

Engineering Dreams

Stories of Hope, Grit, & Determination

EWSEI Annual Report





Draft Report



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Background



About the Initiative:

The ASME Foundation India (AFI) initiated the Sabjikothi intervention in two districts in Bihar as part of its efforts to promote innovative technologies that addresses the `real-world development challenges. The intervention focuses on reducing the post-harvest losses and strengthening the livelihoods of women farmers engaged in vegetable cultivation in the districts of Vaishali and Madhubani.

In these districts, agriculture is the primary source of livelihood. Farmers often face significant challenges due to the lack of reliable storage facilities. As a result, perishable produce such as vegetables must be sold immediately often at low prices. This situation particularly affects the women farmers who manage small landholdings and have limited access to markets and storage infrastructure.

To address this challenge, ASME Foundation India, through its innovation ecosystem under ISHOW (Innovation Showcase), supported the deployment of Sabjikothi, an innovative micro-climate-controlled storage technology developed by Saptkrishi Scientific Private Limited.



The Sabjikothi agricultural equipment helps extend the shelf life of fruits and vegetables from a few days to several weeks without the need for refrigeration, chemicals or preservatives. The technology operates on very low energy consumption and is well suited for rural and off-grid conditions.

The project is being implemented in collaboration with local partner organizations, Sarvo Prayas Sansthan (SPS) in Madhubani and Nav Bihar Samaj Kalyan Pratishtan Kendra (NBSKPK) in Vaishali working closely with women Self-Help Groups (SHGs). Through training and capacity-building activities, women farmers are supported in adopting the technology, managing the storage system and improving their market participation.

By introducing Sabjikothi at the community level, the initiative aims to reduce post-harvest losses, improve storage practices and enable women farmers to sell their produce at better market prices. The project therefore contributes to increasing household income, strengthening livelihood resilience and promoting sustainable agricultural practices in rural Bihar.

The Intervention

Empowering women through social and engineering innovation (EWSEI) project aims to strengthen rural livelihoods in the Bihar region by integrating Micro Cold Storage technology (2–10 tons) with strong women-led social capital through SHGs and federations. AFI, leveraging its successful technology deployment experience in Bihar aims to introduce the decentralized cold storage units across five villages, enabling 50 SHGs and 750 women to benefit over a two-year period.

The Beneficiaries

-  Women from 50 Self-Help Groups (SHGs)
-  Smallholder vegetable and perishable-produce farmers
-  Local communities dependent on agriculture and allied activities

Objective

This intervention aims to empower women Self-Help Groups (SHGs) at Village/Block Desari, District Vaishali and Block Raika, District Madhubani in Bihar, by enhancing the shelf-life of their agricultural produce and thus increasing their economic resilience. Key activities include the establishment of efficient storage solutions like 'SabjiKothi'. By addressing the post-harvest losses, improving market access and fostering sustainable agricultural practices, the project aims to increase the income and livelihood opportunities for women, contributing significantly to the local economy.



Economic and Social Situation of Women in Vaishali and Madhubani District, Bihar

The Vaishali and Madhubani districts, located in Bihar, present a mixed economic and social landscape, especially for women involved in agriculture. Agriculture is the backbone of the state economy and in both districts with a large portion of the population relying on it for sustenance and income, as can be seen from the baseline data where all the women have stated that Agriculture is the primary source of income.

Despite their significant contributions to the agricultural sector, women face numerous economic and social challenges that reflect broader gender disparities seen throughout Bihar. The reliance on secondary sources of income is high and is almost equal to the primary source of income.

Both districts are among the most underdeveloped regions in the state, characterized by widespread poverty, limited infrastructure and significant socio-economic challenges. These issues are particularly severe, making the districts focal points for development interventions aimed at addressing severe hardships faced by the population, especially women.

The social factors exacerbate the economic challenges. Limited access to education, healthcare and social services continues to impede their progress. The baseline data where most women have either not received an education or gone to school or have not received more than primary education. Gender norms that prioritize men in decision-making further constrain women's agency, both at home and in the broader community. This marginalization from key decision-making processes often leaves women excluded from discussions on critical issues like resource allocation, agricultural planning, and community development. As a result, their needs are frequently disregarded, perpetuating gender inequality in the district.



Project Profile: The Year in Numbers

Particulars	Madhubani	Vaishali
Partner	1	1
Number of SHGs	10	10
Number of Women	169	104
Number of	10	4



Baseline & Impact Analysis



The baseline profile establishes the critical need for the innovation to move these women out of poverty (**SDG 1**) and improve their agricultural output (**SDG 2**).

To measure the success of our innovation, we established a baseline of the **Women Self-Help Groups (SHGs)** in Vaishali and Madhubani District. This profile highlights the specific socio-economic barriers the project aims to disrupt.

