Impact Assessment Study

PROJECT: SHODHAN

CSR initiative by - Birlasoft

Implementation partner

CII Foundation

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Executive Summary

Birlasoft along with its partnering institutes such as CII, PAU, and the local government introduced an initiative to improve Crop Residue Management practices in concerned villages. It's an initiative based in villages of Punjab and Haryana where farmers largely adopt stubble-burning practices for removing crop residues from the field. Although it is a common and affordable practice, it is very detrimental to the environment and health of the people. In the burning of the residues, a large amount of toxic pollutants are emitted into the air which contains hazardous gasses that badly affect the ecosystem. Keeping this in view, Birlasoft has taken steps to support farmers adopt advanced techniques and methods in farming and villagers to improve their quality of life and reduce environmental pollution.

It was implemented in **46 villages** in the two states of **Haryana and Punjab**. The objective of this intervention was to create awareness among farmers on the environmental and health issues created due to stubble burning and also to guide and facilitate them with innovative ideas and necessary resources to give a good option to replace the process which will have an overall positive impact.

Along with the support given Birlasoft also worked on capacity building and knowledge sharing on mulching, soil incorporation, and other suitable practices to undertake environment-friendly farming practices. Besides improving the farming practices, this initiative also figured out ways to improve the quality of air in those villages.

The objective of the Birlasoft was to bring inclusive change with a participatory approach which is implemented from 2017 to 2021, and Impact Study was conducted to understand the change in socioeconomic and environmental indicators and if the objectives of the intervention were met.
While Birlasoft and others decided to help farmers and villagers, Impact For Change Foundation endeavored to conduct the impact assessment study, wherein it analyzed the consequences and events that occurred after the adoption of new farming practices and interviewed farmers about it. It also asked them if there is any improvement in the air quality after the installation of new measures.

Major Findings of the Impact Study:

1. It is found that 2864.5 acres of the area were either completely burned or partially burned before intervention. Only 495.5acres area is either being completely burned or partially burned after the intervention.
2. After the introduction of the concerned intervention it was revealed that now only 4% (which was earlier 87%) of farmers are indulged in complete burning.
3. The documented data revealed that 75.4% of farmers are renting the concerned machinery from FPOs/ FCOs, to which machinery was provided by CII under this initiative sponsored by Birla Soft.
4. 58.5% of farmers validated that there was an increase in crop yield after the introduction of this intervention.
5. 90% of respondents stated that due to this intervention farmers are saving a significant sum of money.
6. 94.7% of farmers stated that this intervention gave them an adequate opportunity to get trained in using sophisticated machinery.
7. The efficacy of this intervention can be viewed when all the respondents unanimously stated that the air quality has improved significantly after the introduction of this intervention.
8. 93% of respondents stated that due to this intervention general health conditions have improved significantly after the introduction of this intervention.
9. 86.4% of respondents answered positively when inquired about raised environmental sensitivities among beneficiaries owing to this intervention.
10. 98.7% of the respondents were of the view that this intervention developed awareness around sustainable farming and will have a long-lasting effect on their village

Recommendations:

1. The sponsor can think of procuring more machinery and donating it to FPOs/ FCOs.
2. Before buying new machinery it will be wise to consider farmers' views and contextual needs.
3. More balers can be sponsored to FPOs/ FCOs.
4. High Power tractors can be provided to FPOs/ FCOs.
5. More programs can be conducted considering the judicious use of fertilizer, and pesticides use.
6. The sponsor can initiate an incentive program for farmers practicing in-situ crop residue management.
7. The sponsor can introduce a provision of subsidies and loans to FPOs/ FCOs for buying new machinery.
8. If farmers are connected with factories/ industries using these crop residues for their industrial use; then a noticeable sum can be earned by selling the collected bales to the industries.

Summary Assessment

- **Coherence:** The implemented intervention was found to be in sync with Birlasoft's CSR motivation and was in concurrence with the Government's initiative toward a sustainable environment.

- **Relevance:** The implemented intervention was found to be appropriate keeping the contextual need and aspirations of the beneficiaries at the mainstay. The documented articulations revealed that this initiative yielded some significant and long-lasting outcomes.

Image 1: Awareness Message in Vernacular Language, Nabha, Patiala.

Chapter 1

Stakeholders and Project brief

1.1 Birlasoft for community

Birlasoft believes in 'Sustainable Development,' and through its social programmes aim to have a positive and long-term impact on society. Birlasoft also wants to work with all of its stakeholders to construct a need-based community development model.

1.2 Implementation Partner: CII Foundation

The CII Foundation was established in 2011 to take on a wide range of developmental and humanitarian activities and initiatives across India, allowing industry to infuse inclusive development. While continuing its numerous Disaster Relief and Rehabilitation initiatives, the Foundation is also focusing on Early Childhood Education, Women Empowerment, and Climate Change Resilience.

Vision - Enable Industry for Infusing Inclusive Development

Mission - CII Foundation will work towards inclusive development by providing a meaningful bridge between marginalized communities and donors, especially in the Corporate Sector.

Areas of Intervention

- Climate Change Resilience
    - Cleaner Air, Better Life - A Crop Residue Management Initiative
    - Water Body Restoration
- Women Empowerment
    - CII Foundation Woman Exemplar Program
- Early Childhood Education
- Disaster Management
    - Immediate Relief Efforts
    - Long term Rehab Intervention

1.3 Project Brief: *Shodhan*

Project Title	An initiative in the environment sustainability that aims for "zero crop residue burning" in the villages of Punjab and Haryana.
Location	Punjab and Haryana
Goal of the Project	It's an initiative by Birlasoft to assist farmers in reducing the practice of stubble burning. It's an inexpensive practice largely used by farmers of Punjab and Haryana for setting on fire the straw stubble which is left after the harvesting of grains, but releases harmful gasses and pollutes air.
Project Period	2017-2021
Objectives	❖ To introduce easy and low-cost techniques and methods for straw management among farmers like soil incorporation, mulching and collection. ❖ To facilitate farmers with the necessary training and resources to reduce the harmful practice. ❖ To provide farmers with machinery support by collaborating with FPOs and village-level committees. ❖ To initiate a campaign and spread awareness regarding the loss of air quality due to stubble burning and ways to avoid it, among farmers.
Features of the Project	❖ The project aims at promoting the idea of zero crop residue burning. ❖ Birlasoft and other collaborators have begun training farmers to use sustainable farming techniques. ❖ Excellent machinery support and awareness have been provided to the farmers to adopt environment-friendly practices. ❖ A number of ambassadors have been assigned to the villages of Punjab and Haryana to help and guide farmers in the adoption of new practices.
Deliverables of the Project	❖ Significant improvement has been seen in the soil and farmland because of the use of biomass. ❖ Air quality improved in the villages of Punjab and Haryana where practices like mulching, collection, etc. have been introduced and the burning of residue reduced. ❖ A number of inexpensive air quality monitors have been installed across targeted villages and atmospheric particulate matters analyzed to check the impact of new techniques. ❖ Practice of water conservation has also begun because of the use of mulching techniques. ❖ Villagers' health has also started to improve eventually because of better air quality.

Table 1. Project details

1.4 SWOT Analysis

Strength	Weakness
❖ The implementing partner CII properly identified the contextual needs. ❖ The volunteers associated with this intervention developed an excellent rapport with the beneficiaries i.e. farmers. ❖ Proper planning and project design was implemented. ❖ Cordial relationship has been developed by implementing partners with Punjab Agricultural University and State Agricultural Department. ❖ The intervention is helping to create the required behavioral changes in farmers and it is resulting in farmers planning to buy machinery for residue management collectively. ❖ **The intervention touched 7 SDGs directly and indirectly.** Shodhan increased crop production, which caters to food security (SDG 2). It decreased pollution, increasing the health of beneficiaries (SDG3) -. The air quality (SDG 13), low use of fertilizer (SDG 15) and reduced water consumption (SDG 6) are all results of the intervention. The intervention also provided economic growth (SDG 8) and helped farmers get trained in using sophisticated machinery (SDG 9).	❖ During harvest season farmers face a scarcity of machineries, thus they are compelled to take machinery on rent privately at higher costs. ❖ The machinery provided needs high horsepower tractors to function. Farmers usually have low horsepower tractors. Thus they rent it privately at higher costs. ❖ There exists a huge demand for Baler among farmers for Crop Residue Management. The number of Baler provided to FPOs and FCSs is less. ❖ The rotavator provided is not suitable for *'makka'* i.e. corn farming. The farmers harvesting corn need a smaller rotavator.

