



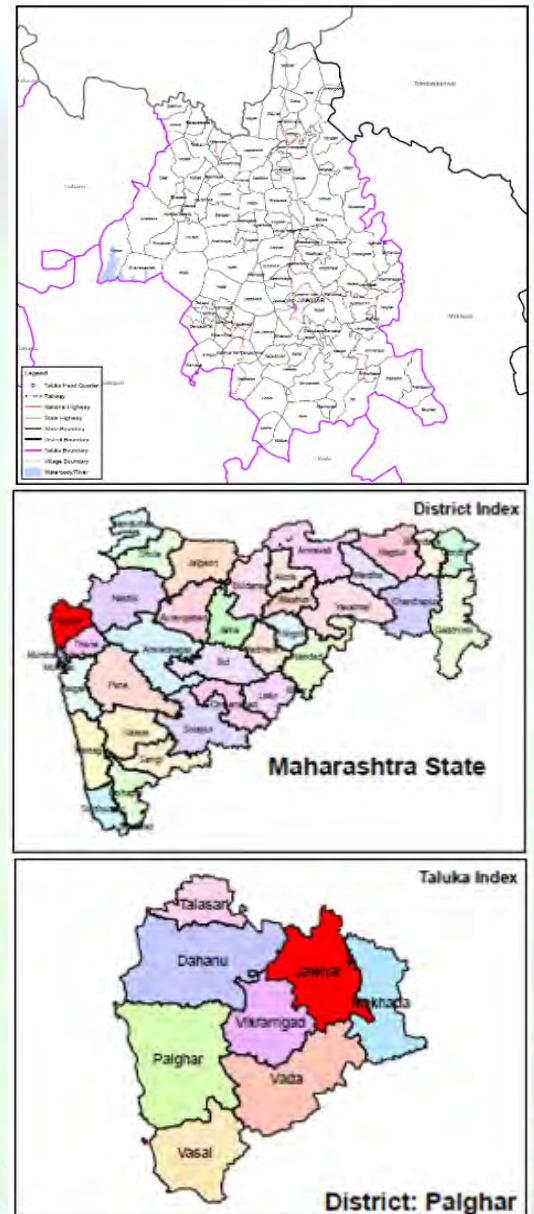
Improving Climate Resilience of Tribal Farmers in Palghar District of Maharashtra through Integrated Watershed Management



Background

About 70% of Jawhar taluka (19.92°N 73.23°E) in Maharashtra is covered by forest area and 98% of its population is tribal. The rainfall in this area is more than 3000 mm and due to it, heavy runoff with high soil erosion is observed. The land holding of the farmers is low and most of the farmers belong to the small and marginal group. Also, crop productivity levels are very low due to adoption of traditional practices.

Considering these factors, the JSW foundation is working with the Maharashtra Govt. to reduce malnutrition in Jawhar taluk. To strengthen these efforts, JSW invited ICRISAT to develop a learning site for livelihood improvement through integrated watershed management approach by adopting science-led development for sustainable management of natural resources and good agricultural practices.



*Jawhar taluk in Palghar district,
Maharashtra*

Description of watershed site

- ♦ The specific goal of this initiative is to increase agricultural productivity and improve rural livelihoods in the selected six villages of Ghivanda, Kogdha, Jamsar, Dabheri, Sakharshet, and Chambharshet.
- ♦ The approximate area of these six bits is around 6,000 ha.
- ♦ The major crops in this region are paddy, finger millet, pigeon pea, black gram, groundnut, sesame, and *warai*.
- ♦ The productivity levels are low for paddy (20-22 q ha⁻¹) and finger millet (3.5 q ha⁻¹).
- ♦ Most of the area is under rainfed agriculture with single cropping system.

Following a consortium approach for community watershed management

- * Convergence
- * Capacity Building
- * Collective action
- * Consortium for technical

The salient features included forming a consortium approach to help undertake science-led interventions in order to benefit farmers, convergence, farmers participation, monitoring mechanism, holistic development, capacity building and knowledge-based entry point activity (KBEPa) to build rapport with the community.