Research Design

The study adopted a descriptive research design to assess changes in the socio-economic status of women SHG members after the introduction of Sabjikothi. A baseline survey was conducted in 2025, and a midline survey in 2026 was carried out to understand early outcomes, particularly the change in beneficiary income and reduction in post-harvest losses.



Sampling

A representative sample of **one-third (1/3) of the total beneficiaries** was selected for the baseline and midline study. In total, 169 beneficiaries in Madhubani and 86 beneficiaries in Vaishali were covered under the overall survey. From this, a sample of 90 respondents was selected, including 60 women from Madhubani district and 30 women from Vaishali district. The 1/3 sample was selected randomly from the total surveyed beneficiaries to ensure fair representation and reduce selection bias.

Respondents

The respondents were women members of Self Help Groups (SHGs) participating in the project through partner organizations *Sarvoprayas Sansthan (SPS)* in Madhubani and *Nav Bihar Samaj Kalyan Pratishthan Kendra (NBSKPK)* in Vaishali. Most beneficiaries are engaged in agriculture, vegetable cultivation and livestock-based livelihoods.

Data Collection

The primary data was collected through structured surveys, field observations, and discussions with SHG members and partner organizations. The survey focused on changes in agricultural practices, storage behaviour, vegetable sales and household income after using *Sabjikothe*. Secondary data was obtained from project records and partner NGO documentation.

Data Validation

The findings were cross-verified through field observations and discussions with SHG members, community facilitators and partner organizations to ensure the reliability of the collected information.

Data Analysis

The collected data was analysed using descriptive statistics such as averages and percentages. A comparative analysis between baseline (FY-25) and midline (FY-26) was conducted to assess the income changes, improved shelf-life of vegetables, reduction in distress sales and increased market participation due to *Sabjikothe* usage.

Indicators Measured

The survey focused on key indicators including household income from vegetable cultivation, post-harvest losses, storage practices, market selling patterns and the usage of *Sabjikothe* for preserving produce.

Comparative Assessment

The midline data was compared with the baseline survey conducted in FY-25 to assess the early changes in income levels, shelf-life of vegetables and reduction in distress sales after the introduction of *Sabjikothe*.



Major Findings

Experience & Stability

With an **average age of 40**, the women participating in this program bring substantial life and agricultural experience, providing a stable base for adopting long-term innovative practices.

Age Profile of Women Participants as per Baseline Feb 2025 and Mid Term Feb 2026

Indicators	In Madhubani District		In Vaishali District	
	2025	2026	2025	2026
Average Age	40 years	40 years	40 years	42 years

Economic and Social Situation of Women in Vaishali and Madhubani District, Bihar

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The baseline data reveals a high-risk profile for women in the project area, emphasizing the need for income diversification.

Vulnerable Caste Profile

The OBC percentage in Vaishali is 86% and in Madhubani is 78%. Over 10% in Madhubani and 13% in Vaishali identify as SC.

The project focuses on social inclusion as a core component of its innovation strategy thus focusing on inclusive growth.

Caste Profile of Women Participants as per Baseline Feb 2025 and Mid Term Feb 2026

Caste	Madhubani	Vaishali
General	4%	8%
Schedule Caste	10%	13%
Other Backward Caste	86%	78%

Education Gap

The women in Vaishali and Madhubani also experienced significant deficits in education and healthcare access, which limit their potential for upward mobility. Low literacy rates, particularly among rural women, reduce their opportunities for non-agricultural employment, further entrenching their economic dependence on low-paying farm labour. In the realm of healthcare, women often face inadequate access to maternal and reproductive health services, contributing to higher rates of maternal mortality and poor health outcomes for women and children in the district. These deficits in education and healthcare perpetuate the cycle of poverty and hinder progress toward gender equality in Madhubani.

Education Profile as per Baseline 2025 and Midterm 2026

Vaishali and Madhubani districts represent a broader socio-economic reality of rural Bihar. According to Census 2011, the **overall literacy rate in Vaishali is 66.6% and in Madhubani 60.9%**, while the **female literacy rate is significantly lower at 53.3% in Vaishali and 51.6% in Madhubani**, indicating a persistent gender gap in education.



Average Educational Profile of Women Participants (Baseline Feb 2025 and Mid Term Feb 2026)

Education Profile (in Years)	Madhubani	Vaishali
1. No Schooling	24	15
2. Primary (1 years -5 years)	59	37
3. Upper Primary (6 years - 8years)	4	10
4. Middle (9 years –10 years)	7	23
5. Upper Middle (11 years -12years)	4	10
6. Graduate or above	2	5

Baseline

In Vaishali **52%** of women, have either no schooling (15%) or only primary education (37%), making traditional employment difficult and highlighting the need for "low-literacy" friendly technical innovations. **In Madhubani, 24%** have had **no schooling**, while nearly **59%** have only primary education. Thus, further highlighting the need to use of **voice-assisted or pictorial training modules** to ensure these women are not left behind by the digital transition.