Threats	Opportunities
❖ The intervention is now influencing the sensibilities of farmers regarding environmental issues; thus, continued association with farmers is recommended, else they might lose their interest. ❖ Many FPOs/ FCOs are observed to be heavily dependent on this intervention. Thus, the focus has to be shifted to make these FPOs/ FCOs more sustainable. ❖ Functioning FPOs/ FCOs are influenced by local politics, thus there exist several influences from these 'political' quarters which affect the efficacy of the intervention.	❖ More machinery based on contextual needs can be provided to FPOs and FCOs. ❖ In Sirsa, the volunteers of CII introduced new sowing techniques to farmers. This can be introduced to other villages also. ❖ More training and awareness have to be initiated concerning fertilizer, pesticide, etc. use. ❖ In order to make FPOs/ FCOs sustainable, this sponsor and implementing partner can introduce subsidies or loans to FPOs/ FCOs for buying new machinery under their head. ❖ In order to make CRM more judicious and lucrative; farmers need to be connected to industries that utilize residue for their consumption.

Table 2: SWOT Analysis of the intervention

Chapter 2

Standpoints and Methodology employed in Impact Study

2.1 Impact Assessment Study

Impact For Change Foundation was boarded by Birla Soft to conduct an Impact assessment of its CSR intervention ***'Shodhan'***, an initiative for Crop Residue Management that was implemented in 46 villages of Punjab and Haryana. This impact assessment aims at documenting the evidence, articulations, and anecdotes from the field, on the process and program indicators from the ground. The IMPACT FOR CHANGE FOUNDATIONteam was keenly receptive to quantitative and qualitative utterances from the field.

Image 2: Impact Assessment Team in Nabha, Patiala

2.2 The Objectives of Impact Study:

1. To measure the impact of the intervention through independent evaluation.
2. To identify the socio-economic contexts of beneficiaries (farmers) associated with the concerned intervention.
3. To assess changes in agricultural sensibilities of farmers associated with the intervention.
4. To document the extent of change in produce after this intervention.
5. To evaluate the extent of environmental sensibilities developed among farmers after this intervention.

2.3 Methodology:

The assessment team employed simple random sampling in order to locate the respondents i.e. beneficiaries of this intervention. In total 230 respondents were interviewed from 46 villages. These 46 villages were distributed in Patiala and Malerkotla (Part of Sangrur district until 2021) districts of Punjab and Sirsa district of Haryana. This impact assessment also documents articulations from officials from the State Agriculture Department, Farmers Produce Organisations, and Farmers Co-Operative Societies. For this documentation Focused Group Discussions, interview methods, and observation methods were employed.

2.4 Location Map

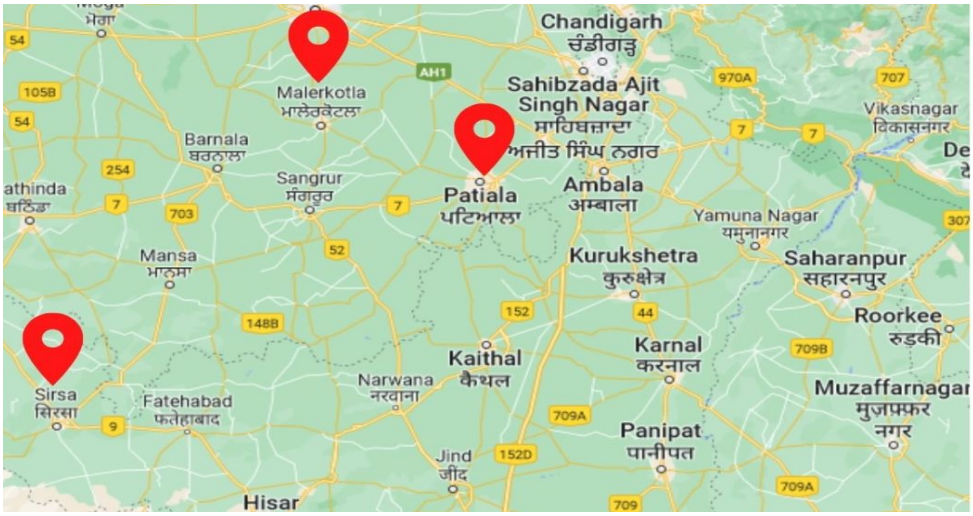

Image 3: Location of Patiala, Malerkotla and Sirsa

2.5 Standpoints and Methods Employed

In anticipation to assess the impact of 'Shodhan' initiated by Birlasoft in the intervened villages, the survey team administered by the IMPACT FOR CHANGE FOUNDATION relied on Primary data collection tools. The impact assessment data collection was carried out from 14th March to 17th March 2022. The tools of data collection employed were:

1. Personal Interviews
2. Focused Group Discussions
3. Observation

Image 4: Personal Interview at farmers house

Image 5: FGDs conducted at farmer's house

Image 6: Rotavator in FCO at Sirsa

Image 7: Wall advertising painting as observed at Fatehpuria, Haryana

The assignment at hand demanded first-hand articulations from beneficiaries, thus an interview aided by an interview guide was used as the primary tool for documenting farmers' articulations. In addition to this, personal interviews were also conducted with the Agricultural Development Officer (Sangrur), Secretaries of Farmer Producer Organizations (FPO), Farmer co-operative societies, and volunteers involved with this intervention. In order to understand the efficacy of the intervention at a deeper level, the research team also indulged in Focused Group Discussions (FGDs) with the beneficiaries. To grasp the nuances, and patterns that were latent during the interactions, observation as a method was employed by the research team.

During this impact study in total 230 beneficiaries were interviewed from 46 villages in Punjab and Haryana. The respondents were selected through simple random sampling. The research team also conducted 9 Focused Group Discussions (FGDs) on the field with the beneficiaries. The representatives of IMPACT FOR CHANGE FOUNDATION also conducted formal interviews with Agricultural Development Officers (Sangrur), secretaries of FPOs and FCSs. The detailed interactions were also held with volunteers of CII.

The collected data was treated systematically. The data processing was done using techniques such as cleaning, editing, coding, creating master charts, tabulations, and report writing. For data analysis, Statistical Package for the Social Sciences (SPSS) and excel were used.

2.6. Data Collection Details

S.No	Data Collection Tools	Respondents	Sampling Method
1.	Interviews administered by Structured Questionnaire.	230 Farmers (3 Districts, 3 Blocks and 46 Villages)	Simple Random Sampling
2.	Interviews were administered through Interview Guide	Agricultural Development Officer and Deputy Agricultural Development Officer.	Purposive Sampling
3.	Interviews administered by Interview Guide	Volunteers of CII/ Other Stakeholders associated with concerned intervention.	Simple Random Sampling
4.	Focused Group Discussions (FGDs)	a. Farmers b. With FPOs c. With FCSs	Convenience Sampling

Table 3 : Details of Data Collection

In order to maintain the precision and uniformity in the data collection process, the research team developed detailed survey tools for this Impact Study.

A structured questionnaire was designed covering:

a. Socio-Economic Profiling of the farmer.

a. Landholdings, Crops Harvest and Varieties of Crops Harvested.

b. Methods adopted to manage Crop Residue.

c. Details of Machinery used for Crop Residue Management, and other specifications related to machinery.

d. Impact of tools/machinery on farm produce, environment, water consumption, fertilizer consumption, etc.

e. Efficacy of this intervention on creating awareness around Sustainable Farming.

