
13 Learnings and a Way Forward

SUHAS P. WANI* AND K.V. RAJU

*International Crops Research Institute for the Semi-Arid Tropics,
Patancheru, India*

13.1 Introduction

The mission of International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is 'to reduce poverty, malnutrition, hunger and environmental degradation in the dryland tropics'. The semi-arid tropics is a hot spot of poverty and malnutrition, as 850 million poor live in the region. In particular, the Indian subcontinent is a hot spot of malnutrition recording 3 million malnourished children below 5 years of age. This region is also water-scarce as the annual evapotranspiration demand is far higher than the available water in the region. As a result, agriculture largely depends on monsoonal rains and per capita availability of water particularly in India has declined from 5177 m³ in 1951 to 1450 m³ in 2015. Similar is the case for arable land availability, which is 0.11 ha per capita (in 2016). The region is also vulnerable to the impacts of climate change. In order to achieve sustainable development goal (SDG) of no poverty (SDG1), zero hunger (SDG2) including overcoming malnutrition through good health and well-being (SDG3) and responsible for production and consumption through sustainable management of natural resources (SDG12), ICRISAT in partnership with stakeholders undertakes science

with a human face through science of discovery to science of delivery.

In order to achieve the impacts of technologies and products developed by the researchers (ICRISAT and other researchers in the region), the ICRISAT Development Center has started addressing the issues of scaling-up by undertaking science-led development since 2002 to take the science of discovery to proof of concept and pilot stages to large impacts through number of innovations in terms of institutions, policies, partnerships, delivery mechanisms and input supply chain along with market linkages to achieve the impact. ICRISAT has developed a holistic, integrated participatory approach by adopting principles of the 4 'ICEs', i.e. 4 'Is': integrated, innovative, inclusive and intensive; 4 'Cs': consortium, collective action, convergence and capacity building; and 4 'Es': efficiency, equity, environmental protection and economic gain. This approach is intended to address the issues of enhancing profitability, building skills for increasing implementation, protecting environment by adopting inclusive market-oriented development (IMOD) approach. Scaling-up is undertaken by addressing the issues through science-led development to undertake corporate social responsibility (CSR) work as a win-win proposition for achieving the goals of sustainability,

* Corresponding author: s.wani@cgiar.org

environmental protection and improving livelihoods while achieving food security and nutrition security. In this process, a number of corporates like Sir Dorabji Tata Trust (SDTT), Sir Ratan Tata Trust (SRTT), Jindal South West Foundation (JSW Foundation), Asian Paints Limited, AB InBev (earlier SABMiller India), Mahindra & Mahindra Ltd, Coca-Cola India Inc., Power Grid Corporation of India Limited and Rural Electrification Corporation Limited (RECL) have joined hands with ICRISAT by providing funds through CSR for rural development.

The main interventions undertaken through this initiative are for improving rural livelihoods through sustainable management of water resources, land resources and enhancing productivity and profitability of agriculture in the region. The results of the CSR initiatives are remarkable where the science-led development approach was adopted with community participation in partnership with implementing non-governmental organization (NGO) partners. This is evident from the number of families reached (>50,000) and nearly 0.5 million m³ of rainwater storage capacity created in the rural areas. This has resulted in the harvesting of 1 million m³ of water and 0.5–0.8 million m³ of groundwater recharge. In addition to rainwater harvesting and increasing groundwater recharge, the interventions also resulted in reducing soil erosion by 40–50%, increasing agricultural productivity from 13% to 56%. It also increased cropping intensity with improved water availability, resulting in reducing the water footprint by 35% and increasing household incomes up to 280%.

More importantly, in addition to the above positive effects, tangible benefits and supportive ecosystem services such as improved water quality, increased carbon sequestration along with improved social capital through enhanced cooperation have also benefited the community, because of the integrated holistic approach. A number of income-generating activities have benefited women and young people in the villages, creating employment in the rural areas. This win-win proposition for corporates and research organizations and the communities through CSR clearly highlights the need for science-led integrated holistic approach and linking farmers to markets where corporates could play an important role. This is one of the best models for sustainable

development through win-win proposition for corporates and the communities.