The Midterm data confirms and highlights that in Vaishali, there is a significant number (23%) that have attended school till 10th grade. Overall, the educational status of women in Vaishali is better than that of the women in Madhubani district.

Income Dependence

The average landholding size in Bihar is approximately 31 kattha (0.39 hectares), which limits agricultural productivity and income generation for smallholder farmers. The asset ownership among women also remains limited, with less than 13% of women having ownership or operational control over agricultural land.



The average landholding in the project area is just 3 Katta in Vaishali and 11 Katta in Madhubani, requiring "intensive" rather than "extensive" agricultural innovation.

Baseline: The current primary income and secondary income in both districts are matching one another.

Income Status

As per the census 2011, agriculture remains the dominant livelihood source, with **around 72% of rural households depending on agriculture and allied activities**. Women play a major role in this sector, with **nearly 70–75% of rural women engaged in agriculture**, although only **18–20% are formally counted in the workforce**.

Profile for Primary Income in Vaishali District 2025 and 2026

	FY 25	FY 26	Average	% Increase
Primary Agriculture Income	33988	51119	17133	50
<i>Crop</i>	10623	12013	1390	13
Vegetables	23365	39106	15741	67
Secondary Income	34566	40200	74766	16

In Vaishali, the income from **Vegetable cultivation is more**. Currently, **vegetables make up 67%** of average Income and contributes more than double the income of **Kharif crops**. It needs to be noted that in the year 2025, there were severe floods in the region that caused damage to the Kharif crop.

Secondly, it needs to be understood that Vaishali being closer to significant towns in Bihar (Muzzafarpur and Patna) has more access to urban markets and consumers. It also points to the fact that the **innovation strategy should focus on post-harvest preservation** to maximize revenue for these smallholder women farmers.

In the year 2025, ASME Foundation India started working with the women in January, but the SabjiKothi was distribution started in May 2025 and it was not till June that the 10 units were established. Thus, we should see the impact of the increase in income from vegetables more in the kharif and rabi seasons.



Profile for agriculture income in Madhubani District 2025 and 2026

<i>Primary Agriculture Income</i>	FY 25	FY 26	Average	% Increase
Average Total Income	33160	37716	4556	14
<i>Crop</i>	21105	22269	1164	6
Vegetables	12055	15447	3392	28
Secondary Income	31650	36426	4776	15

Baseline Profile for Madhubani District highlights that the reliance on agriculture and vegetable cultivation is not as much as it is in Vaishali district. The secondary sources, livestock and dairy play a bigger role.

Secondary Income

Overall, the income analysis shows a strong and equal reliance on secondary sources. The main reason for this could be the small land holdings and thus the need for food security.

Secondary Income Sources	Madhubani	Vaishali
Livestock	76	90
Dairy	6	0
Daily Wage	14	10
Remittance	3	0
Others	1	0

The Livestock Pivot

The Vaishali data shows a high potential for **livestock-led innovation**, a striking 90% **(54 out of 60)** are involved in Livestock, yet only 6 **are reporting daily wages**.

In Madhubani, the **dairy processing tech** or **refrigerated supply chains** could convert these 28 households into active dairy entrepreneurs.



The innovation aims to make agriculture the primary economic driver by increasing the share of **vegetable-income**, which currently only accounts for **33%** of agricultural revenue. In this situation we should explore using the refrigeration device for dairy as well.

In summary, while women are vital contributors to Vaishali & Madhubani districts agricultural economy, their contributions are undervalued. They face a significant economic and social marginalization, structural inequalities, such as lack of land ownership and financial exclusion, along with entrenched gender norms that continues to limit their participation in decision-making and hinder their economic empowerment. Addressing these challenges requires targeted interventions that focus on improving women's access to education, healthcare, land ownership and financial services.

SDG Mapping

Detailed alignment of project activities with specific targets:

SDG 1 Targets:

1.1 Eradicating extreme poverty: The aim is to improve the income so that the proportion of population below the poverty line decreases.

