AGRICULTURAL DEVELOPMENT
for Improved Livelihoods in Rural India
To address the challenges to achieving food security in India requires uplifting and enhancing the incomes of the country’s farming community—80 percent of whom are “marginal” and small landholders who are living in abject poverty. This large segment of the fast-growing population in the world requires multifaceted support to increase production, improve the quality of their produce, obtain an assured market, and receive input and credit support in order to improve their livelihoods and their families’ health and nutrition. Many of these farmers use outdated agricultural practices and work with poor-quality soil, poor-quality seed, and insufficient water for irrigation. They lack information about soil nutrition and the appropriate use of fertilizers, and they do not know how to access this important information.

Sehgal Foundation’s Agricultural Development Program is designed to decrease rural poverty in India by improving the livelihoods of these small and marginal landholders by increasing their crop productivity in a sustainable way, enhancing their knowledge and awareness of scientific farming practices and water-use efficiency, and strengthening their linkages with government departments and academic institutions. Farmers’ incomes improve by introducing them to easy-to-learn and easy-to-adopt best practices that boost agricultural productivity and optimize the cost incurred on inputs such as fertilizers, plant protection chemicals, water, and labor.

Developing allied agricultural activities such as horticulture and livestock management interventions also contribute significantly to household incomes in rural India. Sehgal Foundation crop scientists stationed at the International Crop Research for Semi-Arid Tropics (ICRISAT) continue to develop high-yielding hybrids and varieties that are disease and insect tolerant and are adapted to the tough growing conditions of arid and semi-arid areas. Assisting farmers in gaining access to the most appropriate tools, information, and methodologies in agriculture helps to assure increased farm production and increased livelihoods.
Good governance training and awareness building are key components of every Sehgal Foundation program and initiative. Capacity building is pivotal and a high priority for bringing efficiency to agricultural systems. The foundation team imparts information about modern and sustainable agricultural practices by organizing on-farm training, field days, exposure visits, and refresher coaching. Informational materials are distributed that farmers can easily use for ready reference. The interventions are proliferated far beyond the adopted clusters of villages, demonstrating that the farmers are learning from each other. Sehgal Foundation conducted more than 2,000 trainings and exposure visits in a period of fifteen years. About 50,000 farmers were exposed to best management practices in agriculture in that period.

Every crop grown and harvested depletes nutrients from the soil, and the nutrients must be replenished to sustain the production of a healthy crop. “Seeing is believing” is the core principle of the program’s implementation and operations. Results are demonstrated on the farmers’ own fields with side-by-side control and treated fields. A customized package of practices provided to farmers includes soil testing, appropriate seed rates, seed-sowing methods, essential micronutrients and macronutrients, correct quality and quantities of chemicals, high-yielding varieties of hybrid seeds, along with on-farm support during the crop cycle.

Jaagruk Krishak (enlightened farmer), an initiative of Sehgal Foundation, in Umarin block, Alwar, Rajasthan, trains women in sustainable agriculture. This has increased their self-esteem and decision-making roles in the family.

Crop diversification provides an alternate source of income for farmers that reduces risks from the failure of other crops. The Sehgal Foundation team set up model orchards of ber (Indian jujube), kinno, banana, pomegranate, lemon, and guava with fruit plantlets procured from certified nurseries. For protection from wild animals, orchards are fenced and a drip irrigation system is set up in each unit. About 5,000 saplings were distributed within three years. Beekeeping and mushroom cultivation were also introduced.

Poly tunnels are hi-tech vegetable nurseries introduced by Sehgal Foundation to produce healthy vegetable seedlings in the off season. Growing seedlings early for transplantation in the
field allows for a vegetable supply earlier than the normal season, providing a greater-than-average income. The controlled environment of a vegetable nursery nurtures young seedlings away from the vagaries of weather, pests, and disease, and at the appropriate time, the plants are moved to the fields. A suitable, cost-effective nursery structure is made locally using a polythene cover and a simple design.

**Kitchen gardens** are created by cultivating a small portion of land with an assorted mix of vegetables, fruits, spices, and herbs planted close to the household for a considerable stretch of the year. The foundation team distributes kitchen garden kits to the women of landless farm families. About 2,000 kits were distributed in the first three years.

