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Promoting Organic Fruit and Vegetable Production for Sustainable Horticulture Development

*Yashank Ghritalhre¹, Dr. Medha Saha², Dr. Subuhi Nishad³,
Dr. Kishan Kumar Sharma⁴ and Sunil Kumar Gupta⁵

¹B.Sc. (Hons.) Horticulture (4th Year), Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon, Chhattisgarh, India

²Assistant Professor, Department of Floriculture and Landscape Aarchitecture NSS Programme Officer, Pt. K.L.S. CHRS, Rajnandgaon, Chhattisgarh, India

³NSS Coordinator, Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, Chhattisgarh, India

⁴Assistant Professor, Department of Plant Pathology, NSS Programme Officer, Pt. K.L.S. CHRS, Rajnandgaon, Chhattisgarh, India

⁵Ph.D. Scholar, Department of Post Harvest Management, Pt. K.L.S. College of Horticulture and Research Station, Rajnandgaon, Chhattisgarh, India

*Corresponding Author's email: dityachanged@gmail.com

Organic fruit and vegetable production is increasingly considered a systems-based approach to sustainable horticulture because it integrates soil health, nutrient cycling, biodiversity conservation, ecological pest management and responsible resource use. The present paper develops an NSS-based extension and awareness framework for strengthening knowledge and adoption of organic horticultural practices among rural fruit and vegetable growers of Rajnandgaon district, Chhattisgarh. The proposed framework integrates baseline socio-horticultural assessment, Participatory Rural Appraisal (PRA), farmer awareness programmes, practical demonstrations, compost and vermicompost preparation, mulching, crop diversification, botanical and biological pest-management approaches, biodiversity activities, safe post-harvest handling, record keeping and follow-up evaluation. Particular emphasis is placed on distinguishing low-chemical farming from production that qualifies for an organic claim under applicable standards and certification or assurance systems. A structured set of indicators and corrected data tables is provided for measuring knowledge, participation, practice-wise adoption and perceived intervention impact. Since field observations and respondent-level datasets were not supplied with the manuscript, no numerical outcome has been fabricated; the tables are designed for direct entry of verified NSS field data and subsequent statistical analysis. The framework can help student volunteers function as a practical bridge between horticultural science, farmer institutions and rural communities.

Keywords: Organic horticulture; organic fruit and vegetable production; NSS; sustainable horticulture; soil health; biological pest management; farmer awareness; Rajnandgaon.

Introduction and Background

Fruit and vegetable production contributes substantially to horticultural diversification, nutritional security, farm income and rural employment. At the same time, intensive production systems may be associated with challenges related to soil-health degradation, declining biological diversity, excessive dependence on external inputs, inappropriate pesticide use and inefficient resource utilization. Sustainable horticulture therefore requires an integrated production approach rather than a single-input substitution strategy.

Organic production is a whole-system approach that emphasizes soil biological activity, nutrient cycling, biodiversity and ecological management of pests and diseases. In practical extension work, however, the term “organic” must be used carefully. A reduction in synthetic-input use does not automatically make a farm certified organic. Farmers and extension workers must understand the applicable production standards, permitted inputs, record keeping, inspection and certification or assurance procedures before making an organic claim.

Rajnandgaon district has a strong horticultural base and diverse vegetable and fruit production systems. An NSS-based intervention can complement formal extension by bringing students, faculty, farmers and local institutions together through household visits, demonstrations, awareness meetings, Shramdaan and follow-up activities. The strength of this approach lies in combining technical knowledge with community participation.

Objectives

- To assess baseline knowledge and existing practices related to organic fruit and vegetable production among selected farming households.
- To create awareness regarding soil-health management, composting, vermicomposting, mulching, crop diversification and ecological pest management.
- To demonstrate feasible organic and sustainable horticultural practices through farmer-oriented learning activities.
- To assess community participation in NSS extension activities and practice-wise adoption after the intervention.
- To identify operational, technical, labour, input, certification and market-related constraints affecting adoption.
- To develop an evidence-based extension framework that can be repeated in other horticultural villages of Chhattisgarh.

