

वार्षिक प्रतिवेदन
2023-24
ANNUAL REPORT
2023-24



जैविक खेती पर अखिल भारतीय नेटवर्क कार्यक्रम
All India Network Programme on Organic Farming

ICAR-Indian Institute of Farming Systems Research
Modipuram, Meerut – 250 110, India





ICAR-IIFSR

ICAR Indian Institute of Farming Systems Research (IIFSR) formerly Project Directorate for Farming Systems Research (PDFSR) was established by Indian Council of Agricultural Research New Delhi in April 1989 at Modipuram Meerut Uttar Pradesh.

Vision

Management of natural source of holistic improvement of small and marginal farmers through Integrated Farming Systems

Mission

Improve food, nutrition, livelihood and financial security of small and marginal households through climate smart Integrated Farming Systems (to make marginal and small households as bountiful)

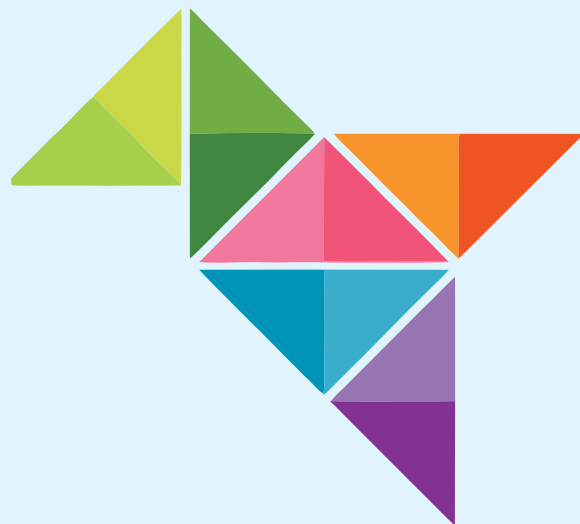
Mandate

- Research in integrated farming Systems on production technologies for improving productivity and resource use efficiencies
- Develop efficient, economically viable and environmentally sustainable integrated farming system models for different farming situations.
- On-farm testing, verification and refinement of system-based farm production technologies.
- Co-ordinate and monitor integrated farming system research in the country

All India Coordinating Coordinated Research Project on Integrated Farming System (AICRP on IFS) is an integral part of ICAR-IIFSR with 74 centres to undertake on-station main (25 no's.) on-station sub (11 no's.) on-station voluntary (6 no's) and on-farm research (32 no's) spread across length and breadth of the country. The institute is also leading an All India Network Programme on Organic Farming (AI-NPOF) with 20 centres

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ALL INDIA NETWORK PROGRAMME ON ORGANIC FARMING

ICAR-Indian Institute of Farming Systems Research

Modipuram, Meerut - 250 110, India



Correct citation : All India Network Programme on Organic Farming. Annual Report 2023-24, ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut- 250 110, pp.v+210
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Published by : ICAR-Indian Institute of Farming Systems Research,
Modipuram, Meerut- 250 110 , India

Important Notes:

- This compilation is a joint contribution of all the scientists involved in All India Network Programme on Organic Farming (AI-NPOF) at 20 centres including 7 new centres started from 2015-16 and ICAR-IIFSR, Modipuram (report writing, compilation, editing and printing).
- The AnnualReport 2023-24 is based on experimental data generated during kharif, rabi and summer seasons of 2022-23. The other details are relevant up to March 2024.
- The report includes both processed and semi-processed data, generated in different experiments under All India Network Programme on Organic Farming (AI-NPOF) and as such no material/ data should be reproduced in any form without prior written permission of the Director, ICAR-Indian Institute of Farming Systems Research and due credit to the concerned scientist (s).

ACKNOWLEDGMENT



All India Network Programme on Organic Farming (AI-NPOF) initiated during 2004 having mandate to develop package of practices and technologies for organic production system is currently operating with 20 co-operating centres covering 16 states by involving 11 State Agricultural Universities, 7 ICAR institutes and 1 deemed university. Results of the study, experiments and demonstrations conducted during 2022-23 at 20 co-operating centres are processed, compiled, and published as Annual Report 2023-24. I take this opportunity to record my sincere thanks to Dr Himanshu Pathak, Secretary, Department of Agricultural Research and Education and Director General, Indian Council of Agricultural Research, New Delhi for the support being extended to the scheme. I also extend my gratitude to Dr. S.K. Chaudhari, Deputy Director General (Natural Resource Management) for his constant guidance and mentoring the scheme to develop organic farming packages. Inputs and support received from Dr S. Bhaskar, Former ADG (Agronomy, Agroforestry and Climate Change) and Dr Rajbir Singh, Assistant Director General (Agronomy, Agroforestry and Climate Change) for improving the output of the scheme is duly acknowledged. The guidance and support received from Dr A.S. Panwar, Former Director, ICAR-Indian Institute of Farming Systems Research, Modipuram and Dr Sunil Kumar, Director, ICAR-Indian Institute of Farming Systems Research, Modipuram are duly acknowledged. Scientific inputs received from Quinquennial Review Team (QRT), Research Advisory Committee (RAC) and Institute Management Committee (IMC) is thankfully acknowledged.

I am highly thankful to each one of the scientists and research fellows involved in the scheme at 20 centres for setting the painstaking effort to conduct the field experiments, lab analysis and generating data. The sincere efforts put forth by all the Scientists and staff of Project Coordination Unit for preparing the report are appreciated. I extend my gratitude and appreciation to Dr Vipin Kumar, Chief Technical Officer and Dr Meenu Rani, Research Associate, Dr Himanshu Joshi, Research Associate, Dr Rahul Kumar, Senior Research Fellow, Dr Vidhu Dixit, Young Professional-I and all others who have helped to shape the report by compiling the data, its statistical analysis, report drafting and proof correction. Administrative assistance to the scheme given by Mrs. Jailata Sharma, Private Secretary, Project Coordination Unit is also duly acknowledged.

The contributions of all the other scientific, technical, administrative, and skilled supporting staff either directly or indirectly at various levels during preparation of this report are duly acknowledged. Findings from the scheme especially package of practices, varietal identification and initial findings of natural farming will pave way for alternate production strategies across different ecosystems.

(N. Ravisankar)

Project Coordinator, AICRP-IFS &
National Principal Investigator, AINP-OF

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The salient research findings made during 2022-23 under All India Network Programme on Organic farming is given below

Evaluation of organic, inorganic and integrated production packages for crops and cropping systems

Bajaura: The vegetable crops under 04 cropping systems, namely, French bean-cauliflower-french bean, Fallow-cauliflower-tomato, Black gram-cauliflower-summer squash, and Okra-pea, were evaluated. Typically, the Inorganic-II tends to give a better yield for all the cropping systems followed by towards organic-I. Under the Organic-I the yields for these cropping systems for the Rabi season were 12170 kg/ha, 9560 kg/ha, 9520 kg/ha, and 5760 kg/ha, respectively. For the same period, the Inorganic-II management yields were 22.51%, 48.33%, 59.87%, and 55.56% higher, while Towards Organic-I also showed positive yields as well with increases of 14.71%, 20.82%, 46.64%, and 28.99% for the aforementioned cropping systems when compared to the Organic-I. The SEY for the Organic-I was observed at 35401 kg/ha, 46610 kg/ha, 30430 kg/ha, and 17720 kg/ha for the considered cropping systems. For the Inorganic-II management, the SEY was 4.40% lower, and 29.09%, 32.76% & 27.65% higher, while for the Towards Organic-I practice, it was 11.48% lower, and 15.53%, 24.54%, and 15.33% higher than the Organic-I management.

Bhopal: Four cropping systems, namely, Soybean-wheat (durum), Soybean-mustard, Soybean-chickpea, and Soybean-linseed, were evaluated. Typically, Inorganic-II management yields lower results for all cropping systems when compared to Organic-I, while Towards Organic-I tends to provide better outcomes. Under Organic-I management during the Rabi season, the yields for these cropping systems were 3194 kg/ha, 1079 kg/ha, 1247 kg/ha, and 1607 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -2.88%, -3.99%, -2.65%, and -5.66%, respectively,

while Towards Organic-I management displayed yield increases of 3.94%, 4.63%, 10.51%, and 3.92% over Organic-I. The SEY for Organic-I was recorded at 2173 kg/ha, 1997 kg/ha, 2251 kg/ha, and 2686 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -4.14%, -4.96%, -3.95%, and -5.88% respectively, indicating a consistent decrease across all systems. Meanwhile, Towards Organic-I management showed SEY increases of 5.71%, 6.31%, 10.04%, and 5.36% for each system, respectively.

Calicut: One cropping system, namely, Turmeric-fallow, was evaluated for the Kharif season. Typically, Towards Organic-I management yields the best results, followed by Organic-II. Under Organic-I management, the yield for this cropping system was 17100 kg/ha. In comparison, Organic-II management showed a yield increase of 19.88%, while Inorganic-I management displayed a yield increase of 5.85%. Towards Organic-I management resulted in a significant yield increase of 36.84%, and Towards Organic-II management showed a yield increase of 19.88% over Organic-I. No data were available for Inorganic-II management in this cropping system.

Coimbatore: Three cropping systems, namely, brinjal-pearl millet-green manure (dhaincha), Chillies-barnyard millet-green manure (dhaincha), and Tomato-finger millet-green manure (dhaincha), were evaluated. Typically, Inorganic-II management yields the best results for all cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 19625 kg/ha, 14381 kg/ha, and 18358 kg/ha, respectively. In comparison,

Inorganic-II management showed yield increases of 19.06%, 19.50%, and 29.76%, respectively, while Towards Organic-I management displayed yield increases of 6.02%, 0.99%, and 8.11% over Organic-I. The SEY for Organic-I was recorded at 23921 kg/ha, 23647 kg/ha, and 18358 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 20.44%, 17.21%, and 29.76%, respectively. Meanwhile, Towards Organic-I management showed SEY increases of 8.00%, 0.99%, and 8.11% for each system, respectively.

Dharwad: Five cropping systems, namely, pigeonpea + green gram, pigeonpea + soybean, pigeonpea + groundnut, Cotton + green gram, and Cotton + soybean, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by towards organic-I. Under Organic-I management during the kharif season, the yields for these cropping systems were 646 kg/ha, 1783 kg/ha, 1071 kg/ha, 531 kg/ha, and 1464 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of -1.55%, 6.73%, -0.19%, 5.46%, and 5.40%, respectively, while Towards Organic-I management showed yield changes of -8.98%, 0.79%, -2.52%, -0.56%, and -2.32% over Organic-I. The SEY for Organic-I was recorded at 646 kg/ha, 1783 kg/ha, 1071 kg/ha, 531 kg/ha, and 1464 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -1.55%, 6.73%, -0.19%, 5.46%, and 5.40%, respectively. Meanwhile, Towards Organic-I management showed SEY decreases of -8.98%, 0.79%, -2.52%, -0.56%, and -2.32% for each system, respectively.

Jabalpur: Four cropping systems, namely, Soybean-wheat, Soybean-mustard-green gram, Soybean-berseem (fodder and seed), and Soybean-lentil-sorghum (fodder), were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems

were 965 kg/ha, 1200 kg/ha, 1400 kg/ha, and 909 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -28.50%, -32.50%, -33.57%, and -15.29%, respectively, while Towards Organic-I management displayed yield changes of -5.08%, -31.17%, -21.43%, and -5.28% over Organic-I. The SEY for Organic-I was recorded at 1996 kg/ha, 2231 kg/ha, 3902 kg/ha, and 1711 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -18.49%, -3.54%, -25.40%, and -22.56%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -5.26%, 4.80%, -13.35%, and -21.04% for each system, respectively.

Karjat: Four cropping systems, namely, rice-brinjal, rice-chickpea, rice-field bean, and rice-onion (white), were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 3570 kg/ha, 2855 kg/ha, 3150 kg/ha, and 3313 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -16.47%, -5.11%, -10.92%, and -10.08%, respectively, while Towards Organic-I management displayed yield increases of 0.25%, 7.25%, 2.83%, and 3.77% over Organic-I. The SEY for Organic-I was recorded at 31739 kg/ha, 11118 kg/ha, 11606 kg/ha, and 31771 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -44.46%, -36.03%, -34.47%, and -45.51%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -17.45%, -20.28%, -19.02%, and -16.64% for each system, respectively.

Ludhiana: Four cropping systems, namely, Basmati rice-chickpea-green manure, Basmati rice-wheat-green manure, Kharif moong-wheat-summer moong, and Sesame-lentil, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the



Kharif season, the yields for these cropping systems were 3760 kg/ha, 3750 kg/ha, 560 kg/ha, and 600 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of 4.26%, 4.00%, -14.29%, and -23.33%, respectively, while Towards Organic-I management displayed yield changes of 5.59%, 3.47%, 1.79%, and -1.67% over Organic-I. The SEY for Organic-I was recorded at 10300 kg/ha, 11100 kg/ha, 10100 kg/ha, and 5900 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 0.97%, 6.31%, 5.94%, and 11.86%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -10.68%, 9.01%, -6.93%, and 6.78% for each system, respectively.

Modipuram: Four cropping systems, namely, Black rice-lentil-vegetable cowpea, Finger millet-barley-Sesbania rostrata green manure, Okra-vegetable pea-Sesbania aculeata green manure, and Black gram-tomato-sun hemp green manure, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 342 kg/ha, 2193 kg/ha, 9164 kg/ha, and 1024 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of -19.30%, 1.96%, -7.66%, and 7.23%, respectively, while Towards Organic-I management displayed yield changes of -9.94%, -11.17%, -5.38%, and 4.10% over Organic-I. The SEY for Organic-I was recorded at 7060 kg/ha, 7423 kg/ha, 14247 kg/ha, and 24037 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -36.30%, -5.12%, -20.42%, and -2.72%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -34.84%, -13.67%, -21.11%, and -11.18% for each system, respectively.

Pantnagar: Four cropping systems, namely, Basmati rice-wheat, Basmati rice-mustard, Basmati rice-vegetable pea (4 rows vegetable pea + 2 rows coriander), and Basmati rice-potato, were evaluated.

Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 4811 kg/ha, 4704 kg/ha, 4905 kg/ha, and 4611 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of 0.06%, 0.55%, -1.67%, and -4.23%, respectively, while Towards Organic-I management displayed yield changes of 0.00%, 0.74%, -1.18%, and 0.85% over Organic-I. The SEY for Organic-I was recorded at 8303 kg/ha, 8057 kg/ha, 9874 kg/ha, and 9646 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 12.50%, 12.77%, -4.70%, and -12.82%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of 13.78%, 16.87%, -2.36%, and -3.61% for each system, respectively.

Raipur: Four cropping systems, namely, soybean-maize (sweet corn), soybean-french bean, soybean-tomato, and soybean-cabbage, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 2243 kg/ha, 2302 kg/ha, 2134 kg/ha, and 2126 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of 2.41%, 0.87%, -0.28%, and -5.46%, respectively, while Towards Organic-I management displayed yield changes of -26.26%, -16.77%, -20.24%, and -23.99% over Organic-I. The SEY for Organic-I was recorded at 11180 kg/ha, 5420 kg/ha, 15640 kg/ha, and 12510 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 19.59%, 6.83%, 1.73%, and 5.20%, respectively. Meanwhile, Towards Organic-I management showed SEY decreases of -15.92%, -23.25%, -10.74%, and -10.95% for each system, respectively.

Ranchi: Four cropping systems, namely, Rice-wheat, Rice-onion, Rice-potato, and Rice-okra, were evaluated. Typically, Inorganic-II management yields



the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 3515 kg/ha, 3507 kg/ha, 3503 kg/ha, and 3568 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -33.26%, -33.25%, -34.06%, and -35.23%, respectively, while Towards Organic-I management displayed yield decreases of -8.42%, -13.86%, -13.36%, and -15.44% over Organic-I. The SEY for Organic-I was recorded at 6596 kg/ha, 16216 kg/ha, 17640 kg/ha, and 10540 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -37.37%, -43.62%, -53.51%, and -46.57%, respectively. Meanwhile, Towards Organic-I management showed SEY decreases of -16.01%, -17.80%, -27.14%, and -19.05% for each system, respectively.

Umiam: Four vegetable-based cropping system were undertaken on sunken and raised bed. Four rice varieties 1.Megha Aromatic 2.Shahsarang-1, 3.Ngoba, 4.Lampnah were taken in sunken beds whereas, okra was taken on raised bed during kharif. Carrot, tomato, potato and french bean was undertaken on raised bed during rabi, Mean yield of rice on sunken bed recorded in order to towards organic < organic < inorganic. Under organic management practice, yield of rice recorded of 3800 kg/ha which is 11.8% higher than the inorganic management whereas it was about 7.9% lower than the towards organic management practice. Performance of okra was found to be in the order of towards organic < organic < inorganic. Organic management resulted in mean yield of okra is 11940 kg/ha which was about 6.1% higher than towards organic. Most of the vegetable crops during rabi on the raised bed performed better in the order of towards organic < organic < inorganic. Organic management resulted in yield of 17532, 17952, 6861, 15741 kg/ha for carrot, potato, tomato and frenchbean respectively which was 9.6, 11.2 and 15.1% higher than inorganic management practice

for carrot, tomato, and frenchbean respectively whereas potato resulted in yield by 4.8% lower than inorganic.

Ajmer: Four cropping systems, namely, Cowpea + maize (4:2) - coriander + cabbage (2:1), Cowpea + maize (4:2) - fennel + cabbage (2:1), Cowpea - fennel, and Cowpea - coriander, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the kharif season, the yields for these cropping systems were 996 kg/ha, 992 kg/ha, 750 kg/ha, and 758 kg/ha, respectively. In comparison, Inorganic-II management showed yield increases of 7.58%, 3.85%, 3.33%, and 2.64%, respectively, while Towards Organic-I management displayed yield changes of 5.80%, 1.51%, -4.44%, and -3.30% over Organic-I. The SEY for Organic-I was recorded at 2398 kg/ha, 3930 kg/ha, 3267 kg/ha, and 1664 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 21.59%, 14.39%, 10.15%, and 9.67%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -8.53%, -6.40%, -6.70%, and -11.05% for each system, respectively.

Almora: Two cropping systems, namely, grain amaranth-wheat + lentil and finger millet + black soybean-wheat + toria, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 1452 kg/ha and 606 kg/ha (Finger millet) + 715 kg/ha (Black soybean), respectively. In comparison, Towards Organic-I management showed a decrease of -23.28% for Grain Amaranth, while Finger millet and Black soybean showed decreases of -7.43% and -14.55%, respectively. The SEY for Organic-I was recorded at 3556 kg/ha and 3067 kg/ha for the respective cropping systems. Towards Organic-I management resulted in SEY decreases of -42.39% for Grain Amaranth-wheat + lentil, and -30.89% for

Finger millet + black soybean-wheat + toria, respectively.

Gangtok: Four cropping systems, namely, maize + ginger (1:1) – french bean, maize – soybean – buckwheat, maize + turmeric (1:1) – rajmash, and maize – black gram (pahenlo dal) – toria, were evaluated. Under Organic-I management during the Kharif season, the yields for these cropping systems were 3153 kg/ha (Maize) + 5944 kg/ha (Ginger), 3273 kg/ha (Maize) + 1762 kg/ha (Soybean), 3047 kg/ha (Maize) + 13840 kg/ha (Turmeric), and 3010 kg/ha (Maize) + 1016 kg/ha (Black gram), respectively. The SEY for Organic-I was recorded at 13420 kg/ha, 6290 kg/ha, 12640 kg/ha, and 9320 kg/ha for the respective cropping systems.

Narendrapur: Four cropping systems, namely, maddy (Gobindobhog)–paddy (Swarna)–black gram, paddy (IET4786)–Lathyrus (Ratan)–Sesbania (GM), paddy (IET4786)–Red amaranthus /cucumber–green gram, and Paddy (IET4786) –vegetable pea–sesame, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 1971 kg/ha, 4958 kg/ha, 3750 kg/ha, and 3592 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of -1.90%, -24.71%, 3.56%, and -2.09%, respectively, while Towards Organic-I management displayed yield changes of -9.94%, -15.63%, 17.78%, and 9.98% over Organic-I. The SEY for Organic-I was recorded at 3942 kg/ha, 6110 kg/ha, 13856 kg/ha, and 10533 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 20.56%, -24.26%, -2.68%, and 10.93%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -4.97%, -13.49%, 9.94%, and 6.43% for each system, respectively.

Sardarkrushinagar: Three cropping systems, namely, Greengram-Amaranthus, Greengram-

mustard, and Groundnut-lucerne, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 594 kg/ha, 525 kg/ha, and 975 kg/ha, respectively. In comparison, Inorganic-II management showed yield increases of 5.72%, 20.19%, and 5.95%, respectively, while Towards Organic-I management displayed yield changes of -1.35%, -3.24%, and -3.18% over Organic-I. The SEY for Organic-I was recorded at 1757 kg/ha, 1744 kg/ha, and 4504 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 10.47%, 16.34%, and 6.08%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -0.11%, 4.47%, and 0.29% for each system, respectively.

Thiruvananthapuram: Four cropping systems, namely, cassava-vegetable cowpea, cassava-groundnut, taro-blackgram, and taro-greengram, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 23970 kg/ha, 23970 kg/ha, 6970 kg/ha, and 6970 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -54.82%, -54.82%, -26.11%, and -26.11%, respectively, while Towards Organic-I management displayed yield decreases of -34.54%, -34.54%, -31.99%, and -31.99% over Organic-I. The SEY for Organic-I was recorded at 28390 kg/ha, 24970 kg/ha, 8700 kg/ha, and 6940 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -49.10%, -53.82%, -15.63%, and -36.74%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -27.76%, -27.95%, -34.48%, and -23.20% for each system, respectively.

Udaipur: Four cropping systems, namely, Maize + blackgram (2:2) – wheat (durum) – Sesbania (GM),



Blackgram – wheat (Triticum), Sweet corn + blackgram (2:2) – chickpea, and Soybean – fenugreek, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 2310 kg/ha (Maize) + 220 kg/ha (Blackgram), 450 kg/ha, 2480 kg/ha (Sweet corn) + 245 kg/ha (Blackgram), and 570 kg/ha, respectively. In comparison, Inorganic-II management showed yield increases of 9.09% (Maize) & 25% (Blackgram), 20%, 8.27% (Sweet corn) & 16.33% (Blackgram), and 12.28%, respectively. Meanwhile, Towards Organic-I management displayed yield increases of 14.29% (Maize) & 31.82% (Blackgram), 33.33%, 10.89% (Sweet corn) & 26.53% (Blackgram), and 19.30% over Organic-I. The SEY for Organic-I was recorded at 8148 kg/ha, 7001 kg/ha, 8565 kg/ha, and 5148 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 11.46%, 10.33%, 9.62%, and 8.47%, respectively. Meanwhile, Towards Organic-I management showed SEY increases of 15.10%, 16.10%, 14.16%, and 15.73% for each system, respectively.

Evaluation of response of different varieties of major crops for Organic Farming

Bajaura: Maize and wheat varieties were evaluated for their suitability under organic management practices. Among the maize varieties, Bajaura Makka and Girija recorded higher grain yield of 5380 & 5180 kg/ha, along with net return and B:C ratio respectively. However, plant height (241.8cm), cob length (21.8cm) and cob diameter (4.8cm) recorded highest in variety L-315. Among the wheat varieties, although plant height and number of tillers/m² recorded higher in HPW-373 (96.4cm & 311.0 /m² but HPW-368 recorded significantly higher grain yield (3510 kg/ha) & 1000-grains weight (46.4 g) & followed by HPW-373 (3070 kg/ha & 45.8g), respectively.

Bhopal: Groundnut and mustard varieties were evaluated under organic management practices. Among the groundnut varieties, cultivar GPBD-5 out performed in terms of plant height (37.9cm), pods/plant (37.3), seed yield (2111 kg ha⁻¹) and biomass yield followed by GJG-17, DH-256, ICGV-16690. Among the mustard varieties of grown under similar organic nutrient source and doses, the cultivar ARAVALI out performed in terms of seed yield followed by CS-52, MAYA, DRMR-150-35, NRCDR-2, PGN-229, PUSA MAHAK, DRMR-IJ – 31, NRCDR-601, NRCHB-101 and RH-749. Seed yield of ARAVALI (1223 kg ha⁻¹) and total biomass (4209 kg ha⁻¹) was found significantly higher than others.

Calicut: Significant difference in oil, oleoresin and curcumin content in turmeric varieties was observed under organic management. Among the varieties significantly higher yield was recorded by Pragati (29200 kg/ha) followed by Suguna (26300 kg/ha) and Sudarsana (24800 kg/ha). Among the varieties, significantly higher oil content was noticed in varieties Suvarna (6.10%) followed by Sobha (6.07%) and Kanthi (5.77%). Aleppey Supreme variety was superior in oleoresin content (12.73%) and least was recorded in Sudarsana (4.50%) on comparison with other varieties. The variety Prabha (5.81%) recorded maximum curcumin followed by Prathibha (5.42%) and Kedaram (5.40%).

Coimbatore: Rice followed by green gram varieties were evaluated. Grain yield difference was observed significantly among the twelve rice varieties ranged from 2609 to 4560 kg/ha. Athur Kichili sambarecorded highest grain yield (4560 kg/ha) while Poonkar had lowest grain yield (2609 kg/ha). Traditional varieties of rice assessed for their response to thrips, the minimum damage (3.11%) was recorded in Poonkar, followed by Athur Kichili samba (3.72%) whereas the maximum damage of 6.62 per cent observed in the Anaikomban. Regarding leaf folder damage at 40 DAT, Kuzhiadichan registered the lowest damage of 0.15 per cent as against the maximum of 2.68 per cent

damage in Sornamasuri. With respect to stem borer damage, Anaikomban registered the lowest damage (0.11 per cent), followed by Milagu samba, as against the maximum 0.72 per cent in Kuzhiadichan. Grain yield difference was observed significantly among the green gram varieties ranged from 645 to 989 kg/ha. VBN-4 recorded highest grain yield (989 kg/ha), followed by VBN-2 (937 kg/ha), while local had lowest grain yield (645 kg/ha). The variety VBN-4 yielded the highest net returns (Rs. 29,584 per hectare) and the highest Benefit-to-Cost ratio (1.75).

Dharwad: Soybean and groundnut was undertaken to test the suitability under organic farming. Soybean varieties yielded between 980 to 1,575 kg/ha, with DSB-34 achieving the highest yield (1575 kg/ha) and MACS 1188 (980 kg/ha) performing the lowest. Among the groundnut varieties, Dh-245 achieved the highest seed yield of 2,260 kg/ha under organic conditions, while DBG-4 produced the lowest yield at 1,440 kg/ha.

Jabalpur Twelve varieties of soybean and chickpea in system mode were evaluated for their performance and suitability under organic nutrient management. Among soybean varieties, JS 20-116 achieved the highest seed yield at 1056 kg/ha, followed by JS 20-94 with 877 kg/ha and JS 335 with 765 kg/ha. JS 20-34 with 376 kg/ha and JS 20 -29 with 408 kg/ha recorded the lowest yields. The seed yields of chickpea varieties ranged from 1143 to 1685 kg/ha. The highest yield of chickpea, 1685 kg/ha, was achieved with the variety Indira Chana, closely followed by JG 63 and JG 322, both yielding 1616 kg/ha. Conversely, the varieties JG 11, JG 24, and JAKI 9218 recorded the lowest seed yield at 1143 kg/ha.

Karjat: Fifteen rice varieties, categorized into early, mid-late, and late maturity groups (with four varieties in each category), including three popular ones among farmers, were assessed for their suitability under organic conditions. Variation for grain yield among the rice varieties ranged from 3090 to 4547 kg/ha. Among the rice varieties

grouped in four categories, rice variety Sahyadri-4 (early maturing), Sahyadri-3 (mid-late maturing), Ratnagiri-8 (late maturing) and karjat-3 which is popular among farmers recorded significantly higher grain yield 4323 kg/ha, 4547 kg/ha, 3961 kg/ha, and 4214 kg/ha, respectively, compare to the other varieties. Among cowpea varieties, Konkan Sadabahar recorded the highest seed yield which was 1371 kg/ha, followed by Dalkhan Local, Phule Pandhari, and GC-5. The seed yields of other cowpea varieties ranged from 793 to 1371 kg/ha, with Panvel Red producing the lowest yield among them.

Ludhiana: Basmati rice and wheat was evaluated for their performance under organic production. Among basmati rice, variety basmati 386 achieved the highest plant height (162.6 cm), which was statistically comparable to Basmati 370 and significantly greater than other varieties. Basmati rice grain yields ranged from 2167 to 3950 kg/ha and the genotype Punjab basmati 7 gained the highest number of effective tillers per square meter (338.9) and grain yield of 3950 kg/ha, which was significantly greater than all other varieties/genotypes. Although Pusabasmati 1637 had the highest number of grains per panicle (63.6) but longest panicle length (30 cm) was recorded in Pusa Basmati 1718. Among the wheat varieties, The highest number of effective tillers per square meter (348.5), spike length (9.7 cm), grains per spike (44.8), and 1000-grain weight (43.5 g) were observed in the Unnat PBW 550 variety. Wheat grain yields varied from 2370 to 4503 kg/ha across different varieties. The highest grain yield of 4503 kg/ha was observed in Unnat PBW 550, which was significantly greater than all other varieties. The lowest grain yield was recorded for Kandi Area Landmark at 2370 kg/ha. Additionally, Unnat PBW 550 had the highest straw yield (6173 kg/ha), which was statistically at par to BWL 3498 (6033 kg/ha).

Modipuram: Brinjal and vegetable pea varieties were tested for their performance under organic production. Among the brinjal varieties, Pusa Hara



Baigan recorded the highest yield at 19,742 kg/ha, followed by Kashi Uttam with 18,953 kg/ha and Navkiran with 17,653 kg/ha. The highest net return recorded by Pusa Hara Baigan at Rs. 1,53,226/ha, followed by Kashi Uttam at Rs. 1,43,364/ha and Navkiran at Rs. 1,27,114/ha. Among the twelve varieties of vegetable pea, Prachi 10 variety recorded the highest yield at 5,842 kg/ha, followed by PS 1100 with 5,423 kg/ha and PS 10 with 4,321 kg/ha. Prachi 10 also achieved the highest net return of Rs. 1,03,750/ha, followed by PS 1100 at Rs. 93,275/ha and PS 10 at Rs. 65,725/ha.

Pantnagar: Total twelve varieties of rice during kharif and twelve varieties of wheat in rabi were evaluated under organic cultivation. Plant height among the different rice varieties ranged from 105 to 154 cm, with Kala Namak being the tallest and NDR-359 the shortest. The number of effective tillers/m² ranged from 249 to 271, with PR-121 producing the highest number (271), while KeshoPohu had the lowest (249). Among the different varieties, the 1000-grain weight was highest in PD-24 at 26.9 g, which was at par to HKR-47 (25.7 g). Highest rice grain yield was significantly observed in HKR-47 of 5880 kg/ha, while KeshoPohu recorded the lowest yield (208 kg/ha). Among the various wheat varieties plant height ranged from 83.5 cm to 105 cm. The tallest variety was Sonalika (105 cm) while the shortest was WH-1105 (83.85 cm). The number of spikes/m² among wheat varieties ranged from 314 to 368, while the test weight (1000-grain weight) varied from 28.0 to 35.3 gram. The grain yield of different wheat varieties ranged from 3239 to 4,319 kg/ha. The highest yield was observed in UP 2903 (4319 kg/ha), while the lowest was recorded in UP-262 (3239 kg/ha).

Raipur: The response of fifteen rice varieties, as well as eleven improved chickpea varieties, was assessed under an organic production system. Among the rice varieties, grain yields ranged from 2056 to 3295 kg/ha. Indira Sugandhit dhan-1 produced the highest grain yield, closely followed by CG Devbhog

of 3162 kg/ha. The lowest yield was recorded (2056 kg/ha) for the Chinni Kapoor variety. Among the chickpea varieties, the highest seed yield was recorded 878.1 kg/ha, for JG-16, which was statistically comparable to Vijay at 864.3 kg/ha and RG2009-01 at 864.1 kg/ha.

Ranchi: Ten varieties of rice and wheat were assessed for their suitability in organic farming system. The highest grain yield for rice of 4286 kg/ha, was achieved with the MTU1010 variety, which was significantly superior to all other rice varieties. The Kalazeera rice variety produced the lowest grain yield at 2829 kg/ha. For wheat, the maximum grain yield of 2503 kg/ha was recorded with the K-1006 variety while DBW-187 wheat yielded the least of 1924 kg/ha.

Umiam: Groundnut and mustard varieties were evaluated for their performance under organic production. Among the groundnut varieties, yield of groundnut recorded ranged from 536 to 1500 kg/ha, with genotype ICGV 91114 being the highest yielded variety followed by ICG 576 and JL 501 which was at par to each other but significantly higher to others, while GG 7 yielded the lowest. Among the Mustard varieties evaluated, yield of mustard ranged between 277 kg/ha to 447 kg/ha. DRMR 15 being the highest yielded variety whereas PT 303 recorded the least performing variety.

Ajmer: The total eight varieties each of black gram, moth bean during kharif and fenugreek, nigella during rabi were assessed under organic cultivation. Among the black gram varieties, Kota Urd-4 achieved the highest yield at 628.3 kg/ha, followed by IPU-11-02, while the lowest yield was observed in the IPU-13-11 variety, at 543.3 kg/ha. For moth bean varieties, CZM-2 variety recorded higher yield (250.0 kg/ha) followed by RMO-423 and RMO-225. Among the fenugreek varieties, Hisar Sonali recorded the highest yield (2126.7 kg/ha), followed by Ajmer Fenugreek-5, while the RMT-143 variety had the lowest yield at 1825.0 kg/ha. For nigella varieties, the



NDBC-10 variety yielded the highest (531.7 kg/ha), followed by Indra Nigella-1 and Ajmer Nigella-1.