Chapter 3

Analytical Review: Statistical Findings and Discussions

3.1 Basic Profiling of the Beneficiaries (interviewed during Impact Assessment)

- The interviewed beneficiaries were selected through Simple Random Sampling. In total 230 respondents were interviewed. They were divided into 3 districts in which the intervention had taken place. (See Fig: 1)

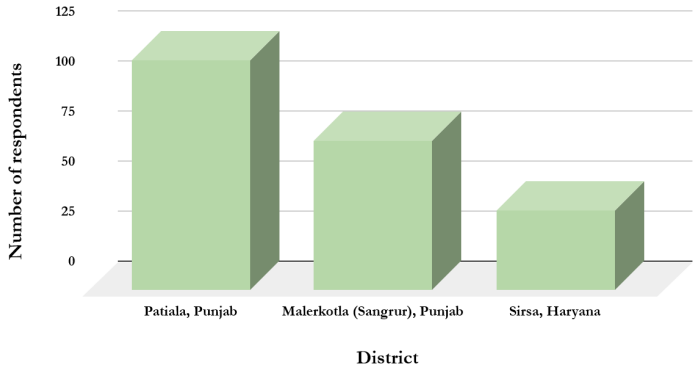

Figure 1: **Division of interviewed beneficiaries across the 3 districts**

- The interviewed respondents were hailing from 46 villages. (See. Table 4)

Ghaniwal	**Palia Khurd**	**Kansuha Kalan**	**Matourda**	**Rurki Khurd**	**Chanduriyan**
Gujarheri	**Palia Kalan**	**Dittupur Jattan**	**Bazidri**	**Jabbo Majra**	**Manvi**
Dandrala Dindsa	**Mungo**	**Dhankounda**	**Pedan**	**Burthal**	**Chaprauda**
Ranjeetgarh	**Bugga Khurd**	**Raimal Majri**	**Rajpura**	**Gajjan Majra**	**Mohamadpuria**
Bishangarh	**Gurditpura**	**Jattiwal**	**Kheri jattan**	**Dugri**	**Balasar**
Mohalgawara	**Doda**	**Khanoura**	**Warah**	**Rurki Kalan**	**Fathepuria**
Birdano	**Todarwal**	**Puniwal**	**Sadhnauli**	**Bulla pur**	
Shivgarh	**Kansuha Khurd**	**Raisal**	**Tundewal**	**Jagowal**	

Table 4： List of the villages covered during the data collection for Impact Assessment by the Survey team

- The research team was able to reach respondents with an age between 21 to 76 years. The average age of respondents that was calculated was **42.69** years. This was evident that young farmers are associating themselves with this intervention. It turns out to be a good sign when anticipating this initiative's sustainability. (See Fig: 2)

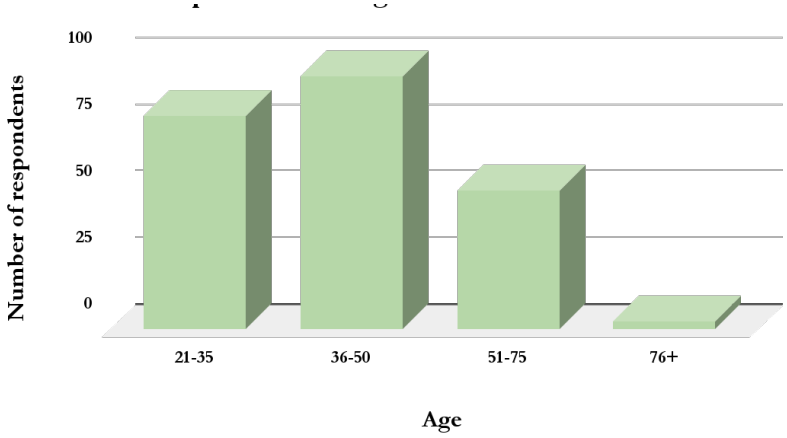

Figure 2: Division of respondents among 4 age brackets (number of respondents vs age)

- Among all respondents **10%** of respondents did their primary schooling. **20.9%** of the respondents completed their Middle Schooling, **36.1 %** completed their schooling till the 10th. Among respondents, there were 22 farmers i.e. **9.6%** completed their 12th or did some technical diploma. Among interviewed farmers 33 i.e. **14.3%** were graduates. **3.9%** [9] of farmers were post-graduates/ honors and **5.2%** of farmers were illiterate. (See Fig: 3)

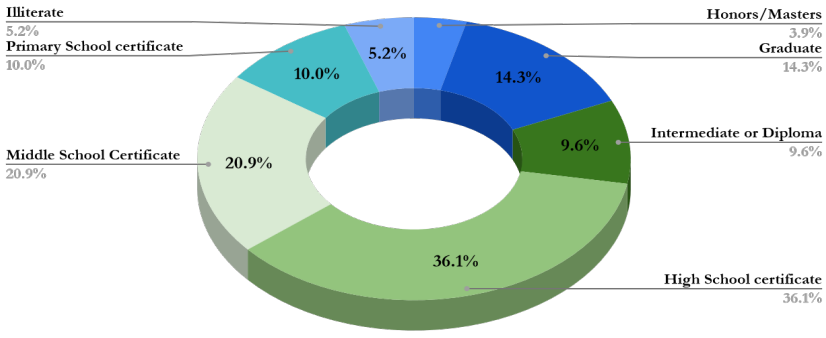

Figure 3: Education status of the beneficiaries in percentage of sample size

- The survey tool documented the monthly income of beneficiaries. Out of 230 respondents **31.3 %** had monthly income ranging between 18,497-30,830 Rs/ Month. **27. 8%** farmers told their monthly income to be 6,175-18,496 Rs/ Month. The **17.4%** of farmers are having monthly income ranging between 30,831-46,128 Rs/ Month. The **7.8%** of farmers were having a monthly income equal to or less than 6174 Rs/ Month. The **3.5%** of respondents were having a monthly income equal to or more than 1,23,322 Rs/ Month. This data reveals that the concerned intervention was not only catering to any particular strand of farmers, instead it is engaging with every economic stratum of farmers. But as we can see the farmers with higher income are less involved in the intervention, as they can afford to buy the machinery themselves. (See Fig: 4)

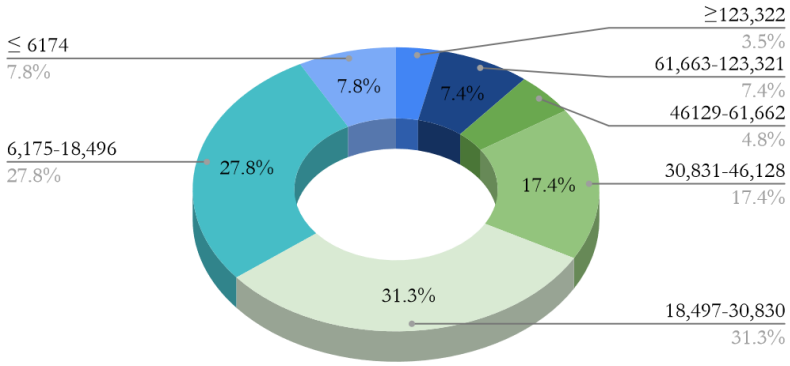

Figure 4: Division of respondents and their monthly income in INR as percentage of sample population

- The data has been analyzed using the Kuppuswamy Socio-economic scale[1] wherein separate scores are assigned to the educational level of the head of the family, occupation, and total per-capita income of the family. All the three scores are then added to find out if the family falls under which socioeconomic class i.e. upper, upper-middle, lower-middle, upper-lower, or lower class. The figure given below clarifies that most of the families of these villages fall under the lower middle class i.e. their total score lies between 11-15, whereas the number of families falling in upper-middle-class is minimum and none of them belong to the upper or lower classes. (See Fig 5)

[1] **For Further details on Kuppuswamy Socio- Economic Scale, kindly refer:**
https://pdfs.semanticscholar.org/821e/17e03c0b75fa52b283094d9770eeb71d7c48.pdf?_ga=2.254728907.2118861326.1644247528-1741768694.1644046326

Fig 5: Division of respondents and their socioeconomic status as calculated using Kuppuswamy scale

- It was documented that operational agricultural land of beneficiaries was ranging from **2 acres** to **58 acres**. The intervention was catering both to the marginal farmers (less than 2.5 acres) and to the large (affluent) farmers (more than 25 acres). According to the Ministry of Agriculture & Farmer Welfare, farmers based on their operational land holding are categorized into 5 size classes. (See Table 5)

S.No	Category	Size Class
1.	Marginal	Less than 2.5 acres
2.	Small	2.5- 5 acres
3.	Semi- Medium	5-10 acres
4.	Medium	10-25 acres
5.	Large	More than 25 acres

Table 5: Category of farm land by size in acres

- Majority of farmers are utilizing varieties such as PUSA 44, 3086, PR 126 are used for Paddy farming. For Wheat farming, varieties sucha 222, 3086, 303, and 1105 are used.

