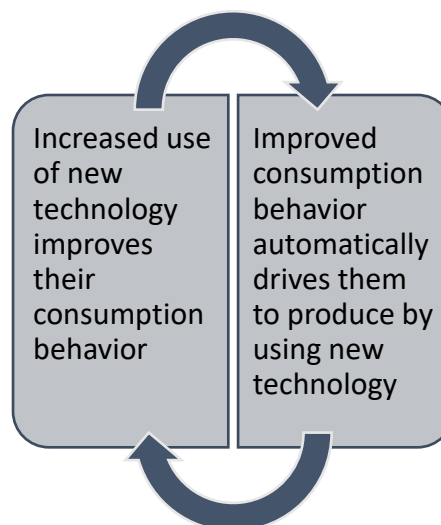
However, we did not find a sustainable exit plan for CNVs. Although CNVs conducted many sessions on nutrition and health (as per project mandate), their incentives lie on the service charge they take for their services like blood sugar and diabetes measurement. But as we can see in figure 6.4.2, households haven't yet started taking these services intensively from them (28% and 57% respectively), and therefore, their relevant income from these two services have not been that high. Nevertheless, CNVs reported that those awareness building trainings worked as good breeding ground which increased their accessibility and credibility as CNVs in their communities, and they are expecting an increasing income in the coming years. They also said that the big billboards that the project mounted in their homes with their names and service list on it has helped them to become more credible as CNVs in the community.



## Chapter Seven: ‘Spontaneous’ Impact on Family and Neighbors of SaFaL

One of the main motivations for this behavioral analysis was to see if the neighboring farmers have been affected by the project, i.e., whether there have been changes in their production and food consumption behavior also due to project interventions. The objective of this project was to spread the use of modern technologies and good practices in farm management (dairy; aquaculture and horticulture) and in food consumption behavior. Even though the capacity building, group mobilization and linkage initiatives were primarily targeted for PG members, the project also intended to spread the good practices and change among the entire community.

In both our quantitative and qualitative analysis, we found that there has been impressive change in neighboring (non-program) producers’ and households’ production and consumption related behavior which can be attributed largely to program interventions. Neighboring households realized that the products and foods they produce and consume affect their own wellbeing and livelihood. The direct relationship between these two levels made the neighboring farmers realize the potential of adopting new technologies in their day-to-day lives. We found that while neighboring producers have been copying practices related to inputs usage, cultivation method, post-harvest management and sales, in the household level there has been change in consumption behavior.



Our major findings are described in the following sections.

### 7.1 Observational learning and its theory

If we want to dive deep into how the project affected the neighboring farmers, it is important to understand the drivers behind the group member sharing the knowledge and the neighboring farmer acquiring the knowledge. Serguey Braguinsky, a professor in department of social and decision sciences from Carnegie Mellon University and David C. Rose, a professor in department of economics at University of Missouri-St Louis came up with a theory, that describes why and how the farmers share information about a new technology with their neighboring farmers. The theory is called *the neighboring farmer effect*<sup>4</sup>. According to their model, cooperation stirs up competition. That is, in a competitive market where everyone is a price taker, if farmer A learns and uses a new technology, he benefits from sharing it with another farmer B. By adopting a new technology, a farmer can reduce his own cost of producing a product. Therefore, the difference

<sup>4</sup> <http://isiarticles.com/bundles/Article/pre/pdf/49146.pdf>



between average cost and market price increases, which in turn increases his benefits. However, he also knows the price will remain unchanged even if he shares the new technology with farmer B, and in turn can increase farmer B's profits at no cost from farmer A. In this theory, they share the technology and the information about how to use it.

For example, by adopting a new technology, a PG farmer can reduce his own cost of producing a product. Therefore, the difference between average cost and market price increases, which in turn increases his benefits. However, he also knows the price will remain unchanged even if he shares the new technology with any neighboring farmer, and in turn can increase the neighboring farmer profits at no cost. Besides, by sharing information, there will be stronger social bond between these two and a level of social indebtedness for the selfless service by PG farmer. Thus, they share modern technology and information between them.