Gangtok: Maize and buckwheat varieties were undertaken to test their suitability under organic production. Maximum cob length (16.6 cm) was recorded under RCM 1-1 which was statistically at par with Ratomakkai, Baigunimakkai but significantly higher than other cultivars. Maximum number of grains row⁻¹ (37.9) was observed under Kalomakkai which was statistically at par with Ratomakkai, Vivek Sankul-31 but significantly higher than other cultivars. Significantly higher value of grain yield (4111 kg/ha) was observed under Vivek Sankul-31 and Vivek Sankul-35 as compared to other cultivars but remained statistically at par with Setimakkai. Among the buckwheat varieties for yield recorded ranged from 920 to 2190 kg/ha. Maximum grain yield (2190 kg ha⁻¹) was recorded under Local Meethay which was statistically at par with IC-109433, IC109729, IC49671 but significantly higher than remaining cultivars.

Sardarkrushinagar: Five varieties of each crop were cultivated in a cowpea-wheat system to evaluate their performance under organic farming conditions. Gujarat cowpea-4 recorded yield of 1394 kg/ha, which were at par to Gujarat Cowpea-3. In contrast, the Gujarat cowpea-5 variety exhibited the lowest yield at 535 kg/ha and performed poorly in economic parameters under organic management practices. Among different variety of amaranth, grain yield, straw yield, amaranth equivalent yield and economics performance, Gujarat Amaranth 5 variety outperformed better and recorded highest grain yield (1042 kg/ha), as compared to other amaranth varieties. Variety BGA 2 was the least performer variety in term of yield and economics.

Thiruvananthapuram: Four varieties of greater yam suitable for organic management practices were evaluated, each differing in duration and nutrient requirements. The tuber yield for these varieties ranged from 6.77 to 8.62 t/ha. Among them, Orissa

Elite variety achieved the highest yield of 8.62 t/ha, with a net return of Rs. 1,24,395/ha and a benefit-cost ratio of 1.41, which is at par to Da-340 variety.

Udaipur: Maize and wheat varieties were evaluated. Among the maize varieties, Pratap Hybrid Maize -3 delivered the highest yield (5915 kg/ha), followed by Pratap QPM Hybrid -1 and Sugar 75. Among the wheat varieties, HI-8713 performed the best and achieving the highest grain yield of 5700 kg/ha.

Evaluation of Natural Farming Practices in different agro ecologies

Ajmer, Udaipur and Sardarkrushinagar undertaken the same cropping system of Groundnut + sesame – fennel + cabbage.

Ajmer: Complete natural farming recorded a system equivalent yield of 2173 kg/ha which was 29.37% and 57.01% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.36% which was 12.5% higher than the AI-NPOF package but was nearly the same as that of the ICMP package. Further, the cost of cultivation & net return was INR 52,487 & INR 67,063 per ha. These were 44.26% & 23.51% and 10.71% & 67.98% lower than that of the AI-NPOF and ICMP packages, respectively.

Udaipur: Complete natural farming recorded a system equivalent yield of 3966 kg/ha which was 43.84% and 59.02% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.69% which was 6.76% and 4.17% lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 68,485 & INR 159,069 per ha. These were 36.78% & 24.31% and 46.31% & 55.35% lower than that of the AI-NPOF and ICMP packages, respectively.

Sardarkrushinagar: Complete natural farming recorded a system equivalent yield of 3762 kg/ha which was 5.29% and 16.70% less than the AI-NPOF and ICMP, respectively. Under complete natural



farming, soil organic carbon (SOC) was observed at 0.12% which was 17.01% and 16.44% lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 95,874 & INR 118,767 per ha. The cost of cultivation was 41.91% & 29.29% lower, while the net returns were 93.03% higher & 2.68% lower than that of the AI-NPOF and ICMP packages, respectively.

Location Almora, Bajaura and Gangtok undertaken the same cropping system of Soybean + maize – garden pea + green coriander

Almora: Complete natural farming recorded a system equivalent yield of 12706 kg/ha which was 23.54% and 26.51% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 1.16% which was 12.78% and 3.33% lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 102,826 & INR 127,230 per ha. The cost of cultivation was the same for all the practices, while the net returns were 25.21% & 37.53% lower than that of the AI-NPOF and ICMP packages, respectively.

Bajaura: Complete natural farming recorded a system equivalent yield of 4562 kg/ha which was 14.02% and 26.07% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.74% which was 10.84% and 5.13% lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 197,068 & INR 341,120 per ha. The cost of cultivation was 27.14% and 9.06% lower, while the net returns were 4.27% & 7.82% less than that of the AI-NPOF and ICMP packages, respectively.

Gangtok: Soybean + maize – garden pea + green coriander cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 11796 kg/ha which was 3.96% greater than the AI-NPOF package. Under complete natural farming, soil organic carbon (SOC) was observed at 1.54% which was 1.28% lower than the AI-NPOF system. Further,

the cost of cultivation & net return was INR 100,210 & INR 200,610 per ha. These were 38.08% & 11.84% higher than that of the AI-NPOF package.

Location Bhopal, Jabalpur and Raipur undertaken the same cropping system of Soybean + maize – wheat + mustard

Bhopal: Complete natural farming recorded a system equivalent yield of 2918 kg/ha which was 19.97% and 32.25% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.65% which was 10.96% and 1.52% lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 35,036 & INR 28,459 per ha. The cost of cultivation was 32.96% and 32.32% lower, while the net returns were 9.16% & 43.82% less than that of the AI-NPOF and ICMP packages, respectively.

Jabalpur: Complete natural farming recorded a system equivalent yield of 2588 kg/ha which was 24.35% and 44.49% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.62% which was 10.14% lower but 1.64% higher than the AI-NPOF and ICMP systems, respectively. Further, the cost of cultivation & net return was INR 83,261 & INR 37,056 per ha. The cost of cultivation was 19.47% and 8.37% lower, while the net returns were 30.42% & 68.96% less than that of the AI-NPOF and ICMP packages, respectively.

Raipur: Complete natural farming recorded a system equivalent yield of 1766 kg/ha which was 19.10% and 28.56% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.62% which was 1.64% higher than both AI-NPOF and ICMP. Further, the cost of cultivation & net return was INR 94,370 & INR 48,802 per ha. The cost of cultivation was 13.72% and 29.59% higher, while the net returns were 23.60% lower & 9.25% higher than that of the AI-NPOF and ICMP packages, respectively.

Location Coimbatore and Dharwad followed the



same cropping systems of cotton + green gram – sorghum + chickpea

Coimbatore: Complete natural farming recorded a system equivalent yield of 1862 kg/ha which was 5.32% higher and 14.86% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.63% which was 1.79% & 19.20% higher than the AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 76,250 & INR 137,025 per ha. The cost of cultivation was 52.37% and 50.65% lower, while the net returns were 410.15% & 112.11% higher than that of the AI-NPOF and ICMP packages, respectively.

Dharwad: Under complete natural farming, soil organic carbon (SOC) was observed at 0.58% which was 21.62% & 15.94% lower than the AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 44,122 & INR 6,283 per ha. The cost of cultivation was 29.18% and 21.38% lower, while the net returns were 222.86% & 36.60% lower than that of the AI-NPOF and ICMP packages, respectively.

Umiam: Turmeric + cowpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 11447 kg/ha which was 47.87% and 43.08% lower than the AI-NPOF and ICMP, respectively. The cost of cultivation & net return was INR 59,675 & INR 85,765 per ha. The cost of cultivation was 27.02% and 33.94% lower, while the net returns were also 51.98% & 41.56% lower than that of the AI-NPOF and ICMP packages, respectively. Location Karjat, Ranchi and Narendrapur followed the same cropping systems Rice + dhaincha – maize grain/sweet corn + cowpea

Karjat: Complete natural farming recorded a system equivalent yield of 9734 kg/ha which was 38.68% and 33.91% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 1.04% which was 0.95% lower than both AI-NPOF and ICMP systems. Further, the cost of cultivation & net return

was INR 161,592 & INR 36,986 per ha. The cost of cultivation was 26.15% and 13.12% lower, while the net returns were 64.78% & 67.68% less than that of the AI-NPOF and ICMP packages, respectively.

Ranchi: Complete natural farming recorded a system equivalent yield of 7067 kg/ha which was 1.70% and 14.35% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.64% which was 1.59% and 18.52% higher than AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 66,796 & INR 127,400 per ha. The cost of cultivation was 6.02% and 13.59% lower, while the net returns were 1.71% higher and 14.58% less than that of the AI-NPOF and ICMP packages, respectively.

Narendrapur: Complete natural farming recorded a system equivalent yield of 6610 kg/ha. The soil organic carbon (SOC) was observed at 0.53%. Further, the cost of cultivation & net return was INR 50,889 & INR 81,042 per ha, respectively.

Location Ludhiana, Modipuram and Pantnagar followed the same cropping systems Maize + cowpea – wheat + chickpea

Ludhiana: Complete natural farming recorded a system equivalent yield of 6400 kg/ha which was 43.71% and 53.76% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.48% which was 5.88% lower than the AI-NPOF, while it was nearly the same as that of the ICMP system. Further, the cost of cultivation & net return was INR 87,587 & INR 87,679 per ha. The cost of cultivation was 56.45% and 41.00% lower, while the net returns were 21.05% and 47.23% less than that of the AI-NPOF and ICMP packages, respectively.

Modipuram: Complete natural farming recorded a system equivalent yield of 2517 kg/ha which was 68.88% and 70.28% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.60% which was 13.04% & 10.45% lower than the AI-NPOF



and ICMP systems. Further, the cost of cultivation & net return was INR 79,360 & INR -8928 per ha. The cost of cultivation was 38.07% and 21.42% lower, while the net returns were 110.64% and 106.90% less than that of the AI-NPOF and ICMP packages, respectively.

Pantanagar: Complete natural farming recorded a system equivalent yield of 3087 kg/ha which was 19.80% and 23.08% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.46% which was 4.17% lower than both the AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 48,870 & INR 145,310 per ha. The cost of cultivation was 36.89% and 37.66% lower, while the net returns were 6.58% and 20.75% less than that of the AI-NPOF and ICMP packages, respectively.

Thiruvananthapuram: Cassava + vegetable cowpea – green gram cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 23970 kg/ha which was 25.77% and 45.84% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.92% which was 22.67% and 35.29% higher than both AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 241,470 & INR 477,018 per ha. The cost of cultivation was 29.76% and 27.81% lower, while the net returns were 23.61% and 51.94% less than that of the AI-NPOF and ICMP packages, respectively.

Development of Integrated Organic Farming System models

Calicut (Kerala): Spices, fodder and vegetables combination was evaluated at Chelavoor farm under IOFS model. The crops were black pepper, turmeric, fodder grasses (CO-3, CO-4), Tapioca, Banana, cowpea, Coconut, were planted and established. Two cows and their calves were maintaining. Turmeric 500 kg, Banana 70 kg, Tapioca 75 kg and vegetable cowpea 30 kg, coconut 1300 nos. were

harvested. Fodder grass fed to the cows that are maintained at ICAR-IISR farm. Net profit of Rs 1,43,556 was received from one-acre IOFS model. Employment generated Man days/year is 322 (Table 7.4.1). Maximum income shares 91.4% was came from livestock (dairy) followed by cropping systems (17.19%) and horticulture (1.41%).

Thiruvananthapuram (Kerala): Net returns of Rs. 3,27,108 was achieved from tuber crop-based farming system, tuber equivalent yield of 41.8 tons obtained from IOFS model involving tuber crops from an area of 75 cents. Total 10646 liter/kg milk yield was produced. The % share of area and income of the various components of IOFS is given in Table 7.3.2 and 7.3.3. Maximum income share was achieved from dairy component of 75.7% followed by crop component which is 22.75%.

Coimbatore (Tamil Nadu): A one-acre IOFS model includes crop components, dairy, perennial horticultural crops, agro-forestry, pest repellent cafeteria, residue recycling unit and beekeeping. Through crop component, an income of Rs.30,902 was obtained. Two numbers of Jersey cross bred were maintained at IOFS model and produced 1063 litre of milk and realised of Rs. 63,780 as return. Fodder grass cumbunapier CO (CN) 5 and desmanthus (Deamanthusvarigatus) harvested 24.6 tonnes at regular intervals and being fed to the cattle. Annually 12.64 tonnes of cow dung and 9486 litres of urine were obtained from livestock which were applied to the crops to boost the yield. From this manure 82.2 kg of N, 34.8 kg of P₂O₅ and 110.7 kg of K₂O with the value of Rs.6065 was saved. Recycling of the on-farm resources such as crop residues and litters collected from the IOFS model were converted into compost, from these units on an average 3245 kg of compost per annum was produced of the value of Rs. 7215. The yield of the boundary crops were expressed in coconut equivalent basis. In this system 1748 nuts per year was harvested with the average cost of Rs.21.3 per nut. The annual gross income realized of Rs.25726



with the cost of Rs.5333 and Rs 20,394 was obtained as net income generated from boundary plantation. From this IOFS model, gross income of Rs. 2,73,851 was obtained with total cost of the Rs. 2,03,961 per annum and the net return of Rs.69,890 was realized.

Gangtok (Sikkim): An IOFS model was developed in 0.6 ha area at research farm of ICAR-Sikkim Centre, Tadong, Sikkim. The IOFS model comprising fishery, dairy, poultry, large cardamom nursery, field crops, etc.. From an 0.6 ha IOFs model, net return of Rs 77,002 was received by crop component from 0.47 ha area, Rs 64,676 was received by dairy (0.05 ha), Rs 22,320 and 7,404 obtained from poultry and fishery, whereas Rs 6000 was received from vermicomposting. From large cardamom, Rs 17,000 was received. From this 0.60 ha IOFS model, gross income of Rs. 3,10,144 was obtained with total cost of the Rs. 1,32,744 per annum resulted in net return of Rs. 1,77,400 was realized with BCR of 3.05.

Raipur (Chhattisgarh): Integrated farming system research model consisting cropping system, horticultural system, fishery and poultry enterprises including dairy component, vermin-compost units, biogas units have also been taken under operation in addition to the aforesaid components. A gross income of Rs 4,89,336/-ha was generated from the whole IOFS model area from different components/enterprises and the net income of Rs 2,05,491/- was achieved from different components/enterprises of Integrated Farming System

Sardarkrushinagar (Gujarat): IOFS model is comprised of different components viz., crops (0.38 ha), boundary plantation, livestock unit and allied component (0.02 ha). Data presented in table 7.3.8 revealed that total net profit of ₹38612 was received by crop component from 0.38 ha area, ₹8560 was received by from boundary plantation. ₹ -4266 was loss in livestock and allied component due to dry period of cow for long spell. Total net profit from all the components of IOFS model including boundary

plantation was ₹ 42906 from 0.40 hectare area.

Udaipur (Rajasthan): An integrated organic farming system model for 0.45 ha comprising of field crops sweet corn + black gram – wheat (0.25 ha) fodder crops maize fodder + cowpea – berseem (0.05 ha) –sesbania green manuring, vegetables in 0.10 ha (okra and cauliflower), fruit crop guava (0.04 ha) and compost unit in 0.01 ha were evaluated. Total maize equivalent yield of 6841 kg/ha recorded from the IOFS model. Net return of Rs. 86,460 /ha was obtained from the integrated organic farming system model by the cost of Rs. 42,850 with 2.02 NRPRI.

Umiam (Meghalaya): The total cost of cultivation was recorded at Rs. 71,750/- per year under the IOFS model with an area of 0.43 ha. A total net return of Rs. 88,820/- per year was achieved under the IOFS model which is about to Rs. 2,06,558/ha and much higher than the region's farmer common practices of rice mono-cropping or improved practice of rice-vegetables cropping system.



Globally organic farming is promoted in 188 countries with an area of 96.4 million ha during 2023-24. The key countries contributing to area include Australia (53 million ha), India (4.7 million ha) and Argentina (4.1 million ha). In addition, Wild Harvest Area are is about 34.6 million ha at global level. Global market Size was \$146 billion USD (135 billion Euros) with USA (43%), EU (34%) and China (9.2%) having larger market share. The key commodities having demand at the global level are Fresh fruits & vegetables (40%), Dairy products (20%), Meat, fish, and poultry (15%), Processed and frozen foods (10%) and Grains and raw commodities (15%). India's position in terms of export value is \$495 million (0.33% share of global organic trade). Product focus by India is primarily in grains and raw commodities, lacking market presence in fruits, vegetables, dairy, and meat products. In India, government initiatives for promotion of organic and natural farming include a) Namami Ganga: Chemical-free farming along the 5 km stretches of the Ganga basin; b) PKVY

(Paramparagat Krishi Vikas Yojana): Development of traditional agricultural practices, c) MOVCD-NER (Mission Organic Value Chain Development for North Eastern Region): Supports organic value chains and d) Marketing & Certification: Online platforms for inputs and outputs, large area certification, PGS (Participatory Guarantee System), and third-party certification. Key metrics in India indicates that 4.47 million ha (Fig) is under third-party certification and conversion during 2023-24, 1.5 m ha under Participatory Guarantee System. India accounts for 4.8% of the world's organic farming area (ranks 2nd) and has 55.1% of the world's organic producers. Country achieved 27.3% annual growth rate in area over the past seven years, with exports reaching \$494.8 million in 2023-24. Area under natural Farming is approximately 6,72,750 ha (data from NITI, 2024). The main focus is for sustainable practices that enhance natural soil flora and fauna, ecological balance, and biodiversity through locally available on-farm inputs.

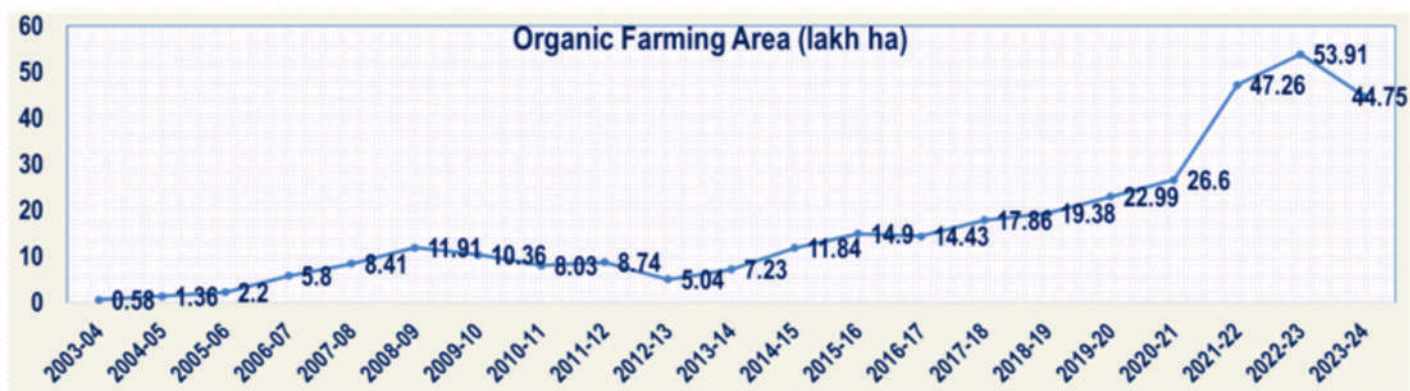


Fig. Trend in third party certified and conversion area under organic farming in India

To develop package of practices for organic farming in a system perspective, a Network Project on Organic Farming (NPOF) was initiated during 2004-05 by Indian Council of Agricultural Research (ICAR), New Delhi with ICAR-Indian Institute of Farming Systems Research (IIFSR) as lead centre. Initially, the project was operating with 13 centres covering 12

states. During XII plan, the numbers of centres of have been increased to 20 covering 16 states. Results of multi-location study and experiments conducted under the scheme on organic and natural farming including geo-tagged characterization of organic and natural farming farmers, demonstration of organic farming packages, development of

integrated organic farming systems and natural farming are presented in the report besides other aspects such as publications, human resource development *etc.* Findings of the experiment

conducted during the year will help to identify the potential areas and crops for promotion of organic and natural farming in the country.



Scheme Objectives

- To study productivity, profitability, sustainability, quality and input-use-efficiencies of different crops and cropping systems under organic farming in different agro-ecological regions
- To develop efficient crop and soil management options for organic farming
- To develop need-based cost-effective new techniques for farm-waste recycling

Methodology

The experiments in the project have been designed mainly to evaluate the relative performance of location-specific, important cropping systems under organic and conventional (chemical) farming, and assess agronomic efficiency of different production systems. Cropping systems, which are under evaluation, involve cereal crops (mainly basmati rice, coarse rice, durum and aestivum wheats, sorghum, barley and maize), pulses and oilseeds (blackgram, cowpea, pigeonpea, chickpea, lentil, linseed, green gram, soybean, mustard, sunflower, safflower and groundnut), spices (black pepper, ginger, turmeric, chillies, onion, and garlic), vegetables (potato, okra, baby corn, cowpea, pea, tomato, french bean, summer squash, beetroot, carrot, dolichos bean, coriander and cauliflower), cotton and fodder crops (sorghum, maize, cow pea and berseem) in location-specific cropping systems. During 2022-23, following experiments/study were undertaken at different centers:

Programme 1: Characterization of Organic and Natural Farming Inputs and Practices

- Geo-tagged characterization of organic and natural farming farmers
- Documentation & validation of organic ITKs.
- Biochemical characterization & molecular identification of microbial population of different organic and natural farming inputs

Programme 2: Development and validation of scientific package of practices for organic and natural farming

- Evaluation of organic, inorganic and integrated production systems for crops and cropping systems
- Evaluation of response of different varieties of major crops for organic farming
- Evaluation of organic management practices for insect pest in various crops
- Evaluation of organic management practice for diseases in crops
- Evaluation and validation of natural farming practices in different agro-ecologies
- Farmers participatory validation of organic and natural farming practices in farmers field under SCSP/STC sub plans

Programme 3: Integrated Organic Farming Systems:

- Development of Integrated Organic Farming System Model

Programme 4: Capacity Building including Policy Support to Central and States Agencies:

- Value chain development with aggregation model for organic farming

The objectives, locations and treatment details of each experiment at various locations are presented in chapter 7 and at respective tables. General guidelines and standards for the production of organic production, as suggested under National Standards for Organic Production (NSOP), forms the basis for raising the experimental crops in the project. A compact block of land has been earmarked at each of the cooperating centres for experimental purposes, as far as possible. The plot identified was in general, free from hazards of erosion, sediments, chemical pollutants and contaminants. Shelterbelts have been developed by planting multi-purpose trees/shrubs etc. such as

Subabul, Sesbania spp. etc. around the field. The individual centre has been advised to select organic sources of nutrients depending upon the local availability and also in suitable combination(s) to fulfill the entire requirement of nitrogen and 80-90% requirement of phosphorus and potassium for each cropping system. Cooperating centers have also been advised that each centre should select only those crops for organic farming research in which effective organic (non-chemical) measures are

available for plant protection to avoid failure of crops at later stages. Bulky manures were prepared within the premises of cooperating centres under the project itself or under any other project going on at university/institute/ centre in order to ensure proper quality of inputs. Inputs related to plant protection, bio-fertilizers etc are procured from reliable sources only. Adequate care has also been taken by the centres that seeds purchased from outside are not treated with any chemical seed dresser.



Multi-location experiments were conducted during 2022-23 at 20 research centers of SAUs/ ICAR Institutes in 16 states. Statewise details of centres are given below in the order of results presented in the chapter 7.

Sl. No.	Location of Centre	State	Address of SAU/ICAR institute
Centres functioning from 2004-05			
1.	Bajaura	Himachal Pradesh	CSK HPKV Hill Agri. Res. & Extn. Centre, Bajaura, Kullu-175 125
1.	Bhopal	Madhya Pradesh	ICAR-Indian Institute of Soil Science, Nabi Bagh, Berasia Road, Bhopal – 462 038
1.	Calicut	Kerala	ICAR-Indian Institute of Spices Research, P.B. No. 1701, Marikunnu PO, Calicut – 673 012
1.	Coimbatore	Tamil Nadu	Tamil Nadu Agricultural University, Coimbatore-641 003
1.	Dharwad	Karnataka	University of Agricultural Sciences, Yettinagudda Campus, Krishinagar, Dharwad-580 005
1.	Jabalpur	Madhya Pradesh	Jawaharlal Nehru Krishi Viswa Vidyalaya, Jabalpur-482 004
1.	Karjat	Maharashtra	Dr. Balasaheb Sawant Konkan Krishi Vidypeeth, RARS, Karjat, Dist. Raigad – 410 201
1.	Ludhiana	Punjab	Punjab Agricultural University, Ludhiana-141 004
1.	Modipuram	Uttar Pradesh	ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut -250 110
1.	Pantnagar	Uttarakhand	G.B.Pant University of Agriculture Sciences & Technology, Pantnagar, Udham Singh Nagar – 263 145
1.	Raipur	Chhattisgarh	Indira Gandhi Krishi Vishwavidyalaya, Raipur-492 012
1.	Ranchi	Jharkhand	Birsa Agricultural University, Kanke, Ranchi – 834 006
1.	Umiam	Meghalaya	ICAR Research Complex for NEH Region, Umiam-737 102
Centres functioning from 2015-16			
1.	Ajmer	Rajasthan	ICAR-National Research Centre on Seed Spices, Tabiji, Ajmer-305 206
1.	Almora	Uttarakhand	ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora-263 601
1.	Gangtok	Sikkim	ICAR Research Complex for NEH Region, Sikkim Centre, Tadong, Gangtok -737102
1.	Narendrapur	West Bengal	School of Agriculture & Rural Development, Ramakrishna Mission Vivekananda University, PO Belur Math, Howrah-711 202
1.	Sardar Krushinagar	Gujarat	Sardar Krushinagar-Dantiwada Agricultural University, Sardar Krushinagar, Banaskantha –385 506
1.	Thiruvananthapuram	Kerala	ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram - 695 017
1.	Udaipur	Rajasthan	Agricultural Research Station, Maharana Pratap University of Agriculture & Technology, Udaipur- 313 001

AI-NPOF



✚ AI-NPOF (20)

State / UT	AI-NPOF (20 no's)
Chhattisgarh	Raipur
Gujarat	SK Nagar
Himachal Pradesh	Bajaura
Jharkhand	Ranchi
Karnataka	Dharwad
Kerala	Trivandram, Calicut
Madhya Pradesh	Jabalpur, Bhopal
Maharashtra	Karjat
Meghalaya	Umiam
Punjab	Ludhiana
Rajasthan	Ajmer, Udaipur
Sikkim	Gangtok
Tamil Nadu	Coimbatore
Uttar Pradesh	Modipuram
Uttarakhand	Pantnagar, Almora
West Bengal	Narendrapur



No regular posts, in any category, have been provided and the responsibility was assigned to a scientist, nominated as Principal Investigator of AI-NPOF, by the parent institute/ university (Names and contact addresses of PI's are given in Annexure10). The scientists of related disciplines were also involved in the research programme by the respective institution. In addition, two senior research fellows (as contractual staff) have been provided at each centre.

Soil type, weather parameters and initial values of soil physico-chemical properties at various locations are presented below.

Soil type, weather, latitude and longitude of the various centres

Sl. No.	Name of centre	Soil Type	Weather				Latitude (N)	Longitude (E)
			Rainfall (mm)	Temperature (°C)		R.H		
				Max.	Mini.	(%)		
Centres functioning from 2004-05								
1.	Bajura	Silty loam	979.5	30.4	16.6	-	31°80	77°00
2.	Bhopal	Vertisols, Clay Montmorillonite/ smectite type	906.2	32.7	20.9	58.8	23°18'	77°24'
3.	Calicut	Clay loam, ustic Humitropept	4121	31.8	22.0	68	11°34'	75°48'
4.	Coimbatore	Sandy, Clay, Loam soil	700	35.9	19.8	87.3	11° 24'	77°30'
5.	Dharwad	Clay loam	1110.6	30.2	185	66.5	15°26'	75°07'
6.	Jabalpur	Vertisols, Chromusterts	1312.10	32.4	17.7	78.2	23°09'	79°90'
7.	Karjat	Red and medium black	3794.8	40.7	11.4	97.1	18°92'	77°33'
8.	Ludhiana	Ustochrepts-Ustic prammments association, alluvial, sandy & sandy loam	806.4	33.5	17.02	76.22	24°35'	74°42'
9.	Modipuram	Alluvium soils Typic ustochrept	747.0	42.5	5.4	76.8	29°4'	77°46'
10.	Pantnagar	Hapludolls, very deep alluvium coarse loomy soils	1300	30.1	17.7	84.2	29°	79°30'
11.	Raipur	Ochraquals association, deep black soil	1267.8	32.7	21.0	64.0	21°16'	81°36'
12.	Ranchi	Ultic Palesustalfs, very deep soils	1818.7	31.4	17.7	77.9	-	-
13.	Umiam	Clay loam	2631.9	26.2	15.3	63.6	24°44'	76°48'
Centres functioning from 2015-16								
14.	Ajmer	Sandy loam	450	-	-	-	36°01'	22°31'
15.	Almora	-	-	-	-	-	-	-
16.	Gangtok		3196.8	23.6	14.8	69.1	27°32'	88°60'
17.	Narendrapur							
18.	Sardar Krushinagar		1422.9	41.3	5.6	96	24°19'	72°17'
19.	Thiruvananthapuram		2117	34.4	21.1	95.5	-	-
20.	Udaipur	Clay loam	795.9	40	4.6	87.6	24°35	74°42



Initial nutrient status of soil (2022-23)

Centre	OC (%)	pH	EC (ds/m)	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (ppm)	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)
Centres functioning from 2004-05											
Bajaura	1.49	6.9	-	265.1	76.5	248.9		17.0	12.2	3.73	2.63
Bhopal	0.53	7.85	0.50	154.2	12.8	530	4.92	5.52		0.74	
Calicut	1.42	5.05	0.32	156	4.4	171		25.0	3.1	0.46	0.58
Coimbatore	0.66	8.3	0.06	247	17.5	495		30.40		4.10	
Dharwad	5.8	77.5	0.13	273.9	28.40	359	13.06	9.50		1.46	
Jabalpur	0.71	7.22	0.23	260	11.5	282	9.6	2.39		0.35	
Karjat	1.14	7.02	0.284	230	20.0	327					
Ludhiana	0.46	8.1	0.50	278	36.3	134					
Modipuram											
Pantnagar	0.57	7.34	0.409	158.6	15.9	221.8	-	30.69	6.25	0.96	2.13
Raipur	0.64	7.67	0.28	237	13.0	274					
Ranchi	0.38	5.260		220	48	270					
Umiam	2.22	5.14		230.7	21.5	258.2		65.2	6.3	0.51	1.12
Centres functioning from 2015-16											
Ajmer	0.28	8.13	0.13	124.6	11.9	336.2					
Almora	0.54	6.47	0.16	382.0	16.2	152.0					
Gangtok	0.88	5.57		237.6	14.07	273.6					
Narendrapur	0.80	6.96	0.38		64.34	242.8					
Sardar Krushinagar	0.33	7.22	0.15	141	13.5	180.0	8.20	8.40	0.68		
Thiruvananthapuram	1.33	4.54		148.11	66.82	198.04					
Udaipur	0.6-0.76	7.8-8.4	0.7-0.9								

A total budget of Rs. 193.78 lakhs were released to 21 centers during 2022-23. The centre wise allocations of funds are given below.

Name of University / Institutes	A. Other than STC/SCSP/NEH										STC (TSP) Component				SCSP Component						Grant-in-Aid, under NEH Component				Grand Total
	Grant-in-Aid 'General'				Equipment	Grant-in-Aid 'General'			Total Other than STC/SCSP/NEH	Grant-in-Aid 'General'			Total SCSP	Grant-in-Aid 'General'			Grant-in-Aid 'General'								
	Domestic c.T.A.	Research Expenses	Operational charges	Sub Total		Works	Information Technology	Sub Total		Research Expenses	Operational charges	Sub Total		Equipment	Works	Sub Total	Domestic c.T.A.	Research Expenses	Operational charges	Sub Total					
IGKV, Raipur	0.30	2.14	4.13	6.57	0.00	0.00	0.00	0.00	6.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.57		
SDAU, S.K.Nagar	0.30	2.05	3.40	5.75	2.00	0.00	0.00	2.00	7.75	0.00	0.00	0.00	0.0670	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.75		
HAREC, Bajaura	0.36	1.10	3.00	4.46	0.00	0.00	0.00	0.00	4.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.46		
BAU, Ranchi	0.38	1.05	2.85	4.28	0.00	0.00	0.00	0.00	4.28	1.50	2.50	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.28		
ICAR-USR, Calicut	0.50	2.05	5.15	7.70	0.00	2.00	0.00	2.00	9.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.70		
ICAR-CTCRI, Trivandram	0.48	1.66	5.36	7.50	2.00	0.00	0.00	2.00	9.50	0.00	0.00	0.00	1.55	6.08	7.63	0.80	8.43	0.00	0.00	0.00	0.00	0.00	17.93		
UAS, Dharwad	0.45	1.15	3.70	5.30	0.00	0.00	0.00	0.00	5.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.30		
JNKVV/Jabalpur	0.10	1.40	3.23	4.73	0.00	0.00	0.00	0.00	4.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.73		
ICAR-ISS, Bhopal	0.05	1.00	5.71	6.76	0.00	0.00	0.00	0.00	6.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.76K		
KV, Dapoli	0.30	1.05	3.23	4.58	0.00	0.00	0.00	0.00	4.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.58		
ICAR-Pes. Comp., Urmiam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	2.00	3.00	3.00	0.00	0.00	0.00	0.00	0.30	5.53	7.20	13.03	16.03			
PAU, Ludhiana	0.48	2.79	4.35	7.62	0.00	0.00	0.00	0.00	7.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.62		
MPU&T, Udaipur	0.33	0.00	5.92	6.25	2.00	0.00	0.00	2.00	8.25	1.00	2.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.25		
ICAR-NRC Seed Spices, Ajmer	0.50	1.00	4.98	6.48	0.00	0.00	0.00	0.00	6.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.48		
ICAR-RC-NEH, Gangtok	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	5.53	7.20	13.03	13.03			
TNAU Coimbatore	0.40	1.54	5.27	7.21	2.00	0.00	0.00	2.00	9.21	1.00	2.00	3.00	3.00	1.23	3.64	4.87	4.87	0.00	0.00	0.00	0.00	0.00	17.08		
ICAR-IFSR, Modipuram	0.05	0.21	6.02	6.28	0.00	0.00	0.00	0.00	6.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.28		
National PI, ICAR-IFSR, Modipuram	2.02	0.00	10.17	12.19	0.00	0.00	0.43	0.43	12.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.62		
GBPU&T, Pantnagar	0.35	1.81	5.34	7.50	0.00	0.00	0.00	0.00	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	11.50		
ICAR-IPKAS, Almora	0.31	1.22	4.85	6.38	0.00	0.00	0.00	0.00	6.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.38		
RMVU, Narendrapur	0.05	1.32	8.08	9.45	0.00	0.00	0.00	0.00	9.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.45		
Total	7.71	24.54	94.74	126.99	8.00	2.00	0.43	10.43	137.42	4.50	8.50	13.00	13.00	2.78	9.72	12.50	17.30	0.60	11.06	14.40	26.06	0.00	193.78		



7.1

Programme: Characterization of organic and natural farming inputs and practices**7.1.1: Geo-tagged characterization of organic and natural farming farmers**

In order to understand the successful practices and constraints of organic farmers, a study on geo-referenced characterization of organic farmers initiated during 2014-15. A minimum of 30 farms household fixed as target for collection of information. However, some centers have collected information from less or more number of farmers depending on the resources. The objective of the study was

- To understand and characterize the practices and constraints of organic farmers
- To access the technological gaps of organic farmers

Centre wise results for each Centre are presented below (Table 7.1.1-7.1.4).