Kitchen gardens add a diversity of food choices for better nutrition for the consumption of food items that may have otherwise been purchased from the market. The gardens add to the family income through the direct sale of freshly produced food items.

**Composting** is an effective method for preparing good-quality manure in a short time. Farmers often left cow dung in the open where it was exposed to the sun and rain and lost its nutritional value. Half-decomposed cow dung invites termites and other soil-borne diseases into the field. To address these issues, the Sehgal Foundation team began promoting waste decomposer composting. The technology developed by the National Center of Organic Farming is used to prepare compost in 40–50 days, and the bed that is used to prepare compost is used three times a year.

**Animal health camps** organized by Sehgal Foundation provide timely vaccinations and primary healthcare services to village livestock. Government veterinary extension services are
taken to junction villages where a veterinarian and a pharmacist provide on-the-spot treatment and advice. Services include pregnancy checks, deworming, dehorning, castration, small surgeries, vaccinations, and treatment of general illness. About 5,000 animals were treated in fifteen health camps.

**Animal nutrition management** is a requirement for profitable dairy farming. Inadequate feeding causes nutrition imbalances in milch animals so they cannot reach a desired body weight; they remain unhealthy and produce less milk. Dairy animals are dewormed and high-quality minerals are added to their diet. The method is sustainable because dietary supplements are available locally, and training is provided on how to administer them to the animals.

**Goat-rearing creates women entrepreneurs.** Goats-rearing is a source of additional income and an insurance against calamity in agricultural subsistence societies. Enterprising women from poor households are given information and training on how to establish goat-rearing units. Each unit has five goats—four females and one male. The Sehgal Foundation team provides training, including best practices in feed and nutrition and seasonal diseases and medicines, to these women entrepreneurs so they can run the units as an enterprise.
WATER CONSERVATION IS VITAL IN FARMING

In rain-fed agriculture, the foundation team promotes in situ water conservation practices that significantly increase the current productivity growth with better water-harvesting techniques.

**Micro-irrigation** systems such as sprinklers and drip irrigation help to improve crop productivity, reduce the cost of labor and fertilizers, and reduce disease. Sehgal Foundation links farmers with the available government subsidies and educates them about water conservation and cost saving.

**Sprinkler** irrigation uses 60 percent less water than flood irrigation. An impact sprinkler has a long spray radius that is driven in a circular motion by the force of outgoing water, creating the effect of natural rainfall.

**Drip irrigation** uses 75-80 percent less water than flood irrigation. It uses a network of valves, pipes, tubes, and emitters to allow water and fertilizer to drip slowly and evenly to the root zone of plants.
Laser land leveling makes the farm surface even, which results in more uniform distribution of moisture in the soil. Use of a laser-leveling machine has a major positive impact on germination, yield, and quality of crops, while reducing the amount of water required for irrigation by 25 percent. This method ensures that irrigation water reaches every part of the field. Fertilizer, chemical, and fuel requirements are decreased. Linkages are provided to farmers for renting the equipment. Fifteen hundred acres of land has been leveled in a span of three years, which saved approximately 525 to 675 million liters of groundwater.

Water-absorbent soil input includes the introduction of zeba, a superabsorbent soil-enhancement input that provides a constant supply of moisture and water-soluble nutrients to seeds and plants throughout the growing season. Applied at the time of seed sowing, zeba absorbs more than 400 times its weight in water, forming hydrogels that slowly release moisture back to plants as needed. With a healthy microenvironment for the root zone, plants grow healthier, crops are more uniform, and yields increase. The team organizes control and zeba-treated plots on farmers’ fields to demonstrate the effectiveness of zeba.

Farm bunds are simple earthen embankment-like structures constructed by the Sehgal Foundation team in collaboration with the farmers on cultivated land to collect rainwater from the up-slope catchments and in the field. These help to conserve soil and water on the farms and reduce the number of irrigations needed. Construction of a bund only begins after determining the land topography and direction of the water flow.

