

# Best Practices Series

## LEPNRM

(Livelihood Enhancement through Participatory Natural Resource Management)



## Context

### Background

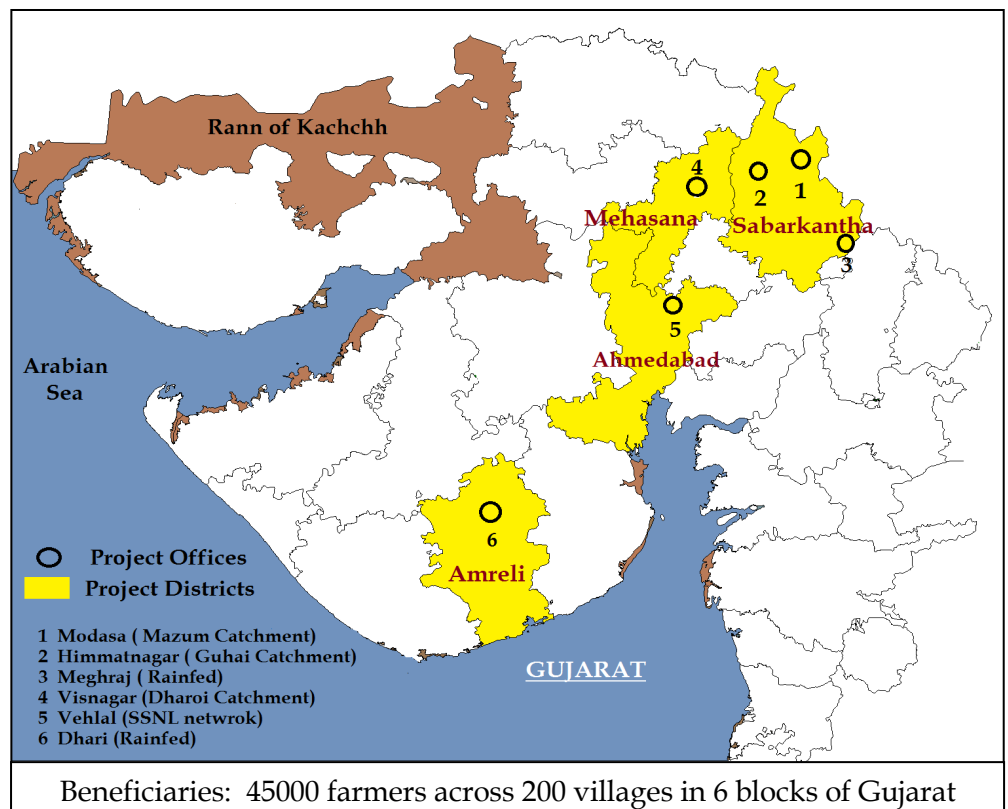
Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts. The LEPNRM (Livelihood Enhancement through Participatory Natural Resource Management) project is financially supported by the RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under the project.

### Project Rationale

A study conducted by Dr. Sukhpal Singh of the Indian Institute of Management, Ahmedabad in 2008 across various field units of DSC revealed that there is significant yield gaps in almost all crops cultivated by the farmers in all project areas. Further DSC's

agriculture experts identified that improper input of seeds, low awareness on scientific farming methodologies and associated technologies lead to reduced crop productivity, higher drudgery and lower agricultural income. Moreover, low market linkages lead to improper price realization of the commodities. It was also observed that there was lack of channelization of necessary information on new research and agri-practices to farmers, which led to low adoption and extension of scientific agricultural practices specifically amongst small and marginal farmers. This called for a comprehensive intervention including improvement on human and social capital along with technological interventions.

The project supported technological interventions through introduction of new technologies, good quality seeds and input materials, efficient agricultural tools for reduction in drudgery and other agri-inputs. The interventions were supported through participatory agriculture extension system for wider outreach to farmers through a network of trained extension local level volunteers, guided by local federations and DSC.



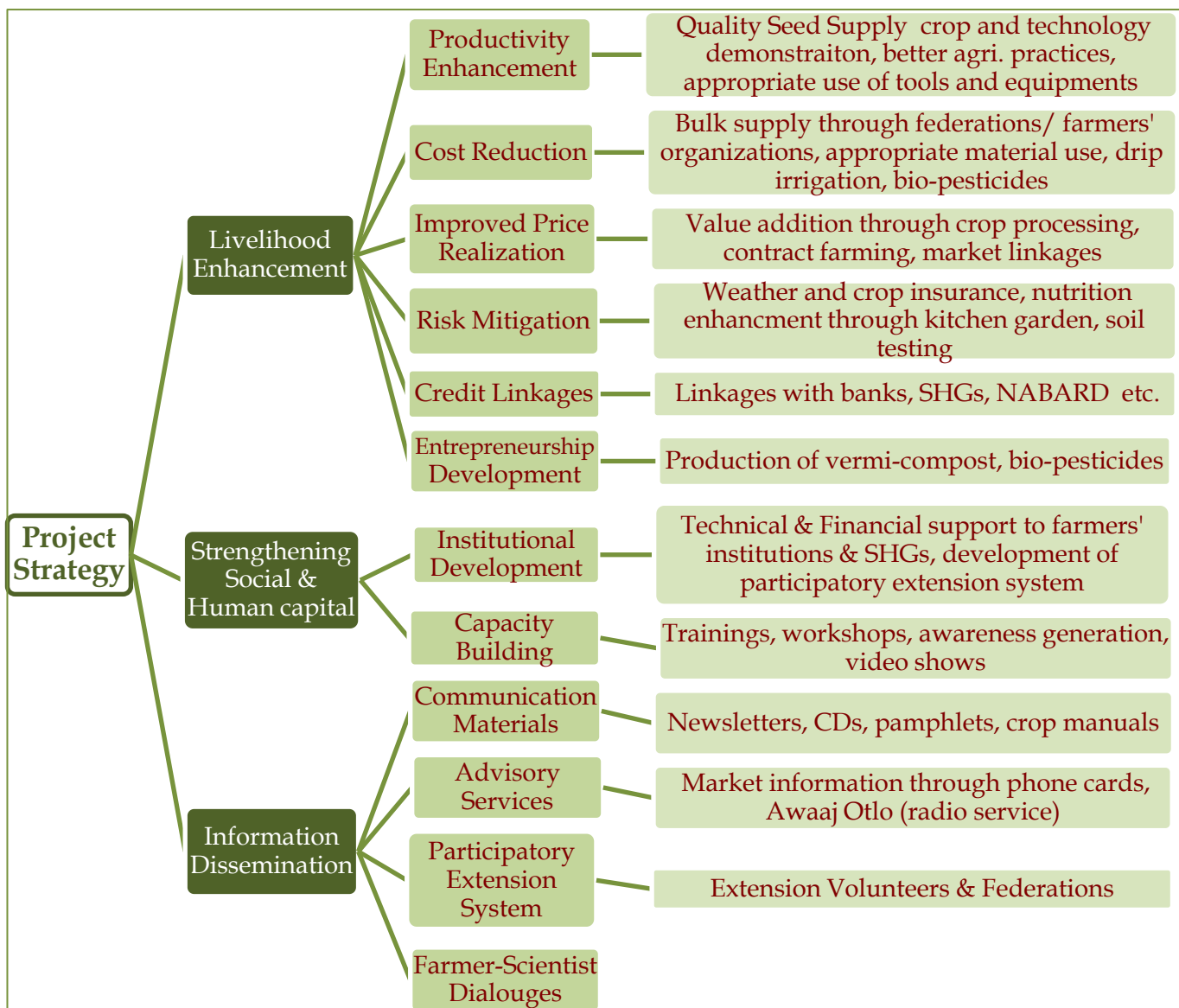
## Project Strategy

Three pronged approaches have been adopted including livelihood enhancement through technological interventions; strengthening of social and human capital through institutional development and capacity building of institutions and farmers; and information dissemination to end users.

The project promotes a participatory agriculture extension system in six project regions involving farmers federations vis-à-vis para workers (extension volunteers).

About 26 extension volunteers (including 1 woman) work in close association with DSC and 6 federations across 4 districts covering 187 villages with 78019 hectares across 6 blocks of Gujarat. The system has been successful in reaching more than 45000 farmers within a span of 3 years.

The extension system provides technical trainings to farmers, community organizing support and information as well as linkages for technical support and market access.



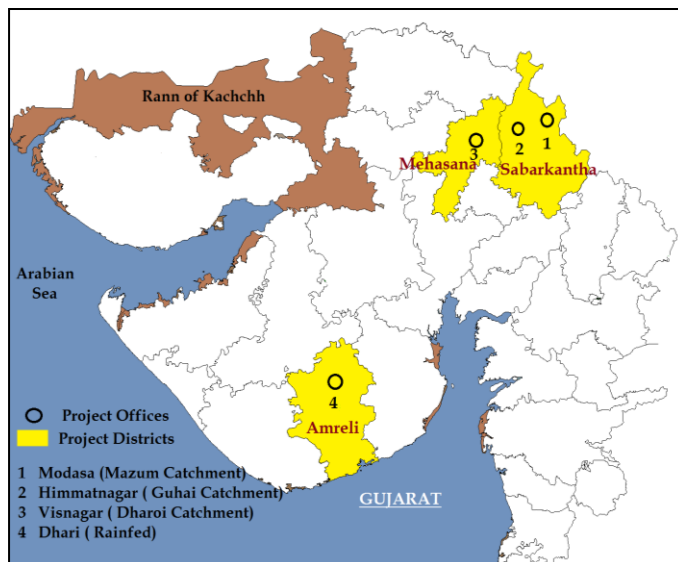


## LEPNRM Project

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## Context

DSC and Water Resource Department (WRD), Gujarat State; have been successful in organizing the farmers through formation of Water Users Association (WUAs) for Participatory Irrigation Management (PIM) in Dharoi major project Right Bank Main Canal network (1995-2009), Guhai irrigation scheme (1997-2006), and Mazum canal irrigation scheme (2000-2006). WUAs were further nested into canal federations. PIM improved the efficiency, equity and sustainability of irrigation management in the command area. From 2007 onwards, these federations also worked for promotion of better agricultural practices through crop demonstration, agriculture input supply, soil testing and marketing of processed seeds under LEPNRM project along with PIM to enhance farmers' livelihood. Through participatory rural appraisals in the region, DSC and the federations found that though wheat is one of the major Rabi crop in these regions (covers 50-60% cropped area in Rabi season), farmers are not satisfied with the net income from this crop. DSC's agriculture professionals observed that practice of old methods and use of old-genetically degraded seeds is responsible for the low yield and reduced net income from wheat. The farmers are also not aware about selection and availability of early, timely and late sowing



varieties. Thus a need to introduce good quality wheat seeds and better agricultural practices was felt for wheat cultivation that would augment income of farmers.

In this context, the federations introduced local procurement, processing and distribution of wheat seeds in their region for promoting better quality seeds, providing better price to farmers, and become self-sufficient in input supply chain in long run. Pilots were undertaken in 3 federations across irrigated areas of Dharoi, Guhai and Mazum as well as Dhari Krushak Vikas Producer Company Ltd. (catering rain fed areas of Dhari block of Amreli district).

Farmers have been successful in producing high quality processed seeds from wheat varieties like GW 496, GW 322, GW 366, GW173, Lokvan and MP Sharbati.. DSC provided new seed varieties and technical support to farmers for on farm demonstration, and supported federations and producer company for seed processing. Guhai federation has been successful in acquiring license from Gujarat State Seeds Nigam Ltd., for production and supply of seeds. Under LEPNRM, about high quality seed demonstration plots have been commenced for 249 farmers across four field units of DSC. About 75082 kg of wheat seeds have been processed by federations and producer company in 3 years. Farmers in Visnagar have started local processing at individual level also. The seed processing interventions have been able to increase average market price of wheat by ₹.1.5/kg. Looking to the better price realization, more than 670 farmers across the 4 project regions have adopted processing of wheat seeds. Moreover due to better productivity through processed seeds, more than 3575 farmers in these regions have started adopting processed wheat seeds for cultivation.

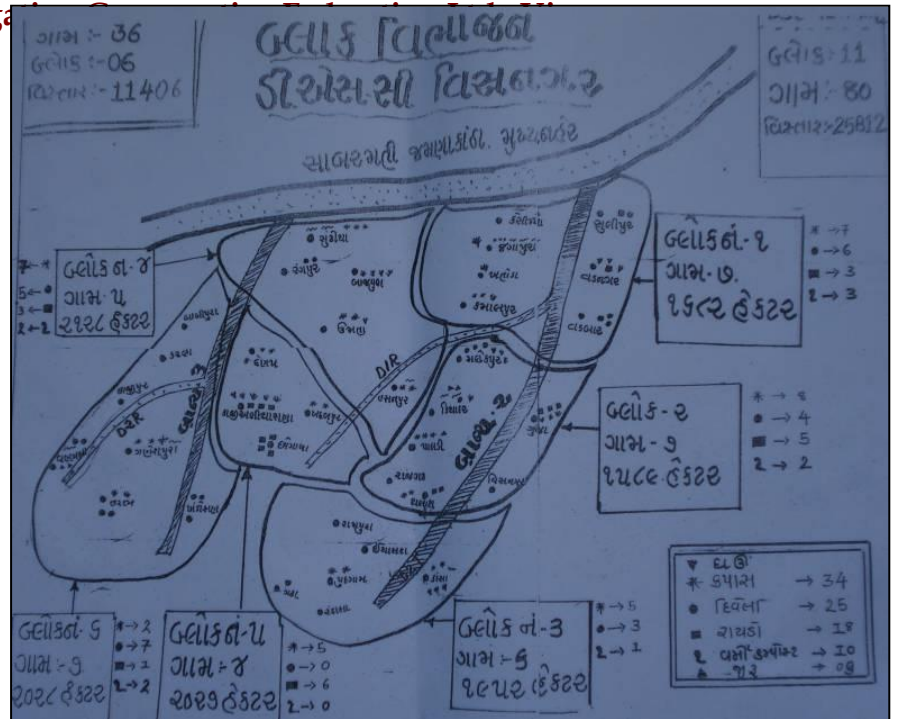
# Local Procurement, Processing & Distribution of Wheat Seeds:

