A Step Towards Climate Resilient Agriculture

System of Crop Intensification

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Photo: Village Khandgedhara, Sangamner, Ahmednagar district, Maharashtra
However, rebuilding soil quality and health through appropriate farming practices may take several years, especially in dryland areas with limited moisture. It also requires institutional and policy backing, funding, capacity building etc. The challenge then is to identify crop management practices that promote soil health, help in moisture retention and ensure productivity as well as short term profitability for farmers.

Need for Adaptive Sustainable Agriculture

Modern-day chemical-based agriculture demands very high input costs which resource-poor farmers cannot afford. This pushes the poor farmers into long-ranging debt-traps. Dryland ecosystems have particularly fragile soil conditions. A high-chemical and high-irrigation based agriculture while giving short-term returns, damages soil health in the long run. There is an urgent need to build soil health systematically and to maintain it.

Monoculture, cash-crop driven agriculture reduces food security, leaving the farmer with lesser access to food crops. In times of stress, and when cash-crops fail, they are driven into vicious starvation cycles. It is essential to increase food crop varieties and diversify agriculture.

Agriculture being climate-dependent is highly vulnerable to weather variations. It is important to increase and diversify land-based income sources. Sustainable agriculture is not only about seed improvement, it is also about sustainable and practical methodologies. These methodologies have to be simple to follow, based on locally available and inexpensive inputs. They also have to be capable of being up-scaled, while being adaptable to local weather-and-soil conditions.

The sustainable improvement of agriculture productivity is an important aim of WOTR. Towards this end, in its project areas across India, WOTR has introduced the System of Crop Intensification (SCI) – a modification of successful SRI and applied it to a variety of crops.
WHAT IS SCI?

System of Crop Intensification: is a four pronged approach that is implemented systematically, more so in the case of poor soils. It involves soil preparation and management, crop spacing, systematic application of locally prepared organic inputs and micro-nutrient foliar sprays.

**Soil preparation and management**

Deep soil ploughing specifically done during the summer works wonders on increasing the crop yields. It also reduces weeds, soil pathogens and pests considerably.

**Crop spacing**

SCI focuses on reducing the crop density per acre based on plant type and variety. Decreasing the density of crop per acre and maintaining a specific distance between the plants ensures that adequate space, light, nutrients and water is available *per plant*. This results in better plant growth and in turn better yields. Healthier plants have a stronger "immune and response system" which helps produce "phytochemicals" that naturally support plant development and protect the plant from external stresses.

**Systematic Application of Organic Inputs**

SCI involves timely application/spraying of specially prepared organic inputs – one is "a growth promoter cum insect repellent and the other is a fertilizer" - prepared with cattle manure and locally available ingredients. The combination of the two, even in highly deteriorated soils, results in enhanced plant growth, good colour, new shoots and flowering and early crop maturity. Over 3 seasons of regular usage it improves soil fertility, microbial and organic content in the soil, soil texture and soil water holding capacity.

**Micro-nutrient foliar spray and basal applications**

Degraded soil conditions with less organic matter and microbial content do not bring in the desired results in plant yields immediately. SCI promotes spraying of micro-nutrient and basal applications to provide adequate nutrients needed in the interim. This is phased off as the soil health improves and eventually it is totally stopped.

1 The method for crop spacing was developed by Mr. Satish Shidhar who has been guiding WOTR in taking this technology to the farmers in WOTR’s project areas.
SCI field trials were conducted on a variety of vegetable crops, sunflower, maize, paddy, turmeric, groundnut, pulses and wheat.
WHY SCI?

SCI is Simple to Follow

SCI is simple to understand and follow and can be practiced by all farmers. It is also a method that can work in any agro-ecological system. It thus can be widely applied across varied crops and ecosystems. SCI uses locally available, inexpensive, organic inputs and only initial use of micro-nutrient foliar spray and basal applications thus making it low input technique.

SCI a Viable Intermediate to Organic Farming

Yields in low external input farming or organic farming increase gradually and actually give results after three years. For a resource poor farmer this is unacceptable. SCI is thus highly suitable for poor farmers as the yields do not show a sudden decrease because initially small amounts of chemical micro-nutrients are used as fertilizers. Pesticide usage is also nil. Over three seasons, as the soil health improves, the usage of micro-nutrients tapers off and the farmer eventually practices pure organic farming without having to face the initial losses due to reduced yields.

SCI is a Climate Adaptive Method

SCI method increases the plant's resilience and adaptive capacity. The plants are much bigger, healthier with stronger root system. They are able to withstand, strong winds, and high intensity rainfall and endure much less damage. The plants also have higher tolerance to heat especially during the dry spells. Adequate amounts of phytochemicals in the plant's system help combat climate induced stresses such as pest attacks better. The application of the specially prepared organic fertilizers in the soil increase the capacity of the soil to hold moisture, due to which even with lesser water availability crop yields do not get much affected.