Irrigation ponds are important for small and marginal farmers who cannot afford to purchase water. During the monsoon season, rainwater is collected from the surrounding catchment area and stored in a pond to be used for critical irrigation water during the dry stress spells between rainfalls or during droughts.
Mechanization in agriculture has always been a major challenge in India due to small and scattered landholding. The Sehgal Foundation team introduces machines suitable for small agriculture. The farmers contribute to the cost of the machinery, which instills in them a sense of ownership as well as entrepreneurship. Farmers are trained to operate and maintain the machines and subsequently earn an extra livelihood by renting them to other farmers.

**Potato planters** are tractor-operated machines that help sow potato tubers on raised ridges (beds), reducing the need for labor and other costs involved in sowing. The machine can also be used for making raised beds for many other vegetables.

**Reapers** are tractor-mounted machines used for crop-cutting, reducing the demand for labor, saving time, and reducing the cost of harvesting.

**Maize shellers** are tractor-operated machines used for removing corn seed from corn cobs.
Zero (or minimal) tillage machines are used to increase the capacity of soil to absorb water, retain organic matter, and reduce erosion by allowing the direct sowing of rice seed (also known as direct seeding of rice, DSR) without ploughing, flooding, or puddling. While sowing the seeds, the zero tillage machine maintains equal depth and distance between seeds and rows. This uniformity provides better air circulation and sunlight, leading to uniform germination, fewer diseases, and better yields. While sowing the seed, fertilizer is provided at the root zone to increase its uptake. The foundation team promotes this technology in rice, wheat, lentils, mustard, and gram crops to reduce cost of cultivation and improve productivity. Farmers are trained in the calibration of the zero tillage machine for the proper dispersal of the seeds for a particular crop. The economic benefit of the zero or minimal tillage technique is demonstrated to farmers by comparing a control to a zero tillage machine plowed plot. About 2,700 acres of wheat have been cultivated using thirty zero tillage machines.

Solar water pumps make irrigation cost-effective and operate with a zero carbon footprint. Since the majority of India’s farmers do not have reliable access to water for irrigation, they buy water from neighboring water sources where it is extracted primarily with diesel pumps, an expensive alternative. Use of solar-powered pumps decreases the input cost to 25 percent, a considerable amount for the small farmer.

Sehgal Foundation uses a cluster development approach, which includes government subsidies for making this technology available to farmers. With these efforts, solar pumps have been used on about 800 acres in a span of three years.

Solar sprayers are battery-operated pumps that are superior to the manually operated spraying pumps in terms of convenience and uniformity of spray.
INFORMATION IS POWER

As with all Sehgal Foundation programs and initiatives, awareness of good governance in order to be able to access the services and programs provided by the government is a key to empowerment. The team provides various avenues for keeping abreast of the critical information.

Mobile Agri Clinic is an informational lifeline created as a partnership project of Sehgal Foundation and Pi Foundation, called Kaushal Krishak (skilled farmer), that delivers extension services to farmers’ doorsteps. In this center on wheels, an experienced agronomist supports farmers by diagnosing and offering remedial measures for plant diseases, insects/pests, weeds, nutrient deficiency, toxicity, and more. Clinic services include instant soil testing, farmers’ trainings, a video library, and relevant literature (handouts, leaflets, pamphlets, booklets). Samples of nutrients and chemicals and a digital repository of crop-specific insects/pests and diseases are on hand for reference. Information is provided on various crop practices, fertilizers, information on government schemes, disease identification and control, and assistance in solving farmer problems. Six thousand farmers in thirty-eight villages benefited from the mobile clinic in its first two years.

A toll-free helpline number managed by Sehgal Foundation’s Good Rural Governance team as part of the Mobile Agri Clinic initiative receives calls from farmers and community panchayats for information on services related to agriculture and government programs.