On the other hand, Braguinsky and Rose also ran a discourse about what would be the benefits of concealing the information. There is only one benefit, and that is he will be able to increase his profits by reducing his costs. However, there are costs associated with concealment as well. Firstly, if farmer A conceals information from farmer B, A will expect to get the same behavior from B in the future in case of reverse situation. Sharing the technology in this case guarantees that B will also be cooperative in the future. Secondly, B can always hire A's workers and thus acquire information about new technology and trained up employees. Consequently, A will end up increasing his costs.

Braguinsky and Rose got the inspiration for their model from the development history of Japan's first example of successful industrial development- its cotton spinning industry in the beginning of 1880s.

## **7.2 Service Providers: Major Drivers behind Community Level Behavior Change**

SaFal project developed lead farmers, small entrepreneurs and skill laborers in the targeted sectors including Community Nutrition Volunteer (CNV), Vegetables Collector or Seller, Community Livestock Service Provider (CLSP), milk transportation van, fish feed processor, vermi-compost producer, agro-input shops, agro-machinery maintenance service provider, vegetable transporter, mobile input seller, etc. It was found in this study that these service providers have been instrumental in bringing positive changes in farmer behavior, private sector transactions, business modalities, market governance, and most importantly, spreading or disseminating good practices among neighboring farmers.

From our FGDs and IDIs with other community members, we actually did not find major difference in knowledge or production practices between program beneficiaries and community members. Other community members admitted that they have learn a lot from program beneficiaries and project promoted service providers in the last few years and there have been

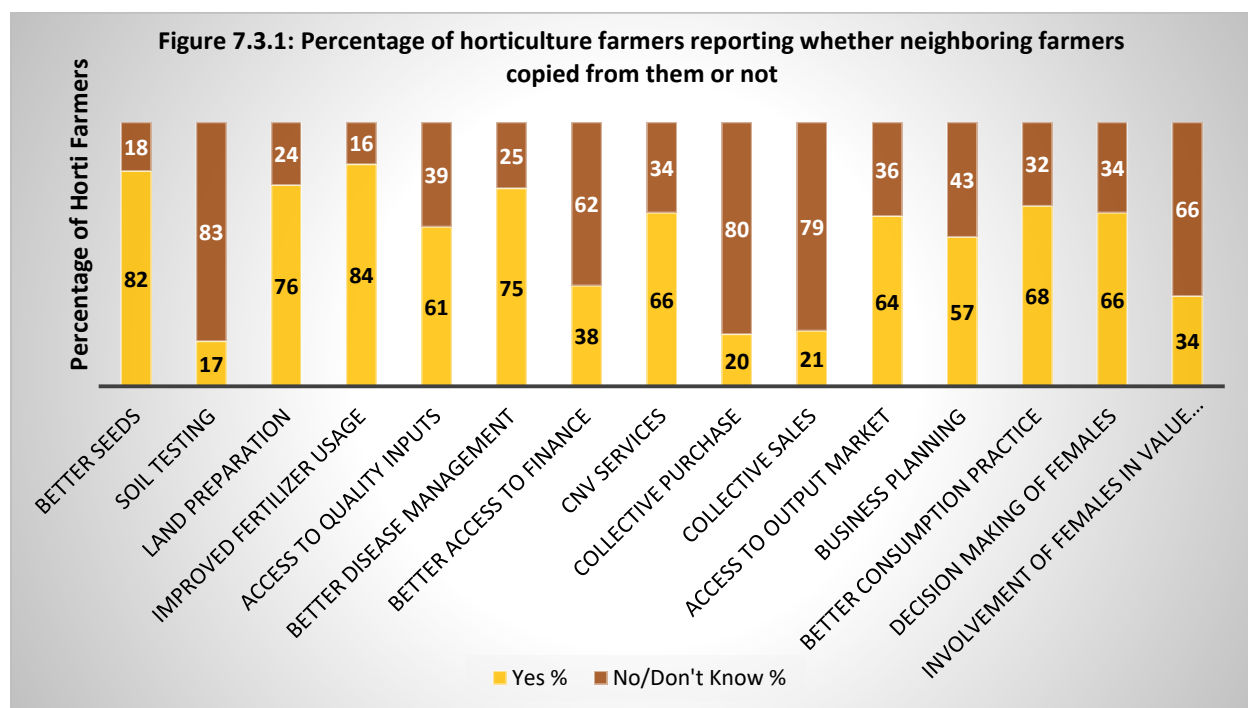
significant changes in their production behavior. They saw the success of program beneficiaries and also wanted to decrease their cost and maximize their profitability. So, they started copying-instructions and advice of the service providers and PG members, and have started enjoying benefits similarly.