## Branch Canal -2 Irriga

### Genesis

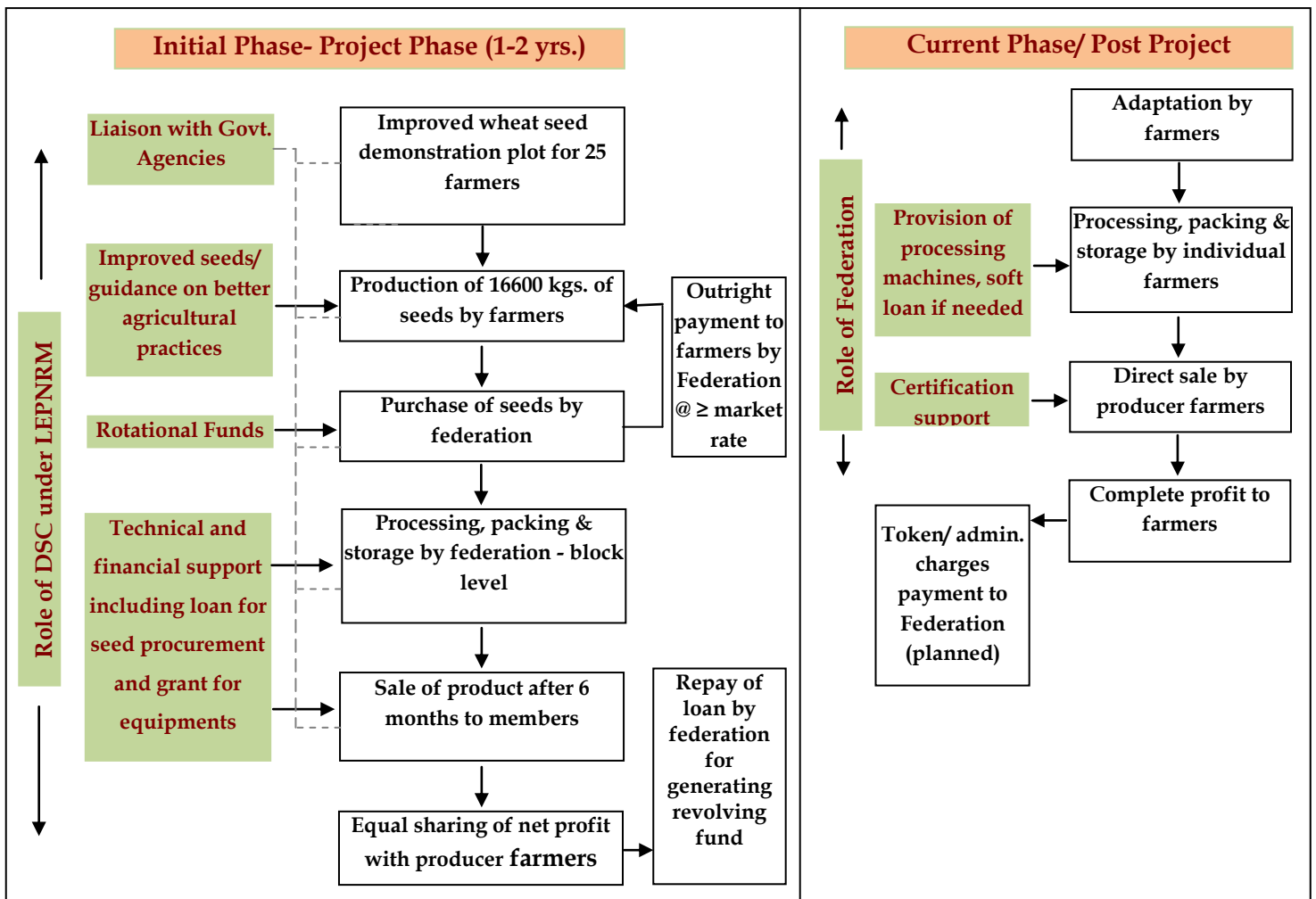
The federation under branch canal no. 2 covers 28 co-operatives with 5200 members in 28 WUAs across 24 villages. The co-operatives were formed during 1995-2004 for PIM activities and federation was registered in 2007 to take the PIM activities further.

Since 2008, federation has supported demonstration plot for 60 farmers (0.4 hectares each) for production of high quality wheat seeds and taken up processing of these seeds. For initial 1-2 years, federation managed the collection, processing, sale and marketing and shared net profit proportionately with the involved farmers. Now, it also promotes local processes through individual farmers to build their

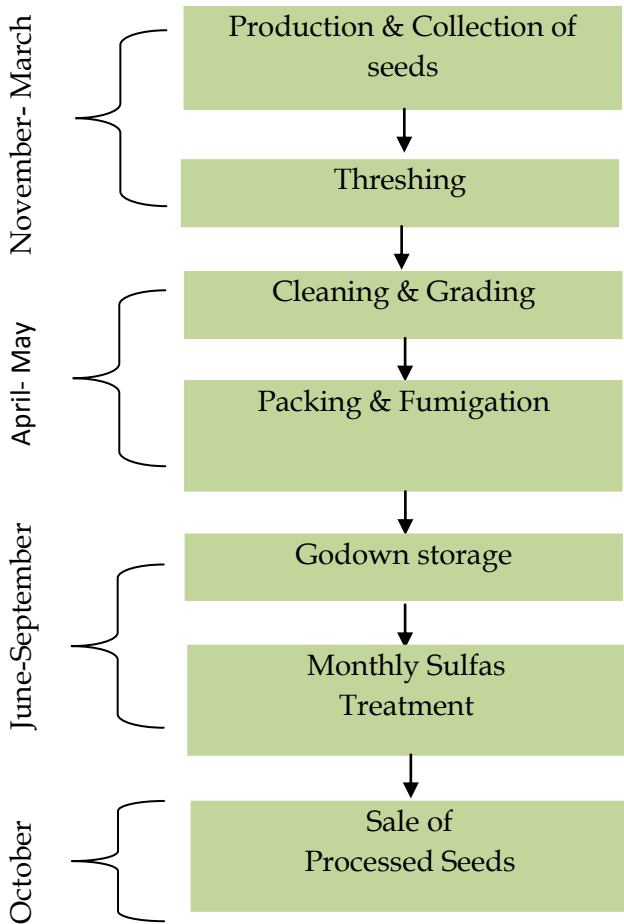


Dharoi Branch-2 Canal Network Map

capacities and reduce logistic costs.



## The Process



The federation signs agreement with farmers for seed production in the months of September-October. Federation's technical staff supervise and monitor the plots throughout the season. Wheat crop is harvested in March and taken up for processing to obtain high quality processed seeds. The first step of the process is preparation of detailed business plan for procurement and processing of seeds by federation. The physical process starts with threshing for detaching wheat grains from the harvested wheat crop and separate threshed wheat grains from the chaff. The next step involves cleaning and grading of seed grains, which is either done manually through various sieves or through motor operated machine. Cleaning of seeds removes impurities like weeds, immature seeds, other crop seeds etc., while grading helps in sorting varied quality seeds. After the grading, seeds are packed in special plastic coated jute bag of 30 kg and sealed with sealing machine. While packing, necessary medicines are added for preserving the seeds till next cultivation season. The packed bags are stacked and stored in godown and are treated with sulfas vapor every month till sale to avoid fungus attack. The processed seeds are later sold off in months of October-November.



Thresher Machine



Weighing Machine



Motor operated grading machine



Manual Cleaning/Grading



30 kgs packed bags of processed seeds



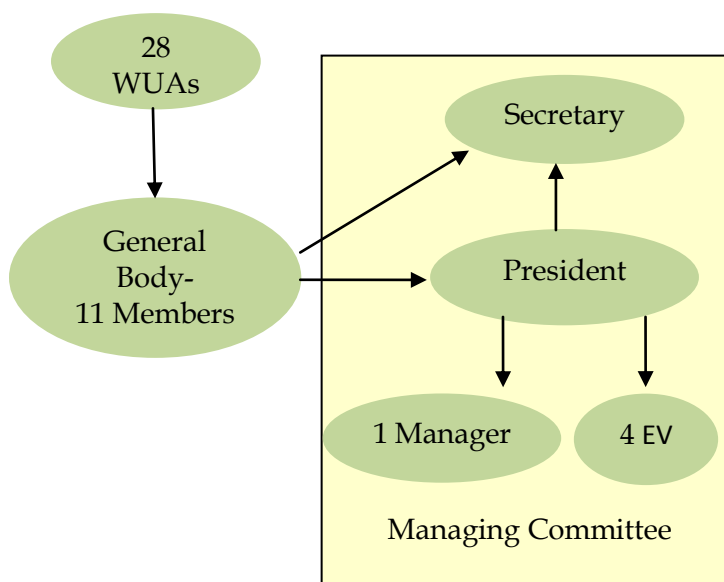
Bag Sealing Tool

## Farmer Selection Criteria for Demonstration

Federation identifies farmers for the demonstration of high quality wheat seeds cultivation based on following parameters:

- Good Soil condition
- Willing to adopt new practices
- Plot demo size less than 0.4 hectares
- Security of irrigation water
- Good road connectivity to farm

## Structure of Federation



WUAs in Dharoi are registered as co-operatives, serving a command area of 300-500 hectares with about 200-350 members. Federations are formed at branch level serving an area of 7000-14000 hectares. Each cooperative purchases shares in accordance to its irrigated land to become member of the federation. The federation is formed by the general body of member WUAs and managed by the Management Committee that looks after administration and land functions of the organization like equitable water distribution, dealing with government, collection of fees, deciding water tax/fees etc. Manager and extension volunteers (EVs) are hired by federation on honorarium. Extension volunteers are appointed from the local areas to carry out various activities in coordination with the farmers.

## Capacity Building Initiatives

Programmes for capacity building were taken up by DSC under the project for the members of federation and extension volunteers to enhance their skills and knowledge through exposure visits, workshops and farmer field days wherein scientists from KVKs, Agriculture Universities, Government Crop Research Centers, Private Companies and farmers participated. Four EVs

and 60 farmers across the branch-2 federation have taken following trainings:

- Three day basic training on agriculture for extension volunteers including exposure visits to Dantiwada Agriculture University and Main Wheat Research Station, Vijapur. The training included orientation of agriculture science particularly extension; planning, implementation and monitoring system of the LEPNRM project; roles and responsibilities of extension volunteers and village institutions for managing demonstrations; wheat crop demonstration methods; soil fertility management ; micro irrigation system and horticulture crops.
- Workshop for involvement of DSC's federations in LEPNRM Project: A two day workshop for federation leaders, DSC field teams and guest scientists for brain storming on issues that would ensure effective implementation and participation of the local institutions of DSC.
- As many as 38 field days for sharing experiences of wheat demonstration by the benefitted farmer and extension volunteers to other farmers.
- Crop manuals for the farmers in vernacular language to disseminate knowledge on appropriate crop practices.
- Training on Business Plan Development for the federation leaders and EVs.





## Cost- Benefit

Under the project, DSC supported the branch federations with grant for capital investment on machineries/tools and revolving fund for purchase of raw materials for each cycle. The federations mobilized matching funds for additional purchase of raw materials, carting and storage.

Typical cost of seed processing apart from purchase of wheat seeds comes to about ₹ 2.20/kg of raw wheat seeds. (Refer Table 2)

### A. Value Addition & Marketing

With the working capital of ₹ 1.4 lakh in form of grant supported under the project, federation has been able to earn net income of ₹ 0.35 lakh producing 29392 kgs. of processed wheat seeds within three cycles from 2008-2011. The average net profit of processed seed is about ₹ 1.19/kg.

The federation has also encouraged the farmers for seed processing at individual level that reduces processing cost from ₹ 2.18 to ₹ 1.70 per kg. The farmers in the local area have sold about 8500 kgs. of processed seed at individual level.

Type of Support	Details	Cost (₹ in lakhs)
<b>A. Capital Investment</b>		
Grant	Grader machine, packing/stitching machine, electric weighing machine	0.4
Revolving fund	Purchase of seeds etc.	1.00
Total capital investment		1.4
<b>B. Recurring expenses/other expenses for three years</b>		
Grant	Initial support for carting, bags purchase, packing etc.	1.00

Head	Particulars	Details	Cost/kg (₹)
Wheat seeds	Material cost		12.5
Carting	Purchase	₹. 30/100 kg bag	0.3
Grading Machine	Rent	₹ 25/100 kg	0.25
	Labour	₹ 5/100 kg	0.05
Packing	Bag	₹ 11.5/30 kg bag	0.38
	Labour	₹ 3.75/30 kg bag	0.13
	Bag printing	₹ 1.5/30 kg bag	0.05
	Plastic floor sheet	Lump sum	0.57
Medicines	Pesticides etc.	1 bag/100 kg- ₹ 5/bag	0.05
Storage Rent & watchman		Lump sum	0.4
<b>Cost of processed wheat seed (₹/kg)</b>			<b>14.68</b>

### B. Productivity Enhancement

Farmers have noted an overall increase in net income of ₹ 10000-12000/hectare due to:

- Cost reduction of ₹ 2000-3000/hectare due to adoption of better crop practices under the demonstration programme;
- Increased yield to about ₹ 4000-6000/hectare due to use of new improved seeds and;
- Value addition of up to ₹ 4000/hectare through seed processing

Year	Purchase			Sale			Processing cost# (₹ in lakhs)	Net Income (₹) (₹ in lakhs)
	Quantum (kg)	Rate (avg.) (₹/kg)	Cost (₹ in lakhs)	Quantum (kg)	Rate (avg.) (₹/kg)	Price (₹ in lakhs)		
2008-09*	16672	12.525	2.08	16630	15/15.5	2.5	0.26	0.16
2009-10**	5220	14	0.74	5220	15	0.78	0.07	-0.03
2010-11**	7500	16.25	1.22	7500	20	1.5	0.06	0.22
<b>TOTAL</b>	<b>29392</b>		<b>4.04</b>	<b>29350</b>		<b>4.78</b>	<b>0.39</b>	<b>0.35</b>

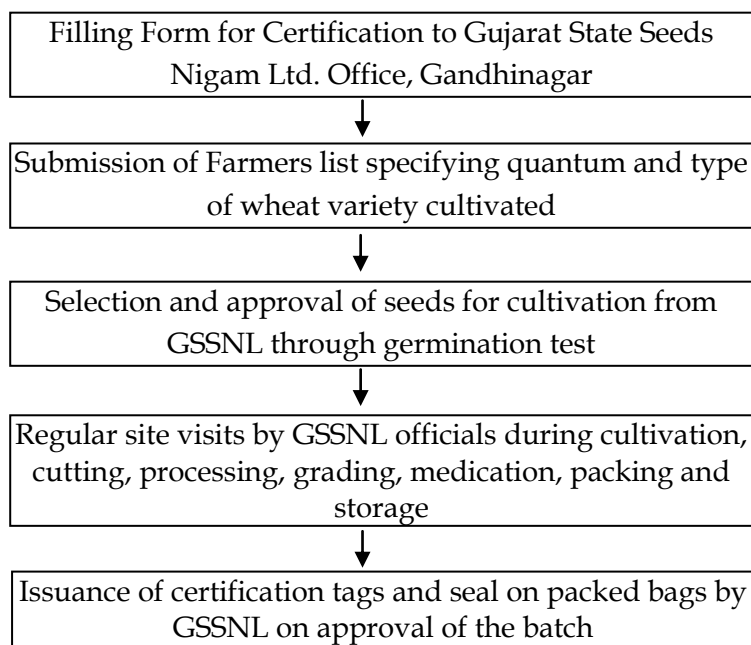
#Includes transportation, labour and packaging costs. \*Purchase of unprocessed seeds from farmers \*\* Purchase of processed seed from farmers  
Capital investment for processing machines supported under the project by DSC, as listed in chart above.  
Salary of EVs and Manager in the federation as well as administration costs like stationery etc., not computed as are shared for varied activities under federation. During the project phase about 40% of these costs supported by DSC.

## Comparative Overview of Wheat Seed Processing Methods and Cost-Benefit

Federations in Mazum and Dharoi irrigation network as well as producer company in Dhari have developed in-house expertise and technical resources for processing, medication/treatment, packing and storage of wheat seeds. Grant for purchase of basic equipments for cleaning, grading, packing and weighing as well as some percentage of recurring cost for initial 2 years is provided to them under LEPNRM project.