1.4 Equal rights to economic resources: Improvements in social protection and resilience to economic shocks

SDG 2 Targets:

2.3 Double agricultural productivity: In order to counter food insecurity and guarantee that the produce doubles and people have access to food throughout the year

2.4 Sustainable food production systems: In addition to storage system, we introduce innovative technologies and practices that increase the yield



Innovation Highlight

Saptrishi Scientific Pvt. Ltd. is an Agritech innovator transforming post-harvest management through microclimate-controlled storage solutions for small and marginal farmers, FPOs, and street vendors. Their flagship product, Sabjikothi, leverages microclimatic control to extend the shelf life of perishable produce from 3 to 30 days, without refrigeration, chemicals, or preservatives. Operating on solar and battery power, requiring only 20 watts of energy and a few liters of water daily making our technology ideal for off-grid and rural areas.

Innovation Strategy & Alignment

The Innovation TOC: This project is an attempt to field-test this innovation and see if it is scalable, and if decentralized solutions would empower farmers to store, transport, and market their produce effectively.

ASME Technical & Operational Progress- The Role of AFI

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ISHOW- Science, Technology, and Innovation (STI) Roadmap:

ASME is a leader in promotion Hardware Innovations and through its flagship program, ISHOW it gives an opportunity to innovators to participate in the Annual Competition in Kenya, USA and India. SabjiKothi and Kisan Rover were both entries at this competition, and they both won in their respective years (2024 and 2025). ASME Foundation India helped them refine their prototype and pilot test it in the field. Thus, it needs to be remembered that in this testing the 257 women of Vaishali and Madhubani are co-pilots.



Pilot Status:

The pilot was launched exactly a year ago. The progress made in the year is shared here.

Risk & Opportunity Assessment:

Identification of potential risks the innovation faces and new opportunities discovered during implementation.



Financial Overview & Resource Mobilization

Investment

To this project, ASME Foundation India, allocated a grant of Rs 21 lakhs to meet the hardware costs and the social engineering involved by working through 2 local partners, SPS and NBSKPK. (Details of partners in Annexure 2)

Additional Finance Leveraged

The women SHGs made a small contribution towards purchasing the batteries required to keep the device working during electricity shortages.



Conclusion & Future Roadmap

Landholding Profile

points us to the fact that the participants being all smallholder farmers, our intervention with them will require "intensive" rather than "extensive" agricultural innovation.

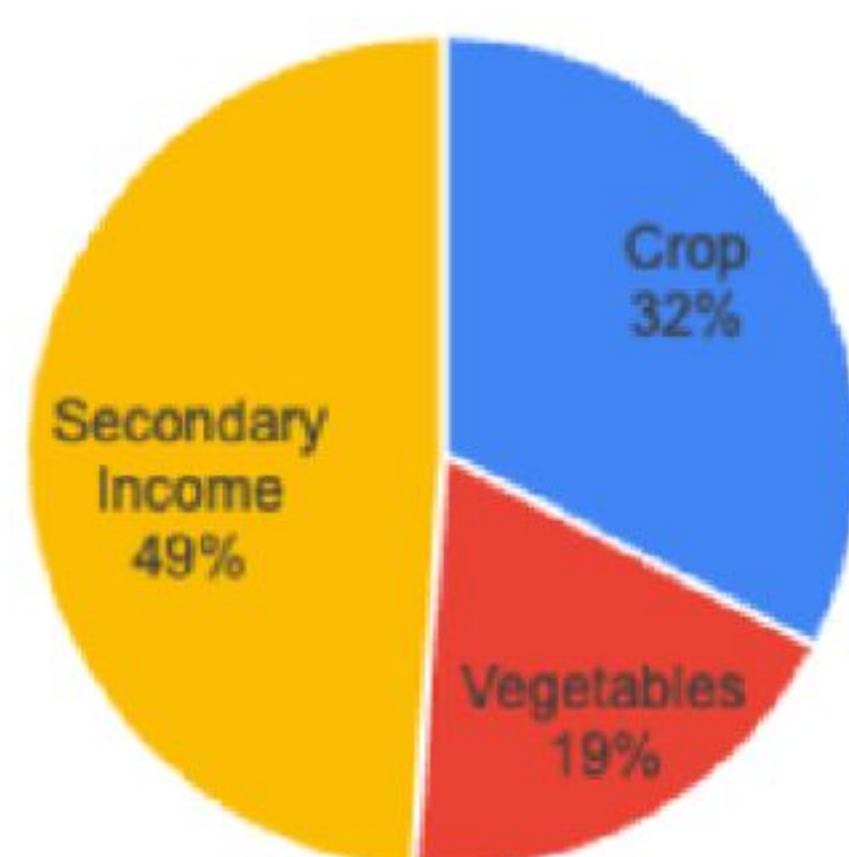
Level of Education

Since most of the women are either uneducated or have only primary education, while designing any instructional manuals and training materials we will have to keep it large pictorial.