3.2 Findings on Crop Residue Management

The intervention was initiated with a motto to have burning-free crop residue management. The survey tools had several queries pertaining to Crop Residue Management. The following findings were documented:

1. From the collected data it was revealed that prior to Birlasoft's intervention **87%** were used to manage residue through complete burning. One of the respondents during FGDs stated *"mazboori me jalana padhta tha, aur koi vyavastha nahin thi"*. Many respondents iterated that stubble burning was out of compulsion, there was no other alternative. Among respondents, **8%** of farmers revealed that with the use of limited machinery they were practicing partial burning, **and 7%** were managing their crop residue through mixing/ soil incorporation. The data evidently reveals that the problem identification was well done by the sponsors and implementing partner of this intervention. (See. Fig 6)

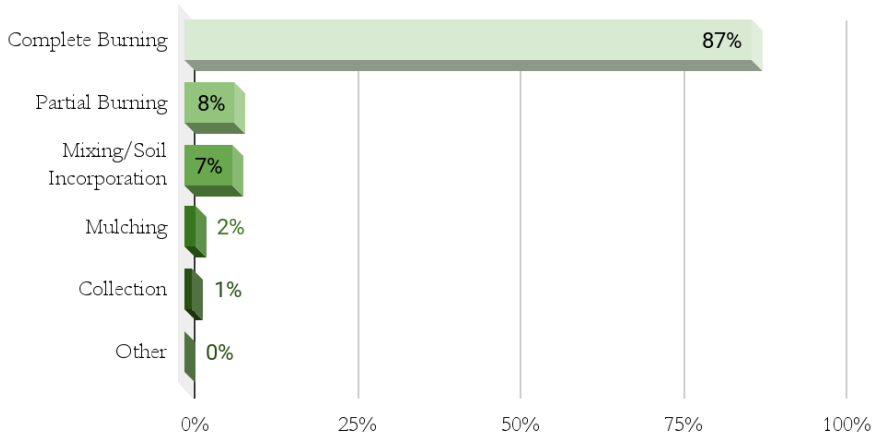

Figure 6: Methods being used before intervention

- On calculating, it is found that **2864.5 acres** area was either being completely burned or partially burned before intervention. Only **495.5 acres** area is either being completely burned or partially burned after intervention.

- On inquiring how farmers are managing the residue after the introduction of the concerned intervention it was revealed that now only **4%** (which was earlier 87%) farmers are indulged in complete burning. The significant change one can sense when data reveals that now **77%** of farmers have adopted Mixing/ Soil Incorporation for managing their residue. The **13%** of farmers are still managing their residue through partial burning. More to this **17%** and **6%** are adopting Mulching and Collection respectively for their

residue management. The data echoes that there is significant alteration in agricultural sensibilities among farmers. Now they are eagerly adopting sustainable and environmental management practices. The documented data testifies the efficacy of *'Shodhan'* initiative. (See Fig: 7)

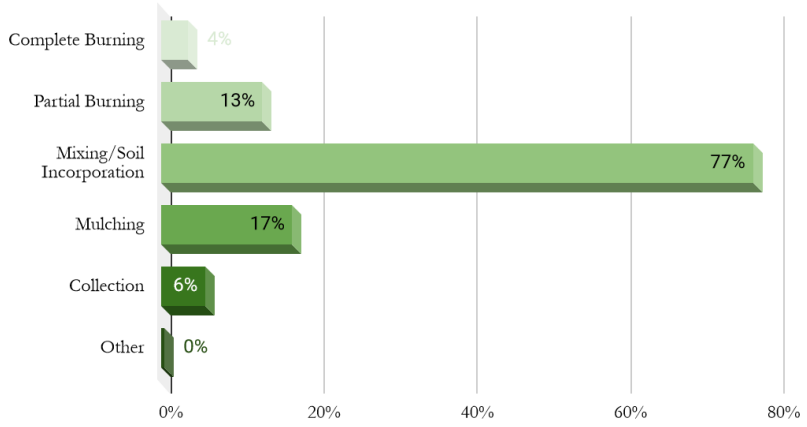

Figure 7: Methods adopted after Intervention

- **97.1%** of the farmers who are practicing partial burning stated that they prefer mixing/ soil incorporation for managing their residue. **2.9%** of the farmers are practicing mulching. The adoption of soil incorporation/ mixing yielded in enhancing soil fertility and moisture content which results in increase in produce. (See Fig: 8)

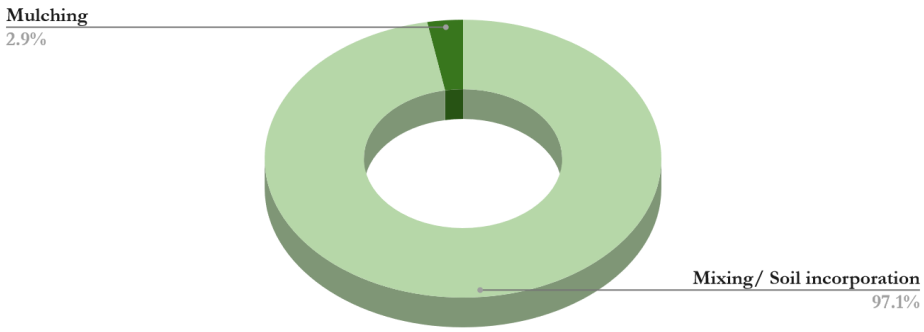

Figure 8: Percentage of farmers practicing Mulching and Soil Incorporation/ Mixing post partial burning

- The analyzed data reveals that farmers are showing a great amount of interest in using Baler Machine (See. Fig) in order to manage their residue, but there exists a deep scarcity of Baler Machines in harvesting season. Respondents stated that ***"baler ke istemal se kaam me aasani ho jayegi; aasani se saaf ho jaate hain khet"***. The usage of Baler can be lucrative as well if the compacted bales are sold to industries. (See Fig: 9)

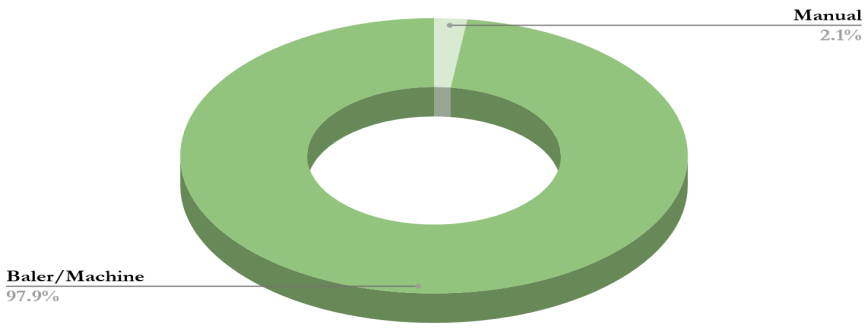

Figure 9: Preference of farmers for use of Baler or Manual Collection for Crop residue

3.3 Findings on the usages of the Machinery

- The analyzed data revealed that **65.8%** of farmers are utilizing Super Seeder on their farms (See Fig: 10). During interaction with farmers it came forth that earlier there was some sort of skepticism on the usage of Super Seeder among farmers. ***"Pehle sankoch tha ki khet me machine lagane se kuch gadbad na ho jaye, par training ke baad humne istemal shuru kar diya"*** stated one of the farmers in Sangrur. The training and awareness provided during the intervention provided enough confidence to them. Now they are extensively using Super-Seeder on their farms.

Image 8: Super seeder

- **35.5%** of farmers are using Rotavator in their field for preparing seed-bed and removing and mixing the residues.

Image 9: Rotavator sponsored by Birlasoft at FPO in Sirsa

- **12.3%** of farmers stated (See Fig: 10) that they are using Mulcher in their field. Farmers in FGDs stated that now they are steadily adopting Mulcher as well in their agricultural practices, one of the farmers in Nabha block iterated, ***"pehle mulcher bahut kam istemaal hota tha ab ek do saal se istemaal karne lage hain"***.