Federation in Guhai irrigation sublets the whole process of cleaning, grading, medication, packing and storage. This federation has availed license from Gujarat Seeds Nigam Ltd. (GSSNL), for production and supply of processed seeds since year 2009-10.

### Procedure for Seeds Certification from Gujarat Seeds Nigam Ltd.



Details of Wheat Seed Processing							
Federation/Producer Company	Irrigation Scheme Network	Project Office	Starting Year	No. of Demo Plots	Seed Type	Financial Support from LEPNRM (₹ in Lakhs)	
						Grant/loan	Recurring Expense
Branch Canal -2 Irrigation Co-operative Federation Ltd.	Dharoi	Visnagar, Mehsana	2008-09	60	GW 496, GW 322 & GW173 MP Sharbati	1.4	1
The Guhai Participatory Irrigation Co-op Federation Ltd.*	Guhai	Himmatnagar, Sabarkantha	2009-10	88	GW 496, GW 322	2.0	0.2
The Mazum Jalagar Irrigation Co-operative Ltd.	Mazum	Modasa, Sabarkantha	2008-09	78	GW 496; GW 322, GW 173 & MP Sharbati	1.59	0.46
Dhari Krushak Vikas Producer Company Ltd. *	Rain fed Area	Dhari, Amreli	2009-10	45	GW 366, GW 322, Lokvan		0.28
<b>TOTAL</b>				<b>270</b>		<b>4.99</b>	<b>1.94</b>

\*The Federation sublets the processing, medication, packing and storage to private party  
 \*\* The Producer Company carries out processing through local farmers

The processing cost of wheat seeds across various regions range from ₹ 1.1-1.87/kg of input seeds. The seed processing interventions have been able to increase market price of wheat by ₹1.5-5/kg, thus giving net return of ₹1.1-2.86/kg after processing.

Farmers in Guhai federation have been able to avail other benefits through certification of seeds. The major benefit of certification and licensing of processed wheat seeds is quality assurance to the buyers, which fetches higher market rate to the farmers. Normal market rate of processed seeds in Guhai region ranges from ₹ 12.5-15/kg. Farmers can avail up to ₹ 20/kg for certified processed seeds, thus providing them increased market value from 30-60%. Currently Guhai federation is selling certified processed wheat seeds at ₹ 22/kg. GSSNL charges nominal fees of ₹ 300/hectare of cultivation for certification service, which is about ₹ 0.075/kg of finished product. Normal duration of expiry of certified seeds is 3 years from packing.

Furthermore, after availing certificate for 2 years from GSSNL, Guhai federation has been able to get a nominal subsidy of ₹ 250/hectare from Central Government's Food Mission. This has reduced the cost of final product to about ₹ 0.1/kg.

Federation will be able to avail higher subsidy from State Government, once it gets the product certified for 3 years consecutively. This will support them in availing a subsidy of up to ₹ 5/kg for the finished product.

Similar interventions were done by Dhari Producer Company for processing of groundnut seeds which fetched additional ₹ 6/kg for market rate of ₹ 23/kg. The processing cost of groundnut was ₹ 3/kg. Hence, the producer company earned additional profit of ₹ 2/kg after processing, thus totalling to net profit of ₹ 15000 through processing 5920 kg of seeds.

**Comparitive cost-benefit analysis of wheat seed processing across various federations**  
(includes cost of cleaning, grading, medication, packing and storage)

Federation/Producer Company	Procurement			Total Process Cost	Sale			Net Profit	Avg. Process cost	Avg. Profit after process
	Amt. kg	Rate ₹/ kg	Cost ₹ in lakh)	₹	Amt. kgs	Rate ₹/ kg	Cost ₹ in lakh)	(₹ in lakh)	(₹/ kg)	Per kg
		*	X	Y		*	Z			Z-X-Y
Branch Canal-2 Irrigation Co-operative Federation Ltd.	29392	12.5-16.25	4.04	0.39	29350	15-20	4.78	0.35	1.33	1.19
The Guhai Participatory Irrigation Co-op. Federation Ltd.	23100	10-22	3.73	0.3	21460	15-26	4.47	0.43	1.3**	1.8
The Mazum Jalagar Irrigation Co-operative Ltd.	20270	10-13.7	2.44	0.38	20270	13.5-18.6	3.4	0.58	1.87	2.86
Dhari Krushak Vikas Producer Company Ltd. ◇	1600	11	0.18	0.017	1520	16	0.24	0.035	1.1	2.69
	720#	0	0	0.008	684	16	0.11	NA	1.1	NA
<b>TOTAL</b>	<b>75082</b>		<b>10.39</b>	<b>1.095</b>	<b>73284</b>		<b>13</b>	<b>1.395</b>		

\*\* includes processing and certification charges ◇ Local farmers have contributed in kind to some extent for processing  
\*Range for various years # Demo farmers have contributed towards wheat seeds free of cost to the company as rotational fund



### Cost Reduction & Productivity Enhancement through Use of Processed Seeds (Wheat)

Bhartiben Dashrathbhai Patel, a small farmer in Kamalpur village, Vadnagar block in Branch-2 of Dharoi command area purchased processed seeds from Branch-2 federation past year. She cultivates wheat every year in about 0.4 hectare of land. With use of processed high quality seeds, she has been able to reduce her input of seeds from 50 kgs to 35 kgs. She has replaced some portion of chemical fertilizer to organic manure last year. With better quality of seeds, she was able to produce a total of 2100 kgs of wheat in the season against merely 1400 kgs. in previous years. Moreover, she was able to fetch ₹ 17.5/kg of cultivation as against ₹ 15/kg in previous years. This has increased her income to about 30% from wheat.

“I have been able to reduce my investment cost by 30% and increase the productivity to 50% as well as market rate to 17% of my cultivation with processed seeds”

#### Key Lessons

- Promotion of better seed quality through processing leads to cost reduction in cultivation and provides better productivity to farmers.
- Seed processing is a good activity for promoting value addition and marketing for Farmers' Organizations working on enterprise model.
- Value addition to crop through seed processing can increase the price of the product by minimum 20%.
- Farmers' federation products can get better acceptance in the local community.
- The paid professionals and para workers can play a key role in managing farmers' entrepreneurship models.
- Technical and financial support to federation for 2-3 initial years is the key for successful farmers entrepreneurship based activities.

#### Way Forward

- Scaling up of wheat seed processing for better profitability as well as introducing other crops under local procurement, processing and distribution in order to avail year round benefits to federation and farmers.
- Developing Business Plan for scaling up the business.
- Scaling up of activities with financial support like soft loans etc., from NABARD and other finance institutions.
- Introduction of administrative fees/commission charges on farmers for decentralized seed processing to ensure sustainability of federations.
- Certification of seeds from government for expanding market, ensuring quality and availing higher market price.
- Involving large farmers along with small and medium farmers for scaling up the production and reducing transaction cost.
- Tie up with other Farmers' Organizations and government departments for sale of processed wheat seeds.

# Entrepreneurship Models through Vermi Compost Production

## LEPNRM Project

Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts with financial support of the RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under the project.

## Context

Deficiency of organic matters is one of the major reasons for poor health of the soils

across Gujarat state. Farmers have been using imbalanced quantity of chemical fertilizers like urea and DAP for decades, adversely affecting the soil health which declined the productivity of soils.

DSC promoted vermi compost under LEPNRM project in their field unit areas with an aim to improve soil health and reduction in cost of cultivations. The demonstrations under the project helped generating mass awareness about organic compost. During 2007-2010, more than 260 farmers have started preparing and using vermi compost in their fields in the project regions. Farmers have reported significant improvement in soil health and productivity since then. But it was observed that though farmers wish to use vermi compost, there is a demand-supply gap at local level.

To cater the huge demand of vermi compost in this area, DSC mobilized women groups to start large scale production of vermi compost through entrepreneurship model. DSC arranged series of exposures for the women SHGs. These SHGs were successfully involved in credit and saving activities for the past 3-5 years. Around 151 women across 4 field units of DSC are involved in 11 groups for vermi compost production within 3.5 years



## Vermi compost technology

Vermi compost is a method of decomposing organic waste to nutrient rich humus with the help of earthworms. These earthworms eat cow dung or farm yard manure along with other farm wastes and pass it through their body. In the process they convert it into compost. The sequential steps for producing vermi compost are listed in adjacent chart:



Typical Shed for Vermicompost



Row pits filled with mixture



Watering the mixture



Ready Compost



Packaging of compost

## **Sequential steps for preparation of vermi compost**

(For every batch of 5000 kg compost output)



\*Organic waste includes agricultural residues, sorghum/rice straw after feeding cattle, dry leaves, groundnut/wheat husk, waste vegetables, soybean residues, weeds, sugarcane trash, silk production residues, animal manures, dairy/ poultry wastes, food industry wastes, municipal solid wastes, biogas sludge, bagasse from sugarcane factories

## Preparatory Materials for Vermi Compost

### Production (For batch of 5000 kg.)

#### **Basic Infrastructure/ capital investment:**

- Green screen (45 ft. x 45 ft/ at least 2000 sq.ft.)
- Fencing poles (bamboo/wood/steel) - 12-16 nos
- Barbed wire (perimeter of shade)
- Gate: 10 ft. wide (metal/wood/steel)
- Weighing machine
- Water tank (500 litres), conveyance pipes (optional), water connection
- Earthworms: 20-25 kgs (one time)
- Cement: 1 bag (50 kgs), Bricks: 500-600 no.
- Sieve (2-2.5 mm hole size)

#### **Input material for every batch**

- Dry organic waste/ cattle dung - 8000 kgs
- Water: 800-1000 litres (3-5 liters /week/pit)
- Rock phosphate: 15-20 kgs. (optional for enriching compost as an added advantage to crop production)
- Packing bags: 100-100 bags (50 kg each)
- Polythene sheet\*: big enough to cover pits (about 12 x 4 ft for 10 ft long rows- 16 pits)
- Gunny bags\*- app. 100 nos.

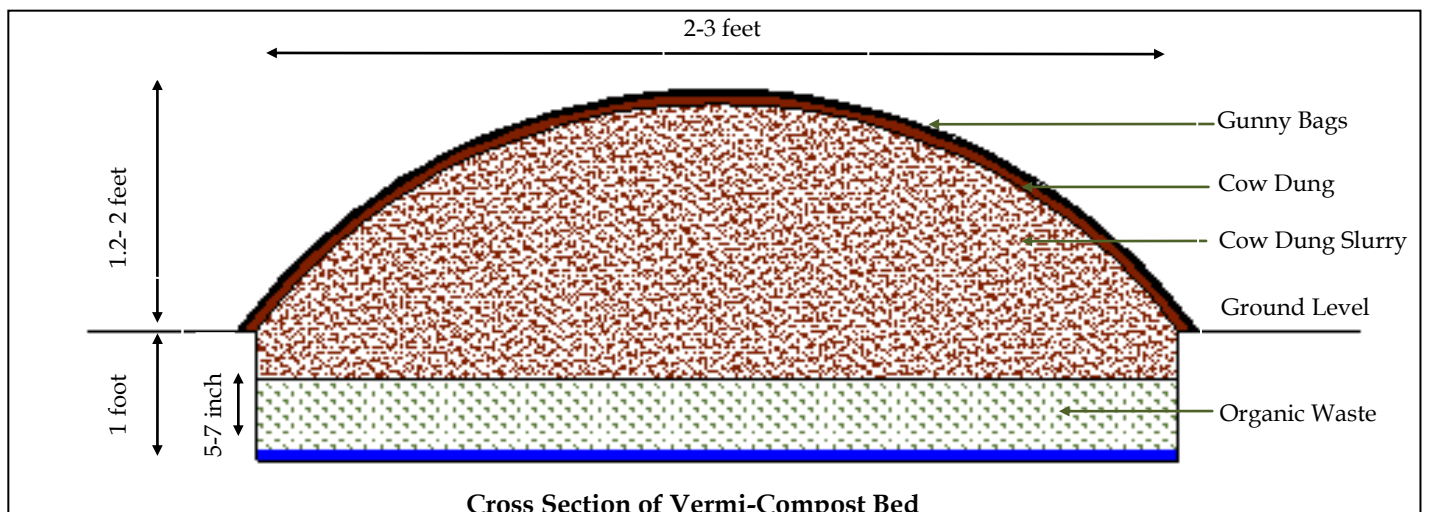
\*can be reused for 3-4 batches

### Dos & Don'ts

- Use non-burrowing red/purple type earthworms which can digest 90% organic waste.
- Avoid pale-coloured burrowing worms inside the soil which eat 90% soil.
- Use only plant materials (vegetable peelings, leaves or grass). Remove glass, metal and plastic materials from the organic material. Always use chopped and wilted organic residues.
- Protect against ant, rat and birds by covering the earthworms with jute.
- Bed temperature should be in range of 20-30 degrees centigrade.
- Sprinkle water regularly and maintain moisture levels (50-60% moisture in pits).
- Avoid low lying areas to avoid flooding.
- If possible, the length of the vermi shed should be in north-south direction

### Tips

- Mixture of cattle dung with vegetable wastes forms ideal feed for worms.
- Addition of neem cake in small quantity enhances growth of worms.
- Biogas slurry aged aerobically for 15 days enhances vermi composting process.
- Compost should be dark brown in colour with fine smell and should have 15-20% moisture in it.



**Cross Section of Vermi-Compost Bed**

## The Kesimpa Model

### **Commencement**

15 SHG women members from Kesimpa village of Vadnagar block, Mehsana District started Vermi Compost enterprise (“Sahyog Vermi Compost Mahila Mandal”) in February 2010, with initial investment of ₹ 62000 (₹ 12000 group Contribution and ₹ 40,000 grant from DSC). Kulsumben, one of the members of the group, allocated the land for shed on rent. DSC provided extensive support for training and production. Now women are trained and manage the enterprise on their own. Every batch can produce 5000 kgs of vermi compost.

### **Operation & Management**

Work is equally distributed among members voluntarily for watering, processing and packaging. Cow dung is used as organic waste and is purchased from the households of the group members. Four women volunteer for collection of dung from members’ households in trucks. The mixture in each batch is prepared and spread in pits by all the members. Watering is done by members on rotational basis. The first batch of compost gets ready in 60 days. Now they manage to take 5 batches in a year with 45-60 days cycle per batch. The prepared compost is then passed through sieves and the ready compost is packed in 50kg bags. All the members participate equally for sieving and packing. The ready compost bags are then sold to farmers in and around the village at ₹ 200 per bag.

Currently the compost is sold in the neighborhood and village itself and some quantity is purchased



by members for their own cultivation. The income is utilized for purchase of materials for next batch and circulated as internal loan within members. Members currently withdraw money only for their labour work.

The group generates income from sale of compost as well as sale of earthworms replicated in each batch. Within one year, the group has been able to generate additional income of ₹ 7500 through sale of worms.