Bajaura

- Geo reference characterization survey was carried out for natural farming farmers involving uncultivated 11 farmers covering 10 villages in Keylong and Udaipur block located in Lahual and Spiti district of Himachal Pradesh.
- Average land holding size small 1.28 ha and marginal 0.56ha. Among the surveyed famers of the village, average livestock population is dairy cattle-2 under natural farming.
- Jeevamrit @ 500l/ha, Ghanjeevamrit 250kg/ha and Beejamrit for seed treatment are the major sources of nutrients in natural farming. Dashparni extract and copper enriched sour butter milk using as plant protection input for natural farming. Mechanical and hand weeding practice using for weed management.
- Cauliflower, pea and potato are the major crops grown by the farmers.
- Insect-pest and disease management is major problem, low productivity, un-adequate quantity of biomass for mulching and premium

price are the major constraint for practicing of natural farming.

Bhopal

- A geo-referenced characterization survey was conducted for organic and natural farming farmers, involving 60 uncultivated farmers (30 organic farmers and 30 natural farming farmers) in the Begamganj block, located in the Raisen district of Bhopal.
- The mean landholding of small farmers was 0.4 hectares for both organic and natural farming. Among the surveyed farmers in the village, the average livestock population maintained was 3.8 dairy cattle under both natural and organic farming.
- All the farmers used CDM and vermicompost @ 2.5 tonnes/ha each as organic resources, while those practicing natural farming used Jivamrit @ 250-500 liters/ha, Ghanjeevamrit @ 500-1000 kg/ha, and Beejamrit @ 0.5-1.5 liters/kg as nutrient sources.
- Most of the farmers cultivated soybean and rice during the kharif season, while wheat and chickpea were grown during the rabi season. The yield gap between research stations and organic farmers' fields was recorded as 12% for soybean and 9.5% for wheat. The yield gap between research stations and natural farmers' fields was recorded as 9.7% for soybean and 4.0% for wheat.
- Neemastra, Brahmastra, Panchpatti, and Dashparni were used as pesticides under natural farming. Neem Kadaha @ 5-6 liters, buttermilk @ 5-6 litres, and neem oil @ 2-2.5 litres were used as organic pesticides for the control of insect pests and diseases in crops.
- Major constraints included the lack of premium

prices and market opportunities for organic produce, as well as poor access to certification agencies for adopting organic farming.

Calicut

- A geo-referenced characterization survey was conducted for organic and natural farming practitioners, involving 10 uncertified farmers (4 organic farmers and 6 natural farming farmers). The survey covered the Irikkur and Iritty blocks in the Kannur district of Calicut for organic farming and the Chelannur, Balussery, Panthalayani, and Kunnamangalam blocks in the Kozhikode district of Calicut for natural farming.
- The mean landholding for different categories of farmers under organic farming was found to be 2 hectares for semi-medium farmers, 1 hectare for small farmers, and 1 hectare for marginal farmers. Under natural farming, the average landholding was 1 hectare for small farmers and 4 hectares for marginal farmers. Among the surveyed farmers in the village, the average livestock population was 4 dairy cattle, 5 goats, 6 poultry, and 10 rabbits under organic farming, while under natural farming it was 8 dairy cattle, 2 goats, and 2 poultry.
- All the farmers practicing organic farming using farm yard manure, goat manure, poultry manure, coco peat, bone meal, neem cake as organic resources while those practicing natural farming using Jivamrit @500 liters/ha, Ghanjivamrit @1020 kg/ha as nutrients source.
- Major crops grown under organic farming were Pepper and Turmeric. While crops grown under natural farming were Coconut, Arecanut, Pepper, Ginger, Turmeric, Banana and Vegetables. The yield gap between research station and organic farmers' field were recorded to be 64% and 10%, for pepper and turmeric respectively. The yield gap between research station and natural farmers' field were recorded to be 5% and 20% for coconut and Ginger

respectively.

- Neem oil @ 2000 liters/ha, garlic neem oil mixture @ 2000 litre/ha and tobacco emulsion @ 2000 litre/ha were used as a pesticide under natural farming. Neem Bordeaux mixture, Trichoderma, Cow urine were used as organic pesticide for the control of insect pest and diseases in crops.
- Major constraints were pest attack and not getting premium price for both organic and natural farming.

Coimbatore

- A geo-referenced characterization survey was conducted among organic and natural farming farmers, involving a total of 52 uncertified farmers (26 organic farmers and 26 natural farming farmers). The survey covered the villages of Tholampalayam, Muthugoundanur, Veerapandi, Paraipatti, Seeliur, Kuppanur, Puthur, Madampatti, and Kilithottam across the blocks of Karamadai, Rajapalayam, Kinathukadavu, Kotagiri, Gudalur, Veppanthattai, Thondamuthur, and Ottanchathiram, located in the districts of Coimbatore, Erode, Tirupur, Nilgiris, Madurai, Perambalur, Salem, Virudhunagar, and Dindigul under organic farming. In natural farming, the survey covered the villages of Kilithottam, Vedapatti, Paraipatti, Ottupattarai, and Mangode across the blocks of Rajapalayam, Gudalur, Karamadai, and Thondamuthur, located in the districts of Virudhunagar, Coimbatore, Nilgiris, and Dindigul.
- Mean land holding size of farmers under organic and natural farming were found to be 3.5 ha and 1.5 ha respectively. Among the surveyed farmers of the village, average livestock population maintained by the farmers were dairy cattle -2, Goat-5 and, Poultry-8 under organic farming and for natural farming dairy cattle-2, goat-5 and poultry-5.
- All the farmers practicing organic farming used FYM @ 2.5 ton/ha and Vermicompost @ 5.0



ton/ha as organic resources while those practicing natural farming used Jivamrit @ 500 liters/ha, Ghanjivamrit @ 250 kg/ha and Beejamrit (for seed treatment) use as nutrients source.

- The major crops grown under organic farming included coconut, sapota, mango, tea, coffee, paddy, and vegetables. Under natural farming, the major crops were tall coconut varieties and various vegetable crops. The yield gap between research stations and organic farmers' fields was recorded as 30% for mango, 25% for sapota, 17.5% for banana, 26.7% for onion, 16.7% for coconut, 10% for potato, and 12.5% for tomato under organic farming. In natural farming, the yield gap was 20.8% for coconut, 12.5% for tomato, and 30% for mango.
- Neem seed kernel extract - 250 l/ha, Neem oil - 7.5 l/ha, Herbal leaves extract - 25 l/ha (5 leaves), Fish amino acid - 5 l/ha, Butter milk - 12.5 l/ha and Traps - 12 Nos/ha used as plant protection input for organic farming. Agniastra - 12.5 l/ha, Neemastra - 500 l/ha, Brahmastra 6 l/ha and NSKE 5% used as plant protection input for natural farming. Weeds were being controlled by hand weeding, mulching and mechanical weeding.
- The major constraints identified were heavy weed infestation and inadequate market facilities for the sale of products.

Dharwad

- A geo-referenced characterization survey was conducted for organic and natural farming farmers, involving a total of 12 uncertified farmers (4 organic farmers and 8 natural farming farmers). The survey covered 6 villages across 6 blocks located in the districts of Belagavi, Dharwad, Gadag, and Haveri, as well as 2 villages in blocks located in the Belagavi and Haveri districts of Dharwad.
- The average landholding size under organic farming is 2 ha for large farmers, 1.50 ha for small farmers, and 1 ha for marginal farmers. In natural

farming, the average landholding size is 6 ha for large farmers, 2 ha for small farmers, and 1 ha for marginal farmers. Among the surveyed farmers practicing organic farming, the average livestock population consists of 2 dairy cattle, 2 goats, 2 poultry birds, and 2 bullocks. Under natural farming, the livestock population includes 2 dairy cattle and 2 bullocks.

- Jeevamrit @ 1000 l/ha, Ghanjeevamrit 800 kg/ha and Beejamrit @ 5 l/ha for seed treatment are the major sources of nutrients in natural farming. FYM, Vermicompost, Crop residues + Ash + vermicompost mixed compost are the major sources of nutrients in organic farming.
- The major crops grown by farmers practicing natural farming include greengram, black gram, soybean, groundnut, chilli, rabi sorghum, safflower, wheat, sunflower, sugarcane, and millets. In organic farming, the major crops grown by farmers are soybean, sugarcane, Bengal gram, rabi sorghum, and millets. Under natural farming, the yield gap between on-station experiments and farmers' fields was recorded as -20% for greengram, 7.14% for soybean, -60% for chilli, -16.40% for groundnut, -8.33% for millets, -8.33% for rabi sorghum, and -16.66% for chickpea. Under organic farming, the yield gap for greengram, soybean, groundnut, and rabi sorghum was recorded as -21.80%, -20.00%, -16.66%, and -12.50%, respectively.
- Neemastra, Agniaster, Brahmastra, Dashaparni and Sour Butter milk using as plant protection input for organic as well as for natural farming. Hand weeding, Inter-cultivation and growing inter crops to smother weeds practices are using for weed management.
- Non availability of required quantity of organic manures and less number of livestock are major constraints under natural farming and for organic farming major constraints are non-availability of desi cow and low milk yield of desi cows and farmers are not having the methods of preparation of liquid organic manures and local plant protection extracts and



expecting to get it from market and institutes

Jabalpur

- A geo-referenced characterization survey was conducted for organic and natural farming farmers, involving a total of 90 uncertified farmers (30 organic farmers and 60 natural farming farmers). The survey was conducted in the villages of Bichua, Madai, and Nigai in the Kundam block. For natural farming, the characterization was conducted in the villages of Bichua, Madai, and Nigai in the Kundam block, as well as Bharda, Padadia, and Keolari in the Panagar block of Jabalpur district, Madhya Pradesh.
- The average landholding size under organic farming is 2.51 ha for large farmers, 1.38 ha for small farmers, and 0.49 ha for marginal farmers. In natural farming, the average landholding size is 3.17 ha for large farmers, 1.28 ha for small farmers, and 0.54 ha for marginal farmers. Among the surveyed farmers practicing organic farming, the average livestock population consists of 1.7 dairy cattle, 10 goats, and 18 poultry birds. Under natural farming, the livestock population includes 2.3 dairy cattle.
- Most of the farmers using FYM @ 2.8 t/ha as source of organic manure. Manual weeding is used for weed management.
- The major crops grown by farmers practicing natural farming include Arhar, Kodo, Kutki, Field pea. In organic farming, the major crops grown by farmers are Rice, Chickpea, Kodo, Kutki, Field pea and Mustard. Under organic farming, the yield gap between on-station experiments and farmers' fields was recorded as 63% for rice, 67% for chickpea and 77% for mustard.
- Major constraints for adoption of organic farming such as lack of awareness regarding certification and marketing process, unavailability of organic plant protection inputs.

Karjat

- Geo reference characterization survey was carried out for organic farming farmers

involving uncertified 30 farmers covering 3 villages in Khalapur block located in Raigad district of Karjat.

- Average land holding size small 30 ha. Among the surveyed farmers of the village, average livestock population is dairy cattle -1, goat-1 and poultry-2 under organic farming.
- All the surveyed farmers using FYM and vermicompost as major sources of nutrients.
- Rice, pulses, mango and vegetables are the major crops grown under organic farming. Majority of farmers control weeds through hand weeding in seasonal crops. The yield gap of major crops grown under organic farming was observed 29.28% in rice, 65.35% in pulses and 20.68% in vegetables at farmers field compared to on-station experiment.
- Average quantity of plant protection inputs used 6 lit./ha. They are using cow urine for insect management.
- Major constraints are non-availability of farm labour due to urbanization and marketing and rates for organic produce.

Ludhiana

- A geo-referenced characterization survey was carried out among 21 organic farming farmers, covering 11 villages in the Malerkotla, Ahmedgarh, and Amargarh blocks of Malerkotla district in Ludhiana.
- The average landholding sizes are 2 hectares for large farms, 4 hectares for medium farms, 6 hectares for semi-medium farms, 8 hectares for small farms, and 1 hectare for marginal farms. Among the surveyed farmers, the average livestock population under organic farming includes 5 dairy cattle.
- All the surveyed farmers using FYM, Vermicompost, Jeevamrit and Ghanjeevamrit as major sources of nutrients.
- Basmati rice, maize, vegetables, wheat, mustard and chickpea are the major crops grown under organic farming.
- Average quantity of plant protection inputs



used 6 Lit. /ha. They are using cow urine for insect management. For plant protection management, farmers are using neem and other plant-based products formulations. Weeds were being managed by hand weeding, mechanical hoeing and mulching.

- The major constraint faced by farmers in adoption of organic farming was high labour cost and no subsidy on organic input.

Modipuram

- A geo-referenced characterization survey was carried out among 30 organic farming farmers, covering 8 villages in 4 blocks located in the Kushinagar and Gorakhpur districts of Modipuram.
- The average landholding size is 0.507 hectares. Among the surveyed farmers, the average livestock population under organic farming includes 0.6 dairy cattle.
- All the surveyed farmers using FYM @ 22.95 t/ha; Vermicompost @ 0.038 t/ha and Oilcakes @ 0.033 t/ha as major sources of nutrients.
- Rice (Var.-Kala Namak) and Wheat are the major crops grown under organic farming. Yield gap between on-station experiment and farmers field for major crop found to be 8.93 % for rice and 22.22% for wheat under organic farming.
- For plant protection management, farmers are using trichoderma spp. @ 3-5 kg/ha and neem oil @ 3-5 l/ha. Weeds were being managed by hand weeding.
- Major constraints are no premium price for wheat and availability problem of certified organic inputs.

Pantnagar

- Geo reference characterization survey was carried out for organic farming farmers involving 45 farmers covering 8 villages in Kotabagh block located in Nainital district of Pantnagar.
- The average landholding size was 3.5 hectares for large farms, 1.5 hectares for medium farms, and 0.35 hectares for small farms. Among the

surveyed farmers, the average livestock population under organic farming included 5 to 6 dairy cattle, 2 to 3 buffaloes, and 2 goats.

- All the surveyed farmers using Vermicompost, FYM, Green manure as major sources of nutrients.
- Basmati Rice and Wheat are the major crops grown under organic farming. Yield gap between on-station experiment and farmers field for major crop found to be 25% for rice and 31% for wheat.
- For plant protection management, farmers are using 45-50 litre cow urine fortified with neem leaves and garlic paste. Weeds were being managed by hand weeding.
- Major constraints are availability of sufficient and quality organic inputs and disease infestation.

Raipur

- Geo reference characterization survey was carried out for organic farming farmers involving 27 farmers covering Parsada village in Arang block located in Raipur district of Raipur.
- Average land holding size large 3.22 ha and small 1.83 ha. Among the surveyed farmers of the village, average livestock population is dairy cattle -4.56 under organic farming.
- All the surveyed farmers using FYM -10.50 t/ha, VC -0.34 t/ha as major sources of nutrients.
- The main crops grown under organic farming were scented rice. The yield gap of 15.89% was observed in aromatic rice over experimental yield.
- For plant protection management, farmers are using Neem oil - 2 lit/ha Tricho cards - 5-6/ha. Weeds were being managed by hand weeding.
- Major constraints under organic farming are lack of technical knowledge of improved organic farming practices and lack of weed management technology under organic farming.

Ranchi

- A geo-referenced characterization survey was



conducted among 20 organic farming farmers. The survey covered the villages of Baridohar, Barkheta, Bairgara, and Bana in the Khunti, Arki, Barwadih, and Chndwa blocks of Khunti and Latehar districts in Ranchi.

- The average landholding size under organic farming was 4 hectares for large farms, 3 hectares for small farms, and 1 hectare for marginal farms. Among the surveyed farmers, the average livestock population included 2 dairy cattle, 4 goats, 10 poultry, and 2 ducks under organic farming.
- All the surveyed farmers using FYM, Vermicompost and Karanj cake as major sources of nutrients in organic farming.
- The major crops grown under organic farming included Black gram, Linseed, Finger millet, Cowpea, Chick pea, lentil, Jackfruit, Papaya, Colocasi (Arvi) and Scented small grain rice. The yield gap of major crops grown under organic farming was observed to be 20% for black gram, 20% for finger millet, and 28.8% for scented small-grain rice in farmers' fields compared to on-station experiments.
- For plant protection management, farmers are using Neem oil and Karanj oil. Weeds were being managed manually.
- The major constraints were certification, marketing, and availability of manures.

Umiam

- A geo-referenced characterization survey was conducted among 438 farmers, including 310 organic farmers and 128 natural farming farmers. The survey covered the villages of Mynsain, Pynthor, and Umden Umbathiang in the Bhoirymbong block of Ri Bhoi district in Meghalaya for both organic and natural farming.
- The average landholding size was 1.7 hectares for small farms and 0.8 hectares for marginal farms. Among the surveyed farmers, the average livestock population under organic farming included 0.16 dairy cattle, 0.12 goats,

and 1.6 pigs.

- All the surveyed farmers using Vermicompost @ 8.5kg/ha, FYM @ 2.5kg/ha, Compost, Poultry manure and Pig manure as major sources of organic nutrients.
- The main crops grown under organic farming were Maize, Rice, Potato, Ginger, Turmeric, French bean, Okra, Sweet potato, yam, Cabbage, cauliflower, Carrot, pumpkin and Chillies. The yield gap of major crops grown under organic farming was observed 23.40 % in rice, 35.1% in maize, 25.2% in potato and 19.5% in French bean at farmers field compared to on-station experiment.
- For plant protection management, farmers use Trichoderma viride, Beauveria bassiana, vermiwash, and neem oil. Weeds are managed through hand weeding and manual weeding using a spade, wheel, and hoe.
- Major constraints include water availability during the winter season, the quality of seed materials, and organic pesticides.

Ajmer

- A geo-referenced characterization survey was conducted among 35 farmers, including 30 organic farmers and 5 natural farming farmers. The survey was carried out in the villages of Ganka and Posaliya in the Abu Road and Shivganj blocks of the Sirohi district in Ajmer for organic farming. For natural farming, the survey was conducted in the villages of Durbana, Vera Jetpura, and Godana in the Sheoganj block of the Sirohi district in Ajmer.
- The average landholding size for organic farmers is 1.26 hectares for small farms. In natural farming, the average landholding size is 1.74 hectares for small farms. Among the surveyed farmers, the average livestock population under organic farming includes 3 dairy cattle and 1 goat. Under natural farming, the livestock population includes 7 dairy cattle and 2 goats.
- All the surveyed farmers using 6.0-7.0 t/ha FYM



+300 kg Vermicompost as major sources of organic nutrients. Under natural farming Beejamrit @ 500lit/ha, jeevamrit @ 150 kg/ha and ghanjeevamrit @ 1 lit/kg seeds are use as nutrient source.

- The main crops grown under organic farming were Wheat, Mustard, Fennel, Bajra and Gaur. Under natural farming main crops are Wheat, Mustard, Bajra and Gaur. The yield gap of major crops grown under organic farming was observed 7.82 % in fennel.
- For plant protection management, farmers use Trichoderma viride at 1-2 kg, neem oil at 2 liters, and neem-aak-dhatura leaf extract. Weeds are managed through hand weeding.
- Major constraints are pest & disease control, weed control and low yield under natural as well as organic farming.

Almora

- A geo-referenced characterization survey was carried out among 24 organic farming farmers, covering 3 villages in the Hawalbagh block of Almora district.
- The average landholding size for small farmers was 0.3 hectares. Among the surveyed farmers, the average livestock population under organic farming was 1.76 dairy cattle, 3.08 goats, and 11.5 poultry.
- All the surveyed farmers using FYM @ 3.73 t/ha as major sources of organic nutrients. Weeds were being managed by family labour.
- The main crops grown under organic farming were Wheat, Fingermillet, Paddy, Toria, Lentil, and Barnyard millet.
- The yield gap of major crops grown under organic farming was observed 62 % in fingermillet, 44 % in wheat. 47% in barnyard millet and 54% in paddy at farmers field compared to on-station experiment. Major constraints are Wild Animal (monkey, wild boar, ape), Lack of irrigation water.

Gangtok

- A geo-referenced characterization survey was conducted among 60 farmers, including 30

organic farmers and 30 natural farming farmers. The survey was carried out in Timpyem village of the Martam Rumtek block in Gangtok district of Sikkim for organic farming. For natural farming, the survey was conducted in Shajong villages of the same block and district.

- The average landholding size under organic farming was 4 hectares for large farmers, 1.7 hectares for small farmers, and 0.9 hectares for marginal farmers. Under natural farming, the average landholding size was 5 hectares for large farmers, 1.8 hectares for small farmers, and 0.7 hectares for marginal farmers. Among the surveyed farmers, the average livestock population under organic farming included 2 dairy cattle, 6 goats, 2 pigs, and 28 poultry. Under natural farming, the livestock population included 4 dairy cattle, 6 goats, 2 pigs, and 30 poultry.
- All the surveyed farmers used farmyard manure (FYM), pig manure, poultry manure, goat manure, and vermicompost as the major sources of organic nutrients. In natural farming, Beejamrit @ 80 g/kg of seeds, Jeevamrit @ 300 liters/ha, and Ghanjeevamrit @ 150 kg/ha were used as nutrient sources..
- The major crops grown under organic farming included rice, maize, buckwheat, ginger, turmeric, soybean, mustard, and seasonal vegetables. Under natural farming, the major crops were maize, soybean, ricebean, green peas, and coriander. The yield gap for major crops grown under organic farming was observed to be 37.8% for rice, 32.44% for maize, 15.41% for soybean, and 13.23% for buckwheat. In natural farming, the yield gap was 28.69% for maize and 14.19% for soybean in farmers' fields compared to on-station experiments.
- For plant protection, farmers used neem oil, Blitox, copper oxychloride (COC), and local botanicals. Weeds were managed through mulching, hand weeding, and zero tillage practices.
- The major problems identified include a lack of



availability of quality seeds and planting materials. Farmers also face difficulties in controlling emerging pests and diseases organically. Additionally, the yield of crops grown under natural farming is lower compared to those grown under organic farming.

Narendrapur

- A geo-referenced characterization survey was carried out among 25 organic farming farmers in the Hanskhali block of the Nadia district in Narendrapur.
- The average landholding size was 2.5 hectares for large farmers and 0.75 hectares for small farmers. Among the surveyed farmers, the average livestock population consisted of 1 dairy cattle, 2 goats, and 2 ducks (poultry) under organic farming.
- All the surveyed farmers using Cow dung manure @ 2.5 t/ha as major sources of organic nutrients.
- The yield gap of major crops grown under organic farming was observed 8.22 % in Paddy (Var. Gobindobhog).
- For plant protection management, farmers are using 200 lit neem extract. Weeds were being managed by manually.
- Major constraints are primitive and underdeveloped marketing system and no premium price except the aromatic rice (Var. Kalabhat) is brought by a certified company.

Sardarkrushinagar

- A geo-referenced characterization survey was conducted among 43 farmers, including 30 organic farmers and 13 natural farming farmers. The survey covered 12 villages for organic farming and 13 villages for natural farming, all located in the Bhiloda block of the Aravali district in Sardarkrushinagar.
- The average landholding size under organic farming was 4 hectares for large farmers, 1.22 hectares for small farmers, and 0.78 hectares for marginal farmers. Under natural farming, the average landholding size was 2 hectares for

large farmers, 1 hectare for small farmers, and 0.68 hectares for marginal farmers. Among the surveyed farmers, the average livestock population consisted of 3 dairy cattle under both organic and natural farming systems.

- All the surveyed farmers used farmyard manure at 8 tons/ha and vermicompost as the major sources of organic nutrients. In natural farming, Beejamrit, Jeevamrit at 400 liters/ha, and Ghanjeevamrit at 250 kg/ha were used as nutrient sources.
- The major crops grown under organic farming included groundnut, soybean, and wheat. Under natural farming, the primary crop was wheat. The yield gap for major crops grown under organic farming was observed to be 5.98% for wheat and 7.52% for groundnut. In natural farming, the yield gap for wheat was 12.20% in farmers' fields compared to on-station experiments.
- For plant protection, farmers used Bhramastra, neem oil, vanamrut, krushibalam, and nimastra in organic farming. In natural farming, Neemastra at 9 liters/ha, Agniastastra at 7.5 liters/ha, Dashparni ark at 10 liters/ha, and Bramhastra at 10 liters/ha were used for plant protection. Weeds were managed through hand weeding.
- Major constraints included lack of labor availability, no assured market, lack of premium prices for organic products, low crop productivity, and a shortage of organic pesticides.

Thiruvananthapuram

- A geo-referenced characterization survey was conducted among 16 natural farming farmers. The survey covered 16 villages in the Parassala, Aryancode, Neyyattinkara, Pallichal, and Kattakkada blocks of the Thiruvananthapuram district in Kerala under natural farming.
- A geo-referenced characterization survey was conducted among 16 natural farming farmers. The survey was carried out in 16 villages within



the Parassala, Aryancode, Neyyattinkara, Pallichal, and Kattakkada blocks of the Thiruvananthapuram district in Kerala.

- All the surveyed farmers use Jeevamrit at 300 liters/ha, Ghanjeevamrit at 350 kg/ha, and Beejamrit at 5 liters/kg of seeds as the major sources of nutrients in natural farming.
- The major crops grown under natural farming include rice, maize, millets (ragi, thinai, samai), and various fruit crops such as banana, mango, jackfruit, dragon fruit, guava, pineapple, rambutan, mangosteen, custard apple, fig, papaya, plum, pulasan, lemon, abiu, and durian rollinia. Vegetables grown include okra, brinjal, bitter gourd, snake gourd, bottle gourd, ridge gourd, ash gourd, pumpkin, cucumber, chillies, amaranth, and vegetable cowpea. Root and tuber crops include cassava, yams, elephant foot yam, taro, sweet potato, coleus, and arrowroot. Spices grown are cinnamon, black pepper, curry leaves, nutmeg, ginger, cloves, Malabar tamarind, and turmeric. Plantation crops include coconut, arecanut, cashew, rubber, and betel leaves. Flower crops include marigold. The yield gap for cassava grown under natural farming was observed to be 95%.
- For plant protection management, farmers are using Neem oil @ 4 l/ha Beauveria liquid @ 4 l/ha or Beauveria WP 4 kg/ha Trichoderma @ 100 kg/ha Pseudomonas @ 100 kg/ha and Fish amino acid @ 4 lit/ha. Weeds were being managed by hand weeding, mulching.
- Major constraints are Non availability of suitable markets and low price of the produce

Udaipur

- A geo-referenced characterization survey was conducted among 34 farmers, including 30 practicing organic farming and 4 practicing natural farming. The survey for organic farming

was carried out in the villages of Tara Ka Kheda, Lapsiya, and Bhagatpura, located in the Railmagra block of the Rajsamand district in Udaipur. For natural farming, the survey was conducted in the villages of Khatwara, Mada, and Chitrati, located in the Faloj and Galiyakot blocks of the Dungarpur district in Udaipur.

- The average landholding size under organic farming is 4 hectares for large farmers, 1.8 hectares for small farmers, and 0.4 hectares for marginal farmers. In natural farming, the average landholding size is 3.17 hectares for large farmers, 1.28 hectares for small farmers, and 0.54 hectares for marginal farmers. Among the surveyed farmers practicing organic farming, the average livestock population consists of 8 dairy cattle and 4 goats. Under natural farming, the livestock population includes 8 dairy cattle, 113 goats, and 2,000 poultry.
- Most of the farmers use FYM and vermicompost as sources of organic manure in organic farming, while in natural farming, they use 500 liters of Jeevamrit.
- Major crops grown under organic farming were maize, blackgram, wheat and chickpea and under natural farming were Maize, soybean, wheat, gram and tomato. The yield gap of major crops grown under organic farming was observed -12.85% in Maize, -11.11 % in blackgram, -31.63% in wheat and -19.81 % in chickpea.
- For plant protection management, farmers use 70 kg/ha of neem leaf paste, 55 liters/ha of cow urine, and 40 liters/ha of fermented buttermilk. Weeds are managed through hand weeding and mulching.
- Major constraints are low yield of crops and marketing problem.