For example, from our IDIs with some vegetable sellers who are connected to high end buyers and retailers like Agora, we found that they have been influential in spreading demand side requirements among all the neighboring producers and maximizing profitability of not just program beneficiaries, but of all the community producers who are linked with them. We found that community producers who are linked with these vegetable sellers, have better performance in case of inputs usage, pesticide use, post-harvest practices, yield/ production and product price. Vegetable sellers have been disseminating market information (what to produce; what is desired quality; when to produce; what should be the post-harvest measures; etc.) to farmers (both PG members and other community members) and this information pushed farmers to adopt improved practices in a more effective way.

Similarly, other LSPs also have been working as influential catalyst in bringing behavioral level changes among community producers and other market actors.

## 7.3 Survey Findings

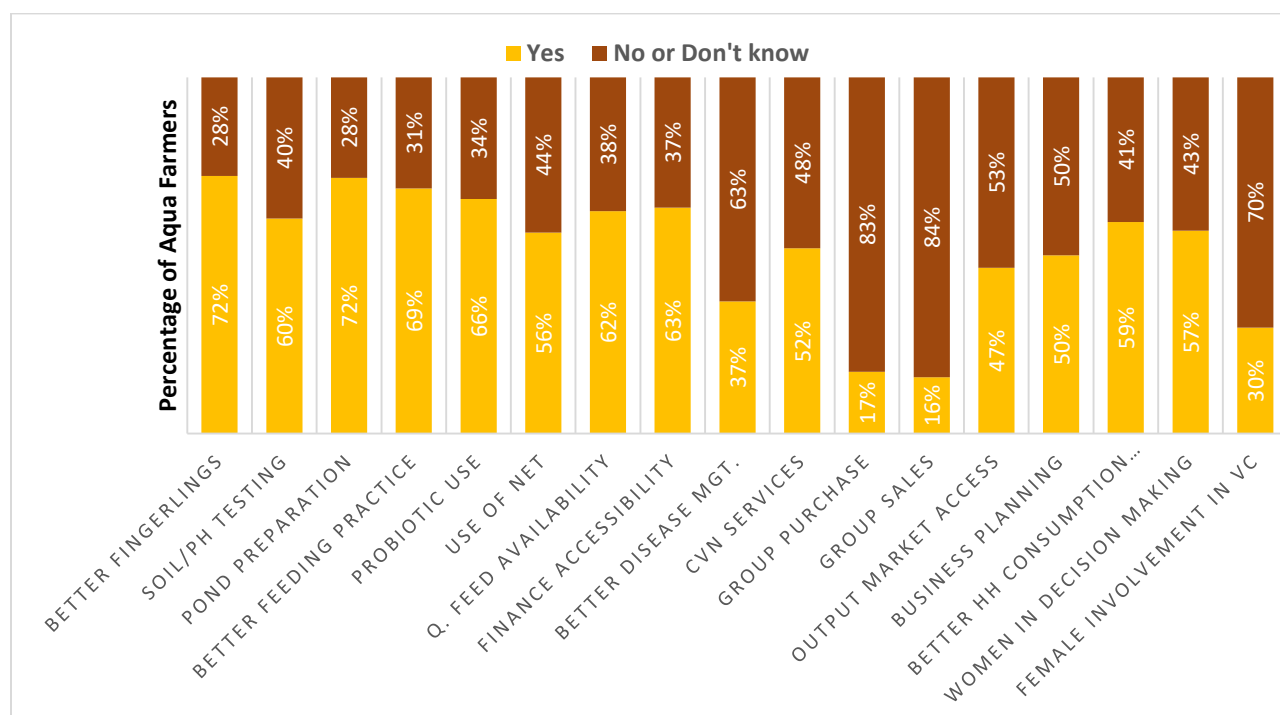
### 7.3.1 Impact on Neighboring Horticulture Producers and their Households



