

Krishimangal Program

Final progress report (May 2021-March 2022)

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**Portable cold storages at farm gates with Tan90, Greenbliss Agro, and DByT
Dynamics**

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Program Overview

Through the Krishimangal program, Tan90, being one of the applicants, worked with 2 consortium partners, Greenbliss Agro and DbyT Dynamics to address the cold storage and market linkage problems at the grassroots. Cold storages in India are centralized and have limited access to marginal farmers. Before the start of the program, market analysis suggested that setting up infrastructure alone would not suffice the impact, and market linkages are necessary for the proper utilization of resources. Through the Krishimangal Program, cold storage infrastructure was not only made accessible to small scale farmers through Tan90, partners were onboarded to help in the market linkages. This is where GreenBliss Agro came in, which is a platform for aggregation of FPOs, supporting them in both input and output workflows. Through Greenbliss Agro, market linkages were provided for the stored fruits and vegetables to aggregators which included aggregators like Reliance Fresh, and gated communities as well. Mobility solutions for movement of perishables from the collection point to the market often takes place by fuel driven trucks that have a high carbon footprint. Since cold chain solutions from Tan90 are green and have lower carbon footprint, it was expected to lower the greenhouse emissions in transit as well. This is the reason why DbyT Dynamics, a platform for providing electric vehicles (2 wheelers and 3 wheelers) was roped in the program to make the whole process in Krishimangal climate friendly as well.

Geographies targeted through the program would include FPOs from Andhra Pradesh and Telangana.

Products to be deployed would include:

- a) EVAP90: a 200 kg evaporative cooler, for storing greens at the farm gate
- b) Bag90: 50 liter bags with 4 panels in each bag, for the transportation of greens at the last mile
- c) Box 90: 50 liter, 200 liter and 1000 liter boxes for the storage and transportation of fresh produce
- d) 2 wheelers and 3 wheelers: for the transportation of produce from the collection center to aggregation points
- E) Freezers: to freeze the cooling panels to be used in Bag90 and Box90.



The scope for work in the Krishimangal program was well differentiated and divided according to the strengths of the consortium partners.:

a) **GreenBliss Agro:** Onboarded the partner Farmer Producing Organizations (FPOs), and the associated farmers and maintained a database of them. They trained the farmers with the products (cold chain products from Tan90), thereby generating direct and indirect employment for ground operations and trained them to drive the electric vehicles. They maintained a register of the installed and grounded products and services, and marketed the produce from fields.

b) **DbyT Dynamics:** They provided electric 3-wheelers and 2-wheelers and grounded them at the site, supported Greenbliss Agro with the training related to driving the vehicles, provided assistance with any troubleshooting of vehicles, servicing of the vehicles, and with any modifications done on the vehicles.

c) **Tan90:** They provided the cold storage infrastructure and materials required for setting up the portable and stationary cold storages, Post manufacturing, they deployed them at sites, and provided support in troubleshooting any problems associated with their infrastructure, prepared SoPs (standard operating procedures) and shared the same with Greenbliss Agro and subsequently to the farmers.

Activities executed as a part of the program

As a part of the Krishimangal Program, the first step was to train the farmers with the standard operating procedures of the cold chain products. In the same concern, a total of 908 farmers were onboarded spread across approximately 30 villages in Andhra Pradesh and Telangana. Training was primarily based on:

- a) Installation of EVAP90s, Tan90 cold storage bags and boxes,
- b) Freezing of the panels in the freezers for their usage in the cold storage bags and boxes.
- c) How to store produce in the cold storage units, and which perishables can be stored,
- d) Use of the 2 wheelers and 3 wheelers for the movement of the stored produce





Location : Bommanacheruvu

Post training, the following products were deployed on the grounds, at the grassroots level. Feedback from the onboarding sessions were taken, and the deployment of higher numbers of larger storage boxes were decided. This was primarily to aid the storage of the produce at the farmgate. Bags were found to be more suited for transportation, primarily by 2 wheelers.

Products	Number of units to be deployed according to grant agreement	Number of units deployed on the grounds
EVAP90	100 units	100 units
Tan90 Cold storage bags	80 units	80 units
Tan90 Cold storage boxes	50 units of 100 liters, 10 units of 220 liters, 5 units of 1000 liters	28 units of 100 liters, 15 units of 220 liters, 10 units of 1000 liters



Electric mobility solutions were deployed according to the agreement on the grounds with in-built telematics. Fabrication and modification of the 3-wheelers were done to maximize the amount of produce that can be transported. The maximum load carrying capacity of the 3-wheelers was 750 kgs, and facility was also provided in the vehicles for fast charging. This was really important keeping the fast turn-around time required on the grounds, primarily for the mid mile transportation.