### **Salient Features of Unit**

- Vermi compost bed area: 45 x 45 ft = 2025 sq.ft.
- Type: Fenced, green covered, vermi bed rows with polythene base
- No. of rows: 16 (each of 10ft length x 2ft. width x 1 ft. depth from ground level)
- Batch cycle 45 days (first batch @ 60days)

### **Input per batch**

- Raw material: 4 trolleys (app. 4 brass /8000 kg)
- Worms: 140 Kg , Water: 100 litres

**Output per batch:** 5000 kgs. compost

**Output per year:** 20000 kgs. (5 batches)





## Cost Benefit Analysis – “ Sahyog” Enterprise Model”

### Capital Cost

- Shed construction with green net: ₹ 31000
- Fence (Optional): ₹ 8000
- PVC Water tank (500 lt): ₹ 1500
- Earthworms: ₹ 7500

**Total Capital Cost: ₹ 48000**

### Recurrent cost per batch (5000 kg output)

- PVC sheet/Tarpaulin: ₹ 860
- Cow dung and waste: ₹ 4000
- Gunny Bags: ₹ 675
- Packaging bags: ₹ 1100
- Printing for packaging: ₹ 300
- Labour for packaging: ₹ 3000
- Rent for shade area: ₹ 120

**Total recurrent cost per batch: ₹ 10055\***

\* Cost of watering and sundry maintenance not considered, as their cost is nominal and generally volunteered by group members

### Returns per batch

- Income from sale of vermi compost : ₹ 20000  
(for 5000kg @ ₹ 4/kg)
- Income from sale of worms : ₹ 2000 (20kg @ ₹ 100/kg)

**Total returns per batch: ₹ 22000**

**Net returns per batch: ₹ 11945**

**Net returns per year: ₹ 59725 (for 5 batches)**

**Payback period: Less than one year**

### Benefits

Within one year of operation Sahyog Vermi Compost Mahila Mandal sold vermi compost worth of ₹ 1 lakh (25000 kgs) and has been able to generate ₹ 60000 net income. A broad cost benefit analysis of enterprise unit for vermi compost, Kesimpa model shows that vermi compost production unit can have payback period of less than a year, if managed effectively. Each member

would be able to earn sustainable income of at least ₹ 4000/year under this model.

This compost is also used by group members in their own fields. Some of the SHG members have noticed significant improvement in soil condition and quality of Bajri crop production in the first year itself.

### Achievements and replication by Government Department

This success story of Kesimpa has not only inspired other groups and farmers in and around the region to adopt vermi compost, but also been acknowledged by district administration. The case finds prominent space in promotional literature by government. In August 2010, the District Development Officer and Collector, Mehsana visited “Sahyog Vermi compost Enterprise” to understand the technology, institution mechanism and benefits to the women from the activity and invited local team of DSC to share its experiences in district level workshop. The workshop was attended by about 1000 participants including Government officers and Panchayat Sarpanchs. Encouraged by the successful model, the Collector-Mehsana developed a scheme for replicating it in the entire district. The official circular was issued to Agriculture Department and Panchayati Raj Department for implementation of the activity in the district. The Kesimpa model has inspired more than 300 women to start this intervention in other blocks.

### Further Course of Action

- Currently, the marketing is done by word of mouth in the neighborhood . However, group is looking forward to market their product in a more organized way by extensively reaching to the community by circulation of pamphlets and other literature.
- The surplus income generated by group is not distributed among members, but deposited in the account and used for internal loans. Members are planning to retain net income for increasing their turnover and taking an additional batch/year to augment their income.
- To target households and small farmers, the group is planning to sell manure in smaller packs of 25 kg and 10 kg at higher rate per unit.

- Group is planning to sell produced earthworms in a more organized way by proper marketing to augment their income.

### **Benefits of Vermi Compost**

#### *a. As compared to chemical fertilizers*

- Supports organic farming without toxins
- Improves soil aeration and texture
- Reduces soil erosion
- Improves soil water retention capacity
- Produces crops with a better taste, luster and lasting quality without toxic residues
- Easy to produce and low cost
- Induces resistance to pest attack and disease
- Increases crop yield with less irrigation

(Farmers in DSC's intervention areas have noted about 20-30% decrease in irrigation water with use of vermi-compost and increase in watering intervals up to 5 days)

- Control on weeds & reduction in weeding drudgery

#### *b. As compared to farm yard manure*

- Significantly enhances the nutrient profile of

NUTRIENT PROFILE		
Nutrient	Vermi Compost	Farmyard manure
N (%)	1.6	0.5
PO (%)	0.7	0.2
KO (%)	0.8	0.5
Ca (%)	0.5	0.9
Mg (%)	0.2	0.2
Fe(ppm)	175.0	146.5
Mn(ppm)	96.5	69.0
Zn(ppm)	24.5	14.5
Cu(ppm)	5.0	2.8
C:N ratio	15.5	31.3

The values are subject to variation depending on waste.

Source: Punjab State Council for Science and Technology, Chandigarh

animal manure, thus adding value to traditional fertilizers.

- Has a higher nutrient value

#### *c. Benefits from By-Product*

Vermi-wash is a by-product extracted during production of vermi-compost. It is an excellent plant growth regulator and can be used as foliar spray. It contains high amount of enzymes, vitamins and useful hormones along with macro and micro nutrients. It is also useful in prevention of pest attack and diseases.



Vermi wash can be easily extracted from the vermi compost production beds through outlet pipe and a collection pot. About 1 litre of vermi wash is extracted per 50 kg of compost produced.

A solution can be prepared with vermi-wash: water ratio of 1:10 in volume. This solution can be sprayed on the leaves in evening for growing crops. Another solution of vermi-wash, cow urine and water can be prepared in a volumetric proportion of 1:1:10. This solution should be kept overnight before spraying. About 100-125 litres of such solutions can be sprayed per hectare of land to control crop diseases.

d. Cost saving & higher returns from cultivations

- The comparative analysis of cost and returns for Rabi wheat production using chemical fertilizer against vermi compost in Visnagar area shows that use of vermi compost can add to savings of ₹ 1750/hectare, if it is self produced.
- Such organically produced crop has higher market rate, if produced consistently for 2-3 years, thus fetching additional income of ₹ 11250/hectare.
- Thus overall benefit of using vermi compost can be ₹ 10500-13000/hectare.

**Comparative analysis – Cost Savings and Returns**

**Rabi Wheat Production**

**Using Chemical Fertilizer:**

- Cost of chemical fertilizers (DAP, Urea)/ha:  
₹ 2250
- Production per hectare : 2250 kg
- Average sale price: ₹15/ kg
- Average watering: 6 times @ 15 days interval
- Cost of watering: ₹ 6000

**Using Vermi compost:**

- Cost of vermi compost /hectare: ₹ 1500 (if produced by farmer ); ₹. 4000 (at market rate)
- Average production per hectare: 2250 kg
- Average sale price: ₹ 20/ kg ( selected buyers)
- Average watering : 5 times @20 days
- Cost of watering: ₹. 5000

**Total Benefit by use of vermi compost:**

- ₹. 13000/hectare (self produced compost)
- ₹. 10500/ hectare ( compost purchased at market rate)

**Household level Production and Use of Vermicompost**



**Household level Production and Use of Vermicompost**

Ratan Singh Jhala from Vakhtapur village, Himmatnagar initiated vermi-compost production in year 2009 with financial support from LEPNRM Project. He has constructed a shed of about 70 sq.mt. area. He has received financial support of ₹ 9505 from the project and has contributed ₹ 7665. He produces 250 kg. of compost per batch and has produced about 20,000 kg. in 2 years. He utilizes the compost in his own farm. He also collects vermi-wash of 5 litre per batch from compost production and sprays it on crops for disease control.

He has completely replaced chemical fertilizers with vermi-compost and chemical pesticides with bio-pesticides made from cow urine in about 1.2 hectares of land.

Ratan Singh has noticed drastic impact on production of wheat which has increased to about 1.5 times. The current production of wheat is 2250 kg/hectare. Due to improvement in soil water retention capacity, he has been able to save 1-2 watering. He has also observed softening of soil, reduction of weeds and better taste of wheat products.

## Learnings

- The technology of vermi compost production is simple, low cost and requires raw materials that are available locally.
- Local production and sale at village level through enterprise models can provide source of additional income for rural communities.
- Vermi compost production through entrepreneurship model builds the capacity of rural women.
- It is a good income generating activity that can be managed at household level.
- The intervention through entrepreneurship model has good prospects for SHGs as they can bring in capital investment.
- Vermi compost production initiative requires small capital investment with payback period of less than a year.

## Challenges

- There is less awareness about the use of vermi compost for sustainable gains amongst small and marginal farmers.
- Lack of space is a major issue in scaling up the production.
- Ensuring consistency in quality of compost with increased production is another issue for scaling up the initiative at local level.

## Way Forward

- Extensive awareness generation for farmers on tangible benefits of vermi compost should be taken up to generate demand.
- Linkages of similar entrepreneurship models through Government livelihood promotion schemes can be taken up for large scale adaptations.
- Decentralized production should be promoted at village level to cater demand-supply gaps and reduce logistic costs.
- Linkages with local federations and SHGs for better market acceptance can also be looked upon for scaling up of initiatives.
- Animal husbandary should also be looked upon in villages planning for large scale production of vermi compost.
- Linkages with NABARD, CAPART and other rural credit organizations can help in availing venture capital for promoting similar models.
- Preparing demand based crop specific compost with various added cultures to promote tailor made compost as per farmers' needs can help in trapping larger market.
- Testing of vermi-compost by authorized laboratories should be promoted for quality management and better marketing.
- Utilization of other biomass can be taken up in scientific proportion to ensure utilization of local waste and cost reduction in production.

# Enhancing Food Security & Nutrition of Women Farmers Through Kitchen Garden- Low Cost Micro Drip Irrigation

## Background

Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts with financial support of RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under the project.

## Context

DSC has been promoting drip irrigation technologies for optimum water use. It was observed that conventional drips were costly for small cultivators and unit cost of system was higher for small land holdings. DSC, thus collaborated with Reliance Plastic, Ahmedabad and Navsari Agriculture University (NAU) for fabrication of low cost micro irrigation system for small and marginal farmers. Moreover, DSC wanted to involve women in LEPNRM project, as their participation was not so encouraging in crop and technology demonstrations. Kitchen garden combined with drip irrigation system was one activity that could interest women cultivators as it is easily manageable, operated at homestead, requires low investment and is a continuous activity which can fulfill their food requirements, and can also be taken up as an activity for additional income generation. DSC involved existing members of women SHGs formed under PIM and watershed projects in their project areas for easy planning, implementation and monitoring of the activity.

## Intervention

The interventions included financial and technical training support for installation of drip system and/or high quality seeds from federation to women farmers and marginal cultivators for cultivation of vegetables in their backyards.

### A. Micro Drip Irrigation

A unit consists of PVC tank of 500 liters capacity, tubes and plastic laterals that cost ₹ 1500 -2700 with tank and ₹ 700 - 1700 without tank. It serves 90-150 vegetable plants. DSC supports 80% of cost of system, while 20% cost is borne by the beneficiary.

### B. Back Yard Vegetable Cultivation

Women farmers, specifically with small, marginal and medium size land are able to cultivate seasonal vegetables in backyard with support of micro drip irrigation. The size of kitchen garden ranges from 500-1500 square feet. In areas with acute water shortage, the farmers divert even the kitchen waste water to these cultivation areas.

Farmers adopting the systems are able to suffice their yearly family demand of vegetables, thus reducing annual expenditure by about ₹ 15000-20000 and also ensuring their nutrition. Some families have started taking up the initiative for income generation by scaling it up.

Project has been successful in promoting low cost micro drip irrigation system in about 16 households across field units of DSC. About 5210 households in irrigated as well as non-irrigated areas across six field units have adopted backyard vegetable cultivation.



**“Our family has cultivated a habit of eating variety of vegetables and not just green chillies. This has improved our health”**

**Krishnaben Thakore,**  
(medium sized farmer,  
Jagapur village, Mehsana)

Her family resides in isolated agricultural farms. They had to travel 10-15 kms daily to fetch vegetables and had adopted a habit of eating green chillies as a substitute to vegetables. In past 2 years, she has adopted backyard vegetable cultivation in about 150 square feet area, which suffices her family's yearly needs for vegetables, and has improved their nutrition. It has reduced stomach-acidity problems due to replacement of chillies.

## The Low Cost Micro Irrigation Technology

Low cost micro drip irrigation involves technology for irrigating plants at the root zone through emitters fitted on a network of pipes (mains, sub-mains and laterals) in a slow yet steady pace promoting “more crops per drop”. Drip irrigation technology generally results in a significant yield improvement over traditional irrigation practices such as flood irrigation.

### Components and Set Up (Refer Illustration Below)

(For 500-1500 sq. ft. kitchen garden)

1. Set up a PVC water storage tank on a firm base at about 3 feet height as water source.
2. Connect the tank with control valve (plastic/metal) to regulate pressure/flow of water. (Optional)
3. Connect it later to filter unit to ensure cleaning of water and prevent blockage of pipes.
4. Connect it with Polyvinyl chloride (PVC) main conveyance pipeline (2 inch diameter)
5. Further connect it with similar size PVC sub main pipe if needed (optional)
6. Connect the conveyance pipes to PVC/rubber lateral pipes (½-1 inch diameter @ 3-4 feet spacing)
7. Connect the lateral pipes to PVC/rubber micro tubes/emitters (½ inch @ 3-4 feet spacing) at 2-3 feet depth from ground through which the water will be discharged to plants. Put pin holes in these tubes for water discharge. There should be one emitter/plant.

### Material Requirement

(For 1000 sq.ft. area of homestead plot)

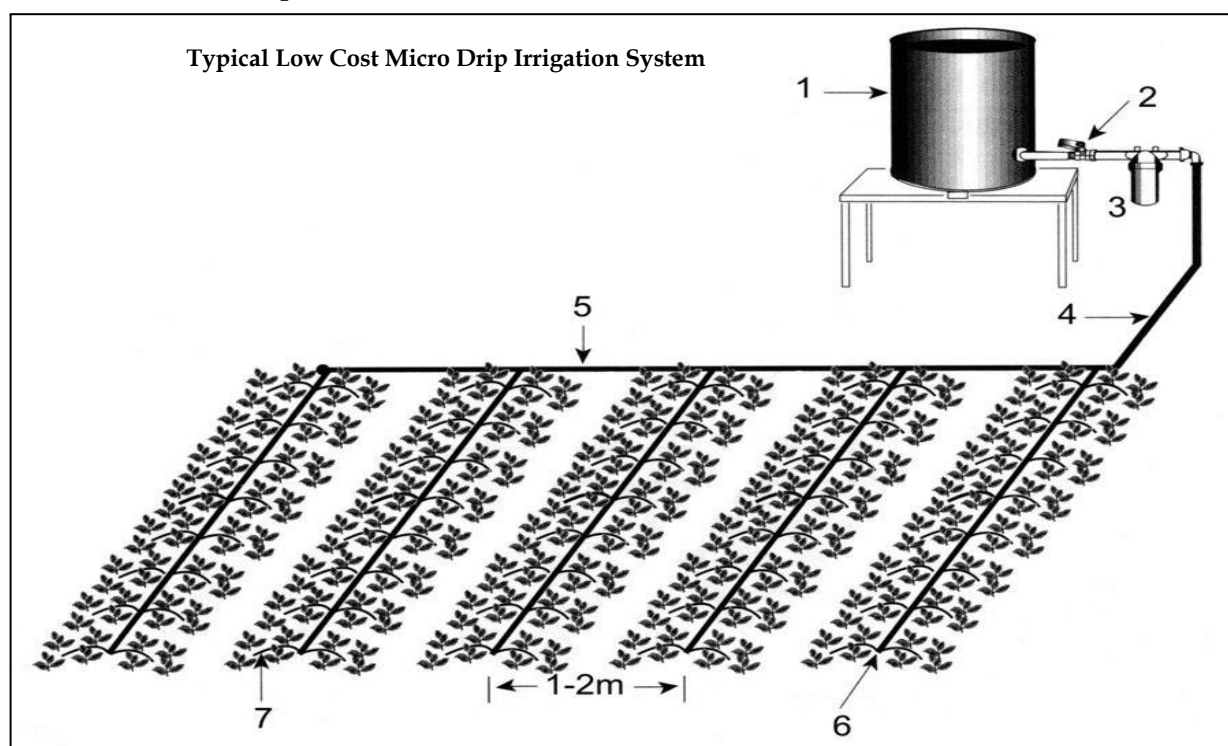
- PVC water tank : 500 litres
- Bricks/stones (platform for tank) : lump sum
- Control valve : 1
- Filter unit : 1
- PVC conveyance pipe (2" diameter): 8-10 feet/as needed
- PVC/rubber sub-main pipe (2" diameter): 30-40 feet/as needed
- PVC/rubber lateral pipe (½-1 diameter): 300-350 feet
- PVC/rubber micro tubes (½ diameter): 100-125 feet
- Plantations: 100-125 nos. in each batch

### Operation

The drip system must be operated about 2 hours a day at an interval of 3-4 days. This will ensure about 2-2.5 litres/hour of discharge per emitter, which is sufficient for kitchen garden.