Table 7.1.1.1: Basic details of organic and natural farming farmers/farms

Location/Centre name	Name of the districts surveyed	Number of blocks	Number of villages surveyed	Number of farmers surveyed			Holding size (ha)					
				Total	Organic farmers	Natural farming	Large	Small	Marginal	Large	Small	Marginal
Bajaura	Lahual & Sapiti	2	10	11	-	11	-	-	-	-	1.28	0.56
Bhopal	Raisen	1	1	60	30	30	-	0.4	-	-	0.4	-
Calicut	Kannur	2	4	10	4	6	-	-	-	-	-	-
Coimbatore	Coimbatore, Erode, Tirupur, Nilgiris, Madurai, perambalur, Salem, Virudhunagar, Dindigul	8	9	52	26	13	-	3.5	-	-	1.5	-
Dharwad	Belagavi, Dharwad, Gadag, Haveri	6	6	12	8	4	6.0	2.0	1.0	.0	1.5	1.0
Jabalpur	Jabalpur	1	3	90	30	60	2.51	1.38	0.49	3.17	1.28	0.54
Karjat	Raigad	1	3	30	30	0	-	-	-	-	-	-
Ludhiana	Malerkotla	3	11	21	21	0	-	-	-	-	-	-
Modipuram	Kushinagar, Gorakhpur	4	8	30	30	0	0.51	-	-	-	-	-
Pantnagar	Nainital	1	8	45	45	0	3.5	0.35	1.5	-	-	-
Raipur	Raipur	1	1	27	27	0	3.22	1.83	-	-	-	-
Ranchi	Khunti and Latehar	4	4	65	20	45	4.0	3.0	1.0	4.0	3.0	1.0
Umiam	Ri-Bhoi	1	3	310	310	0	-	1.7	0.8	-	-	-
Ajmer	Sirohi	1	2	35	30	5	-	1.26	-	-	1.74	-
Almora	Almora	1	3	24	24	0	-	0.30	-	-	-	-
Gangtok	Gangtok	1	1	30	4	3	-	-	-	-	-	-
Narendrapur	Nadia	1	1	25	25	0	2.5	0.75	-	-	-	-
S K Nagar	Aravalli	1	12	43	30	13	4.0	1.22	0.78	2.0	1.02	0.68
Thiruvananthapuram	Thiruvananthapuram	5	16	16	-	16	-	-	-	6.9	1.46	0.52
Udaipur	Rajsamand	1	3	34	30	4	-	-	-	-	-	-
	Total Districts: 34	46	109	970	724	210	-	-	-	-	-	-



Table 7.1.1.2: Mean livestock population and livestock maintained by organic/natural farmers at different location

Name of centre	Name of the district surveyed	Average livestock population/ household (Nos.)			Input of organic manures applied (per ha)			Input of Natural Farming practice by the farmers		
		Livestock	OF	NF	Name of input	Aver. quantity used	Cost of manuring (Rs/ha)	Name of input	Aver. quantity used	Cost of manuring (Rs/ha)
Bajaura	Lahual & Sapiti	Dairy (cattle/buffalo) Sheep	-	2 4	- -	- -	- -	Beejamrit Ghanjeevamrit Jeevamrit FYM	seed treatment 250 kg/ha 500 l/ha 0.8 t/ha	12000
Bhopal	Raisen	Dairy (cattle/buffalo)	3.8	-	Vermicompost & CDM	2.5 t/ha	3500	Jeevamrit Ghanjeevamrit Beejamrit	250-500 l/ha 500-1000 kg/ha 0.5-1.5 litre/kg	300-500
Calicut	Kannur (OF) Kozhikode (NF)	Dairy (cattle/buffalo) Goat Poultry Rabbi	4 5 6 10	8 2 2 -	FYM, Goat manure Poultry manure, Coco peat, Bone meal, Neem cake	1020 kg/ha	22300	Jeevamrit Ghanjeevamrit Beejamrit -	500 l/ha 1020 kg/ha -	6395
Coimbatore	Coimbatore, Erode, Tirupur, Nilgiris, Madurai, perambalur, Salem, Virudhunagar, Dindigul	Dairy (cattle/buffalo) Goat Poultry	2 5 8	2 5 5	FYM Vermicompost	2.5 t/ha 5.0 t/ha	66250	Jeevamrit, Ghanjeevamrit Beejamrit,	500 l/ha 250 kg/ha seed treatment	2000
Dharwad	Belagavi, Dharwad , Gadag , Haveri	Dairy (cattle/buffalo) Goat Poultry Bullocks	2 2 2 2	2 0 0 1	FYM Vermicompost Crop residues	7.0 t/ha	4000	Beejamrut, Jeevamrut, Ghanjeevamrut	5 litre kg/kg seed 1000-2000 l/ha 800 kg/ha	6250
Jabalpur	Jabalpur	Dairy (cattle/buffalo) Goat Poultry	1.7 10 18	2.3	FYM	2.8 t/ha	4200	-	-	-
Karjat	Raigad	Dairy (cattle/buffalo) Goat Poultry	1 1 2	-	FYM, Vermicompost	2.2 t/ha	30000	-	-	-
Ludhiana	Malerkotla	Dairy (cattle/buffalo)	5	-	FYM, Vermicompost, jeevamrit, ghanjeevamrit	21 t/ha	7135	-	-	-
Modipuram	Kushinagar, Gorakhpur	Dairy (cattle/buffalo)	0.6	-	FYM Vermicompost Neem cake	22.95 t/ha 0.038 t/ha 0.033 t/ha	17000	-	-	-
Pantnagar	Nainital	Dairy (cattle/buffalo) buffalo Goat	5-6 2-3 2	-	FYM, Vermicompost, Green manure	10 t/ha	from own farm	-	-	-
Raipur	Raipur	Dairy (cattle/buffalo)	4.56	-	FYM Vermicompost	1.050 t/ha 0.34 t/ha	9046	-	-	-
Ranchi	Khunti and Latehar	Dairy(cattle/buffalo) Goat: Poultry:	2 4 10	2 4 10	FYM Vermicompost, Karanj cake	5.0 t/ha	15000	Mulching, Intercropping	-	10000

Table 7.1.1.2: Mean livestock population and livestock maintained by organic/natural farmers at different location

Name of centre	Name of the district surveyed	Average livestock population/ household (Nos.)			Input of organic manures applied (per ha)			Input of Natural Farming practice by the farmers		
		Livestock	OF	NF	Name of input	Aver. quantity used	Cost of manuring (Rs/ha)	Name of input	Aver. quantity used	Cost of manuring (Rs/ha)
Umiam	Ri-Bhoi	Dairy (cattle/buffalo) Goat Poultry Piggery	0.16 0.12 10 1.6	-	Vermicompost, FYM, Compost, Poultry manure, Pig manure	4.2 t/ha	10500 Rs.2.5/kg FYM	-	-	-
Ajmer	Sirohi	Dairy (cattle/buffalo) Goat	3 1	7 2	FYM+ Vermicompost	7 t/ha+ 300 kg/ha	18000	Jeevamrit Ghanjeevamrit Beejamrit	500 (litres/ha) 150(kg/ha) 1.0 (kg/kg of seeds)	800-1000
Almora	Almora	Dairy (cattle/buffalo) Goat Poultry	1.75 3.08 11.5	-	FYM	3.75 t/ha	from own farm	-	-	-
Gangtok	Gangtok	Dairy (cattle/buffalo) Goat Poultry Pig	2 6 28 2	4 6 30 2	FYM, Pig manure, Poultry manure, goat manure, Vermicompost	5- t/ha	4000/ha	Jeevamrit Ghanjeevamrit Beejamrit	(300 litres/ha) (150 kg/ha) (80gm /kg of seeds)	-
Narendrapur	Nadia	Dairy (cattle/buffalo) Goat Poultry (Duck)	1 2 2	-	Cow dung manure	2.5 t/ha	1500	-	-	-
S K Nagar	Aravali	Dairy (cattle/buffalo)	3 3	-	FYM, vermicompost and compost	8.0 t/ha	7000	Jeevamrit Ghanjeevamrit Beejamrit organic manures	400 (litres/ha) 250 (kg/ha) 25 g /kg of seeds 5.0 t/ha	4000 5000
Thiruvananthapuram	Thiruvananthapuram	Dairy (cattle/buffalo) Goat: Poultry Duck Apiculture Pisciculture	- - - - -	3 2 15 2 1 0.5				Jeevamrit Ghanjeevamrit Besides this farmers using Neem cake, groundnut and cow dung slurry, compost prepared from crop residue, cow dung, panchagavya, vermicompost, poultry manure, water from fish pond, PGPR, Mycorrhiza	300 lit/ha 350 kg/ha 5 litres/kg 5-6 t/ha	150000/ha
Udaipur	Rajsamand	Dairy (cattle/buffalo) Goat: Poultry	8 4 8	113 2000	FYM and Vermicompost	10.5 t/ha	10500	Jeevamrit:	500 lit/ha	18750



Table 7.1.1.3: Major crop grown and yield of organic/natural farming farmer's farm at different location

Centre name	Name of the district surveyed	Name of block	Major crops grown under organic and natural farming	Average yield of major crops at on-station and farmers filed			
				On-station yield (kg/ha)	Organic farming Farmers field yield (kg/ha)	Yield gap (%)	Natural farming On-station yield (kg/ha) Farmers field yield (kg/ha) Yield gap (%)
Bajaura	Lahaul & Spiti	Keylong & Udaipur	Cauliflower	-	-	-	- 17410 -
			Pea	-	-	-	- 8880 -
			Potato	-	-	-	- 19190 -
			Rajmash	-	-	-	- 870 -
			Lettuce	-	-	-	- 18200 -
Bhopal	Bhopal	Phanda	Soybean	743	654	12.0	567 512 9.7
			Wheat	3194	2891	9.5	2000 1921 4.0
			Chickpea	1247	1127	9.6	- - -
			Pepper	3900	1400	64	- - -
			Turneric	20000	18000	10	20500 20000 -
Calicut	Kannur	Irikkur, Iritty	Coconut	-	-	-	20400 19320 5
			Ginger	-	-	-	20150 16000 20
			Mango	10000	7000	30	10000 7000 30.0
			Sapota	20000	15000	25	- - -
			Banana	40000	33000	17.5	- - -
Coimbatore	Coimbatore, Erode, Tirupur, Nilgiris, Madurai, perambalur, Salem, Virudhunaga, Dindigul	Karamadai, Rajapalayam, Kinathukadavu, Kotagiri, Gudalur, Veppanthattai, Thondamuthur, Ottanchathiram.	Onion	15000	11000	26.7	- - -
			Coconut	120 nuts/year	100 nuts /tree	16.7	120 nuts/year 95 nuts /tree 20.8
			Potato	20000	18000	10	- - -
			Tomato	80000	70000	12.5	40000 35000 12.5
			Green gram	600	500	-20.0	640 500 -21.80
			Soybean	1400	1500	7.14	1250 1000 -20.00
			Chilli	500	200	-60.0	- - -
			Groundnut	1795	1500	-16.40	1500 1250 -16.66
			Milletts	1500	1375	-8.33	- - -
			Rabi Sorghum	1500	1375	-8.33	1200 1000 -16.66
Dharwad	Belagavi, Dharwad, Gadag , Haveri	-	Chickpea	1500	1250	-16.66	- - -
			Sugarcane	-	-	-	100000 87500 -12.50
			Rice	4342	1600	63	- - -
			Arhar	-	500	-	- - -
			Kodo	-	300	-	- - -
			Kutki	-	250	-	- - -
			Field pea	-	450	-	- - -
			Chickpea	1060	350	67	- - -
			Mustard	1362	320	77	- - -
			Soybean + Maize	-	-	-	880 + 1000 -
Karjat	Raigad	Khalapur	Wheat + Mustard	-	-	-	1281 + 320 -
			Rice	3510	2715	29.28	- - -
			Pulses	1298	785	65.35	- - -
			Vegetables	13938	11550	20.68	- - -

Ludhiana	Malerkotla	Malerkotla, Ahmedgarh and Amargarh	Basmati rice	3750	3530	3750	-	-	-	-
			Maize	3524	3400	3524	-	-	-	-
			Wheat	3880	3445	3880	-	-	-	-
			Chickpea	1230	1026	1230	-	-	-	-
Modipuram	Kushinagar Gorakhpur	-	Scented Rice	4200	3825	08.93	-	-	-	-
			Wheat	4500	3500	22.22	-	-	-	-
Pantnagar	Nainital	Kotabagh	Rice	4758	3525	25	-	-	-	-
			Wheat	4716	3238	31	-	-	-	-
Raipur	Raipur	Aarang	Scented rice	2400	2019	15.89	-	-	-	-
Ranchi	Khunti and Latehar	Khunti, Arki, Barwadih, Chndwa	Black gram	1000	800	20	1200	1000	16.6	-
			Finger millet	1500	1200	20	-	-	-	-
			Scented Rice	2500	18000	28.8	1800	1400	22.2	-
			Lentil	-	-	-	800	700	12.5	-
			Linseed	-	-	-	800	600	25.0	-
Umiam	Ri-Bhoi	Bhoirymbong	Rice	4230	3352	23.4	-	-	-	-
			Maize	3500	2579	35.1	-	-	-	-
			Potato	20580	15220	25.2	-	-	-	-
			French bean	6880	5675	19.5	-	-	-	-
Ajmer	Sirohi	Abu road, Shivganj	Wheat	-	25.0	-	-	-	-	-
			Fennel	16.0	14.84	7.82	-	-	-	-
			Wheat	-	25.0	-	-	-	-	-
			Bajra	-	-	-	-	1600	-	-
			Guar	-	-	-	-	7500	-	-
Almora	Almora	Hawalbagh	Finger millet	1795	683.90	62	-	-	-	-
			Wheat	1096	613.2	44	-	-	-	-
			Barnyard millet	1037	546	47	-	-	-	-
			Rice	1795	818	54	-	-	-	-
Gangtok	Gangtok	Rumtek Martam	Rice	3596	2234	37.88	-	-	-	-
			Maize	3342	2258	32.44	2942	2098	28.69	-
			Soybean	1324	1120	15.41	1198	1028	14.19	-
			Buckwheat	1058	918	13.23	-	-	-	-
Narendrapur	Nadia	Hanskhali	Rice	1961	1800	8.22	2392	2100	12.20	-
S K Nagar	Aravali	Bhiloda	Wheat	2392	2250	5.93	-	-	-	-
			Groundnut	757	700	7.52	-	-	-	-
			Soybean	-	900	-	-	-	-	-
Thiruvanantha puram	Thiruvanantha puram	Parassala, Arvancode, Neyyattinkara, Pallichal, Kattakkada	Cassava	-	-	-	25290	49380	+95	-
Udaipur	Rajsamand	Railmagra,	Maize	3380	2995	-12.85	3380	2550	-32.55	-
			Blackgram	450	405	-11.11	-	-	-	-
			Wheat	3870	2940	-31.63	3870	2640	-46.59	-
			Chickpea	1240	1035	-19.81	1240	1085	-14.29	-
			Soybean	-	-	-	1171	1385	+15.45	-



Table 7.1.1.4: Name of the organic manures practiced, plant protection and weeding cost of organic/natural farmers at different location

Centres	District surveyed	Plant protection input used (Insect pest & disease management practice)					Weed management practice and cost			Constraints	
		organic farming			Natural farming		Name of practices	Organic (Rs./ha)	NF (Rs./ha)		
		Input name	Average quantity inputs	Cost (Rs/ha)	Input name	Average quantity inputs					Cost (Rs/ha)
Bajaura	Lahual & Sapiti	-	-	-	Dashparni extract Cu enriched sour butter milk	5L in 250L water/ha 15L in 250L water/ha	8,400	Mechanical and hand weeding	-	19,200	Insect-pest and disease management, low productivity, lack of marketing facility and premium price & non availability of bio-mass for mulching
Bhopal	Raisen	Neem Kadaha Buttermilk Neem oil	5-6 litre 5-6 litre 2-2.5 litre	500	Panchpatti, Neemastra, Brahmastra, Dashparni	5-6 litre/ha	400-500	Hand weeding	6,800	6800	No Premium price and market for organic produce, poor access to the certification agencies for adoption to organic farming
Cailcut	Kunnur	Bordeaux mixture Trichoderma Cow urine	200 l/ha 200 l/ha 200 l/ha	20,000	Neem oil Garlic neem oil mixture Tobacco emulsion	200 l/ha 200 l/ha 200 l/ha	9,800	Hand weeding, brush cutter	25,000	25,000	Pest attack, not getting premium price, problems in certification
Coimbatore	Coimbatore, Erode, Tirupur, Nilgiris, Madurai, perambalur, Salem, Virudhunagar, Dindigul	Neem seed kernel extract Neem oil Herbal leaves extract Fish amino acid Butter milk Traps	250 l/ha 7.5 l/ha 25 l/ha 5 l/ha 12.5 l/ha 12 Nos/ha	5500	Agniastra Neemastra Brahmastra NSKE	12.5 l/ha 500 l/ha 6 l/ha 5%	Materials from own farm	Hand weeding, Mulching, Mechanical weeding	32,000	5500	Requirement of large quantities of organic inputs, weed problem, inadequate market facilities for sale of organic products, no premium/guaranteed price for organic products, 60 % farmers were not renewed their organic certification due to difficulty in maintenance of records. But maintaining as organic farm.
Dharwad	Belagavi, Dharwad , Gadag , Haveri	Neemaster Agniaster Brahmastra Dashaparni ark Sour Buttermilk	500 l/ha 15 ltr /ha 15 ltr /ha 15 ltr /ha	1000	Neemaster Agniaster Brahmastra Dashaparni ark Sour Buttermilk	500 l/ha 15 ltr /ha 15 ltr /ha 15 ltr /ha	2000-5000	Hand weeding, Inter-cultivation, Growing intercrops to smoother crops	5000-15000	6000-12000	Yield reduction, non-availability of required quantity, less number of livestock, Lack of organized market facility and premium price, lack of support and risk coverage, Organic certification is cumbersome and expensive for small and marginal farmers & Unable to maintain diversified cropping system
Jabalpur	Jabalpur	-	-	-	-	-	-	Manual weeding	6,000	6,000	Lack of awareness regarding certification and marketing & unavailability of organic plant protection inputs
Karjat	Raigad	Cow urine	6 litre/ha	3,000	-	-	-	Hand weeding	36,000	-	Low Yield, high rates of wages, non Availability of farm labour due to urbanization, marketing and rates for organic produce & lack of technical knowledge about organic farming

Ludhiana	Ludhiana	Homemade neem extract Mix leaf extract Agniaster Fermented butter milk	10 ltr/ha 20%	2000	-	-	-	-	Hand hoeing, mechanical weeding and mulching	10000	-	Marketing, weed infestation, low yields, high labour cost, price premium & no subsidy on organic inputs
Modipuram	Kushinagar, Gorakhpur	Trichoderma spp. Neem oil	3-5kg/ha 3-4 L/ha	6000	-	-	-	-	Hand Weeding	6225-7500	-	Lack of Marketing Facilities, labour Intensive, lower productivity, no premium price for wheat & availability problem of certified organic inputs
Pantnagar	Nainital	Cow urine+ neem leaves+ garlic	45-50 litre	300	-	-	-	-	Hand weeding	Family labourers	-	Availability of sufficient and quality organic inputs, organic seeds and quality bio-inoculants, disease infestation, termite problems & premium price of wheat is not obtained
Raipur	Raipur	Neem oil, Trichogramma	2.0 lt/ha 5-6 cards/ha	2356	-	-	-	-	Hand weeding	5667	-	Lack of technical knowledge organic farming practices, lack of weed management technology, non-availability of organic plant protection inputs & lack of organized market
Ranchi	Khunti and Latehar	Neem oil, Karanj oil	2ltr/ha 2ltr/ha	1000	Dashparni	-	-	500	Manual	15,000	15,000	Certification, marketing, Manures, Lack of skill development related with Beeja amrit, Ghanjiaamrit & Jeevaamrit,
Umiam	Ribhoi	Trichoderma Viride, Beaveria bassiana, Vermiwash, Neem oil	500 ml	-	-	-	-	-	Hand Weeding	-	-	Water availability in Winter season & quality seed materials, organic pesticides
Ajmer	Sirohi	Trichoderma viridae, Neem oil	1-2 kg/ha 2.0 lit/ha	2,000	Neem oil	2.0 lit/ha	-	1,500	Hand weeding	6,000	6,000	Pest and disease control, weed control and low yield
Almora	Almora	-	-	-	-	-	-	-	Manual	Family labourers	-	Wild Animal (monkey, wild boar, ape), Lack of irrigation water
Gangtok	Gangtok	Neem oil, blitox, COC, locals botanicals	3-4ml/lit	4000	Local Botanical spray	3%	-	4000-6000	Hand Weeding, Mulching, Zero tillage	4000-6000	4000-6000	The major problems identified are, lack of availability of quality seeds and planting materials. The farmers are also facing problem in controlling the emerging the pest and diseases organically. Moreover, the farmers are not getting premium market price for their organic products. There is need to encourage the farmers for value addition, packaging and marketing. & the yield of the crops grown under natural farming is less in comparison to organic farming.
Narendrapur	Nadia	Neem extract	200 lit	2000	-	-	-	-	Manual	2100	-	Primitive and underdeveloped marketing system, actual cost price of the crops were not getting by the farmers, no premium price except the aromatic rice (Var. Kalabhat) is brought by a certified company



Centres	District surveyed	Plant protection input used (Insect pest & disease management practice)						Weed management practice and cost				Constraints
		organic farming			Natural farming			Name of practices	Organic (Rs./ha)	NF (Rs./ha)		
		Input name	Average quantity inputs	Cost (Rs/ha)	Input name	Average quantity inputs	Cost (Rs/ha)					
S K Nagar	Aravali	Bhramastra neem oil vanamrut krushibalam nimastra	600 lit/ha 600 lit/ha 600 lit/ha 600 lit/ha 600 lit/ha	1500	Neemastra, Agniasta Dashparni ark Bramhastra	9 lit/ha 7.5 lit/ha 10 lit/ha 10 lit/ha	400-500	Hand weeding	7,000-10,000	8,000-10,000	Lack of labour availability, no assured market and lack of premium price for organic product, low productivity of crops & lack of organic pesticides.	
Thiruvanantha puram	Thiruvanantha puram	-	-	-	Neem oil Beauveria liquid Trichoderma Pseudomonas Fish amino acid	4 l/ha 100 kg/ha 100 kg/ha 4 l/ha 4 l/ha	10,000	Hand weeding, mulching	-	50,000	Non availability of suitable markets, low price of the produce, labour shortage and high wages, climatic changes and damage due to wild boar, peacock and other wild animals	
Udaipur	Rajsamand	Neem leaf extract, cow urine Fermented buttermilk	30 lit/ha 40 lit/ha	1800	Neem leaf extract, cow urine Fermented buttermilk	70 & 55 l/ha 40 lit/ha	2600	Hand weeding, Hand hoeing, Mulching	7,500	3850	Low yield of crops, marketing problem, poor technical knowledge, timely availability of inputs, lack of premium price, nutrient deficiency and disease problem & based on livestock resources	

7.1.2: Documentation and validation of organic ITKs

Objective

- To document popular ITKs in Organic Farming
- To test the documented ITKs

Year of start: 2015-16

Locations: Ajmer and Udaipur (Rajasthan), Coimbatore (Tamil Nadu), Gangtok (Sikkim), Narendrapur (West Bengal). Narendrapur did not report the results

Results: Centre-wise results for each centre are presented below.

Ajmer

ITKs: Bio-pesticide (Katyasani, Merta, Rajasthan)
Content:

- 20 liters desi cow urine
- 5 kg Aak leaves, 5 kg Datura leaves
- 5 kg neem leaves or 1.5 kg neem kernels
- 2 kg desi cow butter milk

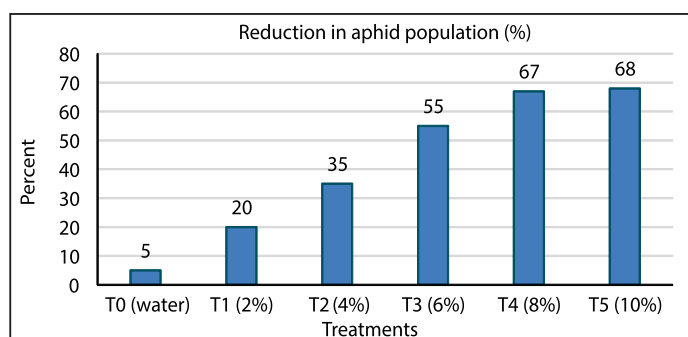


Table 7.1.2.1: Effect of soil and foliar application of compost tea on yield of soybean at Udaipur

Treatments	Yield (kg ha ⁻¹)			Economics	
	Seed	Haulm	Biological	Net return (₹ ha ⁻¹)	B-C ratio
Dose of Panchagavya					
Control	894	1288	2182	36844	2.6
5 %	1165	1431	2596	51240	3.1
7.5 %	1307	1583	2890	59482	3.3
10 %	1365	1650	3014	62281	3.4
S.Em.±	25.30	33.41	47.86	1557.96	0.08
C.D.(P=0.05)	72.42	95.66	137.02	4460.32	0.22
Time of application					
30 DAS	1088	1377	2465	46996	2.9
45 DAS	1153	1487	2640	51387	3.1
60 DAS	1116	1428	2544	48936	3.0
30 and 45 DAS	1253	1539	2791	55846	3.2
45 and 60 DAS	1302	1610	2912	59144	3.3
S.Em.±	28.28	37.36	53.51	1741.85	0.09
C.D.(P=0.05)	80.97	106.96	153.20	4986.79	NS

- Some pieces of copper metal

Udaipur

Performance of soybean (Glycine max) as influenced by various concentration and time of application of Panchagavya

Name of ITKs: Panchagavya

A. Rate of Panchagavya (Foliar application)	B. Time of application
1. Control	1. 30 DAS
2. 5%	2. 45 DAS
3. 7.5%	3. 60 DAS
4. 10%	4. 30&45 DAS
	5. 45&60 DAS

Treatment details

Indigenous ITK Panchgavya evaluated for their efficacy on growth and yield of soybean through foliar application at 30, 45 and 60 days after sowing with 5-10% concentration. Soybean variety JS-335 was undertaken in 3 replication under factorial RBD. RDN 20:40:0 NPK kg ha⁻¹ (as per POP) applied as nutrient supplementation. Among the different treatments, application of @ 10% at 45 & 60 DAS resulted in significantly higher yield, net return and benefit cost ratio of soybean as compare to 5% concentration (Table 7.1.2.1).





Control



Panchgavya @ 5% at 45 & 60 DAS



Panchgavya @ 10% at 45 & 60 DAS

Effect of soil and foliar application of Panchagavya on soybean at Udaipur

Coimbatore

Name of the ITKs identified for validation

- 3G extract (Ginger, Garlic and Green chilli)
- Lantana - Calotropis extract
- Cow dung - Cow urine extract

Among the different ITKs evaluated in cotton, okra and maize, 3G extract (Ginger, Garlic and Green chilli) @ 5% was recorded most effective against sucking

pests infesting viz., leafhoppers, thrips whiteflies, aphids and leaf roller in cotton & okra crop resulted in recorded higher yield of 1493 and 11964 kg/ha respectively. In maize crop, 3G extract @ 5% was also performed better in term of reduction in incidence over control (56.28%) for fall armyworm and recorded highest yield of 4986 kg/ha (Table 7.1.2.2).

Table 7.1.2.2: Performance of 3G extract on sucking pests in cotton and maize crop at Coimbatore

Validated Crop	Best performing	Insect pests treatment	Reduction in incidence over control (%)	Yield (kg/ha)
Cotton	3G extract@ 5 %	Leafhoppers	58.48	
		Thrips	48.32	
		Whiteflies	52.18	1493
		Aphids	72.26	
		Leaf roller	58.32	
Okra	3G extract@ 5%	Leafhoppers	52.55	
		Thrips	38.48	
		Whiteflies	56.14	11964
		Aphids	68.42	
		Leaf roller	51.25	
Maize	3G extract@ 5 %	Fall armyworm	56.28	4986

Gangtok

Name of the ITKs identified for validation

	Material	Name of crops in which ITK's validated	Performance
ITK 1	Well-decomposed cow dung extract (5, 10 & 15%)	Cabbage, red cherry and radish	Yield enhancement
ITK 2	Cow urine (5, 10 & 15%)	Tomato, bitter gourd and bottle gourd	Yield enhancement
ITK 3	Mixture of 10% agave extract + 5% cow urine + 2.5% chilly	Tomato, french bean and broccoli	Aphids & fruit borer
ITK 4	Mixture of 10 % turmeric + 5% cow urine	Dale Khursani, Brinjal and Bee	Managing ants by drenching

ITK 1: Well decomposed cow dung extract: keeping it for 3-4 days then filtering the extract with a cotton cloth before applying to improve the production and productivity of vegetable crops.

Treatments taken to validate the ITK: T₁ Cow dung extract (5%), T₂ Cow dung extracts (10 %) *Farmer's Practice*, T₃ Cow dung extract (15%) and T₄ Control (only water spray).

Results: Cabbage and radish crop grow under low

cost plastic tunnels and open condition. The red cherry pepper growing under low cost plastic rain shelters and open condition. All the treatments have significantly improved the yield of cabbage, red cherry pepper and radish as compared to control. Application of cow dung extract @ 10% FP resulted in higher yield of cabbage however, cherry pepper and radish resulted in higher with application of Cow dung extract (15%).

Table 7.1.2.3: Effect of cow dung extract on yield of vegetables at Gangtok

	Cabbage (kg/sqm)	Cherry pepper	Radish (kg/sqm)
Cow dung extract (5%)	6.3	1.31	4.58
Cow dung extract (10%)*FP	8.1	1.61	6.42
Cow dung extract (15%)	7.9	1.64	6.99
Control (water spray)	3.9	0.70	2.70

Note* Farmer's Practice: FP

ITK 2: Cow urine; keeping it for 3-4 days then filtering the extract with a cotton cloth before applying to improve the yield of tomato and cucurbitaceous vegetables.

Treatments to validate the ITK: T₁: Cow urine (5%); T₂: Cow urine (10%) *Farmer's Practice*; T₃: Cow urine (15%) and T₄: Control (only water spray).

Results: Tomato, bitter gourd and bottle gourd

growing under low cost plastic rain shelters and open condition. It was observe that all the treatments have significantly improved the yield of tomato, bottle gourd and bitter gourd as compared to control. Among the ITK treatments, application of 10% cow urine resulted in higher yield of tomato, bottle gourd and bitter gourd and increased the yield to the tune of 8.7 and 12.7 % over cow-urine concentration @ 5 and 15% respectively.

Table 7.1.2.4: Effect of cow urine extract on yield of vegetables at Gangtok

Treatment details	Tomato (kg/plant)	Bottle gourd (kg/plant)	Bitter gourd (kg/plant)
Cow urine (5%)	4.82	8.60	2.57
Cow urine (10%) Farmer's Practice	5.24	9.38	2.86
Cow urine (15%)	4.65	8.52	2.69
Control (water spray)	1.82	3.56	1.29

ITK 3: Mixture of 10% agave extract + 5% cow urine + 2.5% chilly. Before spraying all the ingredients were mixed properly in plastic container and kept in shade for 3-5 days and then from this mixture 0.2% solution is prepared for spray in vegetable crops for managing aphids and fruit borer.

Treatments taken to validate on the yield of vegetables; T₁: 0.1% solution spray; T₂: 0.2% solution spray (*Farmer's Practice*); T₃: 0.5% solution spray and T₄: Control (only water spray).

Results: It was observed that all the treatments have significantly improved the yield of tomato, french

bean and broccoli as compared to control. The significant increase in yield of tomato and broccoli was observed in between the farmer's practice (T₂) and the higher doses applied (T₃), however, french bean yield was highest in farmer's practice (T₂). The T₃ was recorded maximum number of aphid population decrease over control in all the crops viz, followed by French bean. In fruit borers treatment 3 was maximum number population decrease over control in all the crops viz, broccoli followed by tomato.



Table 7.1.2.5: Effect of agave extract on yield and %reduction of aphid and fruit borer at Gangtok

Treatment details	Tomato (kg/plant)	Frenchbean (kg/sq.m)	Broccoli (kg/sq.m)	Percent reduction over control			
				Aphid		Fruit borers	
				French bean	Tomato	Tomato	Broccoli
T ₁ : 0.1% sol ⁿ spray	3.94	3.72	5.88	70.78	65.91	62.82	67.82
T ₂ : 0.2% sol ⁿ spray *FP	4.25	5.22	4.37	62.97	58.82	54.53	69.82
T ₃ : 0.5% sol ⁿ spray	4.94	4.02	6.06	80.77	82.65	72.03	83.52
T ₄ : Control	1.03	1.52	1.94	-	-	-	-

FP=Farmer's Practice

ITK 4: Mixture of 10 % turmeric + 5% cow urine for managing ants by drenching 0.2% solution. Before drenching all the ingredients were mixed properly in plastic container and then from this mixture 0.2% solution is prepared for drenching in vegetable.

Treatments taken to validate the ITK and its effect on the yield and ant control on vegetables. T₁: 0.1% solution spray; T₂: 0.2% solution spray (*Farmer's Practice*); T₃: 0.5% solution spray and T₄: Control (only water spray).

Results: The experiments were conducted on Dale khursani, brinjal and bee growing under low cost plastic rain shelters. The significant increase in yield of Dale Khursani was observed in between the farmer's practice (T₂) and the higher doses applied (T₃), however, Dale Khursani yield was highest in farmer's practice (T₂). The T₃ was recorded maximum number of ant population decrease over control in all the crops viz, brinjal (82.6 %) followed by bee (80.8%).

Table 7.1.2.6: Effect turmeric extract on yield and %reduction of ant at Gangtok

Treatment details	Dale Khursani (kg/plant)	Brinjal (kg/sqm)	Bee (kg/sqm)	Percent reduction over control		
				Ant		
				Dale Khursani	Brinjal	Bee
T ₁ : 0.1% sol ⁿ spray	3.9	3.7	5.8	65.91	62.82	67.82
T ₂ : 0.2% sol ⁿ spray *FP	4.2	5.2	4.3	58.82	54.53	69.82
T ₃ : 0.5% sol ⁿ spray	4.9	4.0	6.0	82.65	72.03	83.52
T ₄ : Control	1.0	1.5	1.9	-	-	-

FP=Farmer's Practice

7.1.3: Bio-chemical characterization & molecular identification of microbial population of different Organic and Natural Farming inputs

Objective

- To characterize the indigenous organic input preparations
- To identify the microbes and other parameters of indigenous manure

Year of start: 2015-16, initially it was start at Narendrapur later on from 2020-21, 4 more centres were included for characterization of inputs.

Location: 5; Narendrapur (WB), Calicut (KL), Coimbatore (TN), Ludhiana (PB), and Udaipur (RJ).

Calicut not reported the results Centre wise results are presented below

Narendrapur

Bio-chemical and microbial characterization of Shasyagavya(SG), Shasyagavya live Azolla (SGLA), and Shasyagavya dried Azolla (SGDA) (Table 7.1.3.1-7.1.3.3)

I) Bio-chemical and microbial characterization of Shasyagavya (Table 7.1.3.1)

Shasyagavya(SG), a vegetable waste derived liquid



organic formulation, is usually fermented for 10-15 days before use. This study reports the dynamics of various microbes and plant-available nutrients over 30 days of decomposition. The pH of SG changes from initial acidic (6.22 ± 0.02) to the final neutral range (7.10 ± 0.02) over decomposition. Further, the EC ranges from 9.69 ± 0.08 to 10.80 ± 0.72 dS/m. The plant-available macronutrient dynamics indicate that SG could be an alternate source of nitrogen (0.06 ± 0.00 to $0.10 \pm 0.00\%$), phosphorus (187.29 ± 38.95 to 256.83 ± 11.42 PPM), and potassium (1656.58 ± 229.07 to 2480.75 ± 134.05 PPM). However, the concentration of nitrogen was found to be low in SG. Additionally, culture-based microbial assays establish that this formulation is an abundant source of microbes, including the higher bacterial load (10^{13} CFU/ml), actinomycetes (10^8 CFU/ml), and fungi (10^5 CFU/ml). Further, PGPB dynamics reveal that SG is an enriched bacterial consortium with the microbial population of FNFs (0.53 ± 0.21 to $3.00 \pm 1.73 \times 10^7$ CFU/ml), PSB (0.51 ± 0.17 to $4.76 \pm 0.54 \times 10^7$ CFU/ml), and KSB (0.48 ± 0.03 to $3.23 \pm 0.48 \times 10^7$ CFU/ml).

ii) Bio-chemical and microbial characterization of Shasyagavya live Azolla (Table 7.1.3.2)

Shasyagavya live Azolla (SGLA), a modified liquid concoction of SG, is fermented for 30 days to study the nutrient dynamics, including the microbial load. The pH of SGLA follows the same trend as SG and becomes slightly alkaline pH at 30 days of incubation. The EC of SGLA ranges from 8.83 ± 0.40 to 11.68 ± 0.01 dS/m. The addition of Azolla in live form improves the organic carbon (1.13 ± 0.05 to $1.42 \pm 0.02\%$) and plant-available nitrogen (0.11 ± 0.01 to $0.15 \pm 0.01\%$) content of SG significantly. However, there are no changes in the plant-available

phosphorus (120.27 ± 9.12 to 167.47 ± 4.02 PPM) and potassium (2056.50 ± 30.25 to 2493.50 ± 31.19 PPM) content. Additionally, microbial dynamics reveal an overall increase in the microbial abundance of bacteria (10^{15} CFU/ml), and actinomycetes (10^{11} CFU/ml). Interestingly, this formulation failed to improve the fungal population (10^4 CFU/ml). On the other hand, the population of FNFs (0.15 ± 0.07 to $6.23 \pm 0.44 \times 10^8$ CFU/ml), PSB (0.04 ± 0.02 to $7.98 \pm 0.72 \times 10^8$ CFU/ml), and KSB (0.03 ± 0.00 to $9.17 \pm 1.28 \times 10^9$ CFU/ml) has been significantly increased due to the addition of Azolla in its live form.

iii) Bio-chemical and microbial characterization of Shasyagavya dry Azolla (Tables 7.1.3.3)

The modified semi-solid formulation of SG, i.e., *Shasyagavya* dry Azolla (SGDA), is also decomposed for 30. SGDA is mostly alkaline in nature, with EC ranging from (7.36 ± 0.14 to 9.36 ± 0.04 dS/m). The addition of Azolla in its dried form drastically improves the organic carbon (4.24 ± 0.03 to $5.30 \pm 0.03\%$), including plant-available macronutrients, i.e., nitrogen (0.24 ± 0.03 to $0.33 \pm 0.03\%$), phosphorus (418.78 ± 59.252 to 857.67 ± 100.68 PPM), and potassium (3396.67 ± 106.86 to 4532.83 ± 50.76 PPM). Further microbial dynamics studies reveal the improvement in the bacterial (10^{15} CFU/g) and actinomycetes (10^{10} CFU/g) load. However, the fungal (10^3 CFU/g) population tends to decline compared to standard SG. Interestingly, the PGPB population has been positively influenced by the addition of dry Azolla as revealed and observed in the dynamics of FNFs (0.47 ± 0.02 to $3.02 \pm 0.84 \times 10^8$ CFU/g), PSB (0.22 ± 0.02 to $0.98 \pm 0.02 \times 10^8$ CFU/g), and KSB (0.05 ± 0.00 to $19.11 \pm 1.17 \times 10^{10}$ CFU/g).