Image 10: Mulcher sponsored by Birla Soft

- It was also evident that now farmers are also utilizing Zero Till (**4.4%**), MB Plough (**5.3%**), and Happy Seeder (**3.5%**) (See Fig: 10). Though the number of farmers using these machines is less, this data reveals that farmers are readily adopting new technologies(See fig 10) . Farmers stated that after the introduction of this intervention farmers are confident in using new machines and methods in farming. One of the

farmer in Sangrur stated that, ***"CII ki taraf se training milti rehti hai machines ke baare me, gaanv me bhi training hoti hai aur Ludhiana, PAU me bhi"***

Image 11: Farmers with Happy Seeder in Sirsa

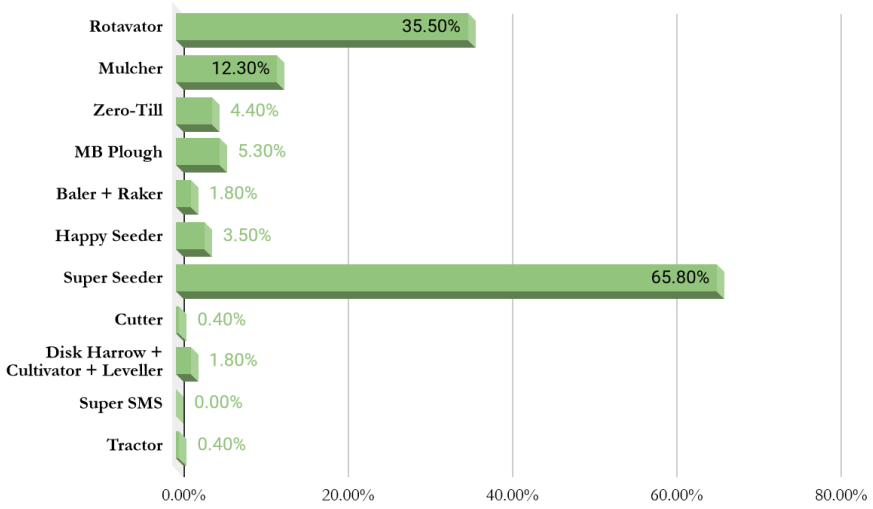

Figure 10: Utilization of machines by farmers

- The documented data revealed that **75.4%** of farmers are renting the concerned machinery from FPOs/ FCOs, to which machinery was provided by CII under this initiative sponsored by Birla Soft. Majority of farmers are relying on machinery provided by FPOs/ FCOs during harvest season. The rent charged here is 100 Rs/ Hour for most machines, and varies up to 250 for some of the machines. Farmers stated that ***"machine khareedne ke aur bahar se kiraye me lene ke paise nahi hote hain, yanha se bilkul kam kiraye 100 rupaye har ghante ke liye mil jata hai, humari kaafi bachat hoti hai"***.

- During harvest season as the demand for machines is high, few of the farmers (**10.1%**) are compelled to take them on rent from private service providers. The rent charged here ranges from 1700 Rs/ Hour to 2200 Rs/ Hour. One of the farmers stated, ***"season me sabko machine chahiye, yanha kam hai tabhi bahar se leni padhti hai"***.

- With discussions, it came forth that after the introduction of this intervention, and after seeing the efficacy of machines; farmers have started buying machines collectively. **14.1% of respondents** stated that they now own machines. The awareness and training programs conducted during the intervention encouraged farmers to adopt technology in their agricultural practices. (See Fig 11)

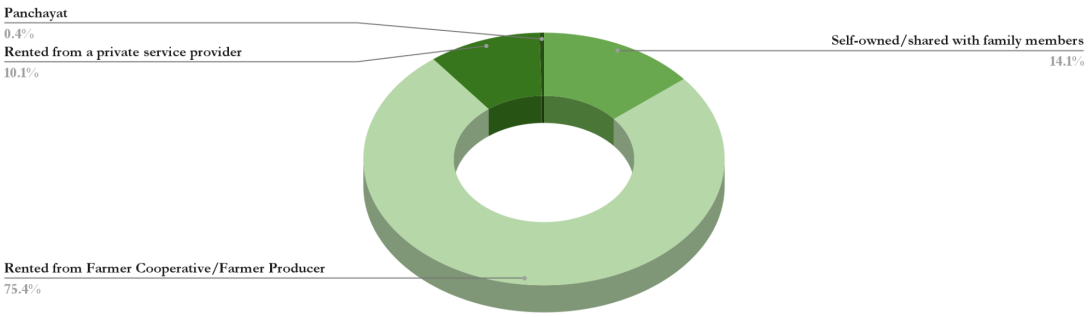

Figure 11: Percentage of farmers renting machinery from FPOs/ FCOs or other sources.

3.4 After- effects of CRM practices introduced by this Intervention

- Farmers stated that Pest Infestation remained the same, as it was before the introduction of the intervention.

- The weed infestation decreased evidently after the adoption of CRM as introduced by this intervention.

- There is a slight decrease in fertilizer consumption after adopting sustainable CRM practices.

- We received mixed responses when inquired about water consumption after adopting sustainable CRM practices. **50.4%** of our respondents stated that water consumption remained the same as it was with earlier practices. Then 46.1% of respondents opined that the water consumption was reduced after adopting sustainable CRM practices. (See Fig: 12)

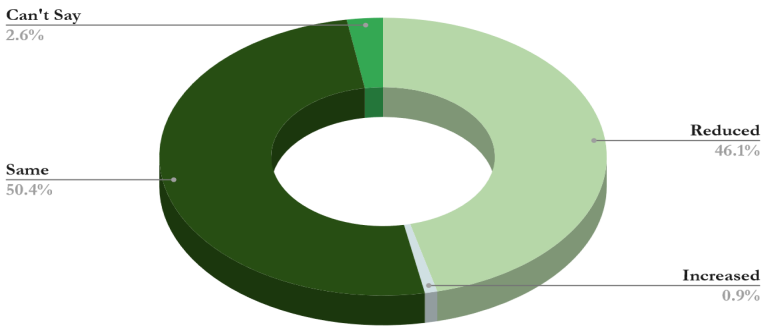

Figure 12: Water consumption after intervention

- The testimony for the success of this intervention is when **58.5%** farmers validated that there was an increase in crop yield (See Fig: 13). A farmer in Sirsa stated that ***"ab thoda paidawar badi hai, pehle se"***. The secretary of FCO in Rurki Kalan during interaction with field investigators stated that on an average there is an increase of 1.8 to 2 quintal per acre in crop produce.

- **35.8%** of farmers stated that the produce after the introduction of sustainable CRM remained the same as it was earlier.

- During discussions, it was evident that farmers were confident that the sustainable farming as introduced by this intervention is not a losing affair.

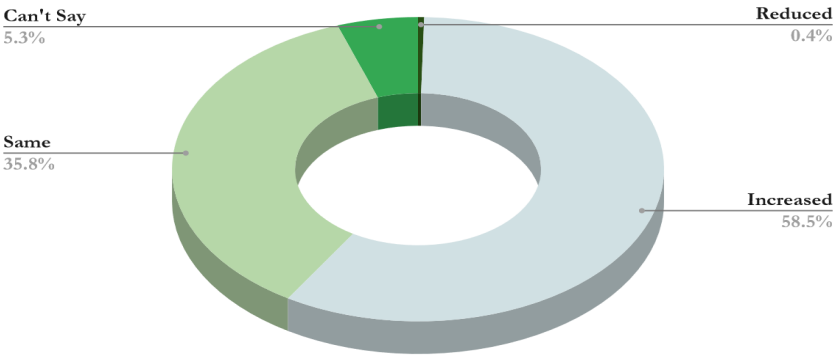

Figure 13: Crop produce after intervention

- This intervention certainly yielded economic benefits to the farmers. **90%** of respondents stated that due to this intervention farmers are saving a significant sum of money (See Fig: 14). An aged farmer during FGD stated ***"kaafi bachat hoti hai, laborer ka, diesel, samay sab bachta hai. Paidawar bhi badi hai pehle se"***. With a slight decrease in fertilizer use, the farmers are saving money. At the same time over half the respondents mentioned an increase in yield, which also generates higher income. Few other factors like reduced water consumption combined with these two have yielded economic benefits for the farmers.