### Maintenance

- Dripper and filters are susceptible to clogging due to salinity in water. Hence the holes/emitters and filter must be cleaned every 15 days. Filter can be washed with clean water, while holes can be cleaned with pin.
- Laterals and pipes may need yearly repairs/replacement of parts.





Typical Micro Drip Irrigation System Being laid in Backyard



PVC storage tank on raised platform

### Benefits of low cost micro irrigation against conventional drip irrigation system

- Less capital intensive - suitable for small and marginal cultivators and backyard cultivation.
- Available in small packages and expandable as per need. Parts are easily available in market
- Requires low pressure for operation
- Easy in installation, operation and repair. Suitable for marginal cultivators.
- Early payback period - normally 2-3 months against about 1.5 years in conventional system .

### Vegetable Cultivations for Kitchen Garden

Vegetable cultivations can be taken up year round with production cycles ranging from 45-60 days.

Cultivations promoted under LEPNRM are :

Kharif/ Monsoon (June-July): bitter gourd, cucumber, guvar, tomato, bottle guard, corriander, mint leaves, green chilli, brinjal, ginger, turmeric

Winter (Oct-Nov): cabbage, carrot, tomato, corrainder, onion, mint, spinach, methi/fenugreeek, beet root, green chilli, brinjal, sarsav/green mustard leaves , okra, raddish

Summer (Feb-March): guvar/cluster beans, corrainder, methi, okra, brinjal, tomato, parvar

### Cost-Benefit Analysis (Area served: 1000 sq.ft. )

#### Basic Details

- System Components: PVC tank of 500 litres + PVC/rubber pipe + plastic laterals + filter tank)
- Vegetable plants served: 90-100 in each batch
- Refill of tank- every 3-4 days.
- Irrigation: 2 hours/day at an interval of 3-4 days
- Total water consumption: 40000-50000 litres/year
- Expected output: Approx. 10-12 kgs/day for average 200 days/year
- Monthly maintenance: cleaning of filter tank and laterals

#### Investment and Recurring costs

- Standard Investment Cost: ₹ 2400 for the system
- Cost of seeds : ₹ 200/ year
- Cost of water: nominal charges under the village water tax
- Annual repair cost (change of tapes/plastic laterals): ₹ 200
- Cost of organic manure (50 kgs/year) : ₹ 200/year

#### Cost-Benefit (Per annum)

- Recurring costs: ₹ 600
- Gross income from vegetables/savings on vegetables by family: ₹ 20,000
- Net income : ₹ 19000

Payback period of micro drip system: 2-3 months

Note: Currently the drip system and seeds are provided by DSC (20% contribution by benefitted family for micro drip



## Income Generation through Backyard Kitchen Garden

**Sajanben Rajuji Thakore, Jagapura Village, Vadnagar, Mehasana**

Sajanben is a small farmer. Her family works on leased land in Jagapura village. Last summer she had developed a vegetable cultivation in about 0.2 hectare unused area of the leased land. DSC provided improved seeds for kitchen garden. With open well irrigation; she was able to cultivate 600 kg of Guvar last summer. The total cost of labour, water pumping and manure was ₹ 5000; while net earnings in a season were ₹ 13000.

Now, she plans to diversify vegetable cultivation for year round income generation.

### Benefits of Interventions

- Utilization of backyard land for cultivation
- Reduction in expenses on vegetables against availing from market (About ₹ 1000-1500/family/month)
- Increased productivity of vegetables with limited/optimum water use
- Increased use of varied vegetables for small-marginal farmer families
- Year round availability of seasonal vegetables at door steps
- Increased nutritional value due to use of diverse vegetables specifically for marginal farmer families
- Increased income due to sale of additional vegetables

- Adoption of tailor made packaging for drip system increases ease in installation, maintenance and repair for small cultivators.

### Way Forward

- Wider outreach to small and marginal women farmers through soft loans, credit and subsidies etc.
- Linkages of community with central/state government schemes for storage, packaging etc.
- Improved efficiency of micro drip system through training can help users in its annual maintenance and regular cleaning.
- Up scaling the activity from backyard to conventional farming through decentralized irrigation system and improved outreach size of drip system
- Promoting women farmers to upscale the initiative into income generation activity.
- Training some women as local service providers for installation and maintenance of the low cost drip system.

### Key Lessons

- Quick returns against investment as well as additional income at homestead allure marginal cultivators and women
- This activity helped in increasing overall women participation in on-farm livelihood promotion programme

## Enhanced Food Security & Nutrition through Backyard Kitchen Garden supported by Micro Drip Irrigation:

**Case of Shantaben Choudhary, Kajiliyasana Village, Visnagar, Mehasana**

Shantaben, a medium farmer in Kajiliyasana village owns about 2.5 hectares of land. She was able to cultivate only 50% of her land due to water shortage. Her family used to cultivate vegetables earlier in the agricultural land but could not suffice her family needs from it. She has adopted micro drip irrigation and cultivates vegetables in her backyard in about 1100 sq.ft area since two years. She received 80% financial support from DSC for the micro irrigation kit (500 litres PVC tank + tape and plastic laterals with filter) costing about ₹ 2400. Vegetable seeds were provided by DSC through federation and water requirement was met by household water. She also adds a total of 30 kg of vermi compost/organic manure per year to her kitchen garden.

Shantaben is now able to cultivate about 8-10 kgs. of vegetables daily for average 7 months, which suffices her family needs, thus saving her annual expenditure to about ₹ 18000-20000. She gives away surplus vegetables to neighbours and relatives. She has been able to invest the savings for paying for her husband's life insurance.





# Livelihood Enhancement through Production & Use of Bio-Pesticide (Cow Urine based)

## Background

Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts with financial support of the RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under the project.

## Context

Over a period of work under LEPNRM project, DSC's staff observed decrease in soil fertility and increased toxic substances in crop products due to use of chemical pesticides. Moreover, it was observed that these chemicals though useful in controlling pests are costly for small and marginal farmers. DSC was thus inspired to promote organic product for control of pest, which could be easily prepared by local communities with the use of local materials.

Field unit of DSC, Himmatnagar piloted production of highly effective cow urine based bio-pesticide with 33 items. The demonstration of use of bio pesticide was

successfully piloted in Himmatnagar for crop seasons from 2009 on brinjal, cotton and other crops. The Guhai Participatory Irrigation Co-operative Federation Ltd., Himmatnagar took up the initiative in its region to produce and sell this bio-pesticide to avail income for federation and promote better agricultural practices in the region. Several exposure visits were arranged for staff and farmers from other field units of DSC to Himmatnagar for sharing the experiences of bio pesticide production and use. Encouraged by the benefits, farmers across Vehalal, Dharoi, Modasa and Meghraj units have also started preparing and using bio-pesticide with the similar formula.

Only men have been involved in the production process across all the federations due to issues of raw material collection and installation of production units outside main village habitat. However "Sangam Women's Federation" in the tribal area of Meghraj have shown courage to manage the production with women's group successfully due to large availability of raw materials in local forest region and benefit of house location in the farms itself.

## Intervention

The interventions for production included financial support for capital investment on along with training support. A total financial support of ₹ 86672 has been given to federations/farmers under LEPNRM project for commencing bio-pesticide production. Project has been successful in production of about 8300 litres of bio-pesticide through federations and individual farmers in 5 field units within three years. More than 330 farmers in 5 field units have adopted the use of bio-pesticide.

Guhai Federation has been able to earn net profit of ₹ 52,200 within 2 years with total sale of 2680 litres of bio pesticide.

## About Bio Pesticide

With increased demand for food production and attraction of farmers for boosting their cultivation, intensive use of chemical pesticides is observed in India. These pesticides have proved useful in control and eradication of insects, pests and diseases; but are also responsible for damaging useful organisms in soil and adversely affect soil fertility. Moreover they leave toxic contents in crop produce, damage soil layer and pollute land and groundwater on longer run.

Bio-control is the best method to compensate the losses made by the chemicals. In this process, insects, pests and pathogens are removed using biological methods without harming the environment and other organism. Conventional chemical pesticides are made from synthetic materials, while bio-pesticides are made from natural materials like plants, animal waste matter, bacteria and certain minerals etc. mostly available in local areas

Some of these types of bio-pesticides used in various regions are cow urine, fermented curd water, dashparni extract, neem -cow urine extract, mixed leaves extract, chilly-garlic extract etc.

### Cow Urine Extract

In India, cattle rearing go hand in hand with farming. So cow urine is easily available in rural areas. Cow urine based bio-pesticide is known for the control of pests and it acts as a growth promoter for the crops.

## Preparation of Cow-Urine based Bio-Pesticide

### A. Material Requirement (for output of 80 litres)

No.	Item	Qty.	No.	Item	Qty.
1	Plastic /RCC tank - 500 litres capacity	1	18	Ratanjyot/Jetropha leaves	700 grams
2	Cow-Urine (local breed) - fresh	100 litres	19	KuvarPathu	1.5 kgs
3	Neem leaves	6 kgs	20	Bhorangli leaves	1 kg
4	Akado	400 grams	21	Methi powder (leaves)	1.5 kgs
5	Tulsi leaves	400 grams	22	Turmeric	700 grams
6	Karan leaves	700 grams	23	Kachki powder	700 grams
7	Arni leaves	1 kg	24	Vavdi powder	800 grams
8	Ardusi leaves	800 grams	25	Garlic	500 grams
9	Ketki leaves	700 grams	26	Tobacco waste	1 kg
10	Kanji leaves	700 grams	27	Eranda Khol	2 kgs
11	Kukadvel leaves	700 grams	28	Morthathu	400 grams
12	Darbh	700 grams	29	Bajri flour (sour)	2 kgs
13	Bitter Saragva leaves	3.5 kgs.	30	Asofoetida	250 grams
14	Vakhada leaves	2 kgs.	31	Lemon pieces	1.5 kgs
15	Dhatura leaves	500 grams	32	Gugal	400 grams
16	Pieces of Thor	1 kg	33	Lime	750 grams
17	Ganda Baval leaves	1 kg	34	Kapur	100 grams

### B. Preparation Method

1. Cut all the leaves and other medicines into small pieces and pound them into powder.
2. Mix all the pounded ingredients and other materials with cow urine into the tank.
3. Stir the mixture for about 15 minutes with bamboo/wood stick.
4. Close the lid of the tank
5. Let the mixture decompose anaerobically into the tank for 20-25 days.
6. Filter the mixture and pack them into plastic containers.



Material Collection and Preparation



Mixing and decomposition of mixture



Sieving and Packing of Final Product

## Precautions for preparation of Cow-Urine based bio-Pesticide

- Use fresh cow-urine as far as possible
- To prevent bursting of airtight tank containing mixture for decomposition, minute hole should be made on the tank with needle for the release of gases.

## Benefits of Use of Cow-based Bio-Pesticide

- Easy to prepare and local level product.
- Easy availability of local material and labour for preparation resulting in lower cost compared to chemical fertilizers
- Improved resistance of crops against diseases. Farmers using cow-urine based pesticide in DSC field unit region have noted good resistance of crop from pests and worms. Few farmers have also noted decrease in pig menace due to strong smell of this pesticide.
- Improved resistance of crop against extreme weather.
- Increase in crop production .
- Better taste in crops and vegetables produced.
- Decrease in crop production cost
- Effective if used in small quantities.
- Decomposes quickly, thereby resulting in lower exposures and minimal environmental pollution.

## Usage of Cow-Urine based Bio-Pesticide

Add 10 gram Asofoetida, 1 litre sour buttermilk, 450 grams of bio-pesticide in about 13 litres of water and sprinkle this fresh mixture 3-4 times per crop at an interval of 10-15 days. 20 litres of bio-pesticide is required in 1 hectare for each cropping season.



## Cost-Benefit Analysis

### A. Production of Bio-pesticide

Production of bio-pesticide requires an investment of ₹ 2400 for 100 litre batch. Producers can fetch net profit of ₹ 21.25 per litre. The investment is recovered from the first batch itself.

#### Cost- Benefit Analysis for Production of Cow-Urine Based Bio-Pesticide (batch of 100 litres input material)

Investment Cost:

- PVC/RCC tank: ₹ 900 (150 litres capacity)

Recurring Costs

- Cow urine: (100 litres \* ₹ 5/litre) : ₹ 500
- Other ingredients : ₹ 500
- Labour: ₹ 300
- Packaging materials: ₹ 200

Total input cost/batch: ₹ 1500

Total Income from Sale (80 litres \* ₹ 40/litre): ₹ 3200

Net income from each batch: ₹ 1700

Net income per litre of production: ₹ 21.25

### B. Use of Bio-pesticide

The major benefit from use of bio-pesticide is 75% reduction in cost of the input material against chemical fertilizers and increase in production of crop to about 5-10%. The per hectare benefit of cultivation through use of bio-pesticide, compared to chemical fertilizers ranges from ₹ 6500-7300/ha.

Other non-tangible benefits include long term benefits to soil and reduction in environmental pollution as against by chemical fertilizers.

#### Comparative Analysis of Chemical- Bio-pesticide Versus bio-pesticide (Per hectare of cultivation)\*

##### A. Cost of chemical pesticide:

2.5 litres \* ₹ 1500/litre (min. cost) = ₹ 3750

Cost of cow-urine based bio pesticide:

20 litres \* ₹ 40/litre = ₹ 800

Cost Saving in cost on pesticide per ha.: ₹ 2950

##### B. Increase in Productivity

For Maize: 150-200 kgs/ha.

For Castor: 100 kgs/ha.