Community radio is a powerful tool for reaching farmers in their homes with useful information and opportunities for call-in dialogue on topics that matter to the community—agriculture, water initiatives, government services and programs, women’s issues, as well as providing children’s programming, cultural programs, and general entertainment. Sehgal Foundation’s community radio station Alfaz-e-Mewat (“Rural Voices of Mewat”) was launched in 2012 and broadcasts 13 hours per day, 7 days a week. The radio is staffed by members of the community who are provided with training and support. Programming is shared with other community radio stations across India. Giving a platform to such isolated and vulnerable people empowers them to raise their voices and participate in community development.
RURAL RESEARCH TEAM
MEASURES IMPACT

The Rural Research team quantifies the impact created by all Sehgal Foundation activities and establishes findings that are provided to the community, donors, and policymakers to help to improve strategies. Findings continue to affirm that the Agricultural Development Program is effective in empowering smallholder and marginal land-owning farmers and non-landholders with the tools to increase their livelihoods and address health and nutrition issues. For the rural community to be aware, confident, and knowledgeable about the best practices in agriculture and the government programs and services available to them as citizens are priorities for their own ongoing development.

CROP IMPROVEMENT
RESEARCH CONTINUES

*Good quality-improved seed* is critical to crop yield, and Sehgal Foundation is committed to finding improved varieties and hybrids that give high yield. Sehgal Foundation has collaborations with ICRISAT, CIMMYT, Kasetsart University, and University of Hohenheim for infrastructure and for acquisition of new germplasm.

Sehgal Foundation’s Crop Improvement Research program of scientists and researchers housed at International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) is recognized as a Scientific and Industrial Research Organization (SIRO) by the Department of Scientific and Industrial Research (DSIR). The work has been presented in papers at International Maize Conferences.

*Mega field days* attracted public and private-sector scientists who received seed packets of inbred lines on request.

*Hybrids* have been synthesized and evaluated at initial levels and replicated in trials at target locations during the rainy season. More hybrids are being multiplied for further testing in target areas. The team has successfully deployed doubled haploidy (DH); developed DH inbred lines; screened germplasm accessions for diseases; and identified resistant sources for turcicum leaf blight, stalk rot complex, and polysora rust; and identified multiple disease resistant (MDR) sources.

*Hybrids screening for turcicum leaf blight in hot spots* continues to identify germplasm that are moderately tolerant to turcicum leaf blight.

*New germplasm accessions* have been genetically fingerprinted using SSR markers and accessions using SNP genotyping.
**PARTNERSHIPS MAKE THE DIFFERENCE**

*Krishi Jyoti* (enlightened agriculture) is one of Sehgal Foundation’s first and most long-standing project partnerships to help farmers move out of poverty and achieve greater food security. Working with Sehgal Foundation, The Mosaic Company Foundation, and The Mosaic Company (Mosaic India Pvt Ltd) in the semiarid villages of Mewat district, Haryana, and Alwar district, Rajasthan, the project continues to build the capacities of farmers to increase farm productivity, promote water conservation, and promote education of schoolchildren in villages by renovating the infrastructures of government schools. *Krishi Jyoti* began with two villages in Mewat in 2008 and reached fifty-one villages within eight years. Farmers have seen their yields increase by as much as 35 percent over traditional farming practices. The project has directly benefited more than 25,000 villagers, cultivating nearly 12,000 acres of land.

Sehgal Foundation relies on many of these types of valuable and productive partnerships to create projects that are scalable and sustainable and have measurable impact.

**BENEFICIARIES SPEAK**

“I was surprised with the results at the time of harvest. The increase in production was achieved in the demonstration fields with a lower quantity of fertilizers and pesticides as compared to what I usually apply; this reduced the investment cost, saving my money.”

*Dinesh*
Village Amwa, East Champaran, Bihar

“Against an initial investment of Rs. 35,000–40,000 that is required for setting up a model orchard, the savings in irrigation costs and the revenues generated thereafter helped me think bigger. I now plan to allot another 1–2 bighas of land to an orchard.”

*Rameshwar Dayal*
Village Meghavas, Alwar, Rajasthan
“For the first time in the twenty years of my farming work, I recorded a 30 percent increase in yield on the demo portion of my field.”

**Bhagawati**
Village Jaityana, Alwar, Rajasthan.

When the foundation team introduced mini poly tunnels to farmers in Devirai Tola, Samastipur, Bihar, they had been using traditional bed nurseries in open fields, which left plants damaged. Sanjay Bhagat came forward to try out the new technique and, upon seeing his success (95 percent germination), the method was soon accepted by other farmers.