Table 7.1.3.1: Bio-chemical and microbial characterization of Shasyagavya after different incubation period at Narendrapur

Parameter	Unit	Value on 0 day	Value on 5 days	Value on 10 days	Value on 15 days	Value on 20 days	Value on 25 days	Value on 30 days
pH	--	6.22±0.02	4.96±0.02	5.34±0.04	6.33±0.04	6.87±0.04	6.62±0.02	7.10±0.02
EC	dS/m	9.69±0.08	9.72±0.40	10.32±0.03	10.06±0.28	10.14±0.12	10.80±0.72	9.80±0.38
Organic C	%	0.77±0.03	1.03±0.02	1.08±0.02	1.06±0.02	1.05±0.02	1.05±0.02	1.00±0.04
Available N	%	0.08±0.01	0.09±0.01	0.10±0.00	0.10±0.00	0.09±0.00	0.08±0.00	0.06±0.00
Available P	PPM	209.25±7.04	231.21±19.39	256.83±11.42	217.21±29.46	209.21±25.25	205.67±29.45	187.29±38.95
Available K	PPM	1656.58±229.07	2005.50±119.03	2080.75±78.29	2244.00±77.19	2306.33±118.21	2437.25±56.69	2480.75±134.05
Total bacteria	(x10 ¹³) CFU/ml	0.39±0.13	0.39±0.15	0.36±0.16	1.06±0.34	0.85±0.44	0.74±0.44	0.94±0.63
Total Fungi	(x10 ⁵) CFU/ml	0.1±0.00	2.80±0.26	3.43±0.84	1.67±0.59	1.70±0.60	0.07±0.07	0.03±0.01
Total Actinomycetes	(x10 ⁸) CFU/ml	0.08±0.05	0.30±0.13	0.06±0.04	0.09±0.01	0.20±0.06	0.27±0.06	0.46±0.08
Total FNF	(x10 ⁷) CFU/ml	3.00±1.73	2.00±1.15	0.53±0.21	1.13±0.46	0.73±0.32	1.23±0.15	2.43±0.64
Total PSB	(x10 ⁷) CFU/ml	0.51±0.17	1.66±0.05	0.86±0.03	1.45±0.35	4.76±0.54	1.33±0.93	2.53±0.45
Total KSB	(x10 ⁷) CFU/ml	0.53±0.19	0.53±0.08	0.48±0.03	0.53±0.09	1.27±0.40	3.13±1.10	3.23±0.48

Note: Data are means ± standard errors of mean

Table 7.1.3.2: Bio-chemical and microbial characterization of Shasyagavya live Azolla (SGLA) after different incubation period at Narendrapur

Parameter	Unit	Value on 0 day	Value on 5 days	Value on 10 days	Value on 15 days	Value on 20 days	Value on 25 days	Value on 30 days
pH	--	6.71±0.02	6.34±0.01	6.10±0.01	6.58±0.03	7.02±0.01	7.45±0.01	7.62±0.01
EC	dS/m	8.83±0.40	10.24±0.05	10.73±0.10	11.57±0.07	11.68±0.01	11.61±0.08	11.64±0.01
Organic C	%	1.30±0.01	1.24±0.03	1.42±0.02	1.13±0.14	1.13±0.05	1.14±0.03	1.19±0.04
Available N	%	0.15±0.01	0.13±0.01	0.15±0.01	0.14±0.00	0.13±0.01	0.12±0.01	0.11±0.01
Available P	PPM	143.83±6.83	150.60±8.62	143.17±10.42	167.47±4.02	161.37±15.41	120.27±9.12	140.23±6.70
Available K	PPM	2056.50±30.25	2071.00±51.97	2113.00±33.92	2154.00±14.73	2266.66±20.31	2379.17±52.94	2493.50±31.19
Total bacteria	(x10 ¹⁵) CFU/ml	0.48±0.04	30.00±16.91	6.67±2.10	5.57±0.44	0.31±0.12	0.22±0.04	0.07±0.00
Total Fungi	(x10 ⁴) CFU/ml	26.33±7.02	37.33±4.51	40.00±3.61	48.67±5.03	51.00±4.36	4.00±11.79	0.12±0.06
Total Actinomycetes	(x10 ¹¹) CFU/ml	0.07±0.00	3.30±1.488	0.98±0.02	3.22±0.10	7.48±0.16	1.31±0.03	0.02±0.00
Total FNF	(x10 ⁸) CFU/ml	1.23±0.29	0.38±0.07	0.96±0.50	6.23±0.44	0.51±0.08	5.62±0.31	0.15±0.07
Total PSB	(x10 ⁸) CFU/ml	4.38±0.22	0.37±0.07	1.29±0.70	7.98±0.72	0.46±0.04	7.36±0.21	0.04±0.02
Total KSB	(x10 ⁹) CFU/ml	0.76±0.05	3.26±0.14	9.17±1.28	3.75±0.53	0.37±0.03	0.13±0.01	0.03±0.00

Table 7.1.3.3: Bio-chemical and microbial characterization of *ShasyagavyadryAzolla* (SGDA) after different incubation period at Narendrapur

Parameter	Unit	Value on 0 day	Value on 5 days	Value on 10 days	Value on 15 days	Value on 20 days	Value on 25 days	Value on 30 days
pH	--	6.98±0.03	8.35±0.01	8.34±0.01	8.36±0.02	8.51±0.01	8.59±0.02	8.85±0.03
EC	dS/m	8.20±0.02	8.73±0.12	9.36±0.04	8.90±0.29	9.16±0.25	7.36±0.14	7.75±0.04
Organic C	%	4.96±0.09	4.76±0.18	4.24±0.03	4.88±0.09	4.94±0.18	5.24±0.12	5.30±0.03
Available N	%	0.27±0.03	0.27±0.01	0.32±0.01	0.33±0.03	0.32±0.05	0.26±0.02	0.24±0.03
Available P	PPM	418.78±59.25	724.78±98.02	729.78±111.50	857.67±100.68	743.44±73.94	766.67±130.56	735.22±92.06
Available K	PPM	3396.67±106.86	3685.00±15.88	3765.67±70.19	3962.67±56.44	3551.00±59.51	4173.00±18.05	4532.83±50.76
Total bacteria	($\times 10^5$) CFU/g	6.44±0.488	2.30±0.17	0.79±0.14	1.33±0.38	4.45±1.10	6.41±1.50	0.43±0.13
Total Fungi	($\times 10^3$) CFU/g	10200.00±3328.6	400.00±200	0.47±0.15	0.06±0.03	0.66±0.07	1.35±0.37	1.12±0.15
Total Actinomycetes	($\times 10^6$) CFU/g	0.45±0.04	2.75±0.22	0.81±0.20	1.80±0.43	7.39±1.83	2.58±0.15	5.80±0.10
Total FNF	($\times 10^6$) CFU/g	1.16±0.04	1.07±0.16	0.59±0.03	0.98±0.03	0.47±0.02	0.65±0.19	3.02±0.84
Total PSB	($\times 10^6$) CFU/g	2.46±0.23	0.98±0.02	0.78±0.31	0.51±0.07	0.48±0.03	0.22±0.02	0.44±0.03
Total KSB	($\times 10^6$) CFU/g	0.05±0.00	0.20±0.10	6.41±0.66	4.83±1.86	7.60±1.92	19.11±1.17	5.82±0.47



Coimbatore

Natural farming input such as Beejamrit, Jeevamrit, and Ghanjeevamrit prepared using the cow dung and cow urine collected from native breed (Gir), cross-bred (HF) and from both native and cross breed. Microbial population of bacteria, fungi and

actinomycetes, N fixers (Azospirillum, Azotobacter and Bacillus sp.) and P- solubilizers *Bacillus* sp., *B. subtilis*, *Pseudomonas* sp. recorded higher with native breed (Gir) followed by HF and mixed breed among the NF input.

Instrument: Perkin Elmer Clarus Sq8c

Injection: 1 Micro Liter

Sample ID: N1 1110

Coloumn: DB-5 MS Capillary Standard Non Polarcoloumn

Dimension: 30Mts, ID: 0.25 mm, Film: 0.25 IM Carrier Gas: He

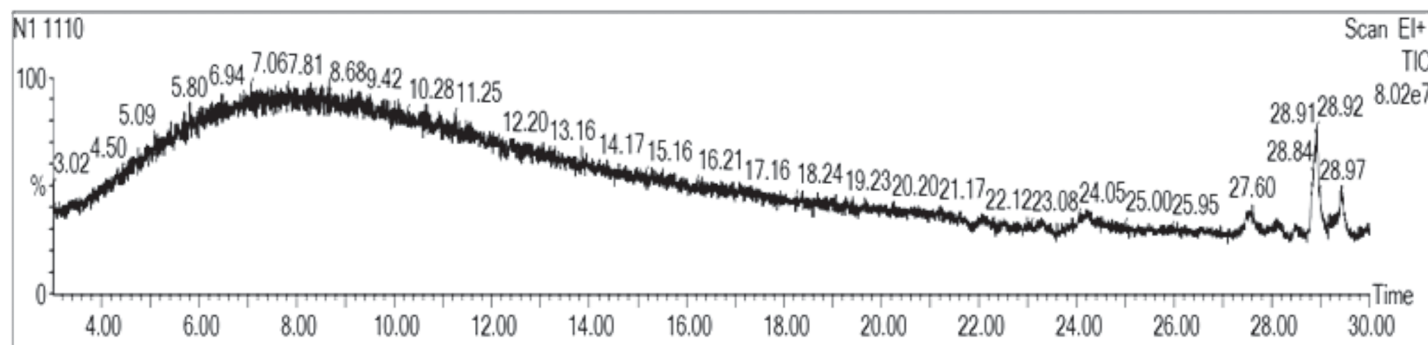


Table 7.1.3.4: Neemastra 1; prepared from Native Breed cow dung and cow urine (Kangayam)

Peak	Retention Time	Name of the compound	
1	4.329	9-Hexadecenoic acid, eicosyl ester, (Z)- 5	
2	5.414	1 17-Pentatriacontene	
3	5.704	Cyclohexane, 1,3,5-trimethyl-2-octadecyl-	
4	5.814	H 1.	1 9-Hexadecenoic acid, hexadecyl ester, (Z)-
		H 2.	17-Pentatriacontene
		H 3.	Z-5-Methyl-6-heneicosen-11-one
5	6.450	i-Propyl 11,12-methylene-octadecanoate	
6	7.065	H 1.	IPCONAZOLE
		H 2.	Cyclohexane, 1,3,5-trimethyl-2-octadecyl-
7	8.280	H 1.	Octadecanoic acid, (2-phenyl-1,3-dioxolan-4-yl)methyl ester, cis-
		H 2.	9-Octadecenoic acid, (2-phenyl-1,3-dioxolan-4-yl)methyl ester, cis-
8	8.666	Pyrano[4,3-b]benzopyran-1,9-dione, 5a-methoxy-9a-methyl-3-(1-propenyl) perhydro-	
9	10.641	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	
10	11.252	18,19-Secoyohimban-19-oic acid, 16,17,20,21-tetradehydro-16 (hydroxymethyl)-, methyl ester, (15á,16E)-	
11	12.382	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	
12	12.527	H 1.	2-Acetyl-9-[3-deoxy-á-d-ribofuranosyl] hypoxanthine
		H 2.	tert-Hexadecanethiol
13	13.563	Morphinan-4,5-epoxy-3,6-di-ol, 6-[7-nitrobenzofurazan-4-yl]amino-	

14	13.848	H 1. N-(tert-Butylacetoxy)pyrrolidine-2-carbaldehyde, 4-nitrophenylhydrazone
		H 2. Pentadecanoic acid, 14-bromo-
15	13.948	Tetradecanoic acid, 3,3a,4,6a,7,8,9,10,10a,10b-decahydro-3a,10adihydroxy-5-(hydroxymethyl)-2,10-dimethyl-3-oxobenz[e]azulen-8-yl ester, [3aR-(3aà,6aà,8à,10á,10aá,10bá)]-
16	14.608	Pregnan-20-one, 3-(acetoxy)-5,6-epoxy-6-methyl-, cyclic 20-(1,2-ethanediylacetal), (3á,5à,6à)-
17	14.748	3,9:7,8-Diepoxybicyclo[4.3.0]nonane-6á-ol-2-one, 9à-acetoxy-4-isopropenyl- 5-methoxycarbonyl-1- methyl-
18	14.993	3-Fluoro-3-(2-oxo-cyclopentylsulfanyl)-2-trifluoromethyl-acrylic acid ethyl ester
19	15.283	1,9-Dioxo-5-thianonane, 3,7-bis(9-borabicyclo[3.3.1]non-9-yloxy)-1,9-diphenyl-
20	15.508	H 1. Methyl 13,16-docosadienoate
		H 2. 11,14-Eicosadienoic acid, methyl ester
21	15.653	1H-2,8a-Methanocyclopenta[a]cyclopropa [e]cyclodecen-11-one, 1a,2, 5,5a,6,9,10,10a-octahydro-5,5a,6-trihydroxy-1,4-bis(hydroxymethyl)-1,7,9-trimethyl-, [1S-(1à,1aà,2à,5á,5aá,6á,8aà,9à,10aà)]-
22	16.309	Octadecane, 3-ethyl-5-(2-ethylbutyl)-
23	16.709	Cyclohexane, 1,4-dimethyl-2-octadecyl-
24	16.944	2,7-Diphenyl-1,6-dioxopyridazino[4,5:2',3'] pyrrolo[4',5'-d]pyridazine
25	17.074	Estra-1,3,5(10)-trien-17á-ol
26	17.499	Dasycarpidan-1-methanol, acetate (ester)
27	17.684	Urea, N-t-butoxycarbonyl-N'-[2(trans)-(1-tetrahydropyrrolyl)-1(E)-cyclohexyl]-
28	17.924	9-Octadecenoic acid, (2-phenyl-1,3-dioxolan-4-yl)methyl ester, cis-
29	18.374	H 1. Dasycarpidan-1-methanol, acetate (ester)
		H 2. 3-Cyclohexen-4-ol-1-one, 3-tridecanoyl-
30	18.434	N,N'-Bis(Carbobenzoyloxy)-lysine methyl(ester)
31	18.680	Dasycarpidan-1-methanol, acetate (ester)
32	18.950	Dasycarpidan-1-methanol, acetate (ester)
33	19.650	Dasycarpidan-1-methanol, acetate (ester)
34	19.830	18-Nonadecenoic acid
35	20.085	H 1. 1H-Cyclopropa[3,4]benz[1,2-e]azulene-4a,5,7b,9,9a(1aH)-pentol, 3-[(acetoxy)methyl]-1b,4,5,7a,8,9-hexahydro-1,1,6,8-tetramethyl-, 5,9,9a-triacetate, [1aR-(1aà,1bá,4aá,5á,7aà,7bà, 8à,9á, 9aà)]-
		H 2. 1b,4a-Epoxy-2H-cyclopenta[3,4]cyclopropa [8,9]cycloundec[1,2-b]oxiren-5(1aH)-one, 2,7,9,10-tetrakis(acetoxy)decahydro-3,6,8,8,10a-pentamethyl-
36	20.260	Geranyl isovalerate
37	20.340	Hexanoic acid, 2-ethyl-, oxybis(2,1-ethanediyl-2,1-ethanediyl) ester
38	20.755	18,19-Secoyohimban-19-oic acid, 16,17,20,21-tetrahydro-16-(hydroxymethyl)-, methyl ester, (15á,16E)-
39	21.611	9-Octadecenoic acid, (2-phenyl-1,3-dioxolan-4-yl)methyl ester, cis-
40	28.924	Formic acid, (4-fluoro-3-nitrophenyl)methyl ester



Instrument: Perkin Elmer Clarus Sq8c
Injection: 1 Micro Liter
Sample ID: N1 1110

Column: DB-5 MS Capillary Standard Non Polarcolumn
Dimension: 30Mts, ID: 0.25 mm, Film: 0.25 IM Carrier Gas: He

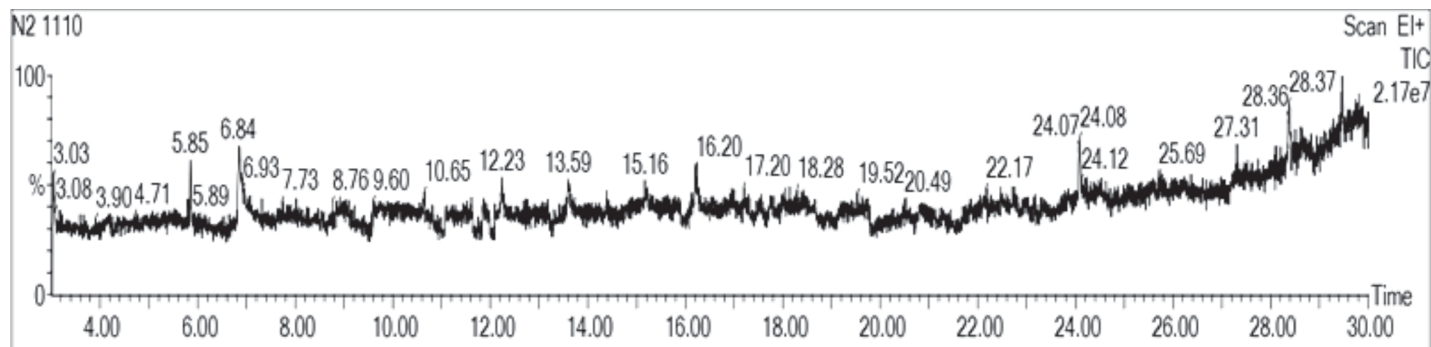


Table 7.1.3.5 : Neemastra 2; prepared from cross breed cow dung and cow urine (Holstein Friesian)

Peak	Retention Time	Name of the compound	
1	3.048	12,15-Octadecadiynoic acid, methyl ester	
2	3.1736	-Methyl-11-propenyl-5-(toluene-4-sulfonyloxy)-12,13-dioxatricyclo[7.3.1.0(1,6)]tridecane-8-carboxylic acid, methyl ester	
3	3.218	Acetamide, 2-[[3-cyano-4-(methoxymethyl)-6-methyl-2-pyridinyl]thio]-N,N-di(2-propenyl)-	
4	3.369	H 1.	3à,4à,9á,11-Diepoxyuurolan-10-ol
		H 2.	Methyl 15-hydroxy-9,12-octadecadienoate
5	3.469	H 1.	25-Dihydroxyvitamin D3, TMS derivative
		H2.	Morphinan-4,5-epoxy-3,6-di-ol, 6-[7-nitrobenzofurazan-4-yl]amino-
6	3.514	H 1.	Sulfone, [2-isobutyl-5-(4-morpholy)oxazol-4-yl](phenyl)-
		H 2.	8-(2-Octylcyclopropyl)-8-oxooctanoic acid, methyl ester
7	3.589	9-Octadecenoic acid, (2-phenyl-1,3-dioxolan-4-yl)methyl ester, cis-	
8	3.709	18-Nonadecenoic acid	
9	3.904	Guanosine	
10	3.984	2-Myristynoyl pantetheine	
11	4.044	Arginine	
12	4.174	Methyl 13,16-docosadienoate	
13	4.304	H 1.	10-Heptadecen-8-ynoic acid, methyl ester, (E)-
		H 2.	Tetraacetyl-d-xylonic nitrile
14	4.364	trans-2-Hexadecenoic acid	
15	4.469	2-Nonadecanone 2,4-dinitrophenylhydrazine	
16	4.504	H 1.	7-Methyl-Z,Z-8,10-hexadecadien-1-ol acetate
		H 2.	Oxiraneoctanoic acid, 3-octyl-, methyl ester, cis-
		H 3.	Toluene-4-sulfonic acid, 2,7-dioxatricyclo [4.3.1.0 (3,8)]dec-10-yl ester
		H 4.	cis-13-Eicosenoic acid

17	4.694	7-Hydroxy-6,9a-dimethyl-3-methylene-decahydro-azuleno[4,5-b]furan-2,9-dione	
18	4.759	9-Hexadecenoic acid, octadecyl ester, (Z)-	
19	4.869	1,2,4-Trioxolane-2-octanoic acid, 5-octyl-, methyl ester	
20	4.924	H 1.	1H-2,8a-Methanocyclopenta[a]cyclopropa [e]cyclodecen-11-one, 1a,2,5,5a,6,9,10,10a-octahydro-5,5a,6-trihydroxy-1,4-bis (hydroxymethyl)-1,7,9-trimethyl-, [1S-(1à,1aà,2à,5á,5aá, 6á,8aà,9à,10aà)]-
		H 2.	Adenosine-3-phosphoric acid
21	4.964	trans-(2-Decenyl)succinic anhydride	
22	5.074	Ethyl iso-allocholate	
23	5.264	Pterin-6-carboxylic acid	
24	5.309	H1.	Z,Z-4,16-Octadecadien-1-ol acetate
		H2.	Z-(13,14-Epoxy)tetradec-11-en-1-ol acetate
		H3.	Oleic Acid
		H4.	2-Methyl-Z,Z-3,13-octadecadienol
25	5.424	Octadecanoic acid, (2-phenyl-1,3-dioxolan-4-yl)methyl ester, cis-	
26	5.614	Methyl 7-(4-hydroxy-3-methoxyphenyl)-5-methyl-4H,7H-[1,2,3,4]tetrazolo[1,5-a]pyrimidine-6-carboxylate	
27	5.850	Undecane	
28	6.840	Benzoic acid	
29	9.731	1. à-d-Xylopyranoside, methyl-2,3,4-tris-O-[9-borabicyclo [3.3.1]non-9-yl]-	
		2. Corynan-17-ol, 18,19-didehydro-10-methoxy-, acetate (ester)	
30	9.88	Erucic acid	
31	12.232	Benzenebutanal	
32	13.588	H 1.	Formamide, (2-acetylphenyl)-
		H 2.	L-Kynurenine, TMS derivative
33	15.218	11-Bromoundecanoic acid	
34	16.219	3-Isopropyl-6a,10b-dimethyl-8-phenethyldodecahydrobenzo[f] chromen-7-one	
35	17.199	2-Myristinoyl pantetheine	
36	24.082	Phytol	
37	24.472	H 1.	9,12-Octadecadienal, dimethyl acetal
		H 2.	Methyl 13,16-docosadienoate
38	28.373	H 1.	2-Furan-2-yl-6-phenyl-7-oxa-1-aza-bicyclo[2.2.1]heptane
		H 2.	12-Hydroxy-14-methyl-oxa-cyclotetradec-6-en-2-one
39	29.464	1. 1-Dodecanol, 3,7,11-trimethyl-	
		2. tert-Hexadecanethiol	
40	29.599	H 1.	Stearic acid, 3-(octadecyloxy)propyl ester
		H 2.	11,14-Eicosadienoic acid, methyl ester
		H 3.	9-Octadecene, 1-[2-(octadecyloxy)ethoxy]-



Instrument: Perkin Elmer Clarus Sq8c
Injection: 1 Micro Liter
Sample ID: N1 1110

Column: DB-5 MS Capillary Standard Non Polarcolumn
Dimension: 30Mts, ID: 0.25 mm, Film: 0.25 IM Carrier Gas: He

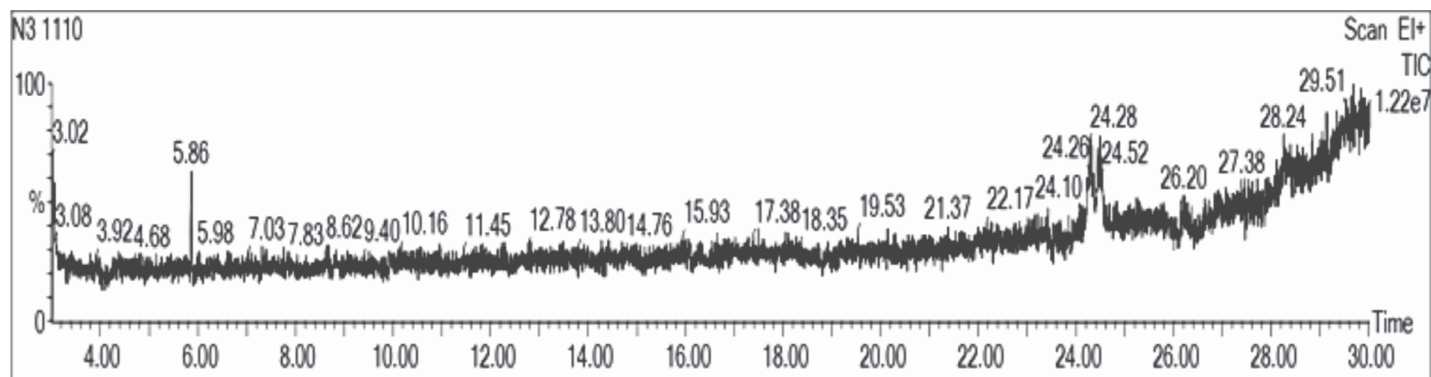


Table 7.1.3.6: Neemastra 3; prepared from mix of native and cross breed cow dung and cow urine (Kangeyam + HF @ 50% each)

Peak #	Retention Time	Hit #	Compound Name
1	3.018		2-Methyl-6-phenyl-5,6-dihydro-4H-1,3-oxazine
2	3.058	H1.	Ethylbenzene
		H2.	o-Xylene
3	3.163	H1.	E-11,13-Tetradecadienal
		H2.	2,15-Heptadecadiene, 9-(ethoxymethyl)-
4	3.364		Carbamic acid, N-(4-mercaptophenyl)-, methyl ester
5	3.414	H1.	1. cis-10-Heptadecenoic acid
		H2.	2. cis-13-Octadecenoic acid
6	3.464		Pyrimidin-4-ol, 2,6-diamino-5-(2-furfurylidamino)-
7	3.499		16-Hydroxyhexadecanoic acid
8	3.574		B(9a)-Homo-19-norpregna-9(11),9a-dien-20-one, 3-(dimethylamino)-4,4,14-trimethyl-, (3à,5à)
9	3.614		Citronellal
10	3.704		à-D-Glucopyranose, 1-thio-, 1-(N-hydroxybenzenepropanimide)
11	3.729		trans-Cyclobutane-1,2-dipropanoic acid, diethyl ester
12	3.919		1-Heptatriacotanol
13	5.860		Oxalic acid, isobutyl nonyl ester
14	18.169		2-Acetylamino-4-(4-hydroxy-phenyl)-3-oxobutyramide
15	20.640	H1.	PI3-Kinase à Inhibitor 2
		H2.	3-Fluoro-3-(2-oxo-2-phenyl-ethylsulfanyl)-2-trifluoromethyl-acrylic acid methyl ester
16	22.571		1. Oxacyclotetradecan-2-one, 13-methyl-
			2. Hexanoic acid, 3,5,5-trimethyl-, 1,2,3-propanetriyl ester
17	22.741		1,2-Cyclopentanedicarboxylic acid, 4-(1,1-dimethylethyl)-, dimethylester, (1à,2à,4à)-
18	23.106		Diclofop-methyl

19	23.281	Dodecane, 5,8-diethyl-	
20	23.58	12-Methyl-E,E-2,13-octadecadien-1-ol	
21	24.127	H1.	Naphthalene, 1-chloro-2,6-dimethoxy-5-nitro-
		H2.	4,6,8(14)-Cholestatriene
22	24.282	Hexadeca-2,6,10,14-tetraen-1-ol, 3,7,11,16-tetramethyl-	
23	24.302	Dimethyl(bis([(2E,6E)-3,7,11-trimethyldodeca-2,6,10-trien-1-yl]oxy))silane	
24	24.352	6-epi-shyobunol	
25	24.432	H1.	trans-Farnesol
		H2.	2,2,4-Trimethyl-3-(3,8,12,16-tetramethyl-heptadeca-3,7,11,15-tetraenyl)-cyclohexanol
26	24.467	H1.	Caryophyllene oxide
		H2.	1H-Cyclopropa[3,4]benz[1,2-e]azulene-5,7b,9,9a-tetrol, 1a,1b,4,4a,5,7a,8,9-octahydro-3-(hydroxymethyl)-1,1,6,8-tetramethyl-, 5,9,9atriacetate, [1aR-(1aà,1bà,4aà,5à, 7aà,7bà,8à,9à,9aà)]-
27	24.487	Paromomycin	
28	24.507	Fluazinam	
29	24.817	10,13-Dioxatricyclo[7.3.1.0(4,9)]tridecan-5-ol-2-carboxylic acid, 4-methyl-11-(1-propenyl)-, methyl ester	
30	25.022	1-Dodecanol, 3,7,11-trimethyl-	
31	25.372	p-Menth-1-en-3-one, semicarbazone	
32	25.477	1-t-Butyl-2-(hydroxyphenylmethyl)aziridine-2-carbothioic acid, Sphenyl ester	
33	25.682	Fenretinide	
34	25.847	H1.	9,15-Octadecadienoic acid, methyl ester, (Z,Z)-
		H2.	9,15-Octadecadienoic acid, methyl ester
35	25.932	ç-Isosparteine	
36	28.243	H1.	1,3-Dioxocane, 2-pentadecyl-
		H2.	Heptadecane, 9-hexyl-
37	28.328	H1.	1-Heptatriacotanol
		H2.	Ethyl iso-allocholate
38	29.259	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	
39	29.789	H1.	Pregn-5-en-20-one, 3,8,12,14-tetrahydroxy-, (3à,12à,14à,17à)-
		H2.	Methyl 15-hydroxy-9,12-octadecadienoate
40	29.824	Cyclohexanone, 3-carbomethoxy-4-(2'-carbomethoxyvinyl)-4-hydroxy-,TMS derivative	

Instrument: Perkin Elmer Clarus Sq8c
Injection: 1 Micro Liter
Sample ID: B1 1110

Coloumn: DB-5 MS Capillary Standard Non Polarcoloumn
Dimension: 30Mts, ID: 0.25 mm, Film: 0.25 IM Carrier Gas: He

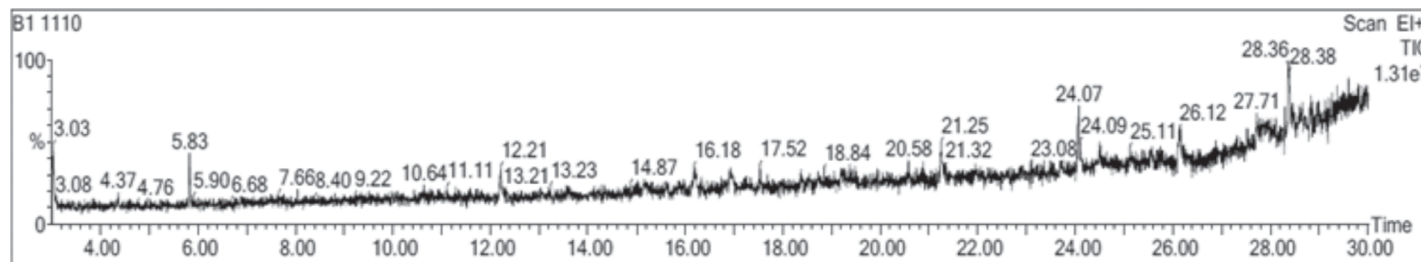


Table 7.1.3.7: Brahmastra 1; prepared from Native Breed cow urine (Kangeyam)