Goal

The overall goal of this initiative is to increase agricultural productivity and improve the livelihoods on a sustainable basis by enhancing the impact of integrated watershed management programs through capacity- building initiatives using site of learning in high-rainfall agro-eco-regions. The specific goal of this initiative is to increase agricultural productivity, incomes and improve rural livelihoods sustainability in selected villages of Palghar district in Maharashtra.



Objectives

- ♦ To enhance water availability and its (green and blue water) use efficiency for diversifying the livelihood systems in the target villages by adopting integrated water resource management approach.
- ♦ To develop capacity of the farmers in the region for improving rural livelihoods through knowledge sharing and dissemination strategy.

Constraints

- ♦ Lack of awareness about improved farming practices.
- ♦ Degradation of land due to high rainfall and runoff.
- ♦ Low water availability during post monsoon season.
- ♦ Poor soil fertility status and use of fertilizer.



Key Interventions

- * Community mobilization
- * Rainwater harvesting and management
- * Soil health analysis and soil conservation
- * Crop productivity enhancement
- * Horticulture and vegetable cultivation
- * Capacity building

Impacts

Problems	Interventions
Water scarcity and soil erosion	Soil and water conservation structures
Low water availability during post rainy season	Rain water harvesting and groundwater recharge
Low soil fertility	Soil test based fertility management
Low crop productivity	Demonstration of good agricultural practices on farmers field and initiating village level seed banks for seeds of improved crop cultivars
Low income from agriculture	Introducing high value crops (vegetables), strengthening SHGs activity towards income-generation.

Table 1. Table depicting the problems faced in the watershed and the interventions used.

Soil health mapping: An entry point activity

The soil analysis indicated micronutrient deficiency in the soil. Based on the analysis, micro nutrient application along with crop demonstrations has been planned. A total of 410 soil samples were analyzed of which 93% samples indicated sulphur deficiency, 78% samples indicated boron deficiency, 37% samples indicated potash deficiency and 24% samples are deficient in zinc.



Collection of soil samples in farmer's field



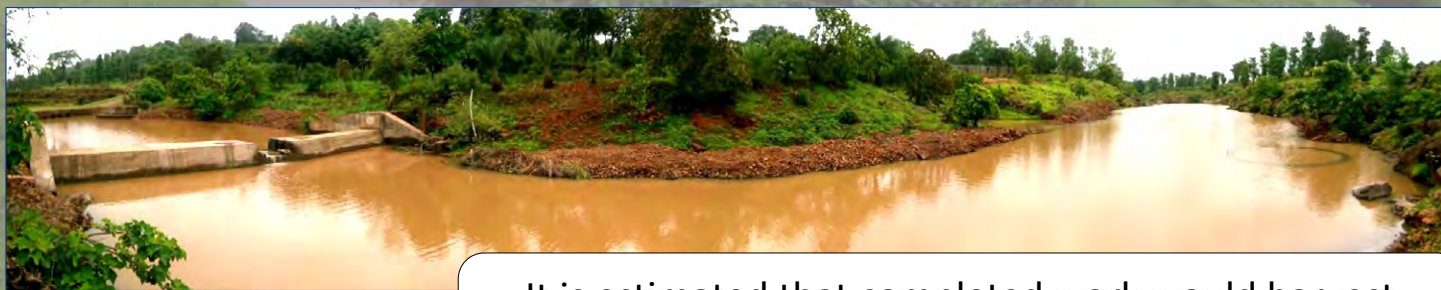
Increasing water availability and reducing land degradation

Various measures for rainwater harvesting and reducing soil erosion are critical in this region as it receives around 3000 mm of rainfall, often with high intensity, during a span of four months and faces water scarcity situations during the summer season. To address this issue, various interventions are being implemented in collaboration with village community including rejuvenation of existing water bodies (35 open wells and 16 check dams), treating land area with continuous/staggered trenches, bunding across the slope, etc.