“After the death of my husband, I was totally dependent on my sons who themselves didn’t have much to eat. With the help of the kitchen garden kit, I now have an uninterrupted supply of nutritious vegetables. In addition, I am earning some money by selling them locally in the village.”

**Chandrakala Devi**
Village Khairimal, East Champaran, Bihar

“Spraying medicines prior to solar pump was a tedious process, often resulting in blisters on my hands and pain in the shoulders due to which I was unable to perform household tasks properly. Besides this, not worrying about the availability of electricity is a big relief.”

**Savitri**
Jatiyana village, Alwar, Rajasthan

“Bhagawati Village Jaityana, Alwar, Rajasthan.

The zero tillage machine brought good fortune to me. With manual plantation, the expenditure was much higher. Now it has decreased a lot, and the yield has been, in fact, one of the best yields not only in my village but in the entire block.”

**Yadav Lal Shah**
Village Mathiya, East Champaran, Bihar

“The solar pump has been a blessing in my life. The uninterrupted supply of water for irrigation has encouraged me to grow cash crops like onion, potato, and maize. My yield of paddy and wheat has increased greatly due to adequate water supply.”

**Abhay Singh**
Village Khairimal, East Champaran, Bihar
AGRICULTURE AWARDS RECOGNIZE IMPACT

2017
Iowa Secretary of Agriculture Leader Award for Outstanding Service in Agriculture.

2016
Ninth Global Agriculture Leadership Award from Indian Council of Food and Agriculture.

2014
ICRISAT Plaque of Appreciation and Thanks from Director General Dr. William Dar, 42nd Anniversary Celebration.

2010
Seghal Foundation model project “Improving Sustainable Livelihood Security Using Proven Solutions to Land Degradation in Semi-arid Regions of India” selected in the top 30 most innovative projects at 2010 Global Conference on Agriculture, Food Security, and Climate Change, The Hague, Netherlands, organized by Dutch, Norwegian, and Ethiopian governments.

2006
Department of Scientific and Industrial Research (DSIR) Government of India, R&D Recognition for Crop Improvement.

2002
ICRISAT “Best Friend of ICRISAT” Trophy from Director General Dr. William Dar.
SCALE, IMPACT, AND REACH ARE ESCALATING

Holding Special Consultative Status with the ECOSOC (United Nations Economic and Social Council), Sehgal Foundation is able to share its work related to the United Nations Sustainable Development Goals (SDGs) with a global audience.

Corporate Social Responsibility activities and goals approved by Schedule VII Section 135 of the Companies Act 2013 are strongly endorsed and supported by Sehgal Foundation.

As of 2019 Sehgal Foundation projects and initiatives have spread to 890 villages, 27 districts, and 8 states: Andhra Pradesh, Bihar, Haryana, Karnataka, Maharashtra, Rajasthan, Telangana, and Uttar Pradesh.

PLEASE JOIN

Sehgal Foundation invites partnerships with other individuals, corporates, government bodies, multilateral organizations, and educational institutions to further the sustainable development work to achieve positive social, economic, and environmental change across rural India.

Please contact smsf@smsfoundation.org.

S M SEHGLAL FOUNDATION
Plot No. 34, Sector 44, Institutional Area, Gurugram, Haryana 122 003, India
Tel: +91-124-474 4100, Fax: +91-124-474 4123,
Email: smsf@smsfoundation.org

S M Sehgal Foundation is a public, charitable trust registered in India since 1999.
www.smsfoundation.org

SEHGLAL FOUNDATION
100 Court Ave, # 211, Des Moines, IA 50309-2256, USA
Tel: +1-515-288 0010, Fax: +1-515-288 4501,
Email: sf-usa@smsfoundation.org

Sehgal Foundation is a 501(c) (3) tax-exempt private foundation established in 1998.

CROP IMPROVEMENT RESEARCH
Building 303, Room # 9-13, ICRISAT, Patancheru, Hyderabad, Telangana 502 324, India
Tel: +91-40-3071 3312, Fax: +91-40-3071 3044/75
Email: p.vanisekhar@smsfoundation.org