

Innovative Technologies for Agri Business



**Zonal Technology Management &
Business Planning and Development Unit
Indian Agricultural Research Institute**

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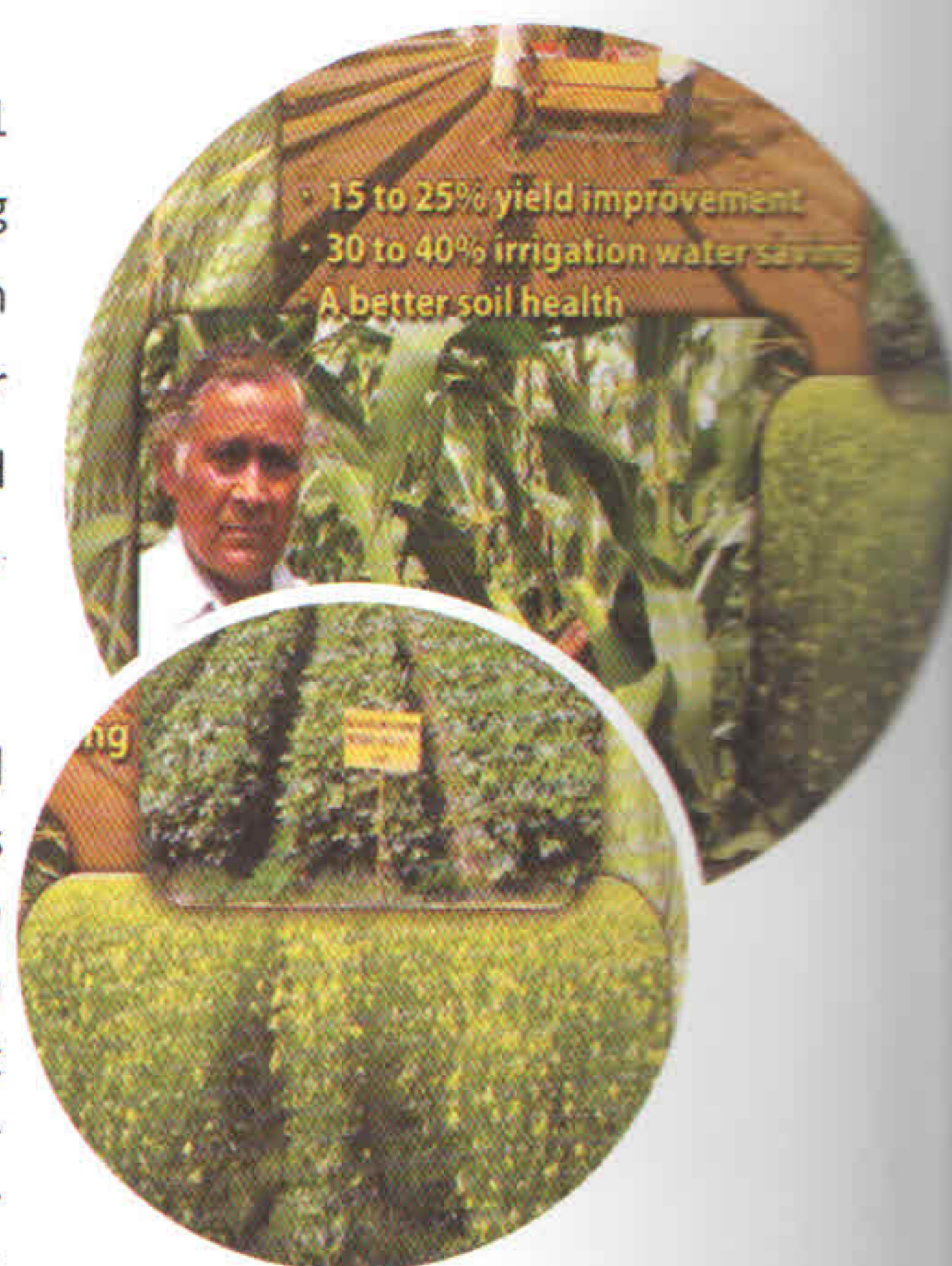
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Bio-Intensive Complementary Cropping Systems