For Cotton: 100-125 kgs/ha

##### C. Cumulative Benefit (A+B)

For Maize: ₹ 6450/ha.

For Castor: ₹ 6750/ha.

For Cotton: ₹ 7325/ha.

\*Based on consultation with farmers in DSC's field unit area in Himmatnagar

## Learnings

- The technology of bio-pesticide production is simple, low cost and requires raw materials that are available locally.
- Local production and sale at village level through enterprise models can provide source of additional income for rural communities.
- There are multiple short term tangible and long term intangible benefits in use of bio-pesticides including livelihood enhancement of farmers and improved environment through control on soil, air and water pollution.
- It is a good income generating activity that can be managed at farm/ household level.
- The intervention through entrepreneurship model has good prospects for SHGs as well as federations, as such institutions can bring in capital investment.
- Bio-pesticide production initiative requires small capital investment with payback period within first batch of production.

## Challenges

- There is low awareness for use of bio-pesticides for sustainable gains among small and marginal farmers.
- Involvement of women in production of bio-pesticide is minimal due to difficulties in collection of various raw materials and location of production units outside the main village habitat.
- Non-availability of continuous supply of cow-urine as well as other wide range of forest products inhibits scale of operation.

## Way Forward

- Extensive awareness generation of farmers on tangible and non-tangible benefits of bio-pesticide should be taken up for demand generation.
- Linkages of similar entrepreneurship models through Government livelihood promotion schemes, Ministry of Agriculture and the Department of Biotechnology etc. can be taken up for large scale adaptations.
- Decentralized production should be promoted at village level to cater demand-supply gaps and reduce logistic cost.
- Animal husbandary should also be looked upon in villages for planning of large scale production of bio-pesticides.
- Linkages with rural credit organizations can help in availing venture capital for promoting similar models.
- Testing of bio-pesticide by authorized laboratories should be promoted for quality management and better marketing.
- Region specific formulas can be derived for production of bio-pesticides based on local and seasonal availability of raw materials. Traditional knowledge and support from agricultural universities and other manufacturers in the region can be availed.

# Organizing Women for Livelihood Augmentation in Rain fed Areas: A Case of Women's Federation at Meghraj, Sabarkantha

## LEPNRM Project

Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts with financial support of the RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under project.

## Context

DSC has been working in tribal rain fed areas in Meghraj block of Sabarkantha district for past 12 years under watershed development and women's saving-credit programmes. It was observed that farmers, specifically, small tribal farmers are unable to get timely agriculture credit in this region. Lack of proper agriculture input affect crop production and ultimately livelihood in these tribal areas. Local money lenders seek high interest rates, which is not favourable for small farmers and that often results to debts. It was thus necessary to create a local farmers' group for internal money lending at affordable rates through saving and credit facilities for agriculture development.

Under the watershed project, DSC had organized women, through Self Help Groups (SHGs) in these tribal areas. These groups were further nested and registered as

cluster federation in 2008. The federation has 33 SHGs with 566 members across 15 villages now. DSC visualized a great potential in linking these village level institutions for livelihood improvement under LEPNRM project through micro saving and credit, accelerated income generation activities, input supply etc.

## Major Objectives of Federation

- Micro savings & credit
- Income generation activities
- Management and governance of SHGs and cluster federation
- Natural resource management activities

## Savings & Credit

Women's Federation at Meghraj has been successful in creating an asset of more than ₹ 13 lakhs including share capital of ₹ 1.87 lakhs. It has lent ₹ 9.44 lakhs to women farmers for livelihood activities with recovery rate of 63% in the first year.

The cluster federation manages to collect about ₹ 20,000 per month.

Loans are given to members for productive and consumption purposes like seeds and grass purchase, digging of bore well, land purchase, house repairing, educational purpose, health expenses etc. The maximum loan per member is ₹. 10,000/- (@ 3 times the saving amount of member) at interest rate of 18% per annum.

Under LEPRNM, amount of ₹ 1 lakh is provided as rotational fund for credit facilities.

## Financial Accounting

The federation keeps manual as well computerized records of all its financial accounts and gets an yearly audit conducted by District Registrar, Himmatnagar.

## Livelihood Augmentation under LEPNRM

About 50 women have formally organized under LEPNRM project for developing new business opportunities through production and sale of

## Livelihood Augmentation - Sangam Group Vermi-compost & Nursery

vermi compost, nursery plants and bio-pesticide since 2010.

Under LEPNRM, 50 women from the federation have formed a separate group for livelihood augmentation. They work under the federation as “Sangam Group Vermi-compost & Nursery” for activities like production and sale of vermi-compost, nursery plants and bio-pesticides.

Under the project, DSC has supported the federation with ₹ 88000 for installation of a working shed (30 ft. x 50 ft.) at Valuna village with basic tools & equipments. Women members have contributed ₹ 24000/- in form of labour.

The group initiated vermi-compost production

since 2010 and has produced 9150 kgs. of compost within a year. The place for the shed has been rented @ ₹ 1000 per year. Members pay ₹ 6000 per year for water and electricity usage for the shed. Animal dung is purchased locally @ ₹ 2/kg. The members have contributed the labour work in turns. Federation has been able to generate net profit of ₹ 10,000 with sale of about 8000 kg of compost. These funds are currently utilized for the expansion of income generation activities.

Now, the total production capacity of compost in the shed is 25000 kg/year. The profit is planned to be shared within these 50 women members after they reach break-even within 2.5 years.



Women members have recently initiated production of bio-pesticide with cow-urine. They have produced about 200 litres till now with investment cost of ₹ 24,000 as material input cost. The labour cost has been share by members equally. The group plans to sell the produce @ ₹ 40/litre, thus earning net profit of ₹ 56000.



While the involvement of women in bio-pesticide production has remained a challenge across other project unit regions, this women's group has managed the entire process of bio-pesticide production without support from men. These tribal women are capable of collecting all specified raw materials from the forest area and are hopeful to expand bio-pesticide production soon.

The women's group has also taken up nursery plantation in the same shed recently. They have taken up cultivation of flowers and medicinal plants. About 8000 saplings have been cultivated in first batch within 2 months, with investment of ₹ 4.5/plant. They plan to sell saplings at ₹ 6.5/plant, thus aiming to earn ₹ 2/ plant. They now plan to expand nursery plantation with inclusion of forest based medicinal plants. Further, they had a dialogue with forest department and

hope to get a yearly supply contract from department..



### Capacity building under LEPNRM

Extensive capacity building programmes have been taken up for the group under the project by DSC involving technical, administrative and marketing inputs. Some of the basic capacity building initiatives are listed below:

- Exposure visit to Visnagar vermi compost group for awareness generation and basic knowledge.
- Exposure visit to Visnagar for marketing & management of vermi compost entrepreneurial activities.
- Marketing campaign in Meghraj for vermi compost and bio pesticide.
- Exposure visit to Himmatnagar for understanding bio pesticide production.
- Exposure visit to Himmatnagar for understanding marketing processes for bio pesticides.
- Video shows on bio pesticide in 2 villages of Meghraj.

DSC has also linked the group with Forest Department for training on nursery establishment.

## Learnings

- Organizing women in a group and linking them with income generation activities at their door step can promote leadership among women and bridge the gender gap in production of bio-pesticides.
- Women groups are comparatively more cohesive and cooperative, which is beneficial for the growth of federation.
- Linking existing women's savings and credit group with income generation activities makes it easy to bring in capital cost for any initiative.
- Linking women with income generation activities which can be managed at door steps is more workable and sustainable.
- Tribal habitations provide good availability of forest based materials and have farm locations adjacent to habitation, which is conducive for production of bio-pesticides by women.
- Savings and credit groups are substitute for formal banking, and has a potential to work as distribution channel for banking services.

## Way Forward

- It is essential to scale up the income generation activities of the federation.
- Federation should look forward in increasing its membership extensively in order to bring volume of work as well as capital holding to look into formal micro finance activities in the region.
- Federation can take up lead role in agri-input supply for better agricultural practices in the region.
- Federation can support decentralized village level production and sale of vermi-compost, bio-pesticides, nursery etc.
- Animal husbandry activities should also be targeted in order to undertake associated income generation activities.
- Linkages of existing SHG members with government livelihood programmes can help in augmenting their income.



Bhuriben Arjan Gomati, Chairperson,  
The Sangam Women's Savings & Credit Co-operative Ltd., Meghraj

"We have been successful in savings and credit activities through SHGs and undertaking income generation activities through women's federation. We hope to initiate a women's microfinance institution in future to target agriculture credit issues in our region"



# Improving Livelihood by Market Orientation Through Contract Farming: A Case of Potato Cultivators in Modasa

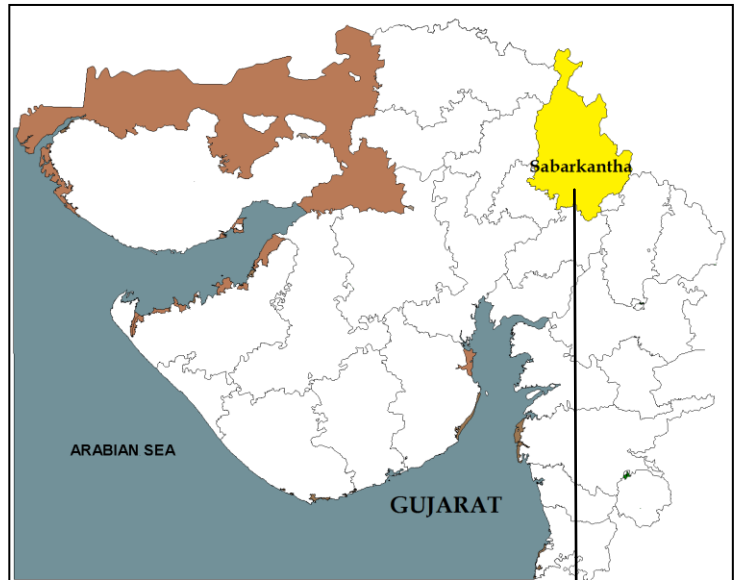
## LEPNRM Project

Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts with financial support of RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under the project.

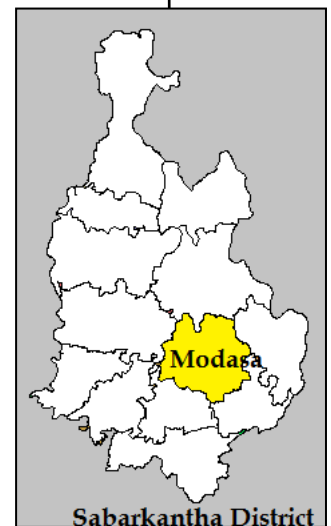
## Context

In recent years, there has been increased private sector participation in farming in India. Contract farming is a system of production and supply of commodity under forward contracts between producer and buyer. The system offers benefits to both. Buyer obtains specific quality produce in stipulated time frame and secured availability of the produce. While, the producer avails committed market, credit and better technologies in the process. Contract farming has been prevalent in various parts of country for commercial crops specifically for big and medium farmers, but not practiced amongst small farmers. It has a good scope for small cultivators as they can have access to credit and new technology as well as pricing arrangement that can reduce the risk and uncertainty of market.

In order to promote contract farming with small/ marginal farmers, DSC worked with two companies in Modasa region. The companies, Pepsico & McCain had been associated with big farmers through contract farming for production of specific quality potatoes which would



qualify for potato chips production. The companies worked with farmers with minimum 1 acre (0.4 hectare) land holding. DSC liasoned with the companies to work with small and marginal farmers through formation of groups preferably in contiguous block of about 4 hectares.



Contracts were made with 12 farmers on pilot basis in 2008-09 and 2009-10. DSC, under LEPNRM project, provided 50% subsidy on seed cost and 50% amount was availed by farmers from companies on credit. Thus, a total financial support of ₹ 33,000 have been provided under LEPNRM project. The demonstrations covered 12 farmers (65% medium, 16% small and remaining big farmers) across 5 villages with contracts for potato cultivations in 48 hectares. About 80 farmers across 11 villages in the project region have adopted contract farming for potato cultivation in 480 hectares with various private companies after the success of pilots.

The farmers are happy as they receive credit for input material, better technology with reduced risks and increased productivity as well as certainty of market place. The companies are satisfied as they have steady supply of produce.

## Contract Farming Process- Pilots under LEPNRM

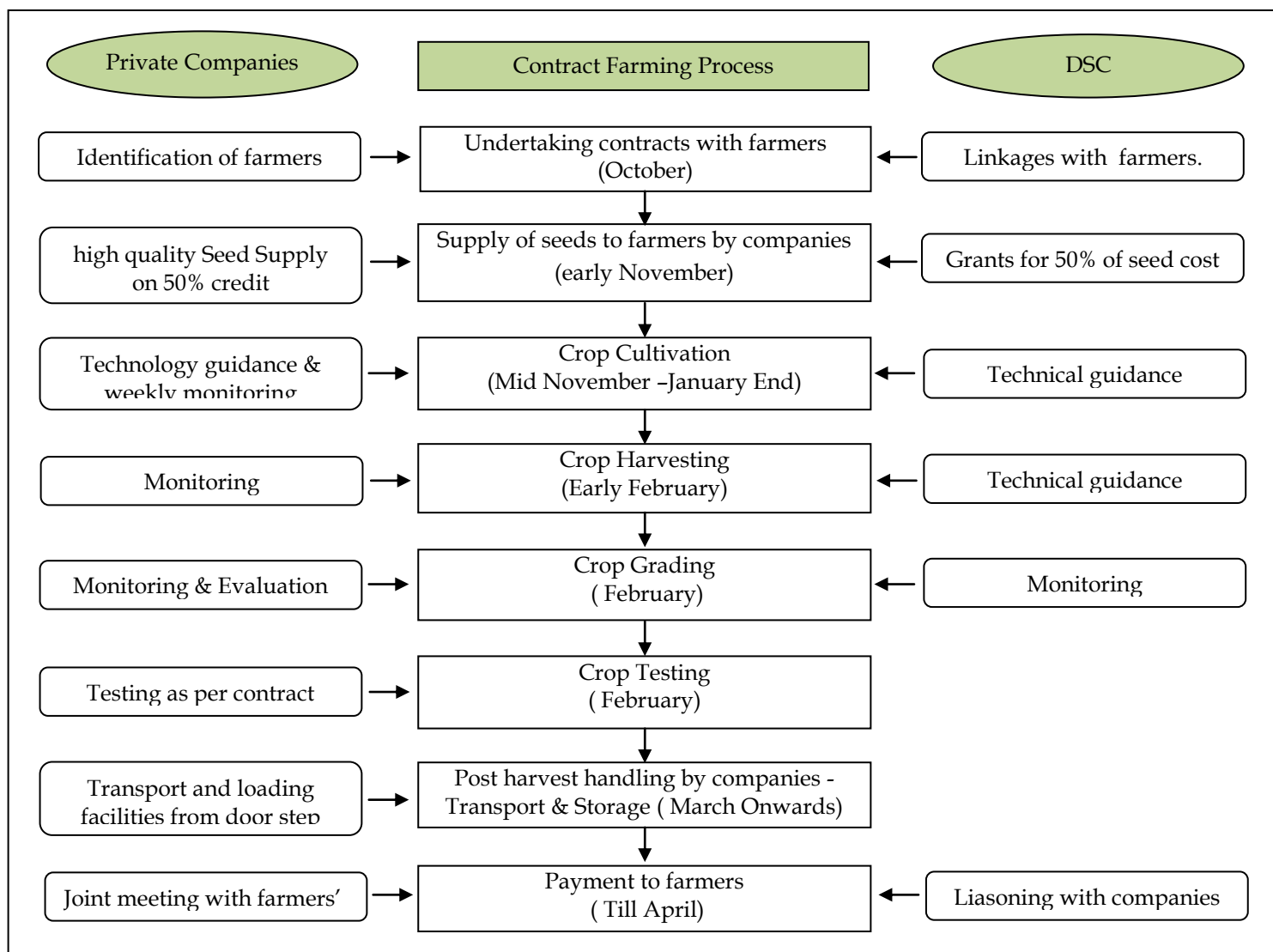
Two private companies, Pepsico and McCain have piloted contract farming for potato cultivation in association with small-big farmers in the pilot phase. Pepsico has sub-contracted the work at regional level through S.K. International. McCain co-ordinates the work through Area Manager from regional office at Modasa.

