

Recent natural resource management achievements

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Natural Resource Management Division of ICAR is conducting basic and strategic researches to develop technologies for conservation, management and sustainable utilization of the natural resources ensuring food, nutritional and environmental security in the country. Its vision is sustainable management of natural resources for achieving food, nutritional, environmental and livelihood security in the country.

Key words: Organic farming, Rubber dam, Soil test kit

NRM Division has re-oriented its research in farmers' participatory mode, addressing issues at ground level and developing location specific, cost effective, eco-friendly, socially acceptable scientific farming practices. The farming practices include areas of soil health management, integrated water management, watershed management, enhancement of nutrient and water use efficiency, resource conservation, crop diversification, integrated weed management, integrated farming system including agroforestry, dryland farming, arid, coastal and hill agriculture, abiotic stress management, climate resilient agriculture, conservation agriculture, waste water utilization and solid waste management, keeping in view the farmers' resource availability, traditional indigenous technology knowhow and grassroot farm innovations. Some of the salient achievements in the recent years are as under:

Developed digital portable soil test kit cum mini lab (Mridaparikshak): A digital portable soil test kit cum mini Lab capable of measuring 12 parameters depicted in soil health card to provide soil testing service at farmers' doorstep alongwith soil



Fig. 1. Mridaparikshak: Digital portable soil test kit cum mini lab.

test based fertilizer recommendations (Fig. 1).

Design and development of rubber dams for watersheds: Developed multipurpose rubber dam for watershed to reduce soil erosion, create water storage facility, enhance ground water recharge, and quick and safe disposal of sediments (Fig. 2). It can store 20-25% additional water in comparison to traditional checkdam to provide irrigation in critical stage.

Integrated farming System



Fig. 2. Multipurpose rubber dam for watershed

models: Developed 45 multi-enterprise IFS models to enhance farm productivity and income of small and marginal farmers to the tune of ₹ 1.5 -3.6 lakhs per annum.

Organic farming package of practices : Developed organic farming package of practices for 51 crops/cropping systems which have been promoted NCOF/PKVY/NHM.

Agri-voltaic system of crop production and electricity generation: Developed agri-voltaic solar farming system for raising income both from agriculture and generation of electricity as well. The model enables growing crops under the solar panels.

The details with visuals are given below:

Digital portable soil test kit cum mini Lab (Mridaparikshak):

In order to facilitate National Mission on Soil Health Card, NRM Division of ICAR has developed a portable soil test kit/Mini Lab (Mridaparikshak/) (Fig. 1), capable of measuring all the 12 soil parameters of Soil Health Card to provide soil testing service at farmers' doorstep. It contains 12 parameters,



Fig. 3. Crops grown at inter-space area of agri-voltaic system

namely N,P,K (Macro-nutrients); S (Secondary nutrient); Zn, Fe, Cu, Mn, Bo (Micro nutrients); and pH, EC, OC (Physical parameters). The kit is capable of providing information to farmers on soil nutrient status of their land and recommendation on appropriate dosage of nutrients to be applied for improving soil health and its fertility.

Feature:

- The kit is complementary to soil testing labs
- It is useful for rapid analysis of soil samples for generating soil health cards along with the crop and soil specific fertilizer nutrient recommendations, monitoring of soil fertility and preparation of geo-referenced soil fertility maps at block/village level.
- Area of operation: Village/panchayet level, KVKs and STLs
- Cost: ₹ 86,000
- So far more than 1096 units already sold.

Multipurpose, inflatable, flexi Rubber dam for watershed.

- ICAR has developed multipurpose rubber dam for watershed (Fig. 2) to reduce soil erosion, create water storage facility, enhance ground water recharge, and quick and safe disposal of sediments. It can store 20-25% additional water in comparison to traditional checkdam to provide irrigation in critical stage and to facilitate ground water recharging with yield advantage by 62% in *Kharif* rice and 47% in vegetables during *Rabi*. This technology has a potential to

benefit farmers in rainfed agro-ecosystems by providing irrigation. This can also be used in coastal creeks, estuaries, streams and channels to restrict the inflow of sea water into land mass during cyclone, tsunami and high tides.

Features:

- Cost: Nearly ₹ 8 lakhs (width 5 m × 1.5 m height)
- The investment on rubber dam can be recovered within a span of three years i.e. the payback period at 14.3% internal rate of return (IRR).
- Installed 43 rubber dams in 6 states (Odisha, Uttarakhand, Maharashtra, Madhya Pradesh, Gujarat and Jharkhand).

Organic farming package of practices

With the increase in global health consciousness, organic food is set to knock every door and make its way in healthy kitchens worldwide. Organic farming is gaining popularity among the farmers due to higher remuneration of organic produce in domestic as well as international markets. ICAR, so far, has developed 51 organic farming package of practices for various crops/cropping systems under Network Project on Organic Farming. These are being promoted under through NCOF/PKVY/NHM.

Integrated farming system model

Integrated Farming System (IFS) enhances resource use efficiencies for improved and sustainable crop productivity. Integrated Farming is linked to profitability, livelihood generation and risk minimization. IFS

models are in line with the Government efforts towards doubling farmers' income. ICAR has developed 45 location specific multi-enterprise IFS models encompassing field and horticultural crops, agroforestry, livestock, fisheries suiting to small and marginal farmers of different agro-ecological regions of the country to enhance farm productivity and profitability. IFS intervention can increase Farmers' income to the tune of Rs. 1.5 -3.6 lakhs per annum. IFS provide more stable incomes even during years of extreme weather events. Net Profit (mean of 3 years) ranges between ₹ 1.5- 2.5 lakhs. 34% of total inputs except labour is recyclable. Expected value of additional employment is ₹ 88,000. Kerala government sanctioned ₹ 1470 lakhs (2017-18 to 2018-19) to establish 2300 models (@2 in each Panchayat).

Agri-voltaic system of crop production and electricity generation

ICAR has designed and developed an Agri-voltaic system (Fig. 3) through which electricity can be generated, crops can be cultivated at interspace area and rainwater can be harvested from top surface of PV-module. About 49% land area of a solar PV-installation system can be used to cultivate crops, which is otherwise left as fallow. Apart from crop production, about 150,000 litre of rainwater on one acre can be harvested. The stored water can be used as supplemental irrigation to crops during *rabi*. Annual income from PV generated electricity has been estimated as ₹ 700,000 per acre, whereas cost involved for installation of such system is ₹ 55,00,000 and thus the breakeven period of the system is about 9-10 years. The solar farming system may bring huge opportunity to dryland farmers. Although the initial investment for solar farming system is high, however the break even period or payback period of the system is about 8-9 years whereas the life cycle of the system is 25 years. Apart from economic benefit, solar farming system also reduces GHG emission (598.6 tons of CO₂ savings/year/ha).

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