Mobility Solutions	Deployment according to the agreement	Deployed on the grounds
2 wheelers	10 units	10 units
3 wheelers	10 units	10 units



Installation and number of farmers impacted

Before the installation of the infrastructure, baseline data points were collected from the farmers regarding the amount of produce they were able to sell. Post the deployment of the program, we could reach out to **5000 farmers, increasing their average income by about ~16%** (details with increase in income of individual farmers shared by Greenbliss Agro). The increase in the income of the farmers were primarily due to 2 reasons:

- a) decrease in wastage of the farm produce at the farmgate due to the installation of the cold chain infrastructure
- b) Increased market linkages of the produce stored at the farmgate through mobility solutions.





Marketing

The word and the work done through the Krishimangal Program were showcased in exhibitions, where the footfall of farmers are high. The success story of the sustainable and a green post harvest management covered under the Krishimangal program was shown to partner FPOs as well, thereby encouraging them to be a part of our consortium post the program completion.

Packaging of green produce and mushrooms were also changed to provide information about the produce to the end clients.



Objective of the program

Based on the above, the major division of KPIs were demarcated between setting up of the infrastructure, onboarding farmers, providing market linkages, installation of vehicles and training the farmers for driving the vehicles.

KPI Estimated	KPI Achieved (Actual)	Remarks
<p>MoU Signing/Onboarding farmers for the Krishimangal Program</p> <p>Estimated: 10 FPOs</p>	<p>Actual: MoUs signed with all 10 FPOs</p> <p>MoU signed between the consortium partners and the FPOs for the onboarding of the farmers</p>	<p>MoU signed with 10 FPOs spread across Andhra Pradesh and Telangana.</p>
<p>Fabrication of cold storage infrastructure and their installation:</p> <p>Estimated 100 EVAP90s 80 Tan90 Cold Storage Bags 50 units of 100 liters, 10 units of 220 liters, 5 units of 1000 liters</p>	<ol style="list-style-type: none"> 1. Fabrication of 100 units modular cold storages, EVAP90 was completed as per the agreement. 2. Fabrication of cold storage boxes was completed of various capacities. (28 units of 100 liters, 15 units of 220 liters, 10 units of 1000 liters were fabricated and deployed) 3. Fabrication of cold storage bags was completed. (80 units) <p>All 100 units of EVAP90s, portable cold storage boxes and bags have been installed in locations spread across Andhra Pradesh and Telangana. (details of locations shared before)</p>	<p>The number of boxes of varying capacities were changed from the actual number in the agreement, particularly after taking market feedback. The number of the boxes were altered to match the storage requirements at the farmgate. The number of 1000 liter boxes were doubled, as compared to the grant agreement.</p> <p>Training of 908 farmers were undertaken as a part of the program</p>
<p>Fabrication of 2 wheelers and 3 wheelers:</p>	<p>Actual: All 10 units of 2 wheelers and 3 wheelers were</p>	<p>2 wheelers were fabricated and deployed faster than the 3</p>

Estimated 10 units of 2 wheelers 10 units of 3 wheelers	fabricated, registered and deployed.	wheelers. Fabrication of the 3-wheelers took time as modifications were incorporated based on usage.
Market linkage connects for organic produces	MARKET linkages stated before schedule, however, we could not achieve the required scale. We could touch the movement of 10 tonnes per day to the maximum possible limit with the given infrastructure.	Market linkages started much before the stipulated time. This was primarily because of the lockdown and the demand for doorstep deliveries of fresh produce. There was a specific demand for organic produce which was primarily provided through the program.

Impact and sustainability study

Evap90, Bag90 and Box 90s were fabricated and deployed at the grounds. In order to support the transport and logistical requirement during the first lockdown of COVID19, boxes and bags along with the cooling panels were dispatched on an urgent basis. 2-wheelers were modified to carry the boxes and bags that were used for the last mile movement. The boxes and bags maintained the freshness of the perishables during transit resulting in higher income for the farmers. Makeshift shops were constructed at the gated communities for marketing and selling the fresh produce. SOPs for the usage of EVAP90, Box90 and Bag90 with Greenbliss Agro for the purpose of training.

Number of farmers using EVAP90	60
Number of farmers using Bag90	75
Number of farmers using Box90	40
Total amount of produce stored during the program	1300 Tonnes
Total amount of produce moved during the program	December to February, daily 10 tonnes were moved, while from May onwards, 5 tonnes were moved daily



While perishables like mangoes, green leafies, and high water content vegetables were stored in EVAP90s, mobility solutions were used for the transportation of both temperature sensitive and non perishables. This is one of the major advantages of modular cold storages, which Tan90 is validating, wherein businesses can do part truck loading and use the same vehicle for the transportation of perishables and non perishables alike.