Organic Horticulture Policy and Practice Alignment

The intervention should link technical field demonstrations with the institutional systems that govern organic production, community assurance and extension support. The following corrected table replaces the distorted/duplicated table in the original manuscript.

Programme / Institution	Primary role	Relevance to organic horticulture	Suggested NSS-linked activity	Expected contribution
National Programme for Organic Production (NPOP)	Standards, certification and labelling	Provides the formal framework for certified organic production and market claims	Awareness on standards, records, certification pathway and permitted practices	Improves credibility of organic claims and market readiness
PGS-India	Participatory assurance for domestic organic production	Group-based assurance and peer participation for eligible domestic/local-market pathways	Farmer-group meetings, record keeping and awareness on peer verification	Supports local-market organic assurance
National Service Scheme (NSS)	Student community service and extension	Mobilizes youth for awareness, demonstrations and community action	Household visits, rallies, demonstrations, Shramdaan and awareness campaigns	Strengthens community participation and knowledge transfer
Horticulture extension institutions / KVKs	Technical advisory and capacity building	Provides crop-specific scientific guidance, diagnostics and demonstrations	Joint training, field diagnosis and expert-led demonstrations	Improves technical accuracy and adoption

Programme / Institution	Primary role	Relevance to organic horticulture	Suggested NSS-linked activity	Expected contribution
Farmer Producer Organisations (FPOs) / farmer groups	Collective input, aggregation and marketing	Can support collective planning, grading, traceability and market linkage	Group discussions on records, aggregation and marketing	Reduces individual marketing and transaction constraints

Study Area and Research Methodology

Study area

The proposed intervention is designed for selected agricultural villages of Rajnandgaon district, Chhattisgarh, with emphasis on households engaged in fruit and vegetable production. The framework can be adapted to villages growing tomato, brinjal, chilli, cauliflower, cabbage, knol-khol, gourds and locally important fruit crops. Village-specific demographic and horticultural information should be recorded during the baseline survey rather than assumed in advance.

Parameter	Field entry / verified value
Village	To be recorded during baseline survey
Tehsil	To be recorded during baseline survey
District	Rajnandgaon, Chhattisgarh
Main market	To be recorded during baseline survey
Distance from college	To be recorded (km)
Total population	To be recorded
Total horticultural farm households	To be recorded
Total geographical area	To be recorded (ha)
Total horticultural/cropped area	To be recorded (ha)
Major horticultural crops	To be recorded from village survey

Sampling and research design

A mixed-method participatory extension design is proposed. Respondents should be selected from households actively engaged in fruit and vegetable production in the selected NSS-adopted village(s). The sampling procedure, sample size, inclusion criteria and respondent characteristics should be stated explicitly after field selection. PRA tools such as resource mapping, seasonal calendars, problem ranking, transect observations and farmer group discussions may be integrated with a structured questionnaire. A baseline assessment should be conducted before the intervention and the same or equivalent measurement instrument should be used during follow-up. The primary outcome variables should include knowledge, participation and practice-level adoption. Where respondent-level data permit, pre- and post-intervention scores may be compared using an appropriate statistical test. Categorical variables may be summarized through frequency and percentage, while continuous scores may be summarized through mean, standard deviation and change score.

Intervention strategy

- Baseline survey and PRA mapping: document crops, input practices, soil-fertility constraints, pest and disease problems, labour availability and market channels.
- Multi-channel awareness campaign: conduct farmer meetings, household visits, poster exhibitions, leaflets, demonstrations and Nukkad Natak on organic and sustainable horticulture.
- Demonstration-based learning: establish compost/vermicompost units and demonstrate mulching, crop rotation, intercropping, trap crops, botanical/biological pest management and safe produce handling.
- Community action through Shramdaan: support sanitation, community composting areas, biodiversity-supporting planting and demonstration beds.