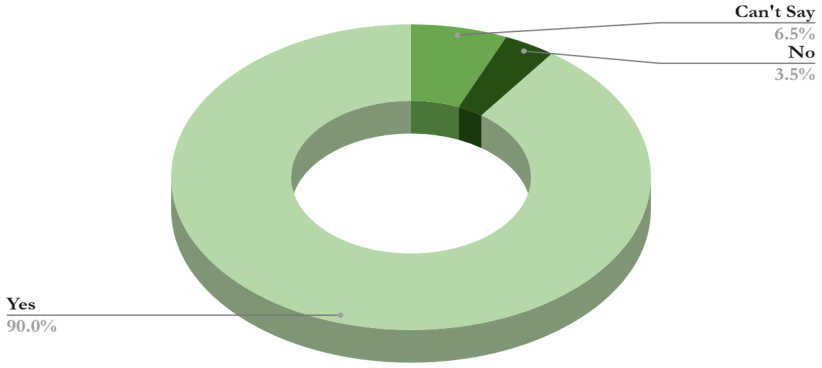

Figure 14: Farmer's view on Economic benefits of the intervention

- In the survey tool it was inquired whether the economic increment translated into the upliftment of other social spheres such as education; **65.9%** answered positively to this query.

- **94.7%** of farmers stated that this intervention gave them an adequate opportunity to get trained in using sophisticated machineries. One of the young farmers in Nabha block iterated ***"is project ke wajah se nayi nayi machine ke baare me jankari aur training mil jati, jo waise mumkin nahin tha"***. The cordial relationship of volunteers of CII with ADO and PAU is resulting in frequent training sessions for farmers that is proving instrumental for farmers.

- Answers to the issues of women's involvement and empowerment indicate the presence of a patriarchal attitude that doesn't allow the opposite gender to come out and participate in agricultural activities. Approximately 65.7% of the respondents believe that the intervention didn't encourage women's participation or help in women's empowerment. Whereas 23% agree that women have definitely been empowered with the help of new ideas and techniques but 23% say that they have no idea if it has any influence on women or not. Thus, it is evident from the figure given below that the agricultural sector in these villages is mostly male-dominated and women still await their participation in the workforce.

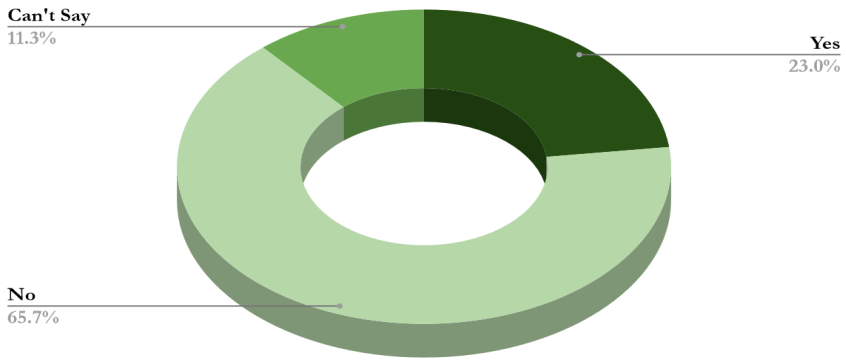

Figure 15: Women involvement and empowerment

- The efficacy of this intervention can be viewed when all the respondents unanimously stated that the air quality has improved significantly after the introduction of this intervention. ***"Hawa kaafi saaf ho gayi hai"***; ***"saans lene me aur dhundh bahut rehti thi pehle ab hawa theek hai"*** these were frequent utterances during interactions with farmers. The pie chart below shows the change in the quality of air after the intervention according to the respondents. (See Fig: 16)

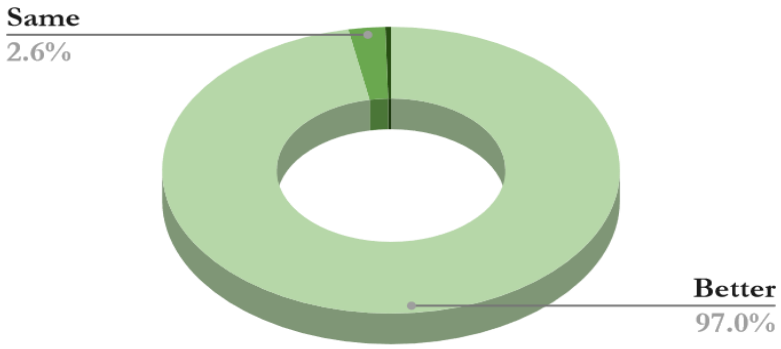

Figure 16: Improvement in Air quality after this intervention

- **93%** of respondents stated that due to this intervention the general health condition (breathing, vision, irritation in eyes, etc) has improved significantly after the introduction of this intervention.

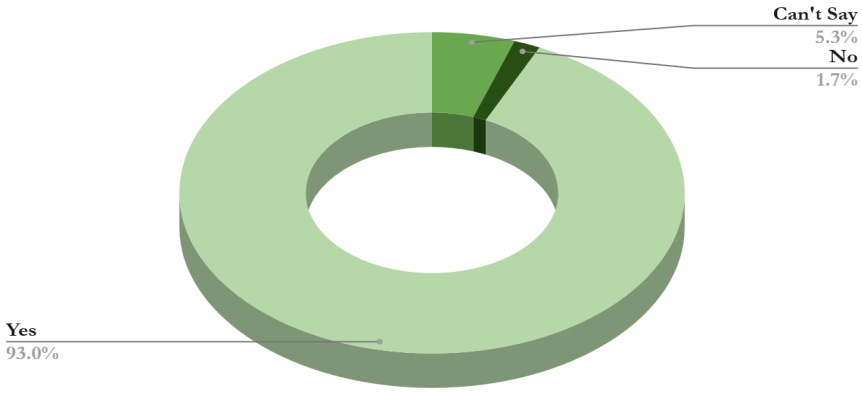

Figure 17: Impact of intervention on general health conditions

- It was apparent in the field that farmers have developed environmental and sustainable sensibilities after the introduction of this intervention. **86.4%** of respondents answered positively when inquired about raised environmental sensitivities among beneficiaries owing to this intervention. One of the aged farmer in Nabha block stated, ***"humesha se parali jala rahe the, ye log jab aaye tab machine aayi, in logon ne bataya ki parali jalane se kitna nuksan hota hai paryavaran ko, ab log dheere dheere jalana khatam kar diya hai".***

- It was well perceived in the field that beneficiaries have contended with this intervention. **98.7%** of the respondents were of the view that this intervention developed awareness around sustainable farming and will have a long-lasting effect on their village (See Fig: 19). A young farmer in Sirsa said, ***"is project ke baad cheezein kaafi badali hain, in sab ka faida lambe samay tak milega"***.

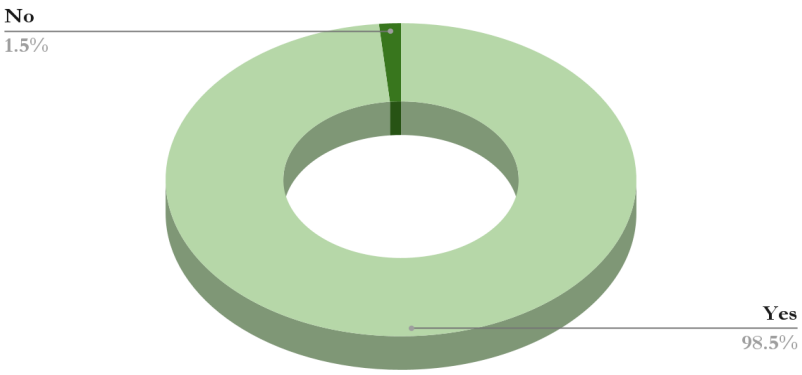

Figure 18: Impact of the concerned intervention on developing environmental sensibilities

- This intervention's potency can be seen when **98.3%** of the respondents opined that this intervention has to be extended to other villages and regions as well. One of the respondents in Sangrur block stated, ***"aisa***

project aur jagah bhi kariye, wanha abhi bhi log aag laga rahe hai. Sabko jankari milein aur faida milein is project ka”.