Structure	Units	Quantity	Storage capacity (m ³)	Benefits
Desilting of open wells	Numbers	35	-	Increased storage capacity
Desilting of check dam	Numbers	16	30000	Increased storage capacity
Bunding	Meters	13300	-	Less soil erosion
Trenches	Meters	32200	11400	Increased water infiltration
Check dam	Numbers	1	410	Increase storage capacity

Table 2. List of soil and water conservation activities, quantity, storage capacity in m³ and benefits obtained from the interventions



It is estimated that completed work would harvest additional 50,000 m³ of rainwater in 3 fillings

***In-situ* moisture conservation**

The Broad Bed and Furrow (BBF) system facilitates draining of excess rainwater as runoff and furrows act as traffic zone for plough bullocks and labors during the wet period. In case of low rainfall, the BBF stores more rainwater as soil moisture due to increased surface area.

Cultivation of ICGV 91114 with BBF method



Cultivation of ICGV 91114 across slope



Crop yield enhancement by 48% against farmer practice



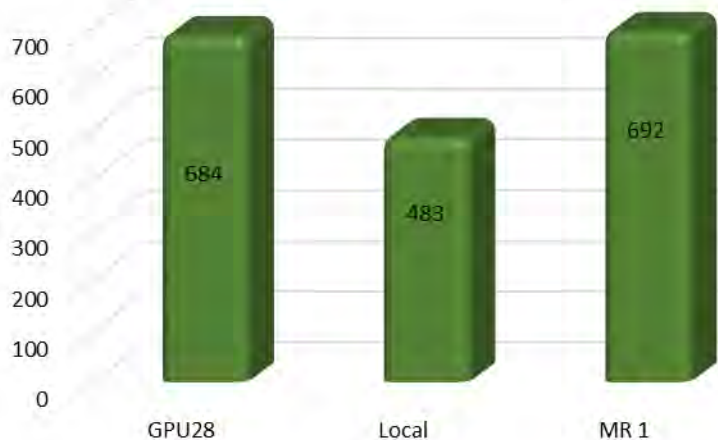
Groundnut crop yield comparison

Instead of broad casting of seeds in finger millet, transplantation was promoted and line sowing along with soil health-based fertilizer application was adopted.



**Crop yield enhancement
by 43% in comparison to
farmers practice**

Finger Millet Yield



Crop Demonstrations

- ◆ Based on the agriculture practices in the villages, ICRISAT has decided to establish demonstration of the following crops in the villages. The participating households in the crop demonstration have already been selected. The select crops and its variety details are given in table 3.
- ◆ The demonstrations carried out in 25 ha area covering 483 farmers have shown increase in crop yield by 30% to 50% as compared to traditional practices.
- ◆ During *kharif*, crop wise yield increase in paddy is 35%, groundnut – 48%, finger millet – 45% and pigeon pea is 75%.

Sr. No.	Crop	Seed Variety
1	Minor Millets	MR 1, GPU 28
2	Pigeon Pea	Laxmi, Asha, Hybrid ICPH 2740
3	Groundnut	ICGV 0351
4	Pearl Millet	Dhanshakti

Table 3. Selected crop variety details



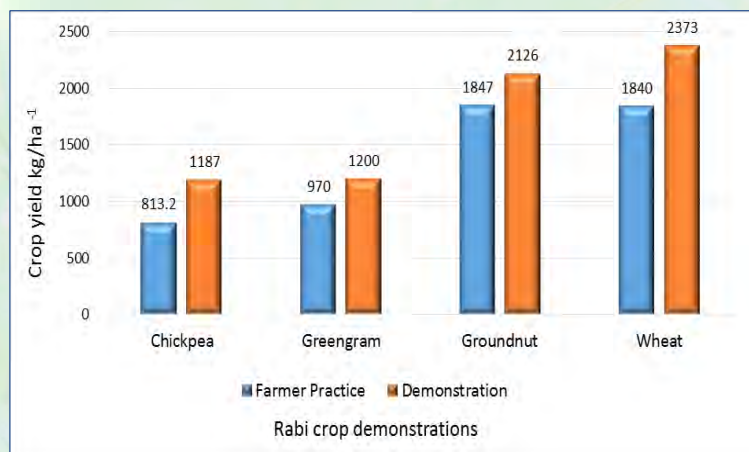
*Surekha Korda, Jamsar Village,
weeding Groundnut plot*