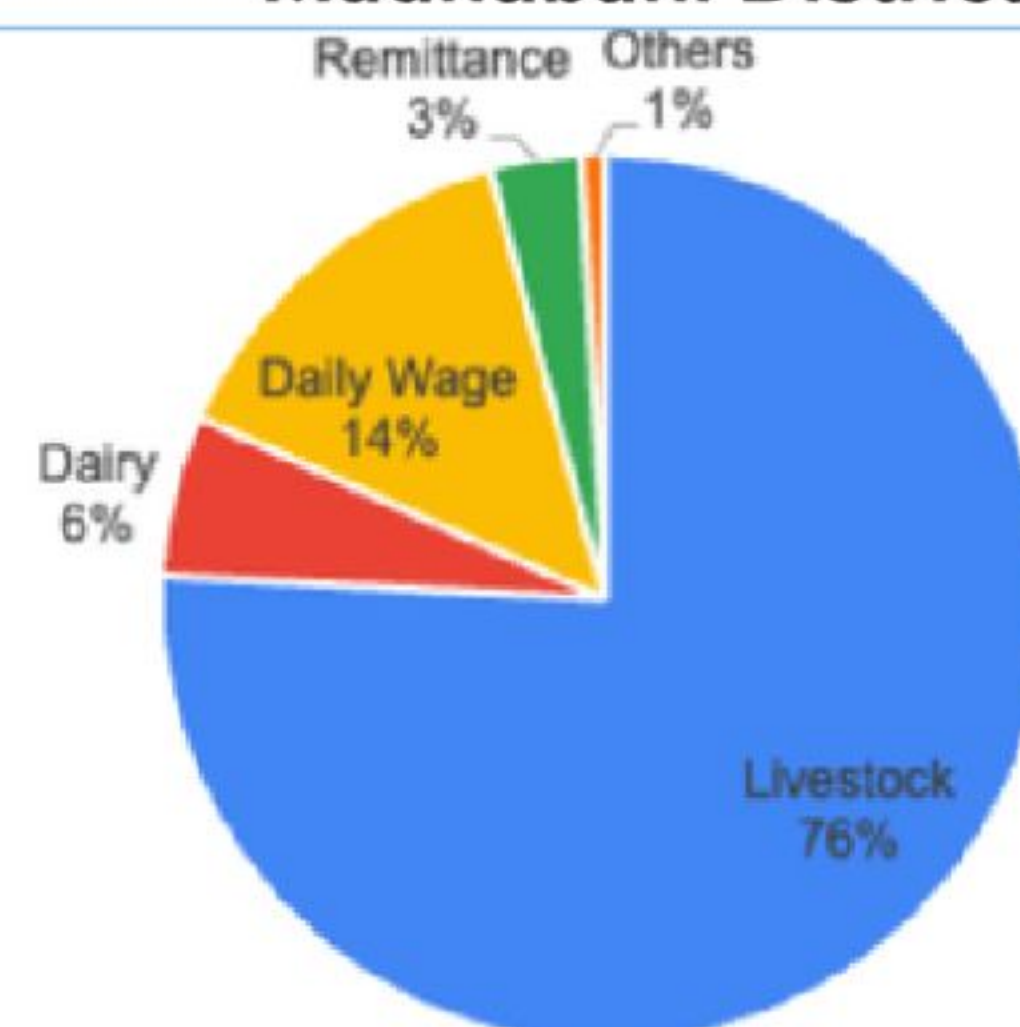
Livestock in Madhubani

The livestock pivot which points to the fact that livestock is a large part of the income, we need to explore if there are any products, like dairy or eggs, or meat that might require refrigeration and if *Sabjikothi* like cooling device has the capacity to meet their needs for livestock products.