Bio-intensive System of raising maize for cobs + vegetable cowpea in 1:1 ratio on tractor made broad beds (BB) and *sesbania* in furrows during *kharif* and mustard in furrows and zero till sown 3 rows of lentil on broad beds in *rabi*, zero till sown 3 rows of green gram (on beds in summer for grain and residue incorporation) was found remarkably better which produced highest rice equivalent yield of 18.32 t ha⁻¹ with productivity of 50.2 kg grain ha⁻¹ day⁻¹ and profitability of Rs.363 ha⁻¹ day⁻¹.

The complimentary effects could be reflected in the system as in broad bed and furrow (BBF) system, the furrows served as drainage channels during heavy rains in *kharif* which were utilized for *in-situ* green manuring with 35 t ha⁻¹ green foliage incorporated after 35 days of sowing and timely sown mustard crop in these furrows resulted a good harvest 1.94 t ha⁻¹ and a bonus yield of lentil (1.44 t ha⁻¹) could be harvested. In the summer season green gram could yield 1.05 t ha⁻¹ grains while incorporation of green foliage of about 4 t ha⁻¹ in the soil further helped the system favorably. In overall 40% water, 10-20% energy, 30-40% nutrients and 50% pesticide use could be saved on one hand while productivity could be doubled on the other when compared to existing rice-wheat system.

The future of agricultural scenario in India will be decided by increasing human population thereby increase in demand for more of food, imbalances in demand and supply, limiting resources specially water, nutrient and climatic concerns etc. Truly to produce more with less and to address these emerging issues the concept of bio-intensive complementary cropping system could be conceived.



Benefits / Utility :

- ❖ Resource saving specially water up to 50% with improved productivity upto 100% thereby producing more with less.
- ❖ Improving *in situ* wealth by increased microbial activity, harvesting more of radiant energy thereby more of biomass production.
- ❖ Natural management of weeds and pests resulting saving of input costs.
- ❖ Nutritional security (100%) can be sustained / maintained.
- ❖ The cost of cultivation of different bio-intensive complementary cropping systems ranged from Rs 48000 to 64500 per ha.
- ❖ The output in terms of rice equivalent yield from 6.7 in rice-wheat system to 18.3 t ha⁻¹ in the best system.

Country Context :

The Indian agriculture is dominated by small holders. To secure the livelihood, diverse nature of crops needs to be produced farm households. The food security of small farm holders can be addressed through the improved technology.

Scalability :

Technology best suited to small and marginal farm holders of western plain zone of Uttar Pradesh

Potential investors to this technical innovation :

National Bank for Agriculture and Rural Development

Business and Commercial Potential :

Diversified crops can be produced from small units. Area specific business model can be established /sustained. Provides an opportunity for small scale area based business to small markets.

Financials :

For small farmers only.

Finance of Rs.50, 000 to Rs. 75,000 investment may result in net gain of Rs. 1.2 to 1.5 lakhs/ha/year with 100% nutritional security for small household.

Target Market / Customer :

Small/Marginal farm holders in India

Social impact of the technology :

Nutritional security, improved productivity, profitability with less resources especially relevant to small and marginal households has direct relevance in social perspective.

Limiting factors for large scale commercialization :

Understanding the need, adjustment of crops and timely operations require special attention

Timely planning and implementation of cropping activity is essential.

Scientific Experts :

Dr. B.Gangwar
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and

a team of scientists from different discipline

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Package of Practices for Organic Farming

Package of practices for organic production of cropping systems has been identified under Network Project on Organic Farming. The systems which was giving consistently (6 years) higher net returns (>20 %) over inorganic farming are identified for the following five agro climatic zones.