In the project villages, wheat was introduced in areas where irrigation facility was available. In collaboration with Indore wheat research station, HI 1531 wheat variety was demonstrated in the project villages. As irrigation is a major concern, only three demonstrations could be worked out where assured irrigation was possible. Also, control plots were established by using local variety and these plots were compared with the demonstration plots. With three assured irrigations, the demonstration plots have recorded 29% higher yield against the control plot.

A total of 107 farmers participated in crop demonstration across 6 villages during *rabi* season. The crop yield indicated 46% higher yield in the demonstration plots in comparison to farmers practice.

- **Pigeonpea (75%)**
- **Groundnut (48%)**
- **Finger Millet (45%)**
- **Paddy (35%)**

Increased yield due to improved practices



Graph depicting crop yield in demonstration plots in comparison to farmers practice

Improved Cultivars



Traditionally, farmers use broadcasting method of sowing in the villages. ICRISAT has provided ICPL 88079 also known as Maruti, ICPL 87119 also known as Asha and ICPH 2740 hybrid cultivars. Under the rainfed conditions, it is observed that ICPH 2740 performed very well in the project villages. As far as yields are concerned against the local variety of pigeon pea, ICPH 2740 has recorded 85% higher yield as compared to the local variety and ICPL 87119 and ICPL 88039 have recorded 51% higher yield.

Managing rice fallows

Also, the project would focus on management of rice fallow in the project villages with the promotion of improved cultivar of chickpea. In the project villages paddy fields remain barren during the post rainy season, to utilize available moisture in the field and chickpea (JG 11) is being promoted in the project villages.



Horticulture & Agroforestry

Horticulture plants such as mango, guava, and cashew have been promoted. Horticulture plantation covering 86 farmers in 17.40 ha has been carried out in the project villages. Also, *glyricidia* nursery was raised with the help of SHG in each gram panchayat. A total of 55,000 plants as border plantation were raised to improve soil fertility. Also, a total of 20,000 forestry saplings was planted in barren land.



Dabheri village

Vegetable Cultivation

In the project villages seasonal vegetable cultivation have been promoted to help farmers gain income in short duration. The project mainly promotes creeper vegetables such as bitter melon, ridge melon etc. This helps earn income in short duration. In the project villages, trailing system is promoted with 66 farmers, these farmers have been grouped for collective marketing of vegetables.



SN	Village	Total farmers	Area covered (ha)	Average additional income (₹)
1	Ghivanda	20	1	3,150
2	Jamsar	8	0.40	4,454
3	Kogda	17	4	1,700
4	Chambarshet	20	2	8,424
5	Sakarshet	14	1.13	2,525
6	Dabheri	5	0.52	1,010
Total		84	9.05	

Table 4. Average additional income in ₹ due to vegetable cultivation in six villages

Village Seed Bank

- ♦ Producing and supplying good quality seeds to watershed villages.
- ♦ Women self help groups are trained to manage village seed bank.
- ♦ Model: Supplying seeds at discounted rate in turn recovering 150-200% of seed amount.
- ♦ Present stock: groundnut 370 kg; paddy 40 kg; pigeonpea 65 kg; finger millet 30 kg.