Average Income Profile In Madhubani District



Profile of Secondary Income Share in Madhubani District



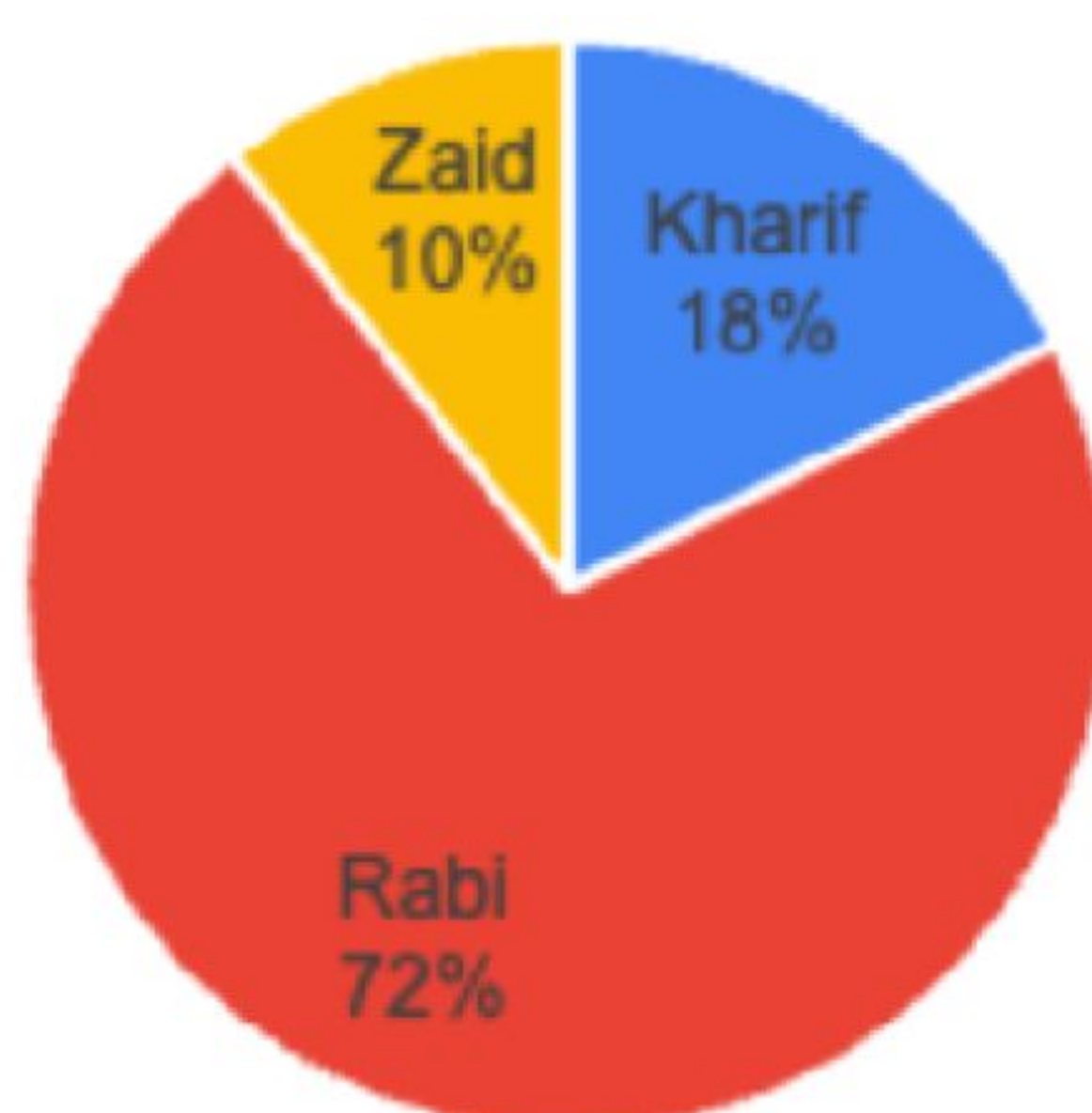
The chart shows that **secondary income is the largest contributor (49%)** to household earnings in Madhubani district, indicating strong dependence on non-farm activities. **Crop income contributes 32%**, while **vegetable cultivation accounts for 19%**, suggesting vegetables play a supportive but smaller role in the overall income structure.

The chart shows that **livestock contributes the largest share of secondary income (76%)** in Madhubani district, indicating that animal husbandry is the main non-farm livelihood source for households. This highlights the strong reliance on livestock activities for supplementary income.

Increase in Vegetable Income

From just one years project work, we have reported an increase in the Rabi and Kharif income from vegetables. This could be attributed to the prize index as well as the impact of the project. Keeping in mind both these factors, we find that the increase is higher than just the change in prices. Thus, affirming to the project's impact.

Income Increase from Vegetables Across 3 Seasons in Madhubani District from Baseline and Midterm