As illustrated in the diagram above (Figure 6.3.1), PG members reported that major areas which they observed neighboring farmers to copy from them include improved inputs usage (84% of the respondents reported that) (especially organic and inorganic fertilizers), quality seed sources (82%), land/ bed preparation techniques (76%), disease management (especially use of natural pesticides) (75%), foods and nutrition related knowledge (68%) and empowerment or improved decision making capacity in enterprise and household level (66%).

The *Neighboring Farmer Effect* theory discussed above tell us that cooperation triggers competition.

### 7.3.2 Impact on Neighboring Aquaculture Producers and their Households



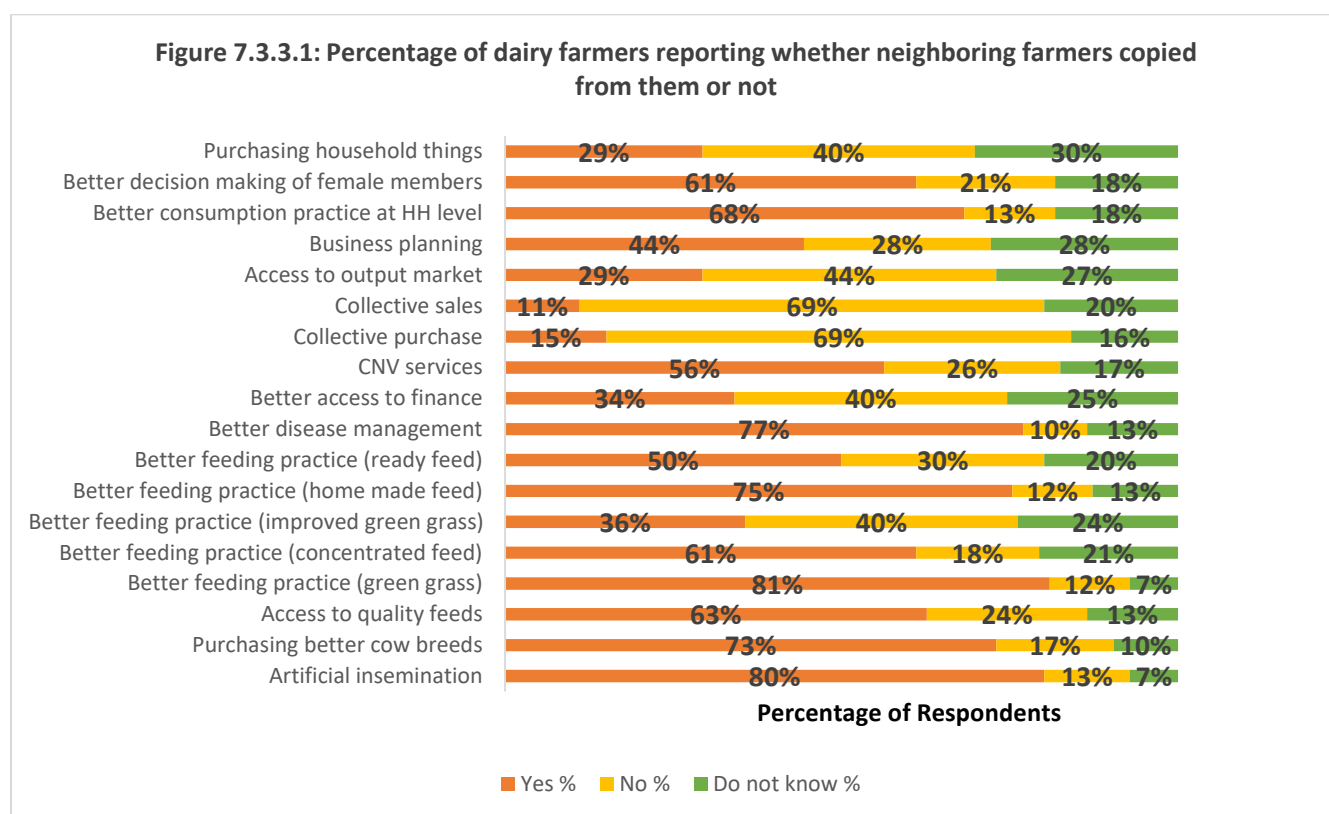
**Figure 7.3.2.1: Percentage of aquaculture farmers reporting whether neighboring farmers copied from them or not**