Peak #	Retention Time	Hit #	Compound Name
1	13.033	H1	p-Xylene (1)
		H2	p-Xylene (5)
2	5.830	H1	Octane, 3,5-dimethyl- (1)
		H2	Undecane (2)
3	12.212		Acetamide, N-(2-phenylethyl)-
4	16.179		(3E,10Z)-Oxacyclotrideca-3,10-diene-2,7-dione
5	16.924		2-Methoxy-6,10-dimethyl-dodeca-2E,6Z,10Z-trienoic acid, 12-acetoxy-, methyl ester
6	17.244		12-Hydroxy-14-methyl-oxa-cyclotetradec-6-en-2-one
7	18.369	H1	5-isopropyl-6,6-dimethylhept-3-yne-2,5-diol
		H2	2,3-Di(2,2-dimethylethyl)thiophene-1,1-dioxide
8	18.545		5 α -Androstan-16-one, cyclic ethylene mercaptole
9	21.246		Oleic Acid
10	22.861	H1	9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z,Z,Z)-
		H2	1,3,5-Cycloheptatriene, 2,4-bis(tetrahydropyranyloxymethyl)-7,7- dimethyl- (2)
11	22.921		Pseudo-sarsapogenin-5,20-dien
12	24.067		Phytol
13	24.492		9-Octadecenoic acid (Z)-, phenylmethyl ester
14	24.727		9-Hexadecenoic acid
15	25.567		1-Dodecanol, 3,7,11-trimethyl-
16	26.148		Benzoyllecgonine
17	26.263		12-Dimethylamino-10-oxododecanoic acid
18	26.298		Androst-4-en-9-thiocyanomethyl-11-ol-3,17-dione
19	27.288		7-Pentatriacontene
20	27.528		12-Hydroxyoctadecanethioic acid, S-t-butyl ester
21	27.573	H1	3-Isopropyl-6a,10b-dimethyl-8-(2-oxo-2-phenyl-ethyl)-dodecahydrobenzo[f]chromen-7-one
		H2	Ethyl 2-[(4-methylphenyl)amino]propanoate (2)
22	27.708		(2,14-Dioxocyclotetradecyl)acetic acid methyl ester
23	27.798	H1	2,6-Dimethylbenzaldehyde, thiosemicarbazone
		H2	4-Methoxycarbonylmethylundec-3-enedioic acid, dimethyl ester (2)
24	27.833		Digitoxin
25	27.913		α -Hydroxyquebrachamine
26	27.968		2-Myristinoyl pantetheine
27	28.018		Dodecane, 5,8-diethyl-
28	28.148	H1	Cyclohexane, 1,1'-dodecylidenebis[4-methyl-
		H2	5,6,7,8,9,10-Hexahydro-9-methyl-spiro[2H-1,3-benzoxazine-4,1'-cyclohexane]-2-thione (2)
29	28.243		cis-13-Eicosenoic acid
30	28.288		1,2-15,16-Diepoxyhexadecane
31	28.373		Scopolamine
32	28.443		α -Ethylether of 11-epi-dihydroartemisinin
33	28.493		Dasycarpidan-1-methanol, acetate (ester)
34	28.589		Glaufenin
35	28.654		Z,Z-4,16-Octadecadien-1-ol acetate

36	28.709	H1	1-Propanol, 3-(octadecyloxy)- 444
		H2	N-(5-Hydroxy-2-oxo-5-phenyl-1-aza-bicyclo [4.2.0]oct-3-yl)carbamic acid, benzyl ester (2)
		H3	Doconexent (3)
37	28.819	11,14-Eicosadienoic acid, methyl ester	
38	28.984	E-9-Tetradecenoic acid	
39	29.199	Cholestan-3-one, cyclic 1,2-ethanediyl aetal, (5á)-	
40	29.959	17a-Methyl-3á-methoxy-17a-aza-D-homoandrost-5-ene-17-one	

Instrument: Perkin Elmer Clarus Sq8c
Injection: 1 Micro Liter
Sample ID: B1 1110

Column: DB-5 MS Capillary Standard Non Polarcolumn
Dimension: 30Mts, ID: 0.25 mm, Film: 0.25 IM Carrier Gas: He

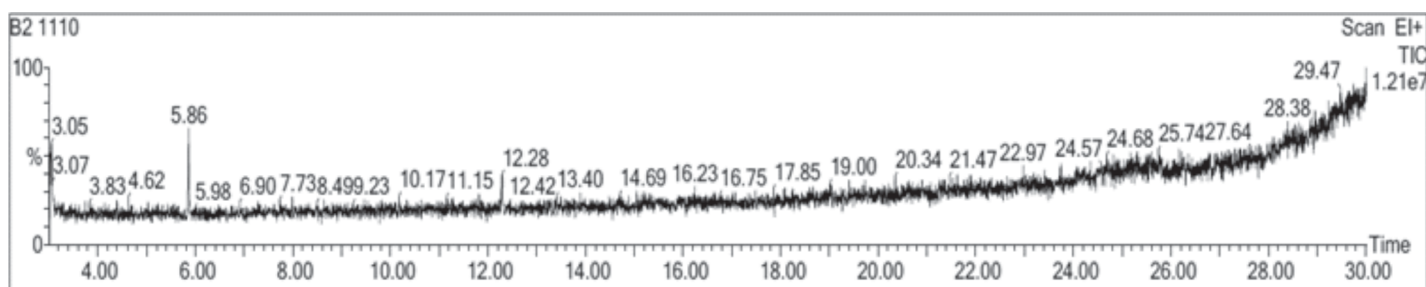


Table 7.1.3.8: Brahmastra 2; prepared from the cow urine of cross breed (Holstein Friesian)

Peak #	Retention Time	Hit #	Compound Name
1	3.053	p-Xylene	
2	3.133	5-[(2,4-Dinitrophenyl)hydrazono]pentan-2-ol	
3	3.168	3-Pentanol, 2,3-dimethyl-	
4	3.294	15-Hexenoic acid, 14-hydroxy-14-methyl-	
5	3.364	Benz[e]azulene-3,8-dione, 3a,4,6a,7,9,10,10a,10b-octahydro-3a,10adihydroxy-5-(hydroxymethyl)-7-(1-hydroxy-1-methylethyl)-2,10- dimethyl-, [3Ar (3aà,6aà,7à,10á,10á,10bá)]-	
6	3.419	7-Hydroxy-bicyclo[3.3.1]non-2-en-9-one	
7	3.454	(2R,3R,4aR,5S,8aS)-2-Hydroxy-4a,5-dimethyl-3-(prop-1-en-2-yl)octahydronaphthalen-1(2H)-one	
8	3.499	11,13-Dihydroxy-tetradec-5-ynoic acid, methyl ester	
9	3.544	H1	E-9-Tetradecenoic acid
		H2	Z-7-Tetradecenoic acid (2)
10	3.619	2-Myristynoyl pantetheine	
11	3.744	H1	Ppropionic acid, 3-(1-hydroxy-2-isopropyl-5-methylcyclohexyl)-
		H2	9,12,15-Octadecatrienoic acid, ethyl ester, (Z,Z,Z)- (2)
12	3.829	H1	Cyclopentane, 1-methyl-1-(2,2-dicyano-1-vinyl)-
		H2	8-Tetradecen-1-ol acetate (2)
13	3.889	Methadone	
14	4.014	6-Nonenal, 3,7-dimethyl-	
15	4.074	2(3H)-Benzofuranone, hexahydro-4,4,7a trimethyl-	



16	4.139	Pterin-6-carboxylic acid	
17	4.184	(Val671)-Amyloid á/A4 Protein Precursor770 (667-676)	
18	4.299	Glafein	
19	4.389	Pentane, 2,2-dimethyl-	
20	4.544	1-(1-Methoxycyclopropyl)-3-methylbut-2-en-1-ol	
21	4.884	2H-Oxecin-2-one, 3,4,7,8,9,10-hexahydro-4-hydroxy-10-methyl-, [4S-(4R*,5E,10S*)]-	
22	5.024	Prosta-5,8(12),13-trien-1-oic acid, 15-hydroxy-9-oxo-, methyl ester, (5Z,13E,15S)-	
23	5.434	3,6,3'-Trihydroxyflavone	
24	5.865	Undecane	
25	12.282	Butylated Hydroxytoluene	
26	24.177	1-Propyl-3,6-diazahomoadamantan-9-ol	
27	24.237	H1	8-(2-Octylcyclopropyl)-8-oxooctanoic acid, methyl ester
		H2	E-2-Methyl-3-tetradecen-1-ol acetate (2)
28	24.507	H1	3à,4à,9á,11-Diepoxyuurolan-10-ol
		H2	1,25-Dihydroxyvitamin D3, TMS derivative
29	24.572	Tertbutyloxyformamide, N-methyl-N-[4-(1-pyrrolidinyl)-2-butylnyl]-	
30	24.762	7-Hydroxy-6,9a-dimethyl-3-methylene-decahydro-azuleno[4,5-b]furan- 2,9-dione	
31	25.282	5H-Cyclopropa[3,4]benz[1,2-e]azulen-5-one, 9,9a-bis(acetyloxy)-3-[(acetyloxy)methyl]-1,1a,1b,2,3,4,4a,7a,7b,8,9,9a-dodecahydro-2,3,4a,7b-tetrahydroxy-1,1,6,8-tetramethyl-, [1ar-(1aà,1bà,2à, 3à,4aà,7aà,7bà, 8à,9à,9aà)]-	
32	25.347	5,6,7,3',4'-Pentamethoxyflavone	
33	25.562	Cholestan-3-ol, 2-methylene-, (3à,5à)-	
34	25.772	Doconexent, TBDMS derivative	
35	26.213	Butanamide, N-[1-cyclopentyl-2,5-dioxo-4-(trifluoromethyl)-4- imidazolidinyl]-3-methyl-	
36	26.273	Corynan-17-ol, 18,19-didehydro-10-methoxy-, acetate (ester)	
37	27.098	7-Isopropylidene-5-methyl-2,3 diazabicyclo[2.2.1]hept-5-ene-2,3-dicarboxylic acid, diethyl ester	
38	27.318	6-Octadecenoic acid	
39	28.949	N-[2-[1-Piperazyl]ethyl]-N'-[2-thiophosphatoethyl]-1,3-propanamine	
40	29.469	Hexadecanoic acid, 2-phenyl-1,3-dioxan-5-yl ester, cis-	

Instrument: Perkin Elmer Clarus Sq8c
Injection: 1 Micro Liter
Sample ID: B3 1110

Column: DB-5 MS Capillary Standard Non Polarcolumn
Dimension: 30Mts, ID: 0.25 mm, Film: 0.25 IM Carrier Gas: He

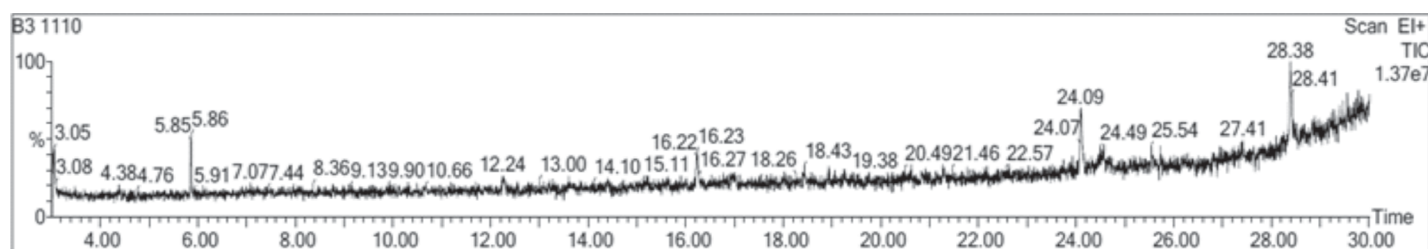


Table 7.1.3.9: Brahmastra 3; prepared from the cow urine of Kangeyam + HF breed

Peak #	Retention Time	Hit #	Name of the Compound
1	3.053	H1	p-Xylene
		H2	Benzene, 1,3-dimethyl- (2)
2	3.178		2,4-Dodecadialenal
3	3.203		á-Amyloid (12-28)
4	3.283	H1	Succinic acid, 8-chlorooctyl 2-methoxyethyl ester
		H2	4-Dodecanol, acetate (2)
5	3.329		Resodiacetophenone
6	3.449		cis-9-Tetradecenoic acid, isobutyl ester
			Trans-Carveol (2)
7	3.524	H1	1-(4-Amino-furazan-3-yl)-5-pyrrolidin-1-ylmethyl-1H-[1,2,3]triazole-4-carboxylic acid hydrazide
		H2	9-Octadecenoic acid, 12-hydroxy-, methyl ester, (Z)-
8	3.574	H1	trans-2-Decenoic acid
		H2	2-Oxonanone
9	3.604		Propionamide, 3-methoxycarbonyl-N-methyl-N-[4-(1-pyrrolidiny)-2- butynyl
10	3.679		PI3-Kinase à Inhibitor 2 408 518
11	3.724		13-Heptadecyn-1-ol
12	4.119		Cyclohexanecarboxylic acid, dodec-9-ynyl ester
13	4.379		Tetradecane, 2,6,10-trimethyl-
14	5.865		Decane, 3,4-dimethyl-
15	12.252		3-Isopropyl-6a,10b-dimethyl-8-phenethylidodecahydrobenzo[f]chromen- 7-one
16	13.267	H1	7-Hydroxy-6,9a-dimethyl-3-methylene-decahydro-azuleno[4,5-b]furan- 2,9-dione
		H2	6-Aminocaproic acid (2)
17	14.398		5-Chloropentanoic acid, 2-tetrahydrofurylmethyl ester
18	16.229		2,2-Dimethyl-N-phenethylpropionamide
19	20.820		Pregn-5-ene-3,8,11,12,14,20-hexol,(3á,11à,12á,14á,20R)-
20	24.097	H1	Undec-10-ynoic acid, dodecyl ester
		H2	Phytol
21	24.567		2-Hydroxy-1,1,10-trimethyl-6,9-epidioxydecalin
22	25.082	H1	14-Octadecenal
		H2	11,14-Eicosadienoic acid, methyl ester (2)
23	25.482		1-Hexadecanol, 2-methyl-
24	25.537		3-Anilino-3-(3-but-2-oxyphenyl) propanenitrile
25	25.597		2'-Hydroxy-2,4,4',5-tetramethoxychalcone
26	26.803		Tetradecanoic acid, 2-phenyl-1,3-dioxan-5-yl ester
27	27.183		Muscone



28	27.318	i-Propyl 11,12-methylene-octadecanoate	
29	27.383	6-Ethoxy-9-thia-bicyclo[3.3.1]non-2-ene	
30	27.443	Cyclohexane, 1,4-dimethyl-2-octadecyl-	
31	27.663	4-Methyldocosane	
32	27.808	6,9,12-Octadecatrienoic acid, methyl ester	
33	28.248	H1	Cyclohexane, 1,3,5-trimethyl-2-octadecyl-
		H2	2-Dodecen-1-yl(-)succinic anhydride
34	28.384	Scopolamine	
35	28.469	Glafenin	
36	29.399	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	
37	29.469	5H-Cyclopropa(3,4)benz(1,2-e)azulen-5-one, 1,1a-à,1b-à,4,4a,7a-à,7b, 8,9,9a-decahydro-4a-à, 7b-à,9a-à-trihydroxy-3-(hydroxymethyl)-1,1,6, 8-à-tetramethyl-, 9a-isobutyrate	
38	29.549	à-N-Normethadol	
39	29.779	12-Hydroxyoctadecanethioic acid, S-t-butyl ester	
40	29.839	Acetamide, N-[2-(3-ethyl-1-methyl-9H-carbazol-2-yl) ethyl]-N-methyl-	

Highlights

Profiling of bio-chemical compounds in the natural farming inputs was carried out using GCMS-MS (Perkin Elmer Claris SQ8C, TNAU, Coimbatore). The bio-inputs like neemastra and brahmastra were prepared using the cow dung and cow urine collected from native breed (Kangayam), cross-bred

(HF) and from both native and cross breed. The data were analysed and highlighted in Table 49 to 54.

Neemastra and Brahmastra prepared from the cow dung and cow urine of native breed (Kangayam) recorded improved level of bio-pesticidal compounds compared to the one prepared from the cross- breed (HF) and mix of native and cross breed.

Table 7.1.3.10: Microbial population in different natural farming inputs

Microorganisms	Neemastra (48 Hours after preparation)			Brahmastra (48 Hours after preparation)		
	Native bred (Kangayam)	Cross breed (Holstein Friesian)	Mix of native and cross breed (50 % native + 50 % HF)	Native bred (Kangayam)	Cross breed (Holstein Friesian)	Mix of native and cross breed (50 % native + 50 % HF)
Bacteria (10 ⁷)	24.0	18.0	21.0	6.0	3.0	4.5
Fungi (10 ³)	11.5	5.0	8.5	-	-	-
Actinomycetes (10 ²)	3.0	1.0	1.5	-	-	-

Table 7.1.3.11: Nutrient content in different natural farming inputs

Name of the input	Organic carbon (%)	N (%)	P (%)	K (%)
Neemastra 1 (NB)	0.59	0.016	0.20	0.07
Neemastra 2 (CB)	1.770.	0.25	0.25	0.13
Neemastra 3 (Mix)	2.87	0.022	0.31	0.09
Brahmastra 1 (NB)	0.27	0.070	0.34	0.87
Brahmastra 2 (CB)	0.37	0.065	0.25	0.79
Brahmastra 3 (Mix)	0.52	0.093	0.27	0.77

NB - Native breed; CB - Cross breed; Mix - Mix of NB and CB



- Neemastra and Brahmastra prepared from the cow dung and cow urine of native breed (Kangeyam) recorded the maximum population of bacteria compared to the one prepared from the cross breed (HF) and mix of native and cross breed. While, the population of fungi and actinomycetes recorded to be higher in neemastra prepared from native breed cow dung and cow urine and nil in the brahmastra.
- Organic carbon content recorded to be the maximum of 2.87% in Neemastra 3, prepared using the cow dung and cow urine of both native and cross breed, as against the lowest organic carbon content of 0.59% in Neemastra

1 prepared from cow dung and cow urine of native breed (Kangeyam). Similar trend recorded with respect to Brahmastra also with the highest organic carbon content of 0.52% in Brahmastra 3 as against the lowest content of 0.27% in Brahmastra 1.

- Regarding N content, the maximum of 0.025% and 0.093% N recorded in Neemastra 2 and Brahmastra 3, respectively. P content recorded to be the maximum of 0.31% in Neemastra 3 and 0.34% in Brahmastra 1. K content recorded to be the maximum 0.13% in Neemastra 2 and 0.87% in Brahmastra 1.

Ludhiana

Source of ingredient	Material	NF inputs to be prepared
Native breed (NB) cow	Urine and dung (NB)	• Beejamrit= 3 types • Ghanjeevamrit = 3 types • Jeevamrit= 3 types
Holstein Friesian (HF) cow	Urine and dung (HF)	
NB + HF cow	Mixed urine and dung of native and HF breeds (50% of each)	
Characterization: 9 treatments × 3 replications = 27 samples		

Characterization of inputs (Jeevamrit, Ghanjeevamrit and Beejamrit)

Methodology: The NF inputs namely Jeevamrit, Ghanjeevamrit, and Beejamrit were prepared at the research farm of School of Organic Farming and brought to laboratory for its chemical, biochemical and microbial characterization. These inputs were prepared using dung and urine of native breeds and HF cows.

Results

Jeevamrit (Table 7.1.3.12-14)

Microbial properties: In general, population of bacteria was more in NF inputs prepared from HF cow. In *jeevamrit*, bacterial and fungi population was highest under HF treatment after two days of preparation. There was 26.2 – 41.9 per cent increase in bacterial population and 42.8 – 71.4 per cent decrease in fungi population at two days after preparation than first day. There was 50% decrease in actinomycetes population 2 days after preparation than first day in *jeevamrit*, which is prepared from

urine and dung of NB cow and NB+HF cows. There were no variation in actinomycetes count in *jivamrit* prepared from urine and dung of HF cow.

Chemical properties: In general, pH and EC was higher in input *jeevamrit* prepared from HF cow. Organic carbon was maximum (0.40%) in *jeevamrit* prepared from dung and urine of NB & HF cow after 24 hours of preparation. Available nitrogen (0.04 %) was higher in *jeevamrit* prepared from NB + HF at 96 hours after preparation however available phosphorous (0.019 %) at 24 hours of preparation. Available K (0.02%) was higher in *jeevamrit* prepared from HF cow 24 hours after preparation.

Biochemical properties: In general, carbohydrates and total soluble protein were higher in the input *jeevamrit* at 0 hours after preparation of input across the breed. However, free fatty acids was higher at 96 hour of preparation input prepared by NB, HF and NB+HF cows.



Table 7.1.3.12: Population of different microbes in Jeevamrit during first and second day after preparation

Treatment	Days after preparation	Microbial populations (CFU)/g		
		Bacteria (10 ⁵)	Fungi (10 ⁴)	Actinomycetes (10 ³)
Desi cow	1	136	7	2
	2	193	2	1
HF cow	1	142	7	1
	2	194	4	1

CFU stands for colony forming units

Table 7.1.3.13: Chemical characterization of Jeevamrit at different time intervals

Treatments	Hours after preparation	pH (1:10)	EC (dSm ⁻¹)	OC (%)	Available N (%)	Available P (%)	Available K (%)
Desi cow (NB)	24	7.85	0.23	0.38	0.011	0.019	0.009
	48	7.42	0.35	0.32	0.016	0.008	0.004
	96	7.15	0.45	0.28	0.0009	0.0007	0.0009
HF cow	24	8.45	0.15	0.36	0.0063	0.016	0.020
	48	8.21	0.38	0.20	0.009	0.007	0.002
	96	8.17	0.46	0.17	0.0005	0.0005	0.0007
NB + HF	24	7.77	0.18	0.40	0.010	0.019	0.008
	48	7.63	0.33	0.27	0.0011	0.009	0.007
	96	7.84	0.46	0.20	0.038	0.0008	0.0007

Table 7.1.3.14: Biochemical characterization of jeevamrit at 0, 48 and 96 hours after preparation

Treatments	Carbohydrate (%)			Total soluble protein (%)			Free fatty acid (%)		
	0 hrs	48 hrs	96 hrs	0 hrs	48 hrs	96 hrs	0 hrs	48 hrs	96 hrs
Desi cow	2.2	1.9	1.1	1.8	1.4	0.9	0.4	1.3	2.3
HF cow	3.5	2.4	1.6	1.5	1.1	0.8	0.3	1.8	2.1
Desi + HF cow	3.5	1.9	1.2	1.6	1.3	0.9	0.3	1.7	2.3

Ghanjeevamrit (Table 7.1.3.15-17)

Microbial properties: Among the breeds, In general, population of bacteria was maximum in NF+HF. In ghanjeevamrit, fungi and actinomycetes population was highest under HF cow input after one and two days of preparation. Bacteria count was increase after day of preparation on second day in all the breedshower, count of fungi and actinomycetes was higher at first day after preparation.

Chemical properties: In general, pH was higher in ghanjeevamrit prepared by desi cow (NB). EC recorded higher input prepared by desi+HF breed, however OC was more in ghanjeevamrit prepared from HF breed. Available nitrogen (0.18%) and K (0.07%) was higher in ghanjeevamrit prepared from

NB cow 24 and 48 hours after preparation respectively. Whereas available phosphorous (0.21%) was higher in ghanjeevamrit prepared from NB + HF cow at 24 hours after preparation.

Biochemical properties: In biochemical characters, carbohydrates and total soluble protein recorded higher at 0 hours which was gradually decrease at 48 and 96 hours whereas, in case of free fatty acids it was observed that these were gradually increased over the period of 48 and 96 hours. Value of carbohydrates and total soluble protein acids were higher in ghanjeevamrit prepared from NB + HF cow at the time of preparation 0 hours however, free fatty acids was more at 96 hours in NB+HF breed

Table 7.1.3.15: Population of different microbes in Ghanjeevamrit during first and second day after preparation.

Treatment	Days after preparation	Microbial populations (CFU)/g		
		Bacteria (10 ⁵)	Fungi (10 ⁴)	Actinomycetes (10 ³)
Desi cow (NF)	1	42	2.5	1.5
	2	56	1.2	1.0
HF cow	1	52	3.0	2.0
	2	66	2.0	1.0
HF + HF cow	1	54	2.2	1.0
	2	72	1.2	1.0

CFU stands for colony forming units

Table 7.1.3.16: Chemical characterization of Ghanjeevamrit at different time intervals

Treatments	Hours after preparation	pH (1:10)	EC (dSm ⁻¹)	OC (%)	Available N (%)	Available P (%)	Available K (%)
Desi cow	24	6.85	2.17	7.6	0.18	0.16	0.008
	48	7.11	2.34	7.4	0.025	0.08	0.07
	96	7.05	2.30	7.4	0.002	0.002	0.001
HF cow	24	6.35	2.23	7.6	0.007	0.16	0.008
	48	6.43	2.41	7.6	0.015	0.04	0.04
	96	6.47	2.53	7.4	0.001	0.002	0.004
Desi+ HF cow	24	6.76	2.76	7.3	0.009	0.21	0.08
	48	6.65	2.62	7.1	0.028	0.04	0.05
	96	6.52	2.72	7.2	0.002	0.001	0.009

Table 7.1.3.17: Biochemical characterization of Ghanjeevamrit at 0, 48 and 96 hours after preparation

Treatments	Carbohydrate (%)			Total soluble protein (%)			Free fatty acid (%)		
	0 hrs	48 hrs	96 hrs	0 hrs	48 hrs	96 hrs	0 hrs	48 hrs	96 hrs
Desi cow	12.3	10.5	8.8	13.6	9.7	6.8	1.57	3.22	4.67
HF cow	11.6	9.7	7.7	15.9	13.2	9.6	1.93	4.15	5.72
Desi + HF cow	15.8	10.2	6.8	16.4	10.8	9.3	2.45	4.76	6.05

Beejamrit (7.1.3.18-20)

Microbial analysis: Microbial population of bacteria, fungi and actinomycetes was more in *beejamrit* prepared from dung and urine of desi + HF cow. In *beejamrit*, bacterial population was highest under NB + HF treatment after two days of preparation whereas, fungi and actinomycetes recorded higher after one day of preparation. There was 11.8 to 26.8% increase in bacterial population 2 days after preparation than first day. Whereas, decrease in fungi and actinomycetes population varies from 25 to 54.5% and 28.6 to 40% respectively,

two days after preparation than first day.

Chemical analysis: In general, pH was more in *beejamrit* prepared from dung and urine of native breed (desi cow) range from 6.55 to 6.73 lowest at 96 hours. EC was more in NB + HF cow dung and urine range from 2.29 to 2.65, which gradually decreased at from 48 hours to 96 hours. Organic carbon content was more in *beejamrit* prepared from dung and urine of native breed, which was recorded maximum at 96 hours. Available Nitrogen (0.16%) was higher in *beejamrit* prepared from native breed cow at 24 hours after preparation whereas available



Phosphorous (0.14 %) and available Potassium were higher in inputs prepared from NB + HF cow at 24 & 48 hours after preparation respectively.

Biochemical analysis: In biochemical characters, carbohydrates and total soluble protein recorded higher at 0 hours which was gradually decrease at 48 and 96 hours whereas, in case of free fatty acids it was

observed that these were gradually increased over the period of 48 and 96 hours. Value of carbohydrates and total soluble protein acids were higher in ghanjeevamrit prepared from NB + HF cow at the time of preparation 0 hours among breeds. However, free fatty acids was maximum at 96 hours from preparation of input prepared by cow and dung of native breed (desi cow).

Table 7.1.3.18: Population of different microbes in Beejamrit during first and second day after preparation

Treatment	Days after preparation	Microbial populations (CFU)/g		
		Bacteria (10 ⁵)	Fungi (10 ⁴)	Actinomycetes (10 ³)
Desi cow	1	34	2.0	2.1
	2	38	1.5	1.5
HF cow	1	41	2.0	2.0
	2	52	1.0	1.2

CFU stands for colony forming units

Table 7.1.3.19: Chemical characterization of Beejamrit at different time intervals

Treatments	Hours after preparation	pH (1:10)	EC (dSm ⁻¹)	OC (%)	Available N (%)	Available P (%)	Available K (%)
Desi cow	24	6.73	2.32	7.4	0.16	0.012	0.007
	48	6.61	2.15	7.2	0.035	0.010	0.06
	96	6.55	2.05	7.7	0.0012	0.009	0.0008
HF cow	24	6.25	2.47	7.4	0.008	0.10	0.009
	48	6.13	2.34	7.6	0.012	0.014	0.046
	96	5.76	2.45	7.2	0.0008	0.0012	0.008
Desi+ HF cow	24	6.20	2.68	7.2	0.0075	0.14	0.009
	48	6.12	2.56	7.1	0.017	0.01	0.07
	96	6.16	2.29	7.1	0.0010	0.0012	0.005

Table 7.1.3.20: Biochemical characterization of Beejamrit at 0, 48 and 96 hours after preparation

Treatments	Carbohydrate (%)			Total soluble protein (%)			Free fatty acid (%)		
	0 hrs	48 hrs	96 hrs	0 hrs	48 hrs	96 hrs	0 hrs	48 hrs	96 hrs
Desi cow	12.8	10.5	8.67	9.5	9.4	6.3	1.47	3.86	4.23
HF cow	11.12	9.87	7.8	14.8	9.2	8.8	2.12	3.78	3.76
Desi + HF cow	17.23	10.56	5.65	15.1	10.7	8.3	1.73	2.95	3.68

Udaipur

Table 7.1.3.16: Bio-chemical characterization of Jeevamrit, ghanjeevamrit and beejamrit at Udaipur

Parameters	pH	EC (dS/m)	N (%)	P (%)	K (%)	Bacterial count (cfu/ml)	Fungal count (cfu/ml)	Actinomycetes count (cfu/ml)	Acid phosphatase (µg/ml)	Alkaline phosphatase (µg/ml)	Dehydrogenase (TPF µg/ml)
Jeevamrit	3.90-4.10	1.60-1.76	1.84-1.97	0.190-0.201	0.200-0.291	5.30 x 10 ⁸ -7.25 x 10 ⁸	4.15 x 10 ⁴ -5.85 x 10 ⁴	2.35 x 10 ⁵ -3.70 x 10 ⁵	0.74-1.25	0.87-3.79	0.94-4.47
Ghanjeevamrit	5.35-5.50	0.75-0.90	2.20-2.50	0.300-0.330	0.360-0.395	27.8 x 10 ⁸ -30.5 x 10 ⁸	4.50 x 10 ⁴ -6.50 x 10 ⁴	3.25 x 10 ⁵ -5.0 x 10 ⁵	80.23-84.66	11.47-15.42	117.11-121.63
Beejamrit	8.20-8.25	5.50-5.60	2.38-2.42	0.127-0.132	0.485-0.492	4.32 x 10 ⁸ -5.44 x 10 ⁸	0.61 X 10 ⁵ -0.84 X 10 ⁵	0.53 X 10 ⁵ -0.71 X 10 ⁵	0.84-3.79	1.97-4.33	0.09-3.97



7.2.1: Evaluation of organic, inorganic and towards organic (Integrated) production systems for crops and cropping systems

Objectives

The experiment was conducted at all the 20 locations with the following objectives.

- To study the impact of organic, conventional and integrated management practices on crop productivity and soil health
- To study the impact of various management practices on microbial population of soil and economics

Year of start: The experiment was originally planned during 2004-05. However, the year of start varied with the centres depending upon the establishment of infrastructure for conducting the experiments. All

the centres started the experiment during 2004-05 except Modipuram and Umiam where it was started during 2005-06. From 2015-16, 7 new centres were included and start the experiment namely Ajmer, Almora, Narendrapur, Sardarkrushinagar, Gangtok, Thiruvananthapuram and Udaipur.

Treatments: The experiment was conducted in strip plot design as un-replicated trial. However, Karjat and Umiam centre have conducted the experiment with three replications in split plot design. The experiment stands modified by dividing the organic, inorganic and integrated plots divided into two for each cropping systems.

The treatments imposed in main plots are given below.

Main plot	Organic management	100% organic (Organic manures equivalent to 100 % N requirement of the system)
		Organic [Supply of only 50% nutrients through organic sources + seed/seedling treatment with Beejamrit + application of Ghanjeevamrit @ 250kg/ha, Jeevamrit @ 500 litres /ha /time twice a month with irrigation water and complete organic management as per NPOP]
	Inorganic management (Chemical)	100 % inorganic package (No organic manures)
		State recommendation or farmers package (Choice to centres)
	Integrated management	50% organic + 50% inorganic source of nutrients management
		Towards Organic (ICM): 25% nutrients through organic +25% nutrients through inorganic source of nutrients + seed/seedling treatment with Beejamrit + application of Ghanjeevamrit @ 250 kg/ha, Jeevamrit @ 500 litres/ha /time twice a month with irrigation water
Sub plot	Cropping Systems	Location specific cropping system 1
		Location specific cropping system 2
		Location specific cropping system 3
		Location specific cropping system 4

The cropping system was selected, as per suitability for the location and was assigned into the sub plots. The number of cropping systems ranged from 3 (Calicut, Coimbatore and SK Nagar) to as high as 5 (Dharwad) in various centres. The details of

cropping systems are given in tables along with experimental results. Nutrient package for the organic and integrated management packages were formulated based on recommended nitrogen dose of each system.



Locations: The experiment was conducted in five eco-systems as mentioned below. These locations represent the different ecological regions of Agro-ecological zone.