1. Salient technical features (cropping systems and inputs for organic production)

Western Himalayan (WH) : For Himachal Pradesh: Cauliflower-radish-tomato and cabbage-radish- capsicum- Reinforced farm yard manure + vermicompost @ $\frac{1}{2}$ N each + Spray of aqueous leaf extract of bhang (*Cannabis sativa*) for pest management in Himachal Pradesh,

For Uttarakhand: rice-wheat-*Sesbania* and rice-pea (vegetable)- *Sesbania*- enriched compost + vermicompost + non edible oil cakes + farm yard manure @ $\frac{1}{4}$ N each + stale seed bed + 2 hand hoeing at 20 and 40 days after sowing for weed management.

Eastern Himalayan (EH): For Meghalaya: Rice-carrot-Farm yard manure + vermicompost + local compost @ $\frac{1}{3}$ N each + Spray of Karanji @ 3 ml / lit for pest and disease management + Mulching with fresh eupatorium/ ambrosia alone or with one hand weeding for weed management.

Trans Gangetic Plains (TGP): In Punjab: Maize-gram, maize -potato- summer moong, rice-wheat- summer moong and maize-berseem – maize+cowpea- Green manure + farm yard manure + vermicompost @ $\frac{1}{3}$ N each during *kharif* and farm yard manure + vermicompost + crop residue @ $\frac{1}{3}$ N each during *rabi* + seed treatment with neem cake + 2 sprays of *Trichoderma harzianum* for pest management.

Central Plateau and Hills (CPH): For Madhya Pradesh: Rice-wheat-berseem- Farm yard manure + neem cake @ $\frac{1}{2}$ each in cereals and farm yard manure + neem cake + vermicompost @ $\frac{1}{3}$ N each to berseem + soil application of *Pseudomonas fluorescence* + two spray of neem extract for pest management + combination of two hand weeding along with mechanical weeding for weed control.

Southern Plateau and Hills (SPH): For Karnataka: Chilli- onion and turmeric +onion for Tamil Nadu and groundnut-sorghum - Farm yard manure + non edible oil cakes @ $\frac{1}{2}$ N each + neem + mahua cake + *Trichogramma* + neem spray + bird perches for pest and disease management + using of mechanical weeder + one hand weeding for weed management in Tamil Nadu and incorporation of enriched compost + vermicompost + green leaf manure @ $\frac{1}{3}$ N each + *Verticillium lecanii* + eco neem + neem seed kernal extract + botanicals for pest management.

Network Project on Organic Farming was initiated by ICAR during 2004 at 13 location with PDFSR as Lead Centre to develop package of Practices for various crops under organic farming

Benefits / Utility :

The package for organic production of crops has been evolved over the period of six years of experimentation under various agro climatic conditions. The cropping systems and packages recommended are specific to the particular agro climatic zone as mentioned above. New packages of input identified for organic production of systems are found to enhance net returns by more than 20 % and organic carbon by 10-15 % over the conventional practice of chemical farming.

Organic farming package identified for different regions does not include any chemical input for management of pest

and diseases. Hence, these packages are highly suitable to environment.

All the practices recommended for the different agro climatic regions have recorded more than 20 % increase in Net returns and 10-15 % increase in organic carbon over conventional practice. Net returns ranged from Rs 25888 to as high as 164310 ha⁻¹ in various agro climatic regions according to the cropping systems and their premium price received by the organic products.

Country Context :

Package of Practices are suitable for the locations in India

Scalability :

Scalable within the agroclimatic region where in the technology was developed

Business and Commercial Potential :

Organic cluster with input-output chain can be established to commercialize the organic product production, certification and delivery

Potential investors to this technical innovation :

National Bank for Agriculture and Rural Development



Target Market / Customer

Commercial Market

Social impact of the technology :

The package is having the innumerable benefits on environment in general and society in particular as production of organic products is having its own advantages.

Standard practices of organic farming in all the crops and cropping systems should be adopted besides the recommended packages of inputs for managing nutrients, weed, pest and diseases.

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