13.2 Background

This initiative of development research or the concept of 'Science with a Human Face' underlines the importance of achieving the impact of the various technologies/products developed by researchers. However, on the ground, large yield gaps currently exist between farmers' current yields and achievable potential yields, which are two- to fivefold higher than what farmers harvest. At the same time, the potential achievable yield in the rainfed situation has been established to be up to 5–6 t/ha in Asia as well as in Africa (Rockström *et al.*, 2007; Wani *et al.*, 2009). However, this potential is not realized, largely due to failure of delivery mechanism in terms of knowledge, about the technologies and products as well as inputs, credit and poor infrastructure. In order to bridge this gap, ICRISAT has initiated scaled-up initiatives for all the technologies and products developed by researchers (national agricultural research system (NARS), ICRISAT and other international organizations) to achieve the impact on a large number of farmers by bridging the gap between the pilot scale and realizing impact. The scientists undertake the 'discovery phase' as well as 'proof of concept' and pilot scale, demonstrating the suitability of the technologies to several hundreds or thousands of farmers. However, the challenge in terms of the science of delivery, through enabling institutions, policies and knowledge delivery systems, calls for innovations to overcome the gaps to achieve the impact.

ICRISAT Development Center has undertaken the science of delivery to ensure that the technologies/products developed by the researchers are made available to the farmers by adopting the consortium approach. In this process, knowledge-generating institutions such as ICRISAT, NARS, state agricultural universities and other international centres are linked with knowledge-transforming institutions such as the Department of Agriculture of both national and state levels, along with NGOs, besides building public-private partnerships to address different issues such as knowledge delivery, market linkages and value addition by adopting the

IMOD approach and innovating, enabling institutions and policies to ensure the availability of the necessary infrastructure to achieve the impact (see Chapter 2 in this volume).

The CSR initiative is supported by corporates, particularly in terms of natural resource management, environment protection, livelihood improvement and skill development of the rural people to improve their livelihoods through increased productivity and profitability. This particular initiative builds on the four pillars of 4 'ICEs'. The strategy is built on *innovations* in the areas of not only technologies but also institutions, building partnerships and networking to ensure *inclusivity* for small and marginal farm holders, for sustainable *intensification* of the systems by adopting *integrated* approach. For building partnerships, IDC adopts the *consortium approach* by bringing different stakeholders such as knowledge-generating institutions with knowledge-transforming institutions, producers, processors and marketers with development partners together on one platform through *collective action* of the farmers, as well as other consortium members, to *converge* different interventions, and actions of the partners, resources and institutions through *capacity building* of all the consortium partners. Through innovations and partnership, ICRISAT aims for *economic gain/profitability* through enhancing resource-use *efficiency* to address the issues of *equity* and *environmental protection* (see Chapter 2 in this volume).

The CSR initiatives have converged in the central place to help development with the Companies' Act 2013 of Government of India. With effect from 1 April 2014, every private limited or public limited company, which either has a net worth of ₹500 crore or a turnover of ₹1000 crore or a net profit of ₹5 crore, is required to spend on CSR at least 2% of its average net profit for the immediate preceding three financial years' activities.

This book provides an excellent insight into the early phase of CSR work undertaken by ICRISAT-led consortium for achieving the impacts and has gathered a number of learnings by working in partnership which can benefit development research as well as corporates to have a win-win proposition for improving the livelihoods, protecting the environment and building the skills in rural areas by undertaking science of delivery.

This also serves as a feedback loop for the scientists to undertake the discovery phase of research which is demand-driven and will benefit the farmers.

13.3 Learnings

ICRISAT has been working with corporates since 2002 and subsequently with the approval of the Companies' Act, a number of corporates and public-sector companies have come forward to help take science to the doorstep of the farmers to benefit through science-led development. In the process, the following lessons were learnt. Also, issues were raised on how to move forward and strengthen efforts to achieve large-scale impacts.