Capacity Building

In the project villages, apart from regular meetings and discussions with the community of on-farm training and capacity building is a regular process. The team has placed efforts towards building capacity of the farmers towards the new methods of crop cultivation. To build the scientific understanding among the community members, in the project villages, rain gauge have been installed. The village youth are trained towards measuring rainfall in their respective villages. As far as Self Help Groups (SHGs) are concerned, in the villages 49 Groups have been promoted/ established by various agencies, most of the groups are defunct. The field team is focusing on revival of the SHGs in the respective villages.



An Apex body involving 12 members has been formed, and has been named as *Pragati Bahu Uddeshiya Sevabhavi Sansthan*. The committee is shouldering responsibility of execution of work in all the 6 villages.

Success Stories

Micronutrients and Broad Bed Furrow (BBF) method helps farmer cultivate during *rabi* season

Kashiram Fufane is from the village Bondarpada and hails from the Gram-Panchayat named Ghivanda. His family consists of 7 members and he belongs to a poor family with marginal land holding of 1.61 ha. After JSW foundation, ICRISAT and Rural Communes started the project in his village, few farmers had agreed to



cultivate chickpea in *rabi* season in his village and Kashiram was initially not convinced about the project.

After witnessing positive changes, the farmer decided to cultivate chickpea crop with 1-2 irrigations and had decided to cultivate the crop in a small area in his farmland.

With the help of project staff, the farmer applied the deficient micronutrients in his land such as zinc sulphate, gypsum, borax and with the seed treatment of PSB and Rhizobium, he had sown 5 kg chickpea in 0.05 ha of land. The team also suggested the *broad bed and furrow* method in



chickpea as it provides the optimum moisture to the crop and less water is required. This was for the first time, that the farmer had applied this practice in his agricultural land. The farmer had to bear an expenditure of ₹ 820 for irrigation and labor. He procured a yield of about 108 kg, which was sold in Jawhar market at a rate of ₹ 70 kg⁻¹. He also earned about ₹ 6300 by selling 90 kg of seed and had kept 18 kg of seed for household use and sowing for the next year. The farmer is now convinced about *rabi* cropping as his land is now able to sustain the second crop and has enabled him to increase his income. He is also planning to increase *rabi* planting area by following *broad bed and furrow method*. The project staff also suggested the farmer to replicate the efforts with groundnut during *kharif* season. The farmer is extremely pleased with the interventions and is thankful to JSW foundation and ICRISAT.

Vegetable cultivation adding additional income and improved nutrition

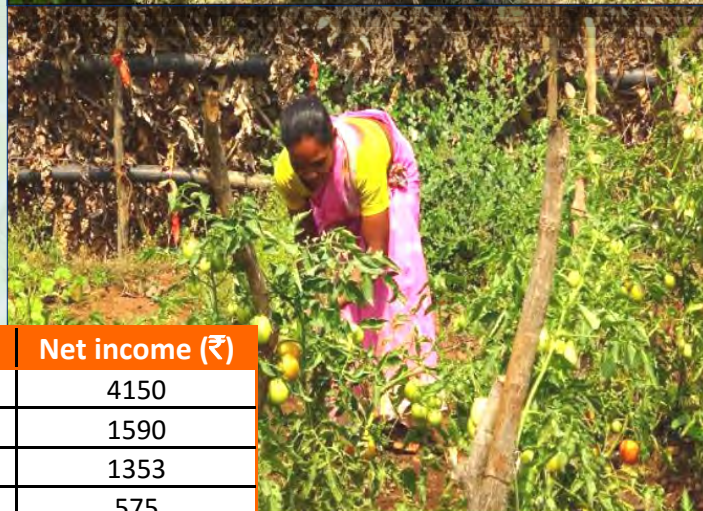
In Jawhar taluka of Palghar district of Maharashtra, JSW foundation with the technical expertise of ICRISAT and Rural Communes had worked with 156 farmers to promote vegetable cultivation and enhance the nutrition of the community in the targeted six gram panchayats.