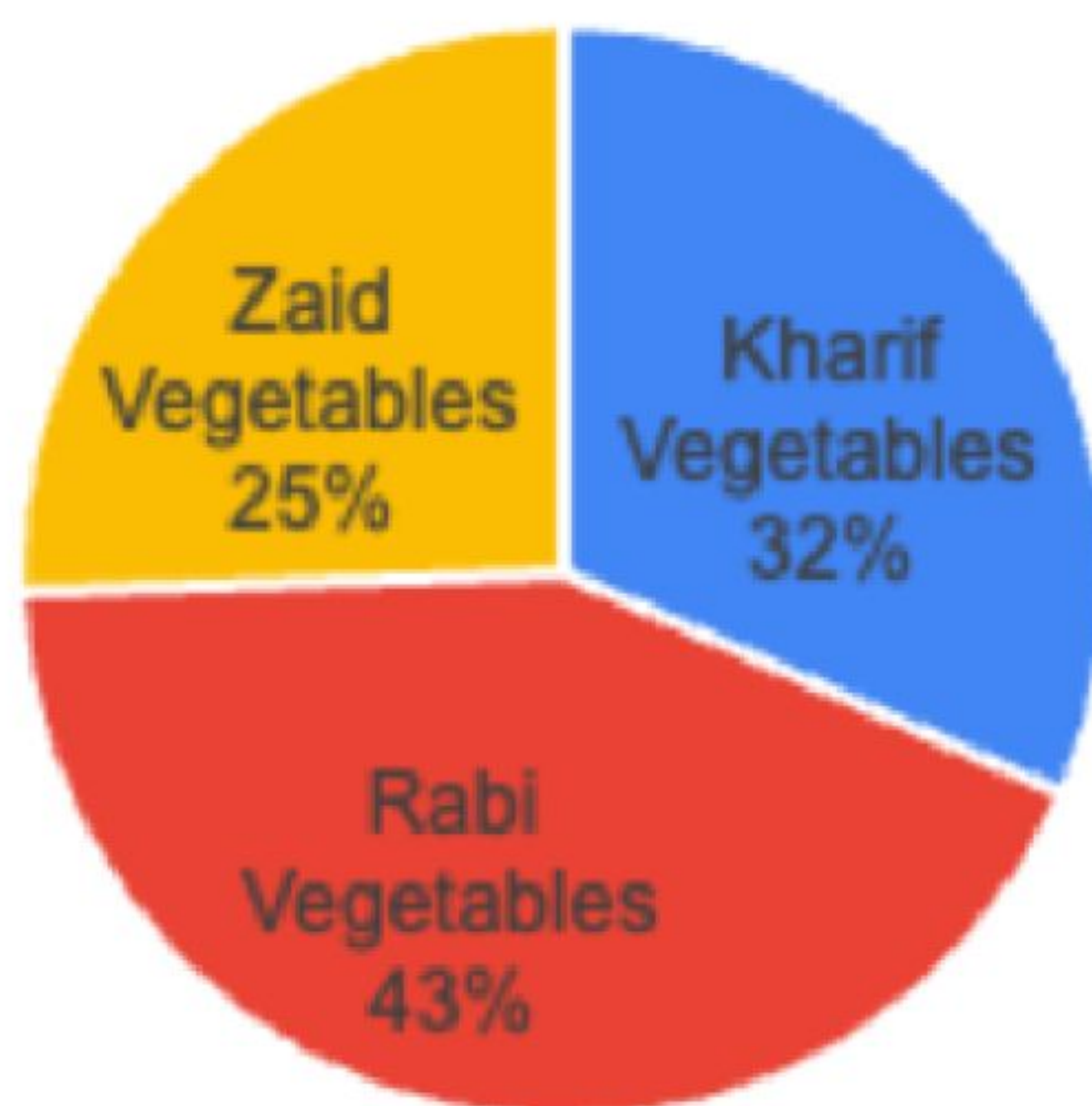


The chart shows that **Rabi vegetables contribute the highest income increase (43%)** in Vaishali district between baseline and midterm. **Kharif vegetables account for 32%**, while **Zaid vegetables contribute 25%** to the overall increase. This indicates that **Rabi season vegetable cultivation plays the most significant role in improving farmers' income**. The AFI project impact, as we estimated should affect the Kharif and Rabi income and thus we should look at the increase in these to attribute to *SabjiKothi*.

However, we need to remember that there were severe floods in the Kharif season in Vaishali in 2026. This is the reason we see a dip in the income from agriculture in Kharif. This will need to monitor in the coming years to assess the contribution of Kharif crops to the income of small holder farmers.



Income Increase from Vegetables Across 3 Seasons in Vaishali District from Baseline and Midterm



The chart shows that **Rabi vegetables account for the largest share of income increase (72%)** in Madhubani district from baseline to midterm. **Kharif vegetables contribute 18%**, while **Zaid vegetables contribute only 10%**. This indicates that **Rabi season vegetable cultivation is the primary driver of income growth for farmers in the district.**