- The survey tool inquired whether the beneficiaries are aware about who funded this intervention. **64.3%** of the respondents answered that they know this initiative is funded by Birlasoft. **12.6%** of the respondents responded to CII on the same inquiry; **18.3%** of the farmers were unaware about the sponsorship of this intervention. There exists a small band of **4.8%** who think that this intervention is funded by FPOs/ FCOs. (See Fig: 20)

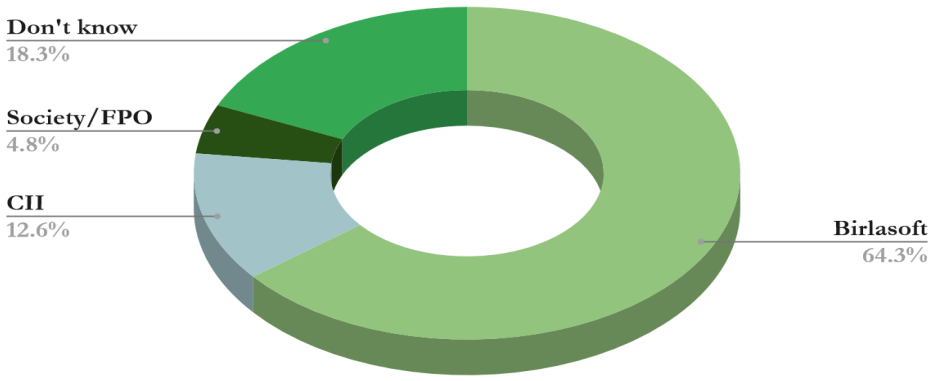

Figure 19: Responses of beneficiaries on who funded this intervention

Chapter 4

Anecdotes from the field: Observations, Discussions & Recommendations

4.1 Agriculture Departments' View on *'Shodhan'*

The field investigators did formal interviews with the Agriculture Development Officer and Deputy Agriculture Officer in Malerkotla (Sangrur). They shared the following views:

1. The intervention initiated by CII is a *'boon'* for small farmers, for them now it is easy to take machines on rent at a minimal cost.

2. We don't have any industries in the vicinity where collected residue can be used for industrial use. If there would have been any plant nearby then these farmers can earn some amount by selling the residue to these industries.

3. The extent of pollution has decreased significantly in the villages where intervention was initiated. The other villages are still practicing stubble burning, but the burning in the intervened villages is negligible.
4. Farmers have developed a sensibility around sustainable farming, they are readily accepting new ecological friendly technologies.

5. The projects of this tenor need to be there for a prolonged period. Exit at this moment will not yield any benefit.

6. Now more people from the intervened villages are applying for subsidies for machines, after the introduction of this intervention.

4.2 General observations from the field

1. Birla Soft has invested its CSR grant in an apt manner and is catering to contextual needs and curating meaningful impact in the intervened region. The entire initiative is implemented excellently by CII.

2. The machinery was provided to FPOs/ FCOs and proper documentation regarding machines, issuance of machines to farmers and rent charged is well maintained.

3. The documentation of beneficiaries is well maintained by CII volunteers.

4. The volunteers of CII developed an excellent rapport with different stakeholders associated with this intervention.

5. The CII team in Sirsa is also indulging in innovative harvesting practices and envisioning new engagements with Northern Region Farm Machinery Training & Testing Institute (NRFMTTI), Hisar (Haryana).

6. The volunteers are also assisting farmers in the maintenance of machines that are self-owned by farmers.

7. The volunteers are mainly from the same villages thus they are already aware about the contextual needs and methods to carry forward the expected intervention.

8. Proper mention of both Birla Soft and CII are there on every machinery sponsored by Birla Soft.

Image 12: Proper Mention of Sponsor and Implementation partner in Every Machines

9. Regular training and awareness programs are conducted both in the villages and if required farmers are taken to Punjab Agriculture University, Ludhiana.

10. Rent charged by FPOs/ FCOs is being used to sustain FPOs/FCOs infrastructure. In Rurki Kalan a secretary of one of the FCO stated that ***"rent procured last year was used to make concrete structures for keeping machines in FCOs premises"***.

4.3 Recommendations

1. In order to enhance the efficacy of this intervention, **the sponsor can think of procuring more machinery and donating it to FPOs/ FCOs.** During harvest season there exists a huge demand for these machineries.
2. Few machinery are outdated and new machinery with advanced technology are there in the market, farmers especially in Sirsa stated that ***"new machinery is more efficient and needs less fuel and saves more time"***. **Thus before buying new machinery it will be more wise to consider farmers' views and contextual needs.**
3. The farmers are interested in using Baler, as it further eases the work of managing the residue of crops**. More balers can be sponsored to the FPOs/ FCOs.**
4. The machinery provided to FPOs/FCOs need high horsepower tractors which are not available either with FPOs/ FCOs or to farmers thus they are compelled to rent it privately. **High Power tractors can be provided to FPOs/ FCOs.**
5. **In Sirsa, the volunteers of CII are encouraging farmers to adopt new techniques in Paddy crop sowing. This can be introduced to other villages also.**
6. Training camps around machine use are frequently conducted, and **more programs can be conducted considering judicious use of fertilizer, pesticide use**.
7. The farmers involved in ex- situ management such as Baling receive a small incentive from the State government, but the majority of farmers associated with this intervention are adopting in-situ management such as soil incorporation/ mixing, and mulching. They don't receive any incentive for this, **the sponsor can initiate an incentive program for farmers practicing in-situ crop residue management.**

8. In order to provide sustainability to this intervention it is important to make FPOs/ FCOs sustainable. **The sponsor can introduce a provision of subsidies and loans to FPOs/ FCOs for buying new machinery.** The state government is having provisions for subsidies but it has long waiting periods and several administrative concerns.

9. The data has been analyzed using the Kuppuswamy Socio-economic scale[2] wherein separate scores are assigned to the educational level of the head of the family, occupation, and total per-capita income of the family. All the three scores are then added to find out if the family falls under which socioeconomic class i.e. upper, upper-middle, lower-middle, upper-lower, or lower class. The figure given below clarifies that most of the families of these villages fall under the lower middle class i.e. their total score lies between 11-15, whereas the number of families falling in upper-middle-class is minimum and none of them belong to the upper or lower classes.
10. There is huge scope in making this Crop Residue Management initiative more lucrative for farmers. The collected bales which is collected to through baler is used in the paper industry, packaging foam, and cardboard industries. **If farmers are connected with factories/ industries using these crop residues for their industrial use; then a noticeable sum can be earned by selling the collected bales to the industries**. At this time especially in Sirsa, people from Rajasthan come to villages to collect these crop residues for which farmers are paying to collect residues and clean their fields. The usage of Baler can be lucrative as well if the compacted bales are sold to industries

Image 13: Baler Machine

Image 14: Bales

[2] **For Further details on Kuppuswamy Socio- Economic Scale, kindly refer:**
https://pdfs.semanticscholar.org/821e/17e03c0b75fa52b283094d9770eeb71d7c48.pdf?_ga=2.254728907.2118861326.1644247528-1741768694.1644046326

4.4 Sustainable Development Goals and *'Shodhan'*

The 2030 Agenda for Sustainable Development, was adopted by nations associated with UN members in 2015. This provides a blueprint for peace, prosperity, and sustainability for people and the planet. At its core are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership.

Image 15: Sustainable Goals Adopted by UN

The burning of crop residues generates numerous environmental problems. The main adverse effects of crop residue burning include the emission of greenhouse gasses (GHGs) that contribute to global warming, increased levels of particulate matter (PM) and smog that cause health hazards, loss of biodiversity of agricultural lands, and the deterioration of soil fertility.

Shodhan is an initiative funded by Birla Soft with a prime motto, *"zero crop residue burning"*, which caters to several Sustainable Goals. The direct interaction of *Shodhan* with SDGs is as follows:

- **SDG- 2** deals with **"End hunger, achieve food security and improved nutrition and promote sustainable agriculture",** the concerned initiative excellently diffused sensibilities around sustainable farming among farmers. **98.7%** of the respondents stated that this intervention introduced practices concerning sustainable farming. **58.3%** of the interviewed farmers stated that after this intervention there is a significant increase in crop produce. This increase in production is certainly catering to achieving food security.