Chandar Rama Choudhari, is a farmer from the village of Tasupada in Chambharshet Gram Panchayat. His family consists of 6 members and they hold 1.41 ha of land. The farmer and his family are very poor and are mostly in debt due to mounting medical and educational expenses. “In the year 2015, ICRISAT and Rural Communes staff members conducted meetings in my village about the *rabi* crop demonstration and summer vegetable cultivation. I was interested in their plans and I had planned to implement both demonstrations as well as summer vegetable cultivation. I had registered my name and then the local project staff visited my farms. I showed interest in groundnut demonstration and the staff suggested me to prepare a channel for easy and better irrigation. I applied zinc sulphate, gypsum and borax as per the guidelines of the project staff and after application of fertilizer, I had sown 6 kg of groundnut seed in 0.04 ha of land, which yielded about 70 kg of groundnut. I had also invested about ₹ 250 as labor charges and for purchasing fertilizer”.



“I had saved about 30 kg of seed for the upcoming *kharif* season for sowing and the remaining 40 kg, I sold as seed to my neighboring farmers at the rate of ₹ 110 per kg thereby earning a profit of ₹ 4400. I had never tried cultivating groundnut during *rabi* season and was surprised with the good yields”, he said.

“I also would like to appreciate and thank organizations such as ICRISAT for providing me with good variety of groundnut seed and the project team for giving good motivation and guidance. JSW officials also visited my farm and motivated me and were happy with my efforts. They also visited my vegetable cultivation plot supported by the project. I had cultivated cluster bean, cowpea, brinjal and tomato. The project team had also suggested to keep a record of sales and overall expenditure incurred and it has helped me to learn about profit and investment. I had sold the entire produce of vegetables in the local market, which earned me a net income of ₹ 5088.



SN	Crop	Yield (kg)	Expenditure (₹)	Net income (₹)
1	Groundnut	70	250	4150
2	Cluster bean	61	240	1590
3	Brinjal	79	227	1353
4	Tomato	39	205	575
5	Cowpea	60	230	1570
Total Profit in ₹				9238

Dhanshakti pearl millet variety and new methods of cultivation boosts farmer's income

Krushna Arjun Thorat, a resident of Bhusarpada, Chambharshet Gram-Panchayat owns 0.80 ha of land. His family consists of six members and he cultivates paddy and finger millet in his field. Due to low fertility and shallow soil, the yield of crop in his field has been declining over the years.

In the year 2015 during *kharif* season, rural communes (RC) introduced the JSW-ICRISAT project in the village and conducted many crop demonstrations of finger millet, groundnut and pigeonpea in a systematic manner with the application of micronutrients and he was very impressed with their work as the crops in demonstration showed good vigor and growth. He was also willing to take one of the crop demonstrations in his field.

Later, rural communes staff educated the farmer about the pearl millet variety ICTP 8203 (*Dhanshakti*) which has good taste, high yield and high nutritional value and helps to eradicate the iron deficiency. The farmer had never tried pearl millet crop so he was willing to cultivate it in his field.





With the technical support of project staff, the farmer prepared land by broadcasting gypsum, zinc sulphate and boron as guided by field staff and sowed the seeds with proper spacing, an operation he had never performed in the past. This was a new learning opportunity for the farmer, as the operation required very less seed.

He also performed weeding and interculture operation and applied urea as per the guidance of the rural communes staff. During the farmers' day event conducted in his village, as many as 60 farmers came and visited his field and asked him about the crop and some of them asked for the seed for cultivation in next *kharif* season. From 0.05 ha of land, he fetched a yield of 45 kg of pearl millet which made the farmer very happy.

The farmer has saved some seed for sale during *kharif* season and uses the millet for preparing tasty *Bhakri* and also shares with his neighbors. The farmer is very thankful to ICRISAT and JSW for selecting his village and benefiting farmers.