Eco-system	Locations (State)	Eco-system	Locations (State)
Arid	Ajmer (Rajasthan)	Humid	Bajaura (Himachal Pradesh)
	Dharwad (Karnataka)		Pantnagar (Uttarakhand)
Semi-arid	SardarKrushinagar (Gujrat)		Narendrapur (west Bengal)
	Bhopal (Madhya Pradesh)		Umiam (Meghalaya)
	Coimbatore (Tamil Nadu)	Coastal	Calicut (Kerala)
	Ludhiana (Punjab)		Karjat (Maharashtra)
	Modipuram (Uttar Pradesh)		Thiruvananthapuram (Kerala)
	Udaipur (Rajasthan)		
Sub-humid	Almora (Uttarakhand)		
	Gangtok (Sikkim)		
	Jabalpur (Madhya Pradesh)		
	Raipur (Chhattisgarh)		
	Ranchi (Jharkhand)		

The details of inputs used for organic nutrient management and their nutrient content at various locations are given below.

Source of nutrient inputs and their NPK content at various locations

Centre	Nutrient Sources	NPK contents on dry weight basis (%)		
		N	P	K
Bajaura	Vermi-compost	0.90	0.20	0.75
	FYM	0.98	0.25	0.90
	Urea	46.0	-	-
	SSP	-	16.0	-
	MOP	-	-	58.0
	Rock phosphate	-	34.0	-
Bhopal	Vermi-compost	1.14	0.72	0.68
	Neem cake	1.50	0.92	1.04
	Sesbaniastrata	2.90	0.7	1.54
Calicut	Farm Yard Manure	0.75	1.0	0.55
	Neem cake	1.50	0.36	1.51
	Ash	-	0.20	6.3
	Vermi-compost	0.76	0.88	0.65
	Green leaf manure	2.02	0.16	1.10
	Rajphos	-	18.5	-
	Urea	46	-	-
	MOP	-	-	58
Coimbatore	Vermi-compost	-	-	-
	Neem cake	-	-	-
	Sesbaniastrata	-	-	-

Dharwad	Enriched compost	0.70	0.40	0.80
	Vermi-compost	1.00	0.86	0.98
	Farm yard manure	0.50	.025	0.49
	Glyricidia(Green leaf manure	0.50	0.32	1.15
Jabalpur	Green manure (Sun hemp)	0.66	0.13	0.50
	FYM	0.54	0.20	0.26
	Vermi-compost	1.6	0.75	1.00
	Neem Oil Cake	5.2	1.10	1.50
	Urea	46	-	-
	SSP	-	16	-
	MOP	-	-	60
Karjat	F.Y.M.	0.50	0.25	0.50
	Neem cake	5.20	1.00	1.40
	Vermi-compost	1.50	1.00	1.50
	Glyricidia green leaves	2.74	0.50	1.15
	Paddy straw	0.61	0.16	1.14
Ludhiana	Urea	46.0	-	-
	DAP	18.0	46.0	-
	MOP	-	-	60.0
Modipuram	FYM	0.51	0.30	0.65
	VC	1.28	0.47	1.39
	Sesbania	2.25	0.41	3.01
	Urea	46.0	-	-
	DAP	18.0	46.0	-
	MOP	-	-	60.0
Raipur	Enriched compost	0.40	0.36	0.56
	Cow dung manure	0.57	0.39	0.72
	NEOC–Non edible oil cake	3.2	0.72	1.59
	Rock phosphate		22	
Ranchi	FYM	0.50	0.30	0.50
	Vermi compost	1.2	0.45	1.4
	Karanj cake	4.0	1.0	1.0
	Urea	46.0		
	SSP		16.0	
	MOP			60.0
Umiam	F.Y.M.	0.72	0.29	0.61
	Vermicompost	1.50	0.62	1.00
	Rock phosphate	-	18.00	-
	Tephrosiaspp	3.31	0.44	1.46
Narendrapur	Vermicompost	1.5	1.0	0.5
	Sashyagavya	1.0	0.015	0.125
	Panchagavya	1.8	0.23	0.44
	Kunapajala	2.34	1.23	1.12



Sardar Krushinagar	-	-	-	-
Thiruvananthapuram	Green manure cowpea	2.80	0.52	2.02
	FYM	1.28	0.50	0.28
	Neem cake	0.95	0.29	0.59
	Vermi compost	0.97	0.42	0.45
	Ash	1.40	0.29	4.65
	Panchagavya	0.22	0.061	0.40
	Vermi wash	0.02	0.004	0.20
Udaipur	Vermicompost	1.114	0.278	0.317
	Neem Cake	5.091	1.135	1.397
	NADEP Compost	1.04	0.382	1.071
	Enriched Compost	1.361	0.472	0.973
	FYM	0.502	0.248	0.507

Results

Studies on comparative efficiency of organic, inorganic and towards organic (integrated) management practices on crop productivity and system equivalent yield of different cropping systems (Table 7.2.1.1-7.2.1.2)

Bajaura: The vegetable crops under 04 cropping systems, namely, French bean-cauliflower-french bean, Fallow-cauliflower-tomato, Black gram-cauliflower-summer squash, and Okra-pea, were evaluated. Typically, the Inorganic-II tends to give a better yield for all the cropping systems followed by towards organic-I. Under the Organic-I the yields for these cropping systems for the Rabi season were 12170 kg/ha, 9560 kg/ha, 9520 kg/ha, and 5760 kg/ha, respectively. For the same period, the Inorganic-II management yields were 22.51%, 48.33%, 59.87%, and 55.56% higher, while Towards Organic-I also showed positive yields as well with increases of 14.71%, 20.82%, 46.64%, and 28.99% for the aforementioned cropping systems when compared to the Organic-I. The SEY for the Organic-I was observed at 35401 kg/ha, 46610 kg/ha, 30430 kg/ha, and 17720 kg/ha for the considered cropping systems. For the Inorganic-II management, the SEY was 4.40% lower, and 29.09%, 32.76% & 27.65% higher, while for the Towards Organic-I practice, it was 11.48% lower, and 15.53%, 24.54%, and 15.33%

higher than the Organic-I management.

Bhopal: Four cropping systems, namely, Soybean-wheat (durum), Soybean-mustard, Soybean-chickpea, and Soybean-linseed, were evaluated. Typically, Inorganic-II management yields lower results for all cropping systems when compared to Organic-I, while Towards Organic-I tends to provide better outcomes. Under Organic-I management during the Rabi season, the yields for these cropping systems were 3194 kg/ha, 1079 kg/ha, 1247 kg/ha, and 1607 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -2.88%, -3.99%, -2.65%, and -5.66%, respectively, while Towards Organic-I management displayed yield increases of 3.94%, 4.63%, 10.51%, and 3.92% over Organic-I. The SEY for Organic-I was recorded at 2173 kg/ha, 1997 kg/ha, 2251 kg/ha, and 2686 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -4.14%, -4.96%, -3.95%, and -5.88% respectively, indicating a consistent decrease across all systems. Meanwhile, Towards Organic-I management showed SEY

increases of 5.71%, 6.31%, 10.04%, and 5.36% for each system, respectively.

Calicut: One cropping system, namely, Turmeric-fallow, was evaluated for the Kharif season. Typically, Towards Organic-I management yields the best results, followed by Organic-II. Under Organic-I management, the yield for this cropping system was 17100 kg/ha. In comparison, Organic-II management showed a yield increase of 19.88%, while Inorganic-I management displayed a yield increase of 5.85%. Towards Organic-I management resulted in a significant yield increase of 36.84%, and Towards Organic-II management showed a yield increase of 19.88% over Organic-I. No data were available for Inorganic-II management in this cropping system.

Coimbatore: Three cropping systems, namely, brinjal-pearl millet-green manure (dhaincha), Chillies-barnyard millet-green manure (dhaincha), and Tomato-finger millet-green manure (dhaincha), were evaluated. Typically, Inorganic-II management yields the best results for all cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 19625 kg/ha, 14381 kg/ha, and 18358 kg/ha, respectively. In comparison, Inorganic-II management showed yield increases of 19.06%, 19.50%, and 29.76%, respectively, while Towards Organic-I management displayed yield increases of 6.02%, 0.99%, and 8.11% over Organic-I. The SEY for Organic-I was recorded at 23921 kg/ha, 23647 kg/ha, and 18358 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 20.44%, 17.21%, and 29.76%, respectively. Meanwhile, Towards Organic-I management showed SEY increases of 8.00%, 0.99%, and 8.11% for each system, respectively.

Dharwad: Five cropping systems, namely, pigeonpea + green gram, pigeonpea + soybean, pigeonpea + groundnut, Cotton + green gram, and Cotton + soybean, were evaluated. Typically,

Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the kharif season, the yields for these cropping systems were 646 kg/ha, 1783 kg/ha, 1071 kg/ha, 531 kg/ha, and 1464 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of -1.55%, 6.73%, -0.19%, 5.46%, and 5.40%, respectively, while Towards Organic-I management showed yield changes of -8.98%, 0.79%, -2.52%, -0.56%, and -2.32% over Organic-I. The SEY for Organic-I was recorded at 646 kg/ha, 1783 kg/ha, 1071 kg/ha, 531 kg/ha, and 1464 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -1.55%, 6.73%, -0.19%, 5.46%, and 5.40%, respectively. Meanwhile, Towards Organic-I management showed SEY decreases of -8.98%, 0.79%, -2.52%, -0.56%, and -2.32% for each system, respectively.

Jabalpur: Four cropping systems, namely, Soybean-wheat, Soybean-mustard-green gram, Soybean-berseem (fodder and seed), and Soybean-lentil-sorghum (fodder), were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 965 kg/ha, 1200 kg/ha, 1400 kg/ha, and 909 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -28.50%, -32.50%, -33.57%, and -15.29%, respectively, while Towards Organic-I management displayed yield changes of -5.08%, -31.17%, -21.43%, and -5.28% over Organic-I. The SEY for Organic-I was recorded at 1996 kg/ha, 2231 kg/ha, 3902 kg/ha, and 1711 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -18.49%, -3.54%, -25.40%, and -22.56%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -5.26%, 4.80%, -13.35%, and -21.04% for each system, respectively.

Karjat: Four cropping systems, namely, rice-brinjal,



rice-chickpea, rice-field bean, and rice-onion (white), were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 3570 kg/ha, 2855 kg/ha, 3150 kg/ha, and 3313 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -16.47%, -5.11%, -10.92%, and -10.08%, respectively, while Towards Organic-I management displayed yield increases of 0.25%, 7.25%, 2.83%, and 3.77% over Organic-I. The SEY for Organic-I was recorded at 31739 kg/ha, 11118 kg/ha, 11606 kg/ha, and 31771 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -44.46%, -36.03%, -34.47%, and -45.51%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -17.45%, -20.28%, -19.02%, and -16.64% for each system, respectively.

Ludhiana: Four cropping systems, namely, Basmati rice-chickpea-green manure, Basmati rice-wheat-green manure, Kharif moong-wheat-summer moong, and Sesame-lentil, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 3760 kg/ha, 3750 kg/ha, 560 kg/ha, and 600 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of 4.26%, 4.00%, -14.29%, and -23.33%, respectively, while Towards Organic-I management displayed yield changes of 5.59%, 3.47%, 1.79%, and -1.67% over Organic-I. The SEY for Organic-I was recorded at 10300 kg/ha, 11100 kg/ha, 10100 kg/ha, and 5900 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 0.97%, 6.31%, 5.94%, and 11.86%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -10.68%, 9.01%, -6.93%, and 6.78% for each system, respectively.

Modipuram: Four cropping systems, namely, Black rice-lentil-vegetable cowpea, Finger millet-barley-Sesbania rostrata green manure, Okra-vegetable pea-Sesbania aculeata green manure, and Black gram-tomato-sun hemp green manure, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 342 kg/ha, 2193 kg/ha, 9164 kg/ha, and 1024 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of -19.30%, 1.96%, -7.66%, and 7.23%, respectively, while Towards Organic-I management displayed yield changes of -9.94%, -11.17%, -5.38%, and 4.10% over Organic-I. The SEY for Organic-I was recorded at 7060 kg/ha, 7423 kg/ha, 14247 kg/ha, and 24037 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -36.30%, -5.12%, -20.42%, and -2.72%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -34.84%, -13.67%, -21.11%, and -11.18% for each system, respectively.

Pantnagar: Four cropping systems, namely, Basmati rice-wheat, Basmati rice-mustard, Basmati rice-vegetable pea (4 rows vegetable pea + 2 rows coriander), and Basmati rice-potato, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 4811 kg/ha, 4704 kg/ha, 4905 kg/ha, and 4611 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of 0.06%, 0.55%, -1.67%, and -4.23%, respectively, while Towards Organic-I management displayed yield changes of 0.00%, 0.74%, -1.18%, and 0.85% over Organic-I. The SEY for Organic-I was recorded at 8303 kg/ha, 8057 kg/ha, 9874 kg/ha, and 9646 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 12.50%, 12.77%, -4.70%, and -12.82%, respectively.



Meanwhile, Towards Organic-I management showed SEY changes of 13.78%, 16.87%, -2.36%, and -3.61% for each system, respectively.

Raipur: Four cropping systems, namely, soybean-maize (sweet corn), soybean-french bean, soybean-tomato, and soybean-cabbage, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 2243 kg/ha, 2302 kg/ha, 2134 kg/ha, and 2126 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of 2.41%, 0.87%, -0.28%, and -5.46%, respectively, while Towards Organic-I management displayed yield changes of -26.26%, -16.77%, -20.24%, and -23.99% over Organic-I. The SEY for Organic-I was recorded at 11180 kg/ha, 5420 kg/ha, 15640 kg/ha, and 12510 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 19.59%, 6.83%, 1.73%, and 5.20%, respectively. Meanwhile, Towards Organic-I management showed SEY decreases of -15.92%, -23.25%, -10.74%, and -10.95% for each system, respectively.

Ranchi: Four cropping systems, namely, Rice-wheat, Rice-onion, Rice-potato, and Rice-okra, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 3515 kg/ha, 3507 kg/ha, 3503 kg/ha, and 3568 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -33.26%, -33.25%, -34.06%, and -35.23%, respectively, while Towards Organic-I management displayed yield decreases of -8.42%, -13.86%, -13.36%, and -15.44% over Organic-I. The SEY for Organic-I was recorded at 6596 kg/ha, 16216 kg/ha, 17640 kg/ha, and 10540 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -37.37%, -43.62%, -53.51%, and -46.57%, respectively. Meanwhile, Towards Organic-I

management showed SEY decreases of -16.01%, -17.80%, -27.14%, and -19.05% for each system, respectively.

Umiam: Four vegetable-based cropping system were undertaken on sunken and raised bed. Four rice varieties 1. Megha Aromatic 2. Shahsarang-1, 3. Ngoba, 4. Lampnah were taken in sunken beds whereas, okra was taken on raised bed during kharif. Carrot, tomato, potato and french bean was undertaken on raised bed during rabi. Mean yield of rice on sunken bed recorded in order to towards organic < organic < inorganic. Under organic management practice, yield of rice recorded of 3800 kg/ha which is 11.8% higher than the inorganic management whereas it was about 7.9% lower than the towards organic management practice. Performance of okra was found to be in the order of towards organic < organic < inorganic. Organic management resulted in mean yield of okra is 11940 kg/ha which was about 6.1% higher than towards organic. Most of the vegetable crops during rabi on the raised bed performed better in the order of towards organic < organic < inorganic. Organic management resulted in yield of 17532, 17952, 6861, 15741 kg/ha for carrot, potato, tomato and frenchbean respectively which was 9.6, 11.2 and 15.1% higher than inorganic management practice for carrot, tomato, and frenchbean respectively whereas potato resulted in yield by 4.8% lower than inorganic.

Ajmer: Four cropping systems, namely, Cowpea + maize (4:2) - coriander + cabbage (2:1), Cowpea + maize (4:2) - fennel + cabbage (2:1), Cowpea - fennel, and Cowpea - coriander, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 996 kg/ha, 992 kg/ha, 750 kg/ha, and 758 kg/ha, respectively. In comparison, Inorganic-II management showed yield increases of 7.58%, 3.85%, 3.33%, and 2.64%, respectively, while Towards



Organic-I management displayed yield changes of 5.80%, 1.51%, -4.44%, and -3.30% over Organic-I. The SEY for Organic-I was recorded at 2398 kg/ha, 3930 kg/ha, 3267 kg/ha, and 1664 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 21.59%, 14.39%, 10.15%, and 9.67%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -8.53%, -6.40%, -6.70%, and -11.05% for each system, respectively.

Almora: Two cropping systems, namely, grain amaranth-wheat + lentil and finger millet + black soybean-wheat + toria, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 1452 kg/ha and 606 kg/ha (Finger millet) + 715 kg/ha (Black soybean), respectively. In comparison, Towards Organic-I management showed a decrease of -23.28% for Grain Amaranth, while Finger millet and Black soybean showed decreases of -7.43% and -14.55%, respectively. The SEY for Organic-I was recorded at 3556 kg/ha and 3067 kg/ha for the respective cropping systems. Towards Organic-I management resulted in SEY decreases of -42.39% for Grain Amaranth-wheat + lentil, and -30.89% for Finger millet + black soybean-wheat + toria, respectively.

Gangtok: Four cropping systems, namely, maize + ginger (1:1) – french bean, maize – soybean – buckwheat, maize + turmeric (1:1) – rajmash, and maize – black gram (pahenlo dal) – toria, were evaluated. Under Organic-I management during the Kharif season, the yields for these cropping systems were 3153 kg/ha (Maize) + 5944 kg/ha (Ginger), 3273 kg/ha (Maize) + 1762 kg/ha (Soybean), 3047 kg/ha (Maize) + 13840 kg/ha (Turmeric), and 3010 kg/ha (Maize) + 1016 kg/ha (Black gram), respectively. The SEY for Organic-I was recorded at 13420 kg/ha, 6290 kg/ha, 12640 kg/ha, and 9320 kg/ha for the respective cropping systems.

Narendrapur: Four cropping systems, namely, maddy (Gobindobhog)–paddy (Swarna)–black gram, paddy (IET4786)–Lathyrus (Ratan)–Sesbania (GM), paddy (IET4786)–Red amaranthus /cucumber –green gram, and Paddy (IET4786)–vegetable pea–sesame, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 1971 kg/ha, 4958 kg/ha, 3750 kg/ha, and 3592 kg/ha, respectively. In comparison, Inorganic-II management showed yield changes of -1.90%, -24.71%, 3.56%, and -2.09%, respectively, while Towards Organic-I management displayed yield changes of -9.94%, -15.63%, 17.78%, and 9.98% over Organic-I. The SEY for Organic-I was recorded at 3942 kg/ha, 6110 kg/ha, 13856 kg/ha, and 10533 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 20.56%, -24.26%, -2.68%, and 10.93%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -4.97%, -13.49%, 9.94%, and 6.43% for each system, respectively.

Sardarkrushinagar: Three cropping systems, namely, Greengram-Amaranthus, Greengram-mustard, and Groundnut-lucerne, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 594 kg/ha, 525 kg/ha, and 975 kg/ha, respectively. In comparison, Inorganic-II management showed yield increases of 5.72%, 20.19%, and 5.95%, respectively, while Towards Organic-I management displayed yield changes of -1.35%, -3.24%, and -3.18% over Organic-I. The SEY for Organic-I was recorded at 1757 kg/ha, 1744 kg/ha, and 4504 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 10.47%, 16.34%, and 6.08%, respectively. Meanwhile, Towards Organic-I management

showed SEY changes of -0.11%, 4.47%, and 0.29% for each system, respectively.

Thiruvananthapuram: Four cropping systems, namely, cassava-vegetable cowpea, cassava-groundnut, taro-blackgram, and taro-green gram, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 23970 kg/ha, 23970 kg/ha, 6970 kg/ha, and 6970 kg/ha, respectively. In comparison, Inorganic-II management showed yield decreases of -54.82%, -54.82%, -26.11%, and -26.11%, respectively, while Towards Organic-I management displayed yield decreases of -34.54%, -34.54%, -31.99%, and -31.99% over Organic-I. The SEY for Organic-I was recorded at 28390 kg/ha, 24970 kg/ha, 8700 kg/ha, and 6940 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were -49.10%, -53.82%, -15.63%, and -36.74%, respectively. Meanwhile, Towards Organic-I management showed SEY changes of -27.76%, -27.95%, -34.48%, and -23.20% for each system, respectively.

Udaipur: Four cropping systems, namely, Maize +

blackgram (2:2) – wheat (durum) – Sesbania (GM), Blackgram – wheat (Triticum), Sweet corn + blackgram (2:2) – chickpea, and Soybean – fenugreek, were evaluated. Typically, Inorganic-II management yields the best results for most cropping systems, followed by Towards Organic-I. Under Organic-I management during the Kharif season, the yields for these cropping systems were 2310 kg/ha (Maize) + 220 kg/ha (Blackgram), 450 kg/ha, 2480 kg/ha (Sweet corn) + 245 kg/ha (Blackgram), and 570 kg/ha, respectively. In comparison, Inorganic-II management showed yield increases of 9.09% (Maize) & 25% (Blackgram), 20%, 8.27% (Sweet corn) & 16.33% (Blackgram), and 12.28%, respectively. Meanwhile, Towards Organic-I management displayed yield increases of 14.29% (Maize) & 31.82% (Blackgram), 33.33%, 10.89% (Sweet corn) & 26.53% (Blackgram), and 19.30% over Organic-I. The SEY for Organic-I was recorded at 8148 kg/ha, 7001 kg/ha, 8565 kg/ha, and 5148 kg/ha for the respective cropping systems. For Inorganic-II management, the SEY changes were 11.46%, 10.33%, 9.62%, and 8.47%, respectively. Meanwhile, Towards Organic-I management showed SEY increases of 15.10%, 16.10%, 14.16%, and 15.73% for each system, respectively.

Influence of organic inorganic and towards organic (integrated) management packages on soil physico-chemical properties (Table 7.2.1.3 -7.2.1.4)

Bajaura: Among all management practices, soil pH ranged from 6.78 to 7.05. The organic management package recorded a pH of 7.05, which is approximately 4% and 1.44% higher than the inorganic and towards organic-I practices, respectively. Organic carbon content ranged from 0.88% to 1.50%. Under organic management, the soil organic carbon (SOC) was recorded at 1.5%, which is 70.4% and 22% higher than the inorganic and towards organic-I practices, respectively. Soil pH and organic carbon did not show significant variation among the different cropping systems.

Bhopal: Electric conductivity among management package ranged between 0.295-0.310 ds/m.

Organic-I recorded EC of 0.308 ds/m which is 4.4 and 2.7% higher than farmers package and towards organic-II respectively. Not much changes in pH was observed among various input practice and ranged between 7.63 to 7.68 whereas organic carbon content in the soil varied significantly ranged between 0.61 lowest in inorganic management to 1.01 as highest in organic-I which is about 11% higher than towards organic-II and 65.6% higher than inorganic package. Among the cropping systems, organic carbon did not differ and recorded more or less similar.

Calicut: In turmeric, soil pH and organic carbon were higher under organic management-I practice. An



increase in soil organic carbon found to higher with organic to the tune of 33.3 and 4.3% over inorganic and towards organic-I respectively.

Dharwad: In general, bulk density, electrical conductivity and pH recorded lower value with organic management practices. Among all management practices, pH ranged between 6.84 to 7.03 and organic carbon ranged between 0.54-0.82%. Organic carbon recorded maximum under organic management practice of 0.82% which is 12.3% & 51.8% higher than towards organic-II and inorganic respectively. Not much variation was observed among all the cropping systems for OC and found to be in range from 0.65- 0.70%. Pigeon pea +soybean recorded the maximum organic carbon (0.70%) among the cropping systems.

Jabalpur: Electrical conductivity recorded ranged between 0.12- 0.19 as lowest with towards organic-I and highest with organic-I ds/m. Among the management practices, not much variation is recorded for pH and organic carbon content in the soil and found to be lowest under organic management-II practices. OC ranged from 0.70 to 0.72%. Not much changes were observed among cropping systems for pH and organic carbon. Among cropping system it varied 0.71 to 0.72%.

Karjat: Electric conductivity and pH were in range between 6.67-6.78 ds/m and 6.67 – 6.76 respectively and found non-significant difference. Organic carbon content in the soil recorded in order to inorganic>towards organic>organic. Organic management package recorded organic carbon of 1.23% in the soil which is about 7 and 9.8% higher than inorganic and towards organic-II. Rice-field bean recorded maximum organic carbon (1.20%) among cropping systems.

Ludhiana: In general, electrical conductivity, pH, soil organic carbon, were higher under organic management either with 100% organic or 50% organic input + 50% NF practice. Electric conductivity recorded in range 0.38-0.43 ds/m, pH was in range 7.23 -7.55. Soil organic carbon

recorded higher (0.62%) under organic management which is higher by 10.7% over towards organic management practice whereas it was higher by 31.9% over inorganic. Among cropping systems, basmati rice- wheat- green manure resulted in higher organic carbon of 0.58%.

Modipuram: Electrical conductivity and organic carbon in the soil recorded in order to inorganic>towards organic>organic. Soil pH was observed in range between 7.85- 8.13. Lowest pH of soil recorded with organic management of 7.85. Among all the management practices, organic carbon ranged from 0.47 to 0.94% which was lowest with inorganic and highest with organic. Organic management resulted in higher OC to the tune of 19% than towards organic-I (50% nutrients through organic +50% nutrients through inorganic source of nutrients) while it was 77.4% higher over inorganic. Among the cropping systems, finger millet – barley – sesbania rostrata green manure recorded maximum carbon content (0.80%) whereas black rice-lentil-veg. cowpea resulted lowest OC (0.54%).

Pantnagar: Lower EC (0.34 dsm-1) was recorded under organic package with 50% organic + 50% NF practices among all nutrient management practice, similarly, basmati rice -wheat and rice-potato system recorded lowest EC (0.39 dsm-1). Soil pH varied from 7.03 to 7.86 across the various management practice and cropping systems. At the end of cropping cycle, maximum soil organic carbon recorded under organic package (1.45%) followed by towards organic (1.33%). The significant improvement in soil organic carbon found to be 20.8% with organic than towards organic-I. Among cropping systems, basmati rice – vegetable pea (4 rows vegetable pea + 2 rows coriander) recorded maximum OC 1.20% followed by other 3 system which recorded of 1.17%.

Raipur: Among all the management practices, organic carbon content recorded in order to towards organic> organic >inorganic and it ranged between 0.75 to 0.83% after end of cropping cycle. Organic management practice recorded organic carbon in



the soil of 0.81% which is about 5.2% higher than towards organic-I but about 2.4% lower than inorganic. Cropping systems did not differ among the systems and found to be in range between 0.78 to 0.80%.

Ranchi: Organic carbon content recorded in order to inorganic > towards organic > organic and it ranged between organic to towards organic 0.75 to 0.96% after end of cropping cycle. Organic management practice recorded organic carbon in the soil of 0.96% which is about 28% higher than towards organic-II. Cropping systems did not differ among the systems.

Ajmer: Among all the management practices, the percent changes of soil organic carbon content recorded in order to inorganic > towards organic > organic. Highest changes recorded with organic management practice of 2.68%. Among the cropping systems, cow pea + maize (4:2) - coriander + cabbage (2:1) recorded highest changes of carbon content in the soil up to 1.6% but not much difference found.

Influence of organic inorganic and towards organic (integrated) management packages on soil available macro and micro nutrient status (Table 7.2.1.5 -7.2.1.9)

Bajaura: Different cropping systems influenced nitrogen availability under various nutrient management practices. Organic management (Organic-I) resulted in the highest nitrogen availability across systems, with values reaching 263.7 kg ha⁻¹ in the okra-pea system. In comparison, Towards Organic-I and Towards Organic-II maintained relatively high nitrogen levels (261.8–258.5 kg ha⁻¹), while 100% inorganic inputs reduced nitrogen levels significantly (247.5–250.3 kg ha⁻¹). A similar trend was observed for phosphorus, where Organic-I retained availability (77.6–79.1 kg ha⁻¹), followed by towards organic and performed better than 100% inorganic. Potassium was highest under Organic-I (255.7 kg ha⁻¹), whereas Towards Organic-I and II showed 252.3–255.0 kg ha⁻¹, demonstrating that integrating organic

Narendrapur: Physico-chemical properties of soil in term of bulk density, electric conductivity, pH, recorded numerically lower with management practice towards organic-II under integrated package followed by organic. Soil organic carbon recorded in range between 0.76-0.99%. Organic management practice recorded OC of 0.93% which is about 6.1% lower than towards organic but 17.7% higher than inorganic. Similarly, rice (Gobindobhog)-broccoli-sesbania green manure system recorded better organic carbon (1.02%) among the systems.

Sardarkrushinagar: In general, lower value of bulk density, electrical conductivity and pH recorded with organic management practices. Organic carbon content was higher under 100% organic practice (0.35%) which is 6.1% and 40% higher than towards organic management-I inorganic respectively. Among the cropping systems, green gram-amaranth – fallow recorded slightly higher (0.33%) carbon in the soil over groundnut- wheat- green gram and groundnut-lucerne system which recorded 0.31%.

components helps maintain soil fertility better than inorganic practices (134.4–140.0 kg ha⁻¹). Among the cropping systems, Okra-pea under Organic-I (263.7 kg ha⁻¹) recorded the maximum nitrogen content in the soil whereas P & K was higher with black gram-cauliflower-summer squash. Organic management resulted in the highest availability of iron (16.9 ppm), manganese (16.9 ppm), zinc (3.73 ppm), and copper (2.63 ppm) across different cropping systems. Among the systems tested, Black gram-cauliflower-summer squash had the highest iron (18.8 ppm) and manganese (18.5 ppm) levels, showing the effectiveness of organic farming in maintaining soil health. Towards organic management showed moderate levels, with iron ranging from 10.1 to 12.3 ppm and zinc from 1.96 to 2.47 ppm. In contrast, inorganic management had



the lowest nutrient levels, particularly for iron (10.1 ppm), zinc (1.96 ppm), and copper (1.11 ppm). The best cropping systems for sustainable soil micronutrient management were french bean-cauliflower-french bean and Black gram-cauliflower-summer squash, particularly under organic and towards organic systems.

Bhopal: Soybean-based cropping systems responded differently to nutrient management. Organic-I recorded the highest nitrogen availability (200.7 kg ha^{-1}) in soybean-durum wheat, whereas Towards Organic-I and II retained $176.7\text{--}180.8 \text{ kg ha}^{-1}$, significantly higher than 100% inorganic (164.9 kg ha^{-1}). Phosphorus followed a similar pattern, where organic management (84.4 kg ha^{-1}) provided better retention than inorganic (59.1 kg ha^{-1}), while Towards Organic approaches ($80.4\text{--}82.6 \text{ kg ha}^{-1}$) bridged the gap. Potassium was notably higher in Organic-I (688.5 kg ha^{-1}), while Towards Organic-I and II maintained similar levels ($662.8\text{--}685.0 \text{ kg ha}^{-1}$) compared to inorganic (644.5 kg ha^{-1}). Among the cropping systems, highest nitrogen availability in soybean-durum wheat, available P is higher in soybean-mustard while K is higher in soybean-linseed system.

Calicut: In turmeric, Organic-I significantly enhanced nitrogen (280.5 kg ha^{-1}) compared to Towards Organic (273.6 kg ha^{-1}), whereas 100% inorganic inputs reduced nitrogen availability to 224.5 kg ha^{-1} . Phosphorus showed the highest retention in Organic-I (166.8 kg ha^{-1}), with Towards Organic retaining comparable levels (130.4 kg ha^{-1}) and inorganic practices depleting it to 35.3 kg ha^{-1} . Potassium availability was highest under organic (504.1 kg ha^{-1}) and dropped significantly under inorganic (423.2 kg ha^{-1}). Turmeric-Fallow cropping system showed a distinct trend in micronutrient availability. Organic management had the highest

iron (44.4 ppm) and zinc (5.74 ppm) levels, while towards organic had slightly reduced values, with iron at 38.6 ppm and zinc at 2.51 ppm. Inorganic management led to a significant decline in these values, with zinc dropping to 2.51 ppm and copper to 0.86 ppm. Turmeric-fallow system ensuring maximum micronutrient retention.

Dharwad: Intercropping systems demonstrated higher nitrogen availability under Organic-I ($267.0\text{--}278.0 \text{ kg ha}^{-1}$) compared to Towards Organic ($263.0\text{--}269.0 \text{ kg ha}^{-1}$), while 100% inorganic applications recorded lower nitrogen to $220.0\text{--}271.0 \text{ kg ha}^{-1}$. The phosphorus content was higher under Organic-I (63.0 kg ha^{-1} in pigeon pea + green gram), with Towards Organic maintaining comparable levels (50.6 kg ha^{-1}), but 100% inorganic systems significantly recorded lowest phosphorus ($23.0\text{--}56.0 \text{ kg ha}^{-1}$). Potassium levels followed a similar trend, peaking at 611.0 kg ha^{-1} (Organic-I) and dropping under Towards Organic (482.0 kg ha^{-1}), while inorganic approaches least it to 278.0 kg ha^{-1} . Availability of N&P is higher in pigeon pea + soybean (2:4) inter cropping whereas K content is higher in cotton+green gram system. Towards organic management proved to be the most effective in maintaining iron (12.4 ppm), manganese (18.08 ppm), zinc (0.616 ppm), and copper (2.14 ppm) availability. Among the intercropping systems, Pigeon pea + soybean (2:4) had the highest iron (16.3 ppm) and manganese (19.5 ppm) levels under towards organic practices. Organic management performed better than inorganic for zinc and copper, with the highest zinc (1.41 ppm) recorded under Pigeon pea + groundnut (2:4). Inorganic farming had the lowest values for iron (8.1 ppm), zinc (0.37 ppm), and copper (1.73 ppm). The best cropping system was pigeon pea + soybean (2:4) under towards organic management, ensuring better micronutrient retention

Jabalpur: Rice-based cropping in Jabalpur showed



higher nitrogen retention in Organic-I (183.8 kg ha^{-1}) compared to Towards Organic-I (231.8 kg ha^{-1}), with inorganic practices significantly lowering nitrogen (177.8 kg ha^{-1}). Phosphorus was best retained under Organic-I (16.4 kg ha^{-1}), followed by Towards Organic (15.7 kg ha^{-1}) and performed better than inorganic (15.6 kg ha^{-1}). Potassium was highest under Organic-I (269.0 kg ha^{-1}), showing that organic and integrated practices sustain soil nutrients better than inorganic applications (255.0 kg ha^{-1}). Availability of N & P is higher in basmati rice–chickpea–maize fodder whereas K content is higher in basmati rice–vegetable pea–sorghum system.