Produce mostly stored in EVAP90s	Leafy vegetables, high water content vegetables like tomatoes, gourds
Produce transported in bags and boxes	Flowers, fruits (primarily mangoes) and leafy vegetables
Produce saved from wastages when stored and transported in cold chain infrastructure	25 tonnes
Average increase in income of farmers	~16%

EVAP90s work on the principle of evaporative cooling. Hence, apart from lowering the temperature, the storage units can also maintain the humidity level above 90%. This is suitable for storing vegetables that have higher water content, like tomatoes, leafy vegetables and gourds. Leafy vegetables are high volume, low value products and they tend to lose water fast, becoming limp, thereby reducing their market value by 50%. Storing leafies in EVAP90s saved them from getting limp and farmers could store them for a whole day as compared to a couple of hours if such infrastructure was not being used.

Employment generation

Both direct and indirect employment were generated in the program. Direct employment included the onboarding of drivers for the 2-wheelers and 3 wheelers, on ground executives for training, troubleshooting and for transportation of produce gathered from farmers. The program has been successful in a way that sustainability has been achieved and the onboarded personnel can now sustain themselves post the completion of the Krishimangal program.

Direct Employment generated at Collection Centres	10
Direct Employment as Field Level Executives	25
Indirect Employment generated aimed at installations, co-ordination on logistics and transportation	46
Total lives impacted financially	81

Climate Impact

Electric vehicles were used for the movement of perishables from the collection points to the aggregation points. As-present modes of transportation included diesel driven trucks and petrol driven two-wheelers. On the adoption of the electric vehicles, the carbon footprint in

the supply chain was considerably reduced, thereby making a model structure to be implemented in other FPOs as well

Number of trips done by 2-wheelers per day	3
Number of trips done by 3-wheelers per day	4
Average distance (in km) traveled by 2 wheelers in a day	13
Average distance (in km) traveled by 3 wheelers in a day	45
Petrol consumption avoided	~40 liters of diesel per day

Sustainability studies

Self sustenance is the key for the success of any program. Keeping this in mind, it was essential for us, from the beginning, that the FPOs have some ownership with all the capital expenditures. In the same concern, contributions from the FPOs were kept at 20% for the EVAP90s, while 40% for the portable cold chain products. It was also anticipated that the FPOs would be able to sustain the operational costs for paying the drivers of the 2 wheelers and 3 wheelers post the initial 2 months. However, we were not able to achieve the same due to the late deployment of the three wheelers and the continued use of diesel driven trucks for the supply chain. However, it was generally observed that the FPOs could recover

the money invested on the infrastructure within 6 months. They re-invested their contribution in the program to cater to an increased volume of produce transported in the later part of the program.

Model implemented during the Krishimangal program:

Farmers associated with FPOs across Telangana and Tamil Nadu were onboarded through the program, in which the FPOs took up certain percentages of the cost of the cold storage infrastructure that were to be deployed. In turn, the FPOs took minimal rental amounts from the farmers for storing their produce in these units, based on the produce stored and their respective amount. Collection of such payments resulted in the FPOs to recover their cost within the program period, and thereby becoming more sustainable.

Post the commencement of the Krishimangal program, Tan90 would be closely involved with the participating FPOs for the refresher training programs. Since the program is self sustainable, in a way that the FPOs can enter in a free cash flow altogether, it has been creating confidence among other FPOs in the state. Our consortium has been receiving interests from other FPOs for the deployment of similar models in their region. Tan90 would continue to support the partner FPOs with any replacement of damaged products, and help them with the maintenance of the products installed at the farmgate. Mobility partner, DbyT Dynamics, will continue to help with the maintenance of the 2 wheelers and 3-wheelers as well.

Tan90 is currently setting up charging stations PAN India, wherein we can provide frozen cooling panels to businesses and FPOs on a rental basis. This reduces the risks of setting up freezers at the farmgate, which are often dependent on the continuous supply of electricity. We are planning to set up similar freezing stations near participating FPOs such that we can impact more farmers down the line and lower their timeline for RoI further.

Learnings from the program and hypothesis validation

The program was well structured to provide an end to end solution, in addition to infrastructure development and market linkages to the marginal farmers. Intermittent lockdowns due to COVID19 prompted a high demand for organic produce delivered at the doorstep. This required an immediate deployment of mobility solutions on the ground. With most of the manufacturing entities closed, our on-ground consortium partners opted for diesel driven vehicles for the initial months. DbyT Dynamics played a major role in deploying electric two-wheelers which enabled us to deliver perishables to the gated societies. There has been a small delay in the deployment of the three wheelers, due to issues related to fabrication on rented vehicles. While the late deployment did not have any detrimental effect on the supply chain, we could have done better on the reduction of carbon footprint.