- Follow-up evaluation: document knowledge change, actual adoption, technical constraints and farmer feedback.

Results and Discussion

The original manuscript contained blank or duplicated cells in several tables. Because verified field-level observations were not supplied, the revised tables below are structured as data-entry and analysis tables rather than fabricated result tables. Once NSS field data are available, frequencies, percentages and statistical comparisons can be inserted directly.

Baseline knowledge of organic horticulture

Knowledge should be assessed using a pre-defined questionnaire covering organic standards, soil organic matter management, compost and vermicompost, biological and botanical pest management, crop rotation, mulching, irrigation efficiency, contamination control, post-harvest hygiene and record keeping. A knowledge score may subsequently be classified into low, medium and high categories using predetermined cut-offs. Interpretation: Knowledge gain should not be treated as equivalent to adoption. Farmers may possess adequate knowledge but still face constraints related to labour, input availability, pest pressure, certification procedures, transition requirements or uncertain market returns.

Participation in NSS extension activities

Percentage formula: Participation (%) = (Number of respondents participating / Total respondents) × 100.

Adoption of organic fruit and vegetable production practices

Adoption should be interpreted practice-wise rather than assigning a single “organic farmer” label. This approach gives a more scientifically defensible picture of which components of sustainable organic horticulture are actually being adopted.

Field Challenges and Constraints

1. Transition and certification requirements: farmers seeking certified-organic status must follow the applicable standards, documentation, inspection and conversion requirements.
2. Input availability and quality: reliable compost, biofertilizers, biocontrol agents and other permitted inputs may not be available locally in sufficient quantity or quality.
3. Labour and time requirements: compost preparation, mulching, mechanical weed management, sanitation and frequent crop monitoring may increase labour demand.
4. Pest and disease pressure: horticultural crops can experience rapid pest and disease outbreaks; timely scouting, prevention and integrated management remain essential.
5. Market and post-harvest constraints: segregation, handling, traceability, grading, packaging and market linkage are necessary for maintaining product identity; higher production costs do not automatically ensure a premium price.
6. Knowledge–practice gap: awareness alone may not produce adoption unless demonstrations, input access, technical support and economic feasibility are addressed together.

Strategic Recommendations and Policy Action Plan

Action area	Recommended intervention	Responsible / supporting stakeholders	Expected outcome
Institutional convergence	Link NSS units with horticulture departments, KVKs, FPOs and Gram Panchayats	University, KVK, FPO, Panchayat	Continuity of technical support
Demonstration-led extension	Establish low-cost model plots for composting, mulching, diversification and ecological pest management	NSS volunteers + technical experts	Hands-on learning and practice adoption
Organic standards awareness	Explain applicable certification/assurance pathways, record keeping and permitted practices	Technical experts / certification support agencies	More accurate organic claims and records

Action area	Recommended intervention	Responsible / supporting stakeholders	Expected outcome
Input and soil support	Promote quality compost, bio-input awareness and soil testing	Horticulture department / KVK / farmer groups	Better input planning and soil-health management
Youth engagement	Use NSS volunteers for household visits, awareness drives and biodiversity activities	NSS cell / students	Sustained community engagement
Market and traceability	Encourage group aggregation, grading, packaging, records and local-market linkages	FPOs / farmer groups / market institutions	Improved market organization

Conclusion

Organic fruit and vegetable production can contribute to sustainable horticulture when implemented as an integrated whole-farm system rather than as a simple replacement of synthetic inputs. Soil health, biodiversity, nutrient cycling, ecological pest management, water-use efficiency, food safety, post-harvest handling, traceability and market organization need to be addressed together. NSS can strengthen this transition by converting technical recommendations into practical demonstrations and sustained community engagement. The revised framework provides a scientifically structured pathway for measuring awareness, participation and practice-level adoption. Numerical results should be reported only after verified field data are collected, coded and statistically analysed.

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