The companies identify and engage farmers every year in month of October. Companies provide seeds to farmers with 50% credit on seed cost. The farmers receive specifications for scientific cultivation of the crop from the companies including advice for cropping, manure, watering, harvesting etc. The company representatives visit the fields every week for monitoring at every stage from sowing to harvest. Grading of crop is done in presence of the company representative and its quantity determined on the site. One of the companies provide transportation service at door step for collection of graded crop. Testing of the

crop is done during and after grading by the company. While McCain tests mainly the size of the crop, Pepsico also undertakes sugar test as they prepare low sugar products from potato. Farmers receive payment as per the contract within 20 days of collection of crop by company.

McCain provides intensive technical advice and monitoring to the contracted farmers for high quality production and risk reduction. The farmers are also taken for exposure visit to Deesa in their own research farm by this company

DSC has provided 50% of seed cost to the farmers for demonstration, offered technical guidance through agri-specialist at regular intervals and also liasoned with companies for payments to farmers as per contract. A district level workshop was arranged at Himmatnagar for dialogues between farmer and various companies interested in contract farming.



## Terms of Contract & Modalities

Modalities/ Contract Terms	Pepsico	McCain
Regional level working mode	Sub contract with S.K. International at regional level	Regional level office and area manager
Farmer Preference	All- Small, Medium, Big	Mainly medium,big
Varieties	American Lady Rosseta, Loker	Santana. Shiphodi Canabag
Seed Supply	Own seeds at 50% credit	Own seeds at 50% credit
Technical Support	Advice on sowing, fertilizer and pesticide use, watering, harvesting etc.	Advice- regular monitoring and involvement of agronomist at every stage. Advice for crop diseases.
Drip irrigation**	compulsory	compulsory
Farmers' Input	All the cost for input materials and labour for cultivation and harvesting, grading	All the cost for input materials and labour for cultivation and harvesting, grading, loading-unloading, transportation.
Transportation services	Arranged by company for collection from door step, loading by farmers	Arranged by the farmers
Quality specifications	<ul style="list-style-type: none"> <li>• Size 45-85 mm</li> <li>• rejection of complete lot if 8% or more &lt; 45mm size, 3% or more &gt; 85 mm, 2% of are sun-burnt or green, 5% or more is cracked, 3% or more with diseases, 5% or more are pounded, lot with stones, sand etc, 5% or more with voids in crop, variety other than contract specifications, use of government banned pesticides or fertilizers used, lot which do not pass fry test</li> <li>• Rejection of the quantity with potato tuber mouth (PTM) , are rotten, are de shaped, cracked</li> </ul>	<ul style="list-style-type: none"> <li>• Size 40 mm</li> <li>• Prohibition on use of government banned pesticides or fertilizers</li> <li>• Rejection of truck load containing glass, chemical container, plastic and metal parts, falling cooking colour test, presence of potato tuber mouth disease in the lot, availability of other quality than specified in the contract</li> </ul>
Testing	<ul style="list-style-type: none"> <li>• Size as per grading</li> <li>• Fry Test for sugar amount.</li> </ul>	Size and cooking colour test.
Payment Terms	<ul style="list-style-type: none"> <li>• Within 20 days of truck loading,</li> <li>• only 70% payment of per unit amount for size of potatoes &lt; 45 mm,</li> <li>• Deduction of amount on pro rata basis in case quantity is lower than contract.</li> <li>• Rejection of contract/lot in case crop not made available before March end.</li> <li>• Company not responsible for payment for loss due to farmers' irregularities.</li> </ul>	<ul style="list-style-type: none"> <li>• Within 20 days of receipt of commodity at McCain's cold-storage/processing unit</li> <li>• Deduction of amount on pro rata basis in case quantity is lower than contract.</li> <li>• McCain may purchase 15% higher production than specified in the contract.</li> </ul>
Court Jurisdiction	Ahmedabad	New Delhi
Force Majeure	Company not responsible in case of loss due to natural & human-made calamities, changes of government regulations, inflation/ deflation,	Not specified
** Both the companies have allowed flood irrigation for demonstration phase under LEPNRM		

## Benefits of Contract Farming

- Credit for purchase of seeds
- Availability of good quality seed
- Guidance and supervision support for scientific cultivation resulting in better productivity and cost reduction
- Assured market and pricing arrangement, thus reducing uncertainty of marketing
- Improved Price Realization
- No post harvest hassles of transport or storage to farmers
- Improved income due to increased productivity, reduction in per unit cost of cultivation and improved price realization.

The farmers under the pilot phase have noted reduction in cultivation cost to about 10-15% as compared to conventional farming system, productivity rise to about 15%, as well as increased and assured pricing. This has resulted in increase in their net income to about 1.25 times.

Cost-benefit of contract versus conventional farming		
	Conventional System	Contract Farming
Cultivation Cost	₹ 60000-70000/ha	₹ 50000-60000/ha
Productivity	22000- 23000kg/ha	25000 kg/ha
rate availed per unit	₹ 5.5-6/kg	₹ 6-6.25/kg
Gross Income	₹ 138000/ha.	₹ 150000/ha.
Net income	₹ 68000/ha.	90000/ha.

## Learnings

- Contract farming is a win-win situation for buyers and cultivators.
- It is highly conducive for small farmers due to risk reduction, payment credit for input materials, assured market and increased price realization.
- Contract farming promotes scientific cultivation practices through technical extension system benefitting specifically small farmers in terms of improved techniques and technologies, leading to better productivity with reduced input cost.
- Small and marginal farmers have huge scope of entering into contract farming through formation of groups in contiguous blocks.
- Contract farming reduces post harvest care for farmers especially for crops which are perishable, perennial and require processing.
- Involvement of community based organizations/ NGOs in the initial phases help in proper legal understanding of contract specifically amongst small-marginal farmers.

## Issues & Challenges

- Promoting small farmers into high risk high return crops in contract farming without any experience of that crop may be counterproductive. The farmers must be familiar with the crop/variety cultivation for at least 1-2 seasons before entering the contract.
- There is no mechanism for availing additional value of crop in case of better market/retail

rate as compared to contract rate in good years.

- Absence of mutually reliable arbitrator in case of any dispute may prove dis-advantageous for small farmers, who cannot afford to enter into lengthy and cumbersome legal process against buyer.
- Contract farming may induce complete dependence of farmers on large buyer companies, which can work against interest of farmers in some cases.

## Way Forward

- Federations and Farmer's Organization can play a major role in organizing small-marginal farmers for undertaking contract farming. They can play a major role as an intermediary between farmers and private companies for protecting farmers' interest.
- Contract farming can be promoted in areas requiring crop diversification.
- Role of micro-finance institutions can be increased for offering credit to small-marginal farmers entering contract farming.

A local third party regulator can be nominated between buyer and producer for minor <sup>dispute</sup> resolutions.

- Crop and weather insurance can be linked with the contract for reducing risks of farmers.
- Small-marginal farmers should be supported in installing drip system before entering into contract farming.

# Enhancement of Agricultural Extension System through Participatory Approach

## Background

Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts with financial support of RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under the project.

## Context & Interventions

Agricultural Extension plays a key role in improving livelihoods of farmers and development of cost-effective and scientific agriculture practices. Many extension institutions in India have limited out-reach for extension in agriculture as they target multiple agendas. Moreover there needs a paradigm shift from top-down technology driven extension system towards more decentralized, participatory, self sustainable and market driven extension system to make the system more efficient.

DSC started its work under LEPNRM for livelihood enhancement of farmers since 2007 and observed that lack of proper information on scientific farming technologies, material resources and market was one of the major reasons for poor agricultural productivity and income, specifically for poor and marginalized farmers. While varied researches have been done for scientific and sustainable agriculture systems, they do not reach to the end users due to lack of extension. Moreover, there is a need of regular dialogue between various stakeholders like researchers, agriculture experts, farmers,

agri-input suppliers, extension workers, concerned government departments, NGOs, farmer clubs, other farmers' associations etc for effective adoption and extension of scientific agricultural practices.

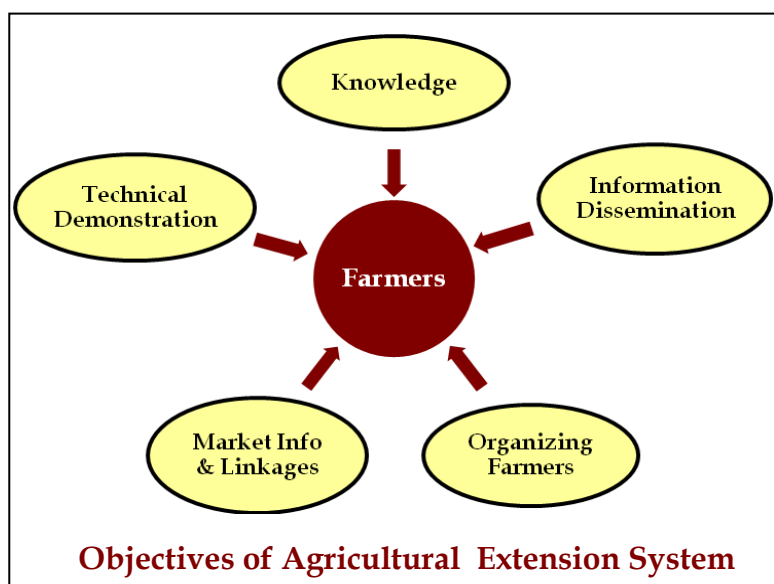
DSC thus promoted a participatory agriculture extension system in its six project regions under LEPNRM project involving farmers' federations and para workers (extension volunteers).

About 26 extension volunteers (25 men and one woman) work in close association with DSC and 6 Federations across 4 districts of Gujarat covering 187 villages with 78019 hectares across 6 blocks of Gujarat. The system has been successful in reaching about 62500 farmers within span of 4 years.

The extension system provides technical trainings to farmers, community organizing support and provides information as well as linkages for technical support, market, and entrepreneurship development. Dialogues are also arranged between agriculture experts, researchers and farmers for specific technical interventions and issues.

The cost of extension system is borne partly by DSC under LEPNRM and partly by Federations. It is planned to make the system financially self-sustainable under the umbrella of Federations through introduction of service-fees etc in coming years.

About ₹ 24.8 lakhs have been put across within 3 years for the system operations.



## Structure of Extension System

The extension system is headed by Farmers' federations. The federations work for technical and market linkages to farmers as well as administrative and financial aspects for the system. Extension volunteers (EVs) are appointed from local region with fixed honorarium and work under

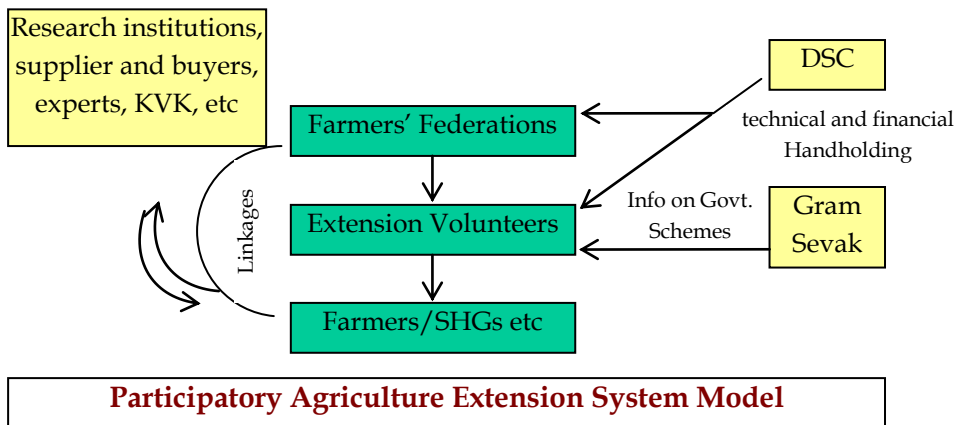
each federation/cluster level federation. The EVs reach out directly to farmers, farmers' clubs, SHGs etc in field through awareness generation activities. Each EV is assigned specific cluster of villages in rain-fed regions and specific catchment area in irrigated regions. Each EV covers 6-7 villages or about 3000 hectares of command area with a target to reach at least 500 farmers per year.

Federation support linkages of farmers with research institutes, experts, KVK (Krishi Vigyan Kendra), agri-input suppliers, dealers and buyers. Extension volunteers also provide information to farmers on government schemes related to agriculture through Gram Sevak.

Under LEPNRM, DSC has provided technical assistance and certain percentage of financial assistance for operation and management of system across 6 federations and 1 producer company at Dhari.

## Factors considered in Extension System

- Promotion of cost-effective sustainable agriculture system with combination of traditional and scientific practices based on agro-ecological and infrastructure conditions in each region.
- Market linkages for better sale price for farmers through farmers' group or federations
- Linkages to access micro-credit for farmers.
- Information to farmers on good quality cost-effective agri-input materials and technologies.



- Dissemination of information to end users from research institutes, government agencies, experts, etc

## Basic Criteria for Selection of EVs

- Must be a farmer or possess basic knowledge on agriculture
- Basic education must be at least 10<sup>th</sup> pass
- Must be from local region having knowledge on local resources and issues.
- Must possess good liasoning skills with farmers and other stakeholders
- Must be practical and have capacity to solve local issues.
- Willingness to travel extensively

EVs are selected through joint interview by DSC field Unit Co-ordinator and President of the federation.

## Works carried out by EV

Every EV spends average 18-20 days for field works, 4-5 days for planning with federation and DSC staff and 2-3 days for capacity building. The major field works undertaken under LEPNRM are:

- Selection of farmers in collaboration with federations for crop/technology demonstration.
- Information dissemination for demonstrations
- Organizing community for exposure visits, field day, meetings etc and giving basic information during the trainings.
- Providing farmers information about availing good quality seeds and manure, crop varieties,

scientific cultivation methods, cost reduction methods, soil improvement techniques, soil testing, pest control, value addition of crops for marketing, crop insurance etc.

- Making good quality seeds available for small and marginal farmers in association with federation.
- Solving technical issues of farmers in association with agricultural experts and federation.

### **Monitoring and Reporting of EVs**

EVs report on daily basis to federation in specified formats and meet Federation as well as DSC staff every week for weekly planning and reporting.