In terms of the Braguinsky and Rose model, the cooperation and competition also reflects in the fish farmer groups. The graph generally poses with affirmative responses in terms of adopting almost all technologies and practices. With them, 72% of PG members reported their neighboring farmers copying new practices about choosing better fish seeds and preparing ponds. Other practices that their neighbors copied include pond preparation (72%), pH testing (60%), better feeding practice (69%) and use of probiotics (66%). It was also found that neighbors also benefit from increased access to inputs (62%) and finance (63%). These finding also resonate with the qualitative data.

However, in contrast with the horticulture groups, the aqua neighbors are not quite there yet with improved consumption behavior and women in decision making role. Less than 60% of PG members reported that their neighbors adopted better feeding or women's decisive role improved. This resonates with another finding about the CNV services in aquaculture groups. Only 52% farmers reported that the neighbors copy the advice and recommendations of the CNV, which in turn reflects why there are much lower rate of changing consumption behavior in these groups. Another reason is that unlike in dairy subsector, women do not sell fish or handle money directly in this subsector.

Neighbors also have not adopted collective purchase and sales practice yet (only 17% and 16% respectively). These findings are similar with PG practice as they also do not purchase or sell collectively yet.

### 7.3.3 Impact on Neighboring Dairy Producers and their Households



Our quantitative findings indicate that the spill over impact over neighboring dairy farmers has been quite high. As illustrated in the diagram above (Figure 6.3.3), PG members reported that major areas which they observed neighboring farmers to copy from them include artificial insemination (80%), feeding of improved green grass (81%), disease management (77%), home-made feed preparation (75%) and feeding improved concentrated feed in right dosage. It was also found that neighbors also benefit from increased access to quality feeds (63%). These findings also resonate with the qualitative data.

In terms of consumption behavior at household level and women's decision taking capabilities, 68% of our respondents stated that they observed their neighboring households had adopted improved consumption practice. They also reported that they observed increased decision making capacity in neighboring women (61%).

Noticable there are several areas where this trickle down theory did not achieve as expected . As for group purchase (15%), group sales (11%), access to input market (29%), and bussiness planning (44%), neighboring farmers had shown comparatively less interests so far. Same goes for participation of women in different value chain processes (29%) which reflects the same issue (social barrier) which is faced by the women respondents mentioned earlier. It is apparent that in these instances *neighboring farmer effect* theory contradicts with 'the benefits of concealing information' as neighboring farmers did not adopt these practices. There might be several reasons behind this mixed result.

First, each districs has its own feature,character,culture and beliefs which might have affected the fermers chice. Secondly, the neighboring farmer might have been relactunt/not interested to adopt the new technology. Thirdly, the neighbors do not know about details (functionality; benefits; sources) of relevant technologies or practices yet.

## Chapter 8: Conclusion and Recommendations

We found SaFaL as a remarkable project to bring positive behavioral changes not only among farmers, but also among neighbors and other relevant market actors. In contrast to other similar market system development projects, their approach and interventions have been throughgoing, innovative and extensive. We found farmers and community members reporting significant behavioral change in their technology use, production practices and consumption behavior and really happy about these changes and adaptations.