- The most important learning which emerged from this initiative is that most of the scientists are not keen to visit farmers' fields, as it is perceived that it is an extension job which needs to be done by the departments, at state or national level or by the NGOs. However, it is observed that neither the state Department of Agriculture nor the NGOs can keep themselves updated with the developments in the area of science as well as do the necessary refinements in the technology which scientists have worked on. Hence this new arena of research for development should be strengthened and the mindset of the scientists need to be changed so that it is a continuum from discovery to the proof of concept to the pilot stage to the impact. Scientists need to lead the partners to achieve the desired impacts, as it is their technologies and products which would benefit the farmers.
- It is observed that the best impact can be achieved by adopting the holistic and integrated approach and not to adopt compartmental approach while dealing with farmers, as they expect complete solutions for their problems from the scientists. In order to offer holistic solutions, a consortium approach should be adopted so as to build a partnership to resolve the issues faced by the farmers, namely scientific, availability of the products/inputs, knowledge, market information, market linkages, infrastructure and

all the solutions associated with agriculture and allied sectors such as horticulture, animal husbandry, fisheries, watershed management, etc. Unless a holistic and integrated approach is adopted, impacts cannot be seen on the ground; for example, ICRISAT had undertaken soil health mapping at the village level, and then scientists made recommendations to farmers using the soil health information. However, if the required inputs like micro- and secondary nutrients are not readily available at the right time and at the right price, farmers will not be able to make use of the knowledge or information provided to them about the soil test-based fertilizer recommendations. Hence the consortium needs to work with the concerned government departments as well as private companies to ensure availability of the recommended nutrients at the cluster/village level so that farmers do not have to travel long distances at the time of sowing, as farmers are really facing hardships to undertake timely sowing in their fields (see Chapter 3 in this volume).

- In the rainfed areas, water is the main limiting factor in agriculture and unless farmers are assured the availability of water during the cropping season, farmers generally do not take the risk to invest much in quality seeds, fertilizers as well as improved management practices as they do not have the capacity to bear the risk. Integrated watershed management approach which enhances the green water content through increased soil moisture, as well as excess rainwater harvested in small structures throughout the toposequence will benefit the farmers through seepage of water to the downstream areas, as well as providing lifesaving irrigation using the harvested rainwater or by increasing the availability of groundwater through groundwater recharge (see Chapters 5, 6, 7, 11 and 12 in this volume).
- Integrated watershed management approach has undergone a paradigm shift since 2009 where the watershed programmes which were dealing with soil and water conservation have been transformed into livelihood programmes in order to address the issues of women and landless people as traditional watershed programmes were land-based interventions so people who do not own land were not the beneficiaries. Also, integrated watershed management ensures tangible economic benefits to the large number of farmers who do not have access to groundwater through *in-situ* moisture conservation and by enhancing water-use efficiency through improved cultivars, fertilizer management and improved soil crop-management practices for increasing crop productivity (Wani *et al.*, 2008).
- As it is evident from the work, productivity enhancement benefits not only farmers but also the market, as it is the market that determines the profitability for the farmers and the value chain or middle men who are involved in disposing the farmers' produce to the market. Hence collective action by the farmers through self-help groups (SHGs) or through farmers' cooperatives such as farmer producer organizations needs to be promoted to ensure that farmers have direct access to the markets and also the number of middle men is reduced so that farmers can get better benefit from the market price by directly dealing with the wholesalers/corporates who buy their products (see Chapters 2, 6, 9, 10 in this volume).
- The IMOD approach has to be adopted to ensure that every small farm holder is linked through cooperatives to the market or to the corporates so that corporates/wholesalers feel comfortable to deal with the producers and achieve full scale in their operations (see Chapter 2 in this volume).
- As farmers adopt mixed farming systems, a farming systems approach needs to be followed to provide solutions to the farmers rather than the compartmental approach of agriculture and allied sectors. Agriculture, horticulture, livestock, credit, market, etc. are the artificial boundaries created and through integrated holistic approach integrated solutions need to be provided to the farmers (see Chapters 2, 8, 9, 10 in this volume).
- Fifty per cent of the population in the villages is comprised of women. Hence women should be the integral part of various initiatives for livelihood and agriculture as they are involved in family decision making. The most important point is that issues such as food security and nutrition security of family