### **Frequently Asked Questions to EVs**

Each EV tackles 2-3 questions/issues of farmers per day. Some of the frequently asked questions are:

- Information on new schemes related to agriculture
- Techniques for control of pests and animals in fields
- Information for availability for good quality seeds and compost
- Support for market linkages through federation

Most of the queries are solved within 2 days by EVs through consultation with federation, experts, research institutes etc.

### **Issues faced by EVs**

- Rapport building in initial phase as compared to government managed extension system as no direct financial support to farmers.
- Logistic-transport issues for wider coverage specifically for women EVs

### **Entrepreneurship development of EVs**

Majority of EVs have build their capacities during the project in terms of technical knowledge, and market analysis, which have helped them in improving their own agriculture and developing new employment opportunities.

Majority of EVs have started adopting new scientific agricultural practices and have noted 30-40% increase in agricultural income. About 25% of EVs have developed new businesses like vermi-compost production, green house cultivations, work as commission agents etc, which have augmented their income substantially. Few EVs have planned to initiate agri-clinics, but need initial technical and financial support for the interventions.

### **Extension activities carried out under LEPNRM**

Various extension activities including field days, exposure visits, video shows, seminars/workshops, field meetings, Krushi Mela etc have been carried out under the extension system.

### **Capacity building of Extension Volunteers.**

About 20 various technical and administrative trainings have been imparted to 26 extension volunteers with total of 198 participant days.

### **Coverage and Finances**

26 Extension Volunteers have been able to reach about 62500 farmers across 187 villages spread across 78019 hectares land within 4 years of project duration through various extension activities.

The total expenditure on extension volunteers in 4 years of project duration, including salary and transportation is about ₹ 2479805. This indicates that extension cost for each farmer is about ₹ 40 and about ₹ 32/hectare of land.

## Learnings

- Participatory agricultural extension system helps in recognition of farmers/communities as owners of their own development.
- Decentralized and participatory extension system makes it more demand driven.
- Development of local representative as EV leads to better community mobilization and acceptance by the local farmers.
- Linkages of multi-stakeholders in the extension system leads to effective and qualitative service delivery.

## Challenges

- Though women EVs can play equal or probably more effective and gender sensitive role in the system, logistical limitations inhibits their involvement.
- Lower remuneration of EVs and better employment opportunities after capacity building leads to high attrition, thus disrupting the pace of work.
- Financial support for strengthening the extension system to larger areas still remains a challenge.

## Way Forward

- ICT (Information Communication Technology) based networking can be provided to extension institutions for better communication and information sharing as well a monitoring.
- Technologies like satellite communication, internet etc can be developed at cluster/village level for communication of farmers with EVs/federations for wider outreach and reduction of logistics of EVs.
- Service fees or membership fees should be introduced on farmers availing the service for income generation and making extension system financially self-sustainable.
- Formal linkages with existing extension systems should also be planned.
- Role of research institutions and experts in extension system should be formalized to increase their involvement fro transfer of technology.
- Promotion of trained EVs for setting up agri-centres or agri-clinics at local level as means to augment their livelihood and develop financially self-sustaining extension system.

### Bharatbhai Jhala, EV, Vadnagar



Bharatbhai is a farmer and his family owns one hectare of land.

He started working as extension volunteer in Vadnagar region of Mehasana district since 2007. He has adopted better agricultural practices like good quality processed seeds, drip irrigation and vermi-compost in his farms, which has augmented his agricultural income by 20-25% in last years. His family produces about 1000 kgs. of vermi-compost yearly and has partially replaced DAP-Urea with it. He has recently availed benefit from government's horticulture scheme for setting up of net house. He has set up a shed in 1000 sq.ft.. area with grant of ₹ 2 lakhs and own contribution of ₹ 30,000. He has cultivated and sold tobacco & chilly sapling in the first batch and recovered ₹ 30,000. He has now undertaken contract farming for production of Paperbilita chilies and tomato with a local company, which supports him with good quality seeds, technical input and marketing. Net house has reduced irrigation water consumption and he expects to earn about ₹ 50,000 per year through it.

Bharatbhai admits that his work as EV has expanded his knowledge on agriculture and given him wide exposure to market This has enhanced his entrepreneurship quality.

- Short duration courses for management of extension system can be formulated with linkages to premier distance learning universities.
- Accountability of the functioning of system should be developed through proper monitoring system.
- Incentives and reward system for EVs can also be looked upon for motivation and competitive work.
- Indigenous knowledge and practices can be documented, authenticated with experts and research institutes and promoted locally. Similarly innovations in agriculture can also be documented and promoted through the extension system. Opportunities for developing participatory technology development (PTD) from participatory extension system (PES) should be explored through these interventions.



## Risk Mitigation through Rainfall & Weather Insurance

### LEPNRM Project

Development Support Centre (DSC) has been facilitating Natural Resource Management (NRM) through watershed and Participatory Irrigation Management (PIM) in rural Gujarat since 1995. In 2007, DSC initiated agriculture based livelihood enhancement programme in more than 200 villages of six field units in Gujarat, covering irrigated and rain fed areas of Mehsana, Sabarkantha, Ahmedabad and Amreli districts with financial support of RBS (Royal Bank of Scotland) Foundation, India. The major objective of the project is to enhance livelihood of farmers through cost reduction, risk mitigation, productivity enhancement, value addition and market linkages. Varied interventions for developing a scientific and localized approach covering technological inputs, formation & strengthening of local institutions, capacity building and channelization of necessary information have been taken up under the project.

### Context

Indian Agriculture is heavily dependent on rainfall and weather. About 60% of the net sown area is rain-fed\*. Moreover, climate change phenomenon has aggravated uncertainties of weather in the past decade, creating insecurities in agricultural output. Small and marginal farmers are the worst affected in the process.

In order to mitigate the risks associated with weather and rainfall in agriculture, DSC promoted index based weather and rainfall insurance in the project areas under LEPNRM.

DSC had been working as a part of Sajjata Sangh, which is a network of NGOs working on issues of NRM. This network has been piloting rainfall insurance in Gujarat since 2006. Sajjata Sangh provides a platform for customizing and designing rainfall and weather insurance products in coordination with Agriculture Insurance Company (AIC). It is termed as “varsha

vimo” which covers rainfall risk for monsoon (kharif) crops. DSC in association with Sajjata Sangh has piloted rainfall insurance (*varsha vimo*) and weather insurance (*Havaman Vimo*) covering risks against uncertainties in rainfall and extremities in temperature, humidity etc in Rabi crops like wheat and cumin.

Under the network, DSC linked the farmers in LEPNRM project areas with Agriculture Insurance Company of India Ltd (AIC) for rainfall and weather insurance. Both the insurance products are index based and have area based approach, where in local weather stations and rainguage (block /cluster level) are considered and the pay outs are automatically calculated and disbursed quickly without the farmers filing a claim. This arrangement reduces transaction cost, is free of adverse selection and provides speedy disbursement to policy holders. This system is thus highly suitable specifically for marginal and small cultivators.

Total 586 farmers have been covered under the scheme during the project phase across Vehlal, Meghraj, Modasa and Visnagar field units. About 160 hectares of land (417 farmers) cultivated under groundnut, maize, paddy and cotton were covered under rainfall insurance scheme of AIC Insurance Company. Weather Insurance has been introduced since 2010 in DSC's field unit areas covering 44 hectares of land (106 farmers) under Rabi cultivation of wheat, cummin and fennel.

About ` 1.8 lakhs compensation has been paid to 225 farmers till 2010-11. About 80 farmers have taken repeat insurance, while about 267 new farmers have adopted similar insurance products across 6 field units of DSC.

Various awareness campaigns and outreach programmes have been conducted by DSC under the project for sensitizing farmers on concept and importance of insurance. More than 5500 farmers across 4 districts have been covered under these programmes through village meetings, Jeep campaigns, workshops, video show and exposure visits.

\*Source: <http://nraa.gov.in/> (National Rainfed Area Authority, India)

# Fundamentals of Index Based Weather Insurance

## About

Index based weather/rainfall insurance covers probable financial loss on account of anticipated crop loss due to adverse weather conditions like rainfall, temperature, humidity, frost etc. It is different from general crop insurance offering yield based guarantee.

## Mode of Operations

It operates through area based approach for purpose of compensation through publicly observable index. Reference unit areas (RUAs) are formed for homogenous clusters. There are separate weather recording gauges in each RUA like rain gauge, temperature & humidity recorder, wind speed gauge etc. RUA are restricted to 25 kilometer radius around the reference weather station in case of rainfall and 100 kilometer radius in case of other parameters like frost, heat/temperature, humidity etc.

In case of bad weather in particular season, the payouts are made by the insurer directly to all the farmers covered in particular RUA based on general calculations of losses per unit area. This approach does not require claim filing process by the insured, except in case of any ambiguity. Thus the area based approach is different to individual approach where every insured farmer files a claim individually.

This process thus provides speedy disbursement to policy holders and reduces company's processing time and administrative costs.

## Benefits

- Such insurance covers losses of crop against adverse conditions covering parameters like rainfall, temperature, relative humidity etc
- It provides speedy disbursement to farmers as process of claim and individual verification is not needed.
- It is beneficial to all the cultivators irrespective of size of landholding, ownership etc. Even small and marginal farmers, tenants and share croppers can be covered under it.
- It has affordable premium for farmers in case of government managed policies due to subsidies.
- The disbursement is transparent and has direct payouts.
- There are no requirements for claim submission by insurer. It provides direct remittance into insurer's account as per loss calculations made by the company in particular bad season.

## Products Developed By Sajjata Sangh & Agriculture Insurance Company

### About

AIC, a Government of India undertaking developed special products in association with Sajjata Sangh for catering specific needs of various categories of farmers in various regions of Gujarat. Two basic types of insurance products are developed:

- a. Rainfall insurance
- b. Weather insurance

### Procedure for enrollment

Farmers need to enroll their names, land survey numbers for which they wish to take insurance and their bank details (bank name and number of account) to DSC's concerned field offices or AIC office in Ahmedabad.

The NGO representative verifies the land ownership documents like 7/12 extract of *Khedut Pothy*. Tenant needs to take no objection certificate from land owner.

Farmers can take insurance in rented land or even if they are share croppers and there is no limitation on land area for insurance coverage.

### Mode of Calculations & Payouts

AIC in coordination with Sajjata Sangh has fixed third party Reference Weather Station (RWS) for each block before it launched such products in market. Farmers are given option to select nearest RWS as per mentioned in block level term sheet. Automatic Weather Station (AWS) installed by any third party such as NCMSL, Agriculture University, state Government, ISRO etc are taken as reference. If such stations are not available at block level, raingauge station installed by state Government are selected as reference.

After the completion of that specific period, actual rainfall/weather data recorded on selected weather station in particular period is compared with the trigger mentioned in termsheet. Policy holders are directly reimbursed by AIC in their bank account if they are eligible for compensation.

### **Rainfall Insurance/Varsha Vimo**

#### About the Product

*Varsha Vimo* product is designed based on historical weather data of the particular block. It can differ based on crop and block/region.

This product covers insurance against losses in crop due to irregularities in rainfall for rainfed areas. The insurer gets the benefit if rainfall in particular year in that particular region is low or irregular/erratic. This product is very useful in rainfed areas where cultivation is highly dependent on rainfall and has low irrigation sources.

#### Crop Coverage

The products covers crops like cotton, groundnut, maize, paddy etc in Kharif season in rainfed areas.

#### Premium & Coverage

Premium for rainfall insurance cover losses due to low rainfall, continuous dry spells, and excessive rainfall. The insurance covers time period ranging from June-October and the products are designed for each specific region. The premium of the product is based on the region and time period, ranging from ` 1350-1630/hectare.

#### Compensation

Farmers are eligible for compensation of maximum of ` 13600/hectare in bad weather conditions.

### **Weather Insurance/Havaman Vimo**

#### About the Product

This product covers insurance against losses in crop due to irregularities in rainfall, heat and moisture.

#### Crop Coverage

The product covers crops like wheat and cummin in Rabi season for irrigated areas and maize, cotton, paddy etc in rainfed areas.

#### Premium & Coverage

Premium for weather insurance cover losses due to excessive moisture, excessive temperature and irregular/erratic rainfall. The insurance covers time period ranging from January-March and the products are designed for each specific region. The premium of the product is based on the region and time period, ranging from ` 1200-1900/hectare.

#### Compensation

Farmers are eligible for compensation of maximum of ` 24700/hectare in bad weather conditions.

## Learnings

- Index based weather insurance are location specific and demand based, thus suited to specific needs of farmers in particular area.
- Index based weather insurance products offer better transparency to farmers as the process is simple and standardized.
- Such products have faster payouts, without putting up a claim and are thus largely suited for small and marginal cultivators.
- All the insured under the the same type of contract pay same premium and receive similar per unit compensation, thus reducing issues of adverse selection.
- Such products target specific region wise perils and are highly suitable for small and marginal cultivators.
- Index based weather insurance products are less expensive to monitor for the insurer.
- Multistakeholder partnerships and farmers' consultations lead to effective design of insurance product and its value addition.
- Involvement of technical support agencies like grassroot agencies, NGOs, research institutions etc ensures fair and satisfactory transaction between the insurer and insured.

## Challenges

- Promotion of rainfall/weather insurance as compared to Government's crop insurance is challenging due non-availability of subsidy currently from the Government.

- Complex terms and condition of the product for pay out as well as technicalities for the design of product are difficult for understanding for farmers in the initial stage.
- High premium rate of the products is a major challenge for acceptance for small as marginal farmers. Premiums for the targeted crops have come in the range of 12%-15% of the sum assured, while 7.5% to 9% premium is a reasonable benchmark value for such farmers.

## Way Forward

- Involvement of local farmers' institutions like Federation, Producer Company, Farmers' Club, etc as service provider/agents can ensure effective and transparent delivery of product and also generate income for the insitutions.
- Horticulture and floriculture crops can also be covered under the weather insurance.
- Mandatory insurance for farmers under contract farming can be looked upon specifically for small and marginal farmers.
- Reference unit for rainfall and weather station can be further narrowed down from block to cluster level and be made more reliable for scalability of weather/rainfall based insurance.

### Risk Mitigation through Rainfall Insurance in Rain-fed Area

Vishrambhai Garanda, Village: Zarda, Sabarkantha

Vishrambhai, a small farmer in Meghraj block took rainfall insurance under AIC for cotton cultivation for year 2010 in 0.25 hectare land. He paid ₹ 331 as premium for the particular year, while NABARD supported the remaining premium of ₹ 169. He got compensation of ₹ 1320 for the month of June due to low rainfall. Vishrambhai had a loss of 200 kgs production in the season as compared to earlier years. He would have availed upto ₹ 3700 in case the complete season was bad, which could have compensated 80% of his total investment for cotton in that land for the season.

Vishrambhai is satisfied with the services as he got the compensation within a month of that particular bad period directly in his account without any claim. About 7 other farmers in his village had got compensation in the same year for irregularities in rainfall.

Vishrambhai has taken weather insurance for wheat in 2011-12 and has convinced other farmers in his region. About 84 farmers across 11 villages have now taken weather insurance in Meghraj block.