In case of horticulture, there have been noteworthy changes among farmers in case of chemical and organic fertilizer use, pest management, post-harvest processes and sales practice. Fish farmers adopted improved technologies and practices including pond preparation, use of quality fish seeds and feeds, use of homemade fish feeds, water and temperature testing, use of probiotics, pond hygiene management, etc. In case of dairy farmers, significant behavioral changes were observed in areas including use of green and concentrated feeds, use of homemade feeds, disease management, shed management, use of artificial insemination service, milking process and milk sales. Women's decision making power increased due to increased income and involvement in income-generating activities. Also there has been promising results in terms food consumption behavior, cooking and hygiene practice. Increased income in targeted enterprises, increased knowledge and awareness and access to relevant services like CNVs have brought these changes.

One important difference between SaFaL PGs and other conventional NGO groups is the size and membership of the group. While most groups limit to 20 to 25 members, SaFaL PGs have on an average of 50 to 60 members. At the same time, while most NGO groups include only poor and extreme poor households, the SaFaL group membership is open to all farmers of the respective sub-sectors within the community. This design has a great potential to result in all inclusive sectoral development in a specific region. In conventional groups as the non-poor are excluded from membership, these groups lack enough bargaining power to negotiate with the local power-holders and elites. At the same time, as elites are kept outside of the groups, they do not have any avenue for effective engagement with the group for attaining its development objective. But, as the SaFaL groups include all willing farmers of the community, there is a very good opportunity for the all community members to contribute to positive sectoral development.

Lead farmer (LF) has been a major influential actor in SaFaL model for group mobilization, technology transfer and resulting behavioral changes. Their inclusion and successful deployment have given SaFaL an additional edge as these LFs are accessible by community members and provide quality services on production related information, output and input market linkage, etc.

Unlike conventional development projects, SaFal prioritized on developing small entrepreneurs and skill laborers in the targeted sectors. These service providers have been instrumental in bringing positive changes in farmer behavior, private sector transactions, business modalities, and most importantly, spreading or disseminating good practices among neighboring farmers.

For capacity development of different market actors and stakeholders, SaFal partnered with proven public and private training providers and allotted sufficient time for training (along with periodic refresher trainings). These considerations have given SaFal a certain edge that other development projects usually do not have. Lead Farmers, CLSP, CNV and other small entrepreneurs were found skilled enough to provide quality services to others and enjoy sufficient monetary incentives from their services.

SaFal's initiatives like establishing collection point/ center and linking producers with local, regional, national and niche market actors have been crucial factors behind project success.

However, some recommendations are briefed below that this project can take out from ths study for further consideration in their future plan.

#### **Horticulture Subsector related Recommendations**

- Explore possibilities of introducing low-cost mobile soil testing facilities.
- Identify and create linkage with large/ institutional buyers (like Agora; Shopno; etc.) as they provide better price for horticulture products. This will provide farmers with demand side specifications and requirements and push them to further improve their production practices.
- Identify and create linkages with potential agro-processing entrepreneurs who would be interested in establishing vegetable processing (frozen and canned) plants to ensure steady market for horticulture products.
- Establish more collection points

#### **Aquaculture Subsector related Recommendations**

- Establish more collection points for aquaculture products in the intervention areas.
- Strengthen the initiative of certification and branding of fishes that use safe farming methods and feeds so that these farmers receive higher prices for their produces.
- Increase the number of local entrepreneurs who will engage in preparing and selling locally made fish feed.
- Explore possibilities of introducing low-cost water, pH and temperature testing facilities.
- Explore piloting other fish farming along with shrimp, prawn and pangash.

### **Dairy Subsector related Recommendations**

- Linking farmers with milk chilling centers/ collection points that are linked with chilling centers. Because chilling centers pay according to fat content and milk amount, this will push farmers to achieve higher milk production and fat content and therefore, to improve their production practices accordingly.
- Link farmers with AI services from where they will get better and trusted insemination service.

### **Generic Recommendations**

- Design new business plan for CNVs adding other health/ nutrition related services which will give them proper incentives to become sustainable market actor.
- Select Lead Farmers (LFs) who are socially respected, people's person, knowledgeable on production practices, has business incentives of their services, and have leadership quality.
- Link farmers with appropriate formal saving schemes.
- Link farmers with appropriate financial products that are suitable for their value chain