Preventing migration thru watershed development and sustainable agricultural practices

In Jawahar taluka of Palghar district most of the area is under rainfed agriculture and single cropping pattern is followed. Also, land is kept fallow during the remaining months of the year. Due to negligible industrial development, most of the agrarian population opts for migration for earning their livelihood in nearby places like Mumbai, Silvassa and Nashik during the dry months. Another major problem is open grazing practice of domesticated animals which leaves the land barren during dry months and the requirement of fodder during these harsh times, forces the farmer to migrate. In this region, several villages suffer from severe water scarcity problem; in few villages, the communities hardly have access to drinking water in the months of April, May and June.



Bhaskar Ghatal is from the village Pagipada in the Gram Panchayat of Ghivanda. Before the project, he had never cultivated a *rabi* crop.

It was only after the project, that he took keen interest to follow project staff guidance and decided to cultivate chickpea crop and also fenced his land from grazing animals.

As per guidance of the project staff, he had performed seed priming and seed treatment before sowing and later sown the seeds as per the guidelines in 0.05 ha of land. He sowed 5 kg of chickpea seed, which yielded about 72 kg of chickpea. The farmer had invested about ₹ 1150 and had sold about 60 kg of seed in the local market at a rate of ₹ 70, thereby earning about ₹ 3050 as net profit. Now he has decided to increase the area of chickpea crop from the next *rabi* season and is very thankful to the JSW foundation, ICRISAT and Rural Communes for implementing the project.



Preventing malnutrition through proper guidance

Rajendra Mahale, a farmer from Sakharshet village in the Gram Panchayat of Sakharshet, belongs to a joint family with 12 members.

He is currently a Watershed Committee member in the village. He is working in the project implemented by ICRISAT and Rural Communes supported by JSW foundation. The project team has been working extremely hard to eradicate malnutrition in the village and Rajendra regularly attends the monthly meeting in which the team takes decisions and brainstorm about the activities and issues happening in the project area. Rajendra's daughter, who is 3 years old, is severely underweight and it was only after attending the meetings, Rajendra became aware about the issue of malnutrition.



During the month of September, the project team had detailed the members about their approach towards eradicating malnutrition from the selected villages by motivating farmers' to undertake nutrient enriched *rabi* crop and reduce the migration to towns and cities during dry season.

Rajendra decided to cultivate chickpea crop, which has good protein source and cultivated the crop in 0.05 ha as per the guidance of the project staff. He invested about ₹ 1094 for irrigation, labor and harvesting. He harvested a yield of about 62 kg, which he utilized to feed his family. It was for the first time, Rajendra had cultivated chickpea crop and he is now thankful to JSW, ICRISAT and Rural Communes for helping his village combat malnutrition and prevent migration.



SUMMARY

The JSW foundation is working with the Maharashtra Government to reduce malnutrition in Jawhar taluk. A total of six bits from this project area, were identified for agronomic interventions to improve quality and quantity of farm produce. ICRISAT initiated the work in the six villages of Ghivanda, Kogdha, Jamsar, Dabheri, Sakharshet, and Chambharshet.

As an entry point activity, a total of 410 soil samples were collected and analyzed for deficiencies. In order to increase water availability and reduce land degradation, 35 existing open wells and 16 check dams were rejuvenated, by de-silting and repair in order to help increase storage capacity and groundwater recharge. ICRISAT has also provided improved varieties of seeds in groundnut, pigeon pea, finger millet, pearl millet and wheat. Also by using methods such as broad bed and furrow, the crop yield in groundnut was enhanced by 48% when compared to farmers practice. Also activities to promote horticulture, vegetable cultivation, chickpea cultivation through management of rice fallows and promotion of SHGs has been vigorously implemented.

For further details :

Dr Suhas P Wani
Research Program Director, Asia and
Director, ICRISAT Development Center (IDC)
ICRISAT, Patancheru
Tel: +91 40 30713466; Email: s.wani@cgiar.org

Mr Dharmesh Gohel
Deputy Manager CSR
JSW Foundation
Tel: 094226 84268;
Email: dharmesh.gohel@jsw.in