are better handled by women than men, and this strength needs to be harnessed by involving the women in integrated programmes through SHGs to handle value chain as well as income-generating activities and processing of the agricultural products in the rural areas (see Chapters 4, 5, 6, 7, 8, 9, 10 and 11 in this volume).

- There is an urgent need to strengthen knowledge delivery systems by using information and communication technology (ICT). About 137 million farm holders in India cannot be met through person-to-person contact methods of knowledge delivery. Hence simple ICT tools need to be developed and the youth should be trained for supporting the farmers through ICTs and also get interested in knowledge intensive technologies driven in the villages. Knowledge delivery system plays an important role and tools like farmer field school, farmer-to-farmer videos, tablet-based extension systems and mobile-based short-messaging systems need to be harnessed in addition to the para-agricultural workers who serve as a link between farmers and department staff or the scientists. Using the information about the soil as well as current rainfall and predictions for the next 5 days, sowing date application has been developed and has benefited farmers with increased crop yields. By undertaking the sowing of crops like groundnut, where the seed costs are very high, such simple applications using artificial intelligence and machine learning are very much needed to benefit the farmers for improving their livelihoods and profitability by minimizing their risk (see Chapters 2, 4, 6, 7, 9, 10 in this volume).
- Agriculture has become unprofitable largely because of the increased costs of inputs and labour. There is an urgent need to undertake mechanization of small farms through appropriate machinery like easy planters, seed dibber and other machines which can be provided through machine-hiring centres in the villages so that each small farmer does not have to own the machines, as these are economically not remunerative because of farm size.
- The access to improved seeds for the farmers needs to be ensured and by adopting farmer

participatory selection of cultivars, they should be able to take a decision about selection of cultivar based on the traits/parameters they prefer in terms of fodder, quality, size, colour, taste, marketability, etc., in addition to yield. Scientists need to provide the choice to the farmers of the improved cultivars by adopting farmer participatory selection approach and once the farmers have identified appropriate cultivars then seed systems particularly at the village level for varieties/cultivars need to be established. This ensures the supply of quality seeds at a reasonable price to the farmers as they themselves have seen the performance in their fields and at the same time, the SHGs can get livelihood opportunities also by establishing decentralized seed banks (see Chapters 4, 5, 9, 11 and 12 in this volume).

- In order to address the issue of integrated water scarcity and health, the perennial source of domestic wastewater in the villages needs to be harnessed through appropriate treatment by adopting decentralized wastewater treatment using filtration, microbes for bioremediation and phytoremediation for purification of domestic wastewater and making it safe for agricultural use. This initiative has benefited a number of villagers for producing fodder for the animals even during summer as well as producing other agricultural crops in small areas through SHGs. The decentralized wastewater treatment needs to be scaled-up across the country and can become part of the Swachh Bharat Mission, so that rural areas can be freed from health issues and address the issues of water availability for growing fodder, etc. (see Chapter 12 in this volume).
- In order to address the livelihood issues by adopting the farming systems approach, valuable trees like teak or fruit trees need to be planted on field bunds so that it benefits farmers in the long term by protecting the field bunds, producing increased income and also efficient use of water from the deeper layers which is not used by field crops (see Chapter 5 and 6 in this volume).
- Proper land-use planning is most important, based on the land capability and agroecological potential. Farmers should be

encouraged through appropriate incentives to produce what the market needs. Market-led development will ensure that through collective planning at village/cluster of villages level, farmers will synchronize plantation and also produce the product/cultivars which are required by the corporates, for processing, etc. Generally, it is the normal scenario in Indian agriculture.