Annexure 1

Profile of Women Participating in the Empowering Women through Social and Engineering Innovation								
	SAMPLE SIZE 60				SAMPLE SIZE 30			
	Madhubani				Vaishali			
	2025 Baseline		2026 Midline		2025 Baseline		2026 Midline	
Indicators	Numbers	%	Numbers	%	Numbers	%	Numbers	%
No of SHGs surveyed	3		3		3		2	
Average Age	40		39		40		42	
Land Holding (Katta)	11		11		3		4	
Caste Profile								
OBC	49	82	54	90	21	70	26	87
SC	6	10	6	10	4	13	4	13
General	5	8	0	0	5	17	0	0
Education Profile								
1. No Schooling	16	27	13	22	6	20	3	10
2. Primary (1-5)	25	42	46	77	9	30	13	43
3. Upper Primary (6-8)	4	7	1	2	2	7	4	13
4. Middle (9-10)	8	13	0	0	8	27	6	20
5. Upper Middle (11-12)	5	8	0	0	3	10	3	10
6. Graduate or above	2	3	0	0	2	7	1	3
Family Size	4		4		5		5	
Agriculture								
Primary Income								
Income	33160		37716		33987		51120	
Crop	21105		22269		10623		12013	
Kharif Crop	10893		13037		6374		6097	
Rabi Crop	10211		9232		4249		5916	
Vegetables	12055		15447		23365		39106	
Kharif Vegetables	3608		4193		11683		16655	
Rabi Vegetables	3534		5863		7009		13754	
Zaid Vegetables	4914		5391		4673		8697	
Secondary Income	31650		36426		34566		40200	
Livestock	35		56		27		27	
Dairy	3		4		0		0	
Daily Wage	17		0		3		3	
Remittance	4		0		0		0	
Others	1		0		0		0	
Business	0		0		0		0	
Vegetable Consumption (K.G)	325		265		518		328	



Annexure 2: Details of Partners

NAV BIHAR SAMAJ KALYAN PRATISTHAN KENDRA (NBSKPK) VAISHALI

Nav Bihar Samaj Kalyan Pratishthan Kendra (NBSKPK) is an NGO registered under the Societies Registration Act, 1860, in 1980. It is a nonprofit developmental institution working for social and economic upliftment. It was established in response to large-scale rural-urban migration caused by industrialization and urbanization after independence. Founded by a group committed to rebuilding the rural economy, the organization follows Gandhian philosophy and addresses issues such as the decline of village industries, poverty, illiteracy, poor health, environmental degradation, labour migration, and the marginalization of women, adolescents, children, and weaker communities. The organization focuses on women's empowerment, basic education, equity, employment generation, and sustainable development. Over time, its work has expanded to include health, nutrition, education, skill training, income generation, environmental initiatives, and empowerment of marginalized communities, especially women.

SARVOPRAYAS SANSTHAN (SPS) MADHUBANI

Sarvo Prayas Sansthan (SPS) was established in 2003 by a group of self-motivated women working for social development in northern Bihar, particularly in the flood-prone districts of Madhubani and Darbhanga. The region remains one of the most underdeveloped in the country, with limited progress in improving livelihoods and quality of life. SPS was founded to address these challenges and support marginalized communities.

The organization believes in the right to a just and equal society and works closely with disadvantaged groups to help them understand and improve their circumstances.

SPS combines grassroots action with advocacy and collaborates with community-based organizations, while fostering strong community ownership and participation in development efforts.



Annexure 3

ISHOW FINALIST | Saptkrishi Scientific

ASME | ISHOW



Sabjikothe

We are solving the problem of the perishability of fruits and vegetables for small-marginal farmers & street-hawkers where we provide a range of affordable storage, that maintains freshness and extends the shelf life of fruits and vegetables up to 30 days without using any chemicals, preservatives or refrigerants.

Problem:

- Losses in the fruit and vegetable supply chain, estimated at 30-40% of total production, pose significant challenges for small farmers and street hawkers, leading to financial strain and environmental consequences. Inadequate storage and market access exacerbate these losses, impacting livelihoods and food security in low- and middle-income countries.

Hardware Level:

- IN THE MARKET (available for purchase today)

Distribution and Sales:

- Target Customers: Small and marginal farmers engaged in horticulture and produce cultivation.
- Distribution Channels: Direct sales and partnerships with local distributors, agricultural cooperatives, and NGOs.
- Key Partnerships: Collaborations with agricultural cooperatives for bulk purchases and NGOs for outreach and support.

Customer/User Challenges:

- Understanding diverse farmer and hawker needs amid language barriers demands adaptability.
- Gathering feedback from dispersed users, some without reliable internet access, poses logistical challenges.

Hardware Challenges:

- NA

Manufacturing Challenges:

- We need to lower the manufacturing cost

Implementation Challenges

- Scaling up the team while maintaining productivity and cultural cohesion.
- Providing high-quality support to a diverse customer base.
- Adapting to dynamic market conditions while staying aligned with long-term goals.
- Addressing technical issues promptly and developing new features.
- Dealing with longer sales cycles and finding suitable channel partners.

Implementation Challenges

- Team capacity constraints in addressing technical issues promptly while developing new features, necessitating efficient resource allocation and skill enhancement.
- Longer sales cycle of 6-12 months and the time-consuming process of finding suitable channel partners, requiring strategic planning and patience in business development efforts.





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