- **SDG- 3** addresses "**Ensure healthy lives and promote well-being for all at all ages";** after this intervention, **93%** of beneficiaries stated that general health conditions **(**breathing, vision, irritation in eyes, etc) improved significantly.

- **SDG- 6** talks about **"Ensure availability and sustainable management of water and sanitation for all"**; after this intervention, 46.1% of farmers believed that the water consumption was reduced after adopting CRM practices.

- **SDG- 8** addresses "**Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all",** with this intervention farmers were equipped with machines that eased their work. This intervention yielded economic benefits for them. **90%** of the respondents stated that because of this intervention farmers are saving a significant sum of money.

- **SDG- 9** deals with **"Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation", Shodhan** sponsored several innovative types of machinery to the FPOs/ FCOs. **94.7%** of farmers stated that this intervention gave them an adequate opportunity to get trained in using sophisticated machinery.

- **SDG- 13** calls to "take urgent action to combat climate change and its impacts". Shodhan keeps this goal as its mainstay. **97.4 %** of respondents stated that the air quality post this intervention improved significantly. More to this there is now a minimal percentage of farmers who are indulged in the complete burning of stubble, almost all the farmers in the intervened village have abandoned this practice. Added to this **86.4%** of respondents answered positively when inquired about raised environmental sensitivities among beneficiaries owing to this intervention.

- **SDG- 15** calls to **"Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"**; this initiative popularizes both in-situ and ex-situ crop residue management practices. These practices increase the extent of micro-nutrients and moisture content in the soil. There is a slight decrease in fertilizer use after the introduction of this intervention. These are all good signs, keeping soil health into consideration.

Annexure

Annexure 1 : Questionnaire for farmers

1. **Name of Surveyor -**
2. **State - Punjab**
3. **District -**
4. **Block -**
5. **Village -**

Socio-Economic Profile of the Respondent

6. Name of the Farmer -
7. Age of the farmer -
8. Gender -
    a. Male
    b. Female
    c. Other

9. **Education of the Head family**

a. Profession or Honors /masters
b. Graduate
c. Intermediate or diploma
d. High school certificate
e. Middle school certificate
f. Primary school certificate
g. Illiterate

10. **Monthly Family Income in Rupees (2021)**
    a. ≥123,322
    b. 61,663-123,321
    c. 46129-61,662
    d. 30,831-46,128
    e. 18,497-30,830
    f. 6,175-18,496
    g. ≤ 6174

11. **Phone number of the respondent -**

12. **Operational agricultural land in acres -**

13. **Crops Area & Variety**

Where A = **Paddy(Rice)**, B= **Wheat**, C= **Potato**, D = **Other vegetable/other crops**

S.No	Crop	Variety/ies	Area (Acres)
1	A		
2	B		
3	C		
4	D		

14. **Methods adopted for managing straw (Crop Residue Management Options)**

S.No.	Method	Tick the method/s being practiced before intervention	Duration of practice (No. of years)	Area under the method before intervention (Acre)	Tick the method/s being practiced after intervention	Area under the method after intervention (Acre)
1	Complete Burning					
2	Partial Burning					
3	Mixing/Soil Incorporation					
4	Mulching					
5	Collection					
6	Other					

15. **How did you manage the remaining straw after partial burning? (Only ask if the person has ticked/ said yes to partial burning in the table above.)**

a. Mixing/Soil Incorporation
b. Mulching
c. Others, please specify…

16. **Is bio- decomposer used in Mixing/Soil Incorporation and Mulching ? (Only ask if the person has ticked or said yes for mixing/soil incorporation and mulching in the table above)**

a. Yes
b. No

17. **Collection**

Type	Tick the one undertaken	Usage of collected straw	Tick the one's undertaken
Manual		Animal Fodder (self owned animal)	
		Sold as Animal Fodder	
		Pit Composting	
Baler/ Machine		Industrial Use	
		Cardboard Making	
		Animal fodder (Self)	
		Other	

Specify other methods of straw utilization :

Tools specific information

18. **Which tools are used for managing the post-harvest remains of paddy?**

(See the Reference document provided and then proceed)

Tool	Source of Tool	Time required for operations (Hours/ Acre)	Rent Charged (Rs/ Acre) If the Tool is 5, 7, 10.	Fuel Consumption For different tools

19. **When compared with past experiences, what are your views with Residue management practices?**

For Wheat/ Potato/ Others

Level	Farmer adopting mixing or mulching	Pest infestation	Weed infestation	Fertilizer consumption
Increases significantly				
Increases slightly				
Remains the same				
Decreases slightly				
Decreases significantly				

20. **How do you prefer to use a paddy straw now?**

a. Compost
b. Bio-gas
c. Manure
d. Other [specify] –

21. **How are farmers in your village indulging in sustainable farming activities?**

a. Improved fertilizer use
b. Growing perennial trees
c. Crop rotation
d. Water management (Reduced water consumption)
e. Zero tillage
f. Other -

22. **Is there any change in the air quality of your village compared to before the intervention?**

a. Better
b. Worse
c. Same
d. Can't say

23. **Is there any difference in your water consumption after the intervention?**

a. Reduced
b. Increased
c. Same
d. Can't say

If reduced or increased then approx how many liters? Increased by 2l

24. **Is there any difference in your crop yield after the intervention?**

a= Reduced, b= Increased, c =Same, d= Can't say

Crop	Change (a/b/c/d)	By how much if a or b chosen
Paddy		
Wheat		
Potato		
Other vegetables/other crops		

25. **Do you think this intervention yielded some economic benefits for you?**

a. Yes
b. No
c. Can't Say

If Yes, then how?

26. **Do you think this economic increment has translated into better education/education opportunities? (Only ask if the respondent answers Yes for ques 25)**

a. Yes
b. No
c. Can't Say

If Yes, then how?

27. **Do you think this intervention provided an opportunity for farmers to get trained in using sophisticated machinery?**

a. Yes
b. No
c. Can't Say

28. **Do you think this intervention has resulted in improved general health conditions (breathing, vision, irritation in eyes, etc.)?**

a. Yes
b. No
c. Can't Say

If Yes, then how?

29. **Do you think this intervention allowed women to be more active in agriculture/ livelihood etc?**

a. Yes
b. No
c. Can't Say

If Yes, then how?

30. **Do you think this intervention imparted environmental sensibilities among the village population?**

a. Yes
b. No
c. Can't say.

If Yes, then how ?

31. **Do you think this intervention assisted in spreading awareness around sustainable farming which has a long-lasting effect?**

A. Yes
B. No
C. Can't

If Yes, then how ?

32. **Do you think this intervention had a long-lasting social impact on your village?**

a. Yes
b. No
c. Can't Say

If Yes, then how?

33. **Do you think interventions of this nature are to be introduced more in numbers in other villages as well?**

a. Yes
b. No
c. Can't say

34. **Do you know who has supported/funded this project?**

Answer -

35. **Any other inputs pertaining to the concerned theme/ project etc, if any?**

Annexure 2: For FPOs/Nodal centers

1. FPO Name and Location -
2. Number of farmers attached with the FPO (Total =

   Active =

   Inactive =

3. What is the reason for the inactivity of these members?
4. Which machines have been provided by CII?
5. Were any training sessions held? If yes, what were they about ? 6. What has been the impact of this intervention on the village and life of farmers attached to your FPO ?
7. What are your thoughts about the program as a whole?

S.No	Name of the Machine provided by CII	Rent charged from Farmers	Average monthly rent collected	Maintenance charges (yearly/monthly)

Annexure 3: For Volunteers -

1. How did you come to know about this intervention?
2. How has the volunteering experience been on this particular intervention?
3. What impacts have you observed in the village due to the intervention?
4. Does this volunteering enhance your understanding of sustainable agriculture?
5. What are your thoughts about the program as a whole?

Annexure 4: For State agencies / PAU/KSV etc.

1. How do you (the agency) collaborate with the Shodhan initiative?
2. What assistance (logistic, administrative, expertise) was provided by your agency?
3. How are you planning to further engage with this initiative? [Future Engagements]
4. How objectively will you evaluate this initiative?
5. What are your thoughts about the program as a whole**?**