Training sessions were held in the initial phase of the program in which the onboarded farmers were handheld in getting used to the installation and the standard operating procedures of the cold chain infrastructures. Refresher training sessions should have been organized more frequently. This is where

having multiple consortium partners play as a double edged sword. Lack of information flow resulted in the farmers not using the storage facilities properly. Though, the gap was rectified post field visits wherein we made sure that refresher training session was being held.

Monsoon and resultant flooding also played havoc with our supply chain. Learnings were taken from the ground and necessary changes in the design of the portable cold storages were done to prevent the effect of stagnant water on the stored veggies, and for preventing reptiles from taking shelter in these cool storages.

One of the major hypotheses was to observe the effect of providing market linkage along with support to infrastructure development at the grassroots. It was often seen that farmers, at the grassroots, were enthused by subsidized infrastructure, which, at the end of the day, went defunct due to poor economics and inability to sustain operational costs. Setting up infrastructure alone would not be enough for proper impact, and the hypothesis that market linkages would drive better usage of infrastructure was proven on grounds. Tan90 is a product company and does not have any definitive plans of getting involved with market linkages in the near future. However, as market linkages drive the sustainability of the cold chain infrastructure, it is essential for the company to work with partners who have the expertise. Through the Krishimangal program, Tan90 were able to find partners who can work together to replicate the model elsewhere.

Articulating the things that worked out well:

- a) Increasing the income of the farmers by ~16%,
- b) provide end to end solution to the farmers, starting from storage solutions to market linkage catalyzed by mobility solutions
- c) wide use case, apart from vegetables, with helping farmers to store mushrooms and flowers.
- d) Making the model sustainable by having the FPOs to operate by themselves post the completion of the program.

Things that would require more work in the future:

- a) Work on better coordination between the consortium partners. While having partners excelling in their own fields is beneficial, non-overlapping activities between partners requires a clear coordination.
- b) Refresher training sessions for the farmers for the usage of the products could have been taken more frequently.
- c) Deployment of the 3-wheelers could have been made faster, though diesel driven trucks were used for the gap period.
- d) More farmers could have been reached out to, thereby increasing the impact.



Case Studies

The below case studies are from the farmers associated with Peddavoora Farmer Producer Company, wherein the baseline conditions involved wastage of perishables at the farm gate. The farmers in this FPC took the advantage of the Tan90 cold storage infrastructures as well as mobility solutions, supported by the Krishimangal program.

1. My name is Nagaraju and I have been growing roses in my field. Roses are highly delicate flowers, and if not stored properly, petals come off from the bud. To prevent wastage, I used to wrap the flowers with wet cloth before, and faced wastage due to the shedding of the petals. Through the program, I was introduced to Tan90 cold storage bags. Since the cooling pads were kept in designated pockets, they were not in direct contact with the flowers. I used to wrap them in papers and store them overnight in the bags. Due to controlled temperature, I could sell my harvest the next day as well.
2. My name is P. Venkataratnam and the Greenbliss team had installed Tan90 boxes in my region. I had access to 2 types of boxes, one being of capacity 100 liters while the other having 220 liters in capacity. Two sets of cooling panels were made available to us. While I dealt with vegetables, leafies and mangoes, I used the higher temperature panels (*TN-1, having temperature of -1 degrees centigrade*). My friend, who deals with meat, used the lower temperature panels for the transportation (*TN-8, having temperature of -8 degrees centigrade*). We stacked the boxes on our three wheelers, and could supply to our neighboring districts as well, which was not possible before. This has increased his income as compared to before, because he had to buy ice everyday. The best part is that the same box can be used for different temperature requirements. However, I would recommend tagging the boxes separately for the greens and meat.

Field Visit snippets



Acknowledgement

If anybody would ask us about the missing link at the grassroots, our response would be: Market linkage drives the usage of infrastructure involved in the post harvest management. Setting up cold storages alone is not going to solve the problem until we bring enough demand for the produce to the farmers. This was an important validation of our hypothesis and we are grateful to the Krishimangal program for the same. Not only this, a holistic support with Go to Market strategies, aiding with the expenses of our financial due diligence during our fund raise, support with marketing collaterals had been some of the highlights. The impact documentary and the press coverage has been helping us create awareness about our technology to our new clients. Sincere thanks to the Social Alpha and Sattva team for their constant



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