- The government also needs to ensure appropriate support mechanisms for farmers to produce food and should have in place the minimum support price mechanism as most of the agricultural activities in the country is driven by the state of national departments. Government support for crops like rice and wheat need to be extended to other crops which are grown by farmers.
- The impacts of climate change are very much evident now and appropriate adaptation and mitigation strategies based on the studies at micro-level of district/taluk need to be undertaken in order to build the resilience of farmers to the impacts of climate change. Farmers do not have the knowledge/information about the impacts of climate change in terms of change in the length of growing period, water availability and temperatures as well as natural disasters like drought, etc., and good information flow with prediction models need to be provided to the farmers (see Chapters 4, 7, 8, 9 and 10 in this volume).
- The science of soil analysis which has been known for the past 100 years has not benefited small and marginal farmers in Asia and Africa for the simple reason that the knowledge was not transformed into information and made available to the farmers. Soil health mapping and developing soil test-based recommendations for different crops are a good entry point activity to ensure tangible economic benefits to majority of the small farm holders in the project area. This simple knowledge-based entry point also helps in protecting the environment by reducing application of unwanted nutrients which result in pollution of water bodies and environment. In addition, it also helps in reducing the cost of cultivation for the farmers and increasing

farmers' income through increased productivity (see Chapter 3 in this volume).

13.4 The Way Forward

Based on the learnings from various CSR initiatives undertaken by the ICRISAT-led consortium as well as by others, there is a huge scope to channel the CSR funds for achieving the goals of no poverty (SDG1), zero hunger (SDG2) and responsible for production and consumption through sustainable management of natural resources (SDG12). However, a paradigm shift is needed to undertake the CSR initiatives, which should be science-led and integrated through building partnerships. Through CSR, ICRISAT has reached out to about 225 villages in different states of India covering about 100,000 ha benefiting 65,000 families and 325,000 people through improved food and nutritional security, and by improving their livelihoods and protecting the environment through various soil and water management and livelihood interventions. The following propositions are suggested for future CSR work.

- In order to achieve larger impacts through CSR, the group of companies should have crowd funding and undertake various development initiatives in the target area in an integrated manner through efficient management of financial resources and building partnerships which will benefit each other and also the community. A consortium of companies can be formed which can be led by an independent organization and by bringing together a reputed implementing agency, the programmes can be implemented which will benefit a large number of farmers in the country.
- The CSR funding has a huge potential to alleviate the agrarian distress in the country by channelling the funds and through convergence of actions/activities along with different government schemes. Corporates can play a leading role to establish novel models and innovations and undertake skill development which will be a win-win proposition for the corporates as well as for the rural people and the government.

- Corporates can harness the opportunities of building sustainable business through CSR by adopting the philosophy of 'whatever is given to society, society gives it back to you' so that it becomes a win-win proposition and also develop goodwill among the masses.
- The targeted initiatives to benefit women and the youth using scientific approaches and tools like mechanization, ICT and value-chain approach can create good number of jobs in the rural areas which will meet the requirement of the corporates in a cost-effective manner and help the rural people to improve their livelihoods.
- Scientific organizations like state agricultural universities, national agricultural research institutes and international institutions need to take lead to develop science-led development approach to benefit rural masses as well as achieve the larger impacts through CSR funding.
- Convergence of CSR funding with appropriate government schemes can be achieved through public-private partnerships and can result in a win-win proposition for the government programmes to achieve the targets through improved implementation and monitoring and evaluation through CSR programmes. The corporates need to procure the required products from agriculture, and the input supply chain can be established through the collective action of farmer cooperatives/farmer producer organizations.
- Infrastructure development through CSR for the value chain can be a good proposition to benefit the farmers, as well as create jobs for the young people in rural areas and also minimize postharvest losses.

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