Adequate amounts of phytochemicals in the plant's system help combat climate induced stresses.

Notes:

1. Farmers have had the above mentioned experiences. However proper documentation of these will be carried out.

CLIMATE RISKS

- Untimely rains
- Sudden high intensity rainfall for prolonged periods
- Dry spells or frost
- Temperature fluctuations
- Heat waves

Application of organic fertilizers increases the soil water holding capacity: plant has higher tolerance to heat and germination problems reduced

Regular weeding and top soil management operations minimize water loss from soil: making more water available for the plants

Plants are bigger in size, with stronger stems, larger root systems, and stronger stilt roots: higher capacity to withstand climate events

Initial micro-nutrient sprays support plant growth: ensures no drop in yields and physiological disorders

Healthier plants mature faster resulting in early harvests, thereby utilizing water more efficiently more ‘crop per drop’

Healthy plants have higher phytochemicals and hence higher response capacity; more resistant to pest and disease attacks

Spraying of organic growth promoters: reduces pest attacks, promotes plant growth, reduces germination problems

Note: The above statements are captured during field trials. Proper documentation and research over a few years is required to substantiate further.
WOTR’s experience has been to use a combination of techniques for extension, an iterative process where strategies are improvised constantly.

**Farmer Field Schools**: Farmer Field Schools (FFS) provided real-time, on-site training and technical support. The trainings are conducted and technical advice is provided on the demo-plots itself.

**Crop demonstration**: With the premise that “seeing is believing” farmers are encouraged to have small demonstration plots right beside their regular field. In this manner, the difference in the crops between the two methods is immediately visible.

**Participatory Documentation**: Interviews of farmers are taken at every stage. Their perceptions, their experiences and their difficulties are recorded. These are used to build awareness and to encourage other farmers to adopt better practices.

**Collaborative Linkages**: WOTR supports farmers by building linkages at all stages; linking with government programmes such as Integrated Watershed Management Programme (IWMP), National Rural Employment Guarantee Schemes (MGNREGS) as well as through Public –Private – Civil society Partnership (PPCP) projects with the corporate sector: registering farmer groups, facilitating access to micro irrigation; and supporting farmers by facilitating market linkages for the SCI produce.

**Onsite Technical Support**: Is the most essential. Timely advise to farmers helps keep them motivated to continue the new techniques and results in faster adoption of the same.
**Agro-Metrology:** The need of locale specific agro-advisories is important to farmers, to help them be prepared for and to respond appropriately to climatic variations (when possible). Weather stations from groups of villages are directly connected to the Indian Meteorological Department (IMD) servers, which provides locale-specific weather forecasts. In collaboration with research institutes WOTR generates crop specific agro-advisories, disseminating these through SMS to farmers’ mobile phones, through village Wall Papers and FFS meetings.

**Enterprise promotion:** This is done by facilitating formation of SHG groups and encouraging traditional livestock keepers to start manufacturing specialized organic manure from indigenous cattle which they sell to farmers doing SCI, Non Pesticide Management, or organic farming. This not only helps to generate income for women Self Help Groups and the traditional livestock keepers but also helps conserve and develop indigenous cattle breeds.

**Involving women:** Changed crop-livestock productions systems at the village level have further increased the work load of women apart from their daily house chores. Due to this, very few women are able to attend training events are participate in exposure visits. With a view to benefit women farmers, trainings are conducted on demonstration plots during real time agriculture activities such as sowing, spraying, harvesting crops etc., explaining to them the SCI methodology.
Comprehending technology is critical
Any technology gives best results in research farms or in progressive farmers' fields because all essential factors are totally controlled or can be managed easily. However with small farmers many factors beyond our control come into play. One would need to address many practical problems that are often not considered leading to unintended consequences. Hence, comprehending the methodology and how it will perform in reality is critical for implementers so that support systems in the form of project interventions can be built in along with customized communication strategies.

Scientific data recording increases the success rate
New technology in the initial years may give varied results even in the same location. Hence, documentation is important-recording field trial results and the improvised methods. Involving the farmer family in documentation helps in their better understanding and acceptance of the methodology.

Understanding the system and locale specific dynamics is essential
Resource poor farmers in dryland regions have unique farming systems and a lot of traditional knowledge. Farming systems, methods, application of inputs differ even within adjoining agro-ecological sub-zones. This is because of differences in lifestyle, access to infrastructure, markets and market information, timely availability of inputs and developments in non-farm sectors. All these factors influence the mind set and decision making of farmers and influence acceptance of the new methodologies.

Communication strategy: Locale specific and an iterative process
It is vital to study the farming systems and locale specific dynamics before designing agriculture extension or communication strategies when introducing any new technology. What works in one location may not work in another. The communication strategies need to be an iterative process and locale specific.