Karjat: Various rice-based cropping systems, including rice-brinjal, rice-chickpea, rice-field bean, and rice-white onion, were evaluated for nutrient availability under different management practices. The highest nitrogen availability (265.4 kg ha^{-1}) was recorded in rice-field bean under Organic-I, while Towards Organic-I and II retained similar nitrogen levels (264.7 – 260.5 kg ha^{-1}). In contrast, 100% inorganic management significantly reduced nitrogen to 243.0 kg ha^{-1} . Phosphorus availability followed the same trend, where Organic-I resulted in the highest levels (28.1 kg ha^{-1} in rice-field bean), while Towards Organic-I (27.7 kg ha^{-1}) maintained similar levels, significantly outperforming inorganic treatments (25.3 kg ha^{-1}). Potassium levels were highest under Organic-I (361.7 kg ha^{-1}), with Towards Organic-I and II (359.3 – 358.4 kg ha^{-1}) performing slightly lower but still better than 100% inorganic management (323.3 kg ha^{-1}). These results indicate that an integrated nutrient management approach (Towards Organic) can sustain soil fertility almost as well as full organic farming, while inorganic practices lead to significant nutrient depletion. Among the cropping systems, availability of N, P & K was higher in rice-field bean cropping system.

Ludhiana: Basmati rice-based cropping systems, including basmati rice-chickpea-green manure, basmati rice-wheat-green manure, Kharif moong-wheat-summer moong, and sesame-lentil, were evaluated. The highest nitrogen availability (370.4 kg ha^{-1}) was observed in Basmati rice-chickpea-green manure under Organic-I, while Towards Organic-I (360.9 kg ha^{-1}) and Towards Organic-II (362.8 kg ha^{-1}) retained similar nitrogen levels, performing significantly better than 100% inorganic management (338.0 kg ha^{-1}). Phosphorus retention was highest in Basmati rice-wheat-green manure (51.2 kg ha^{-1} under Organic-I), with Towards Organic-I (49.5 kg ha^{-1}) outperforming 100% inorganic systems (46.1 kg ha^{-1}). Potassium availability showed a similar pattern, where Organic-I (153.8 kg ha^{-1}) resulted in the highest levels, closely followed by Towards Organic (151.5 kg ha^{-1}), while 100% inorganic practices led to the lowest potassium retention (144.3 kg ha^{-1}). The findings highlight that while full organic management enhances soil fertility the most, integrating organic and inorganic methods (Towards Organic) provides nearly equal benefits, making it a sustainable alternative. Highest N content recorded in basmati rice-chickpea-green manure while available P & K was higher in basmati rice–wheat–green manure.

Modipuram: Cropping systems included black rice-lentil-vegetable cowpea, finger millet-barley-sesbania rostrata, and okra-vegetable peas-sesbania aculeata. Organic management resulted in the highest nitrogen availability (323.3 kg ha^{-1} under Organic-I), while Towards Organic-I (300.0 kg ha^{-1}) and Towards Organic-II (281.7 kg ha^{-1}) retained higher nitrogen levels than 100% inorganic systems (249.7 kg ha^{-1}). Phosphorus availability was highest under Organic-I (37.3 kg ha^{-1}), with Towards Organic-I (32.3 kg ha^{-1}) significantly outperforming 100% inorganic systems (15.7 kg ha^{-1}). Potassium followed



the same pattern, where Organic-I resulted in 232.7 kg ha⁻¹, Towards Organic-I (203.7 kg ha⁻¹) performed better than inorganic (213.7 kg ha⁻¹), but full inorganic practices led to the lowest retention (202.3 kg ha⁻¹). These findings suggest that incorporating organic components into nutrient management sustains soil nutrients significantly better than exclusive reliance on chemical fertilizers. Availability of N & P is higher in black rice–lentil–vegetable cowpea fodder whereas K content is higher in basmati rice–wheat–green manure system.

Pantnagar: Nitrogen availability in the soil was highest under Organic-I (170.3 kg ha⁻¹), but Towards Organic-I (170.1 kg ha⁻¹) showed near-identical values, outperforming 100% inorganic management (166.3 kg ha⁻¹). Phosphorus retention was highest in Organic-I (27.0 kg ha⁻¹), followed closely by Towards Organic-I (25.6 kg ha⁻¹), while 100% inorganic showed the lowest values (20.4 kg ha⁻¹). Potassium availability followed the same trend, with Organic-I (239.3 kg ha⁻¹) out performing Towards Organic-I (239.9 kg ha⁻¹) and inorganic approaches (234.1 kg ha⁻¹). Among cropping systems, highest N content recorded in basmati rice–vegetable pea while available P & K was higher in basmati rice–potato. Organic package resulted in slightly higher iron (32.77 ppm), manganese (8.28 ppm), zinc (1.11 ppm), and copper (4.01 ppm) values. The highest iron was observed in Basmati rice–potato (32.88 ppm), while the lowest was under inorganic management (32.67 ppm). Zinc remained consistently around 1.09 to 1.11 ppm, with organic and towards organic management performing slightly better. The best cropping system was basmati rice–mustard, as it ensured balanced nutrient retention across all treatments.

Raipur: Soybean-based cropping, Organic-I resulted in the highest nitrogen levels (239.4 kg ha⁻¹), while Towards Organic-I (246.7 kg ha⁻¹) performed better

than 100% inorganic management (236.3 kg ha⁻¹). Phosphorus availability were also better retained with Organic-I (22.9 kg ha⁻¹), while Towards Organic-I (23.7 kg ha⁻¹) exceeded 100% inorganic (22.6 kg ha⁻¹). Potassium followed a similar pattern, with Organic-I (388.3 kg ha⁻¹) and Towards Organic-I (392.6 kg ha⁻¹) performing significantly better than inorganic (387.2 kg ha⁻¹). Highest nitrogen availability recorded in soybean–maize among the cropping systems whereas maximum phosphorus and potassium availability recorded in soybean–tomato system.

Ranchi: Rice-based cropping systems, including rice–wheat, rice–onion, rice–potato, and rice–okra, showed the highest nitrogen availability (267.4 kg ha⁻¹ under Organic-I), with Towards Organic-I (253.9 kg ha⁻¹) performing nearly as well, significantly better than 100% inorganic management (220.5 kg ha⁻¹). Phosphorus retention followed the same trend, where Organic-I (55.9 kg ha⁻¹) resulted in the highest levels, Towards Organic-I (54.4 kg ha⁻¹) retained substantial amounts, while 100% inorganic management led to a drastic decline (49.9 kg ha⁻¹). Potassium availability was highest under Organic-I (221.4 kg ha⁻¹), with Towards Organic-I (215.8 kg ha⁻¹) showing similar effectiveness, whereas 100% inorganic approaches depleted potassium to 196.0 kg ha⁻¹. The data clearly indicate that integrating organic and inorganic methods (Towards Organic) ensures sustainability while reducing excessive dependency on organic inputs. Highest nitrogen availability in the soil after completion of cropping cycle recorded in rice–onion among the cropping systems whereas maximum phosphorus and potassium availability recorded in rice–potato and rice–wheat system respectively.

Sardarkrushinagar: cropping systems included green gram–amaranth–fallow, green gram–mustard–fallow, and groundnut–lucerne–lucerne. Organic-I



resulted in the highest nitrogen availability (178.8 kg ha^{-1}), while Towards Organic-I (174.6 kg ha^{-1}) and Towards Organic-II (174.1 kg ha^{-1}) performed better than full inorganic management (173.0 kg ha^{-1}). Phosphorus availability was highest under Organic-I (21.6 kg ha^{-1}), with Towards Organic-I (22.7 kg ha^{-1}) maintaining comparable levels, whereas 100% inorganic systems showed the lowest phosphorus retention (21.5 kg ha^{-1}). Potassium followed the same pattern, where Organic-I retained the highest levels (165.8 kg ha^{-1}), Towards Organic-I performed nearly as well (160.0 kg ha^{-1}), while inorganic management resulted in the lowest potassium retention (142.6 kg ha^{-1}). These results reinforce the trend seen across other locations: while full organic management yields the best nutrient retention,

integrating organic and inorganic inputs (Towards Organic) provides a balanced and sustainable alternative. Among the cropping systems, availability of N & K recorded higher in green gram–amaranth while P content is higher in green gram – mustard system. Organic management resulted in the highest zinc (0.96 ppm) and copper (0.39 ppm) availability, while towards organic had better iron (2.41 ppm) and manganese (7.16 ppm) values. The Green gram-amaranth-fallow system had the highest iron (3.09 ppm) under towards organic management, while the lowest was observed in inorganic farming (1.86 ppm). Zinc levels were also lowest under inorganic farming (0.27 ppm). The best cropping system was Green gram-amaranth-fallow, particularly under organic and towards organic management, ensuring better micronutrient retention.

Soil microbial population as influenced by the different management practices (Table 7.2.1.10-7.2.1.11)

Bajaura: In general, the organic management practice improved soil microbial population across the cropping systems compared to inorganic and towards organic practice. At the end of cropping cycle, microbial bacteria count recorded in ranged $14.227.0 \log \text{ cfu/g}$, fungi $14.9 \text{ } 25.4 \log \text{ cfu/g}$, actinomycetes $17.227.0 \log \text{ cfu/g}$ and PSB $13.426.4 \log \text{ cfu/g}$. Under organic management-II mean population of fungi, bacteria, actinomycetes and PSB recorded of 26.5, 24.5, 26.6 and 25 $\log \text{ cfu/g}$ which is 34.4, 26.6, 22.6 and 28.2% higher than towards organic-I whereas it was 84.9, 60.9, 51.6 and 78.9% higher than inorganic management practice. Among the cropping systems, range of fungi, bacteria, actinomycetes and PSB count recorded 20.3 21.4, 20.2 20.8, 22.5 23.1, and 20.3 20.7 respectively.

Dharwad: Among all the management practices, bacteria population found to be in order to organic < towards organic < inorganic. Fungi, recorded in order to organic < inorganic < towards organic and PSB recorded in order to inorganic < organic < towards organic management practice. The

population of bacteria, fungi and PSB found to be ranged between 72.283.8, 6.010.8, and 31.348.9 $\log \text{ cfu/g}$. The percentage reduction of bacteria, fungi and PSB population with organic as compared to towards organic is 3.6, 44.4 and 5.7% respectively. Among the cropping systems, population of bacteria, recorded higher in cotton+green gram system whereas fungi recorded higher in pigeon pea +soybean system.

Jabalpur: Among the management practices no any differences was found for bacteria, fungi and actinomycetes population in soil rhizosphere. Population of bacteria, fungi and actinomycetes ranged in 41.99-42.87, 39.54-40.72 and 13.14-13.97 $\log \text{ cfu/g}$ respectively. Cropping systems did not varied significantly for bacteria, fungi and actinomycetes.

Narendrapur: Microbial population in the soil viz. bacteria, fungi and actinomycetes recorded in order to inorganic < towards organic < organic. Under organic management practices, population of bacteria, fungi and actinomycetes found to be



higher by 145.2, 30.8 and 15.5% than to towards organic respectively. Among the cropping systems, basmati rice–broccoli–sesbania recorded higher population of bacteria and fungi whereas maximum count of actinomycetes recorded in rice-french bean-green gram at the end of crop cycle in the soil.

Sardarkrushinagar: It is evident from the data outlined in table that population of bacterial and fungi recorded in order to inorganic < organic

< towards organic while actinomycetes recorded in order to towards organic < organic < inorganic at the end of cropping cycle. Population of bacteria, fungi and actinomycetes found ranged from 1971-3578, 395-1487 and 20.7-436.3 log cfu/g respectively. Among the cropping systems, population count of bacteria and fungi recorded higher in groundnut-lucer new whereas actinomycetes was higher in green gram-coriander-veg. cowpea system.

Effect of different management practices organic, inorganic and towards organic) on quality aspects of produce (Table 7.2.1.12)

Bajaura: In general, quality parameters among the various input management practice observed slightly numerically higher either towards organic or organic nutrient management. Protein content in french bean, black gram and pea recorded in ranged between 8.8-9.5%, 12.4-13.9 and 12.9-13.3 respectively. TSS (0brix) in tomato and pea recorded maximum with organic-I (5.4 & 14.2% respectively). Among the different management practice, vitamin C content in tomato fruits and cauliflower curd is recorded higher with organic -I (100% organic) which is closely at par with towards organic.

Bhopal: In general, nutritional quality constituents in soybean, not any difference found among management practice for oil, protein, methionine and tryptophan content. Among nutrient management practice, oil content ranged between 18.00-18.10%, protein 35.0-35.8, methionine 1.70-1.8 (g/16gN) and tryptophan 1.80-1.80 (g/16gN).

Calicut: Nutritional quality in turmeric, curcumin, oleoresin and oil content was higher with towards organic management. Under organic management practice, oil, oleoresin and curcumin content percent in turmeric is 5.3, 11.1 and 4.1% however towards

organic management recorded of 5.5, 11.5 and 4.3% respectively which is closely similar.

Coimbatore: All the quality parameter of brinjal, chilli and tomato did not differ significantly due to various input management practice but in general, all quality parameter was higher with organic management followed by towards organic. Titrable acidity (%) and ascorbic acid in brinjal recorded higher by 50 and 12.6% respectively than inorganic. TSS and ascorbic acid in chilli is higher under organic input practice which is 23.4 and about 7.0% than the inorganic. TSS, titrable acidity (%) and ascorbic acid in tomato recorded superior in also with organic practice and the difference from organic to inorganic found to be by 10.3, 33.3 and 12.6%.

Ajmer: Essential oil in fennel and linalool in coriander recorded in order to inorganic > towards organic > organic. Under organic management practice recorded essential oil (Fenchone) and essential oil (trans anethole) of 13.09 and 24.8 whereas linalool in coriander recorded of 72.1. These were higher by 18.8, 33.1 and 10.5% than inorganic. respectively

Influence of organic, inorganic and towards organic (integrated) management packages on economics of different crops and cropping systems (Table 7.2.1.13 -7.2.1.14)

Bajaura: Among all the management practices evaluated, the average cost of cultivation is in order of organic>inorganic>towards organic. The average cost of cultivation under organic management is ranged between 2.85 to 3.30 lakhs across the cropping system which is about 10.7% to 28.1% higher than towards organic-II (25% each organic & inorganic nutrients +NF practice). Under organic management practices, okra-pea system recorded lower cost of cultivation. In terms of net return, fallow-cauliflower-tomato recorded higher net return (8.99 lakhs) under organic management-II (50% nutrients through organic + NF) while benefit-cost ratio (B-C ratio) is higher (4.24) under towards organic-II (25% nutrients through organic +25% nutrients through inorganic + NF).

Bhopal: Among all the management practices evaluated, average cost of cultivation is in order of Inorganic>organic>towards organic. The average cost of cultivation under organic management is ranged between 0.52 to 0.54 lakhs across the cropping system which is about 2.7% to 5.8% higher than towards organic-II. Under organic management practices, soybean- mustard system recorded lower cost of cultivation. In terms of net return, soybean-linseed recorded higher net return (₹ 70839) and B-C ratio (2.4) which is under towards organic-I.

Calicut: Cost of cultivation for turmeric under organic management I & II was recorded as 1.71 and 1.82 lakhs which is -0.8% to 5.4% higher than towards organic-II. Net return for turmeric under organic practice recorded of Rs.0.56 and 1.22 lakh which is 18-63% lower than towards organic II respectively. Similar trend was observed for net return per rupee invested for both crops.

Coimbatore: Among all the management practices evaluated, the average cost of cultivation is in order of organic>inorganic>towards organic. The average cost of cultivation under organic management is

ranged between 2.28 to 2.38 lakhs across the cropping system which is about 6.8% to 11.6% higher than towards organic-II. Under organic management practices, chillies-barnyard millet-green manure (dhaincha) system recorded lower cost of cultivation. In terms of net return, brinjal-pearl millet-green manure (dhaincha) recorded higher net return (2.08 lakhs) under organic management-I while, benefit-cost ratio (B-C ratio) is higher (2.05) in brinjal-pearl millet-green manure (dhaincha) under inorganic-I (100% inorganic).

Dharwad: Among all the management practices evaluated, the average cost of cultivation is in order of organic>towards organic>inorganic. The average cost of cultivation under organic management is ranged between 3.4 to 3.8 lakhs across the cropping system which is about 7.3% to 18.8% higher than towards organic-II. Under organic management practices, pigeon pea +greengram (2:4) system recorded lower cost of cultivation. Across the treatments and cropping systems, pigeon pea +soybean (2:4) recorded higher net return (1.01 lakhs) which is under inorganic management-II while, benefit-cost ratio (B-C ratio) is higher (4.21) in under inorganic-I.

Jabalpur: Among all the management practices evaluated, the average cost of cultivation is in order of organic>towards organic>inorganic. The average cost of cultivation under organic management is ranged between 0.88 to 0.98 lakhs across the cropping system which is about 17.3% to 34.8% higher than towards organic-II. Under organic management practices, soybean-berseem (fodder and seed) system recorded lower cost of cultivation. Across the treatments and cropping systems, soybean-berseem (fodder and seed) recorded higher net return (1.23 lakhs) which is under organic management-I. At the same time, benefit-cost ratio (B-C ratio) is higher (2.55) in towards organic-II.



Karjat: Among all the management practices evaluated, the average cost of cultivation is in order of organic>towards organic>inorganic. The average cost of cultivation under organic management is ranged between 1.88 to 2.14 lakhs across the cropping system which is about 7.9% to 22.4% higher than towards organic-II. Under organic management practices, rice-chickpea system recorded lower cost of cultivation. Across the treatments and cropping systems, Rice- onion (white) recorded higher net return (3.90 lakhs) which is under organic management-I. On the other hand, benefit-cost ratio (B-C ratio) is higher (2.68) in rice-brinjal cropping system under inorganic management-I.

Ludhiana: Among all the management practices evaluated, the average cost of cultivation is in order of organic>organic>inorganic. The average cost of cultivation under organic management-I and II is 0.85 and 0.91 lakhs, respectively across the cropping system which is about -1.38% lower and 5.4% higher than the towards organic-II. Under organic management practices, sesame-lentil system recorded lower cost of cultivation. Across the treatments and cropping systems, basmati rice-wheat-green manure recorded higher net return (2.31 lakhs) which is under organic management-I. On the other hand, benefit-cost ratio (B-C ratio) is higher (3.46) in Basmati rice-wheat-green manure cropping system under organic management-I.

Modipuram: Among all the management practices evaluated, the average cost of cultivation is in order of organic>towards organic> inorganic. The average cost of cultivation under organic management is ranged between 0.95 to 0.99 lakhs across the cropping system which is about 2.4% to 6.7% higher than towards organic-II. Under organic management practices, black rice –lentil – vegetable cowpea system recorded lower cost of cultivation. Across the treatments and cropping systems, black gram-tomato-sunhemp recorded higher net return (2.31 lakhs) which is under organic management-I. On the

other hand, benefit-cost ratio (B-C ratio) is higher (4.9) in same cropping system but, under inorganic management-I.

Pantnagar: Among all the management practices evaluated, the average cost of cultivation is in order of organic> towards organic>inorganic. The average cost of cultivation under organic management is ranged between 0.71 to 0.77 lakhs across the cropping system which is about 1.0% to 9.6% higher than towards organic-II. Under organic management practices, basmati rice-mustard system recorded lower cost of cultivation. Across the treatments and cropping systems, net return is higher with basmati rice– vegetable pea (4 rows vegetable pea + 2 rows coriander) while, basmati rice – mustard recorded higher value (4.91) of B-C ratio under inorganic management-II.

Raipur: Among all the management practices evaluated, the average cost of cultivation is in order of organic> towards organic>inorganic. The average cost of cultivation under organic management is ranged between 1.26 to 1.31 lakhs across the cropping system which is about 12.3% to 16.7% higher than towards organic-II. Under organic management practices, soybean-french bean system recorded lower cost of cultivation. Across the treatments and cropping systems, net return is higher with Soybean-tomato (6.03 Lakhs) while, soybean-cabbagerecorded higher B-C ratio (6.03) under inorganic management-II.

Ranchi: Among all the management practices evaluated, the average cost of cultivation is in order of organic> towards organic>inorganic. The average cost of cultivation under organic management is ranged between 0.93 to 1.08 lakhs across the cropping system which is about 8.6% to 27.3% higher than towards organic-II. Under organic management practices, Rice -okra system recorded lower cost of cultivation. Across the treatments and cropping systems, net return and B-C ratio is higher with rice-potato (3.31 lakhs and 3.79, respectively) which is under organic management-I.



Ajmer: Among all the management practices evaluated, the average cost of cultivation is in order of organic > towards organic > inorganic. The average cost of cultivation under organic management is ranged between 0.56 to 0.73 lakhs across the cropping system which is about 15.4% to 51.5% higher than towards organic-II. Under organic management practices, cow pea+maize (4:2)-coriander+cabbage (2:1) and cow pea-coriander system recorded lower cost of cultivation. Across the treatments and cropping systems, net return is higher with cow pea+maize (4:2)-fennel+cabbage (2:1) (2.21 lakhs) under inorganic management-II while BC ratio is higher in same cropping system under inorganic management-I.

Almora: Among all the management practices evaluated, the average cost of cultivation is in order of organic > towards organic > inorganic. The average cost of cultivation under organic management is ranged between 0.76 to 0.81 lakhs across the cropping system which is about 13.3% to 20.1% higher than towards organic-I. Under organic management practices, grain amaranth-wheat+lentil system recorded lower cost of cultivation. Across the treatments and cropping systems, net return and B-C ratio is higher with grain amaranth-wheat+lentil (0.52 Lakhs and 1.73, respectively) under organic management-I.

Narendrapur: Among all the management practices evaluated, the average cost of cultivation is in order of organic > towards organic > inorganic. The average cost of cultivation under organic management is ranged between 1.30 to 1.75 lakhs across the cropping system which is about 17.4% to 57.8% higher than towards organic-II. Under organic management practices, paddy (IET4786)-lathyrus (Ratan)-sesbania (GM) recorded lower cost of cultivation. Across the treatments and cropping systems, paddy (IET4786)- red amaranthus /cucumber-green gram recorded higher net return

(2.22 lakhs) which is under organic management-II while paddy (IET4786)-lathyrus (Ratan) –sesbania (GM) recorded higher B-C ratio (2.42).

Sardarkrushinagar: Among all the management practices evaluated, the average cost of cultivation is in order of inorganic > towards organic > organic. The average cost of cultivation under organic management is ranged between 0.78 to 0.86 lakhs across the cropping system which is about 4.6% to 15.2% higher than towards organic-II. Under organic management practices, greengram-mustard recorded lower cost of cultivation. Across the treatments and cropping systems, groundnut-lucerne recorded higher net return and B-C ratio as well.

Thiruvananthapuram: Among all the management practices evaluated, the average cost of cultivation is in order of towards organic > organic > inorganic. The average cost of cultivation under organic management is ranged between 2.50 to 2.73 lakhs across the cropping system which is about 0.77% to 9.06% lower than towards organic-II. Under organic management practices, cassava-vegetable cowpea and cassava-groundnut recorded lower cost of cultivation. Across the treatments and cropping systems, cassava-vegetable cowpea recorded higher net return and B-C ratio as well.

Udaipur: Among all the management practices evaluated, the average cost of cultivation is in order of organic > towards organic > inorganic. The average cost of cultivation under organic management is ranged between 0.79 to 0.83 lakhs across the cropping system which is about 34.8% to 42.7% higher than towards organic-II. Under organic management practices, soybean-fenugreek recorded lower cost of cultivation. Across the treatments and cropping systems, maize +black gram (2:2)-wheat (durum)-sesbania (GM) recorded higher net return and B-C ratio as well.



Table 7.2.1: Influence of organic, inorganic and integrated management practice on grain yield (kg/ha) of various crops in cropping systems at different locations

Locations & cropping systems	Organic				Inorganic				Towards organic (Integrated)			
	Organic-I [100% as per NPOP standard]		Organic-II [Supply of only 50% nutrients through organic sources + NF practice]		100% Inorganic (No organic manures)		State recommendations or Farmers package		Towards organic-I (50% Organic + 50% Inorganic manures)		Towards organic-II (25% nutrients through organic + 25% nutrients through inorganic source of nutrients + NF practice)	
	Kharif	Rabi	Summer	Kharif	Rabi	Summer	Kharif	Rabi	Summer	Kharif	Rabi	Summer
Bejaura												
Frenchbean-cauliflower-frenchbean	6140	12170	4480	5960	12520	4070	6280	14910	4540	5890	13960	4040
Fallow-cauliflower-tomato	-	9560	12350	-	9260	12610	-	14180	15330	-	11550	14100
Black gram-cauliflower-summer squash	800	9520	28620	820	9070	27540	860	15220	36170	850	13960	33850
Okar-pea	10520	5760	-	10670	6440	-	11420	8960	-	11150	7430	-
Bhopal												
Soybean-wheat (durum)	743	3194		643	2756		692	3102		817	3320	
Soybean-mustard	680	1079		667	957		687	1036		783	1129	
Soybean-chickpea	779	1247		703	1136		703	1214		840	1378	
Soybean-linseed	770	1607		707	1512		693	1516		802	1670	
Mean (soybean)	743			680			694			811		
Calicut												
Turmeric-fallow	17100			20500						23400		
Coimbatore												
Brinjal-pearl millet-green manure	19625	2018		17930	1862		23365	2279		20806	2100	
(dhaincha) - Chillies - barnyard millet-green manure (dhaincha)	14381	1713		12658	1586		17185	1760		14523	1687	
Tomato-finger millet-green manure (dhaincha)	18358	2658		16007	2289		23821	2946		19847	2721	
Dharwad												
Pigeon pea+green gram (PEY)	646			616			636			588		
Pigeon pea+soybean (PEY)	1783			1677			1903			1797		
Pigeon pea +groundnut (PEY)	1071			1001			1069					
Cotton +green gram (CEY)	531			502			560			528		
Cotton +soybean (CEY)	1464			1335			1543			1430		

[illegible]

Narendrapur	1971	3583	-	2067	3083	-	1983	4600	-	1933	3833	-	1775	3942	-	2042	5125	-
Paddy (Gobindobhog) –paddy (Swarna)– black gram																		
Paddy (IET4786) Lathyrus (Ratan) –sesbania(GM)	4958	783	-	4750	733	-	3525	650	-	3733	608	-	4183	750	-	4383	691	-
Paddy(IET4786)- Red amaranthus/cucumb r–green gram	3750	2625(A) 1833(C)	775	4200	2416(A) 1804(C)	691	3858	3300(A) 1675(C)	666	3883	3058(A) 1641(C)	658	4417	2541(A) 2316(C)	675	4250	2520(A) 2808(C)	792
Paddy(IET4786)- veg.pea-sesame	3592	2992	662	4092	2208	633	3608	4167	667	3517	3967	608	3950	2958	758	4008	3167	629
Sardarkrushinagar																		
Green gram- amaranth - fallow	594	917		475	703		619	994		628	1039		586	931		514	806	
Green gram-mustard - fallow	525	1083		417	917		547	1222		631	1250		508	1194		494	972	
Groundnut-lucerne - lucerne	975	35986		803	32611		1014	35778		1033	38083		944	36403		831	29639	
Thiruvananthapuram																		
Cassava-vegetable cowpea (pod fresh)	23970	1031		15380	928		11880	897		10830	979		15690	1286		15800	1155	
Cassava-groundnut (pod yield)	23970	1026		15380	688		11880	597		10830	653		15690	1420		15800	853	
Taro-blackgram	6970	682		5750	571		5140	490		5150	545		4740	583		4690	622	
Taro-greengram	6970	185		5750	135		5140	179		5150	187		4740	215		4690	136	
Udaipur																		
Maize+blackgram (2:2)–wheat (durum)– sesbania(GM)	2310(M)+ 220(BG)	3870		2255(M)+ 185(BG)	3800		2380(M)+ 250(BG)	4040		2520(M)+ 275(BG)	4100		2640(M)+ 290(BG)	4190		2190(M)+ 160(BG)	3790	
Blackgram – wheat (triticum)	450	3835		415	3710		480	4285		540	4145		600	3710		395	3610	
Sweet corn + blackgram (2:2) – chickpea	2480(SC) + 245(BG)	1240		2310(SC) + 220(BG)	1160		2540(SC)+ 260(BG)	1310		2685(SC)+ 285(BG)	1350		2750(SC)+ 310(BG)	1410		2200 (SC)+ 195(BG)	1095	
Soybean – fenugreek	570	1635		520	1585		580	1690		640	1755		680	1875		495	1515	



Table 7.2.2: Influence of organic, inorganic and integrated management package on systems productivity (kg/ ha) at various locations

Locations & cropping systems	Organic		Inorganic		Towards organic (Integrated)		Mean
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	
Bajaura (Cauliflower equivalent)							
Frenchbean-cauliflower- frenchbean	35401	34461	23098	33845	31338	30300	31407
Fallow-cauliflower-tomato	46610	47090	35390	60170	53850	51180	49048
Black gram-cauliflower- summer squash	30430	29605	22758	40400	37898	36668	32960
Okar-pea	17720	18720	15125	22620	20437	19710	19055
Mean	32540	32469	24093	39259	35881	34465	
Bhopal (Soybean equivalent)							
Soybean-wheat (durum)	2173	1914	1978	2083	2297	1753	2033
Soybean- mustard	1997	1792	1865	1898	2123	1629	1884
Soybean-chickpea	2251	2054	2152	2162	2477	1943	2173
Soybean- linseed	2686	2508	2492	2528	2830	2392	2573
Mean	2277	2067	2122	2168	2432	1929	
Coimbatore (Brinjal equivalent)							
Brinjal - pearl millet-green manure (dhaincha)	23921	21898	23753	28811	25835	22305	24421
Chillies - barnyard millet-green manure (dhaincha)	23647	20973	23105	27717	23880	22035	23560
Tomato -finger millet-Green manure (dhaincha)	18358	16007	17162	23821	19847	16410	18601
Mean	21975	19626	21340	26783	23187	20250	
Dharwad (Cotton equivalent)							
Pigeon pea + green gram	646	616	561	636	588	501	591
Pigeon pea + soybean	1783	1677	1689	1903	1797	1548	1733
Pigeon pea + groundnut	1071	1001	1090	1069	1044	944	1037
Cotton + green gram	531	502	481	560	528	479	514
Cotton + soybean	1464	1335	1381	1543	1430	1310	1411
Mean	1099	1026	1040	1142	1077	956	
Jabalpur (Soybean equivalent)							
Soybean- wheat	1996	2001	2280	1627	1891	2036	1972
Soybean-mustard-green gram	2231	2679	3356	2152	2338	1841	2433
Soybean-berseem (fodder and seed)	3902	3518	3582	2911	3381	3418	3452
Soybean-lentil- sorghum (fodder)	1711	1555	1483	1325	1351	1833	1543
Mean	2460	2438	2675	2004	2240	2282	
Karjat (Rice equivalent)							
Rice-brinjal	31739	27002	28449	17629	26200	22944	25661
Rice-chickpea	11118	9322	7940	7112	8863	8068	8737
Rice-field bean	11606	10047	8644	7605	9399	8188	9248
Rice-onion (white)	31771	22304	22811	17311	26484	20249	23488
Mean	21559	17169	16961	12414	17737	14862	

Ludhiana (Wheat equivalent)							
Basmati rice-chickpea-green manure	10300	9800	10000	10400	9200	9400	9850
Basmati rice-wheat-green manure	11100	10800	11100	11800	12100	12300	11533
Kharif moong-wheat-summer moong	10100	9200	9700	10700	9400	9400	9750
Sesame-lentil	5900	5300	5600	6600	6300	6000	5950
Mean	9350	8775	9100	9875	9250	9275	
Modipuram (Rice equivalent)							
Black rice –lentil – vegetable cowpea	7060	5714	4824	4497	4600	4325	5170
Finger millet – barley – sesbaniastrata green manure	7423	6367	6912	7043	6408	4438	6432
Okra – vegetable pea – sesbaniaaculeata green manure	14247	12524	11575	11338	11240	9405	11722
Black gram – tomato – sunhemp green manure	24037	19401	22242	23384	21349	16042	21076
Mean	13192	11002	11388	11566	10899	8553	
Pantnagar (Basmati rice equivalent)							
Basmati rice - Wheat	8303	6669	8749	9341	9447	7533	8340
Basmati rice – Mustard	8057	7198	8807	9086	9416	7852	8403
Basmati rice – Vegetable pea (4 rows vegetable pea + 2 rows coriander)	9874	8794	9171	9410	9641	9081	9329
Basmati rice – Potato	9646	7990	8489	8409	9298	8656	8748
Mean	8970	7663	8804	9062	9451	8281	
Raipur (Soybean equivalent)							
Soybean-maize (sweet corn)	11180	7190	10020	13370	9400	7820	9830
Soybean- french bean	5420	3730	4990	5790	4160	3710	4633
Soybean-cabbage	12510	9760	11480	13160	11140	10580	11438
Soybean-tomato	15640	10880	15360	15910	13960	12860	14102
Mean	11188	7890	10463	12058	9665	8743	
Ranchi (Rice equivalent)							
Rice -wheat	6596	6039	5344	4131	5540	5833	5581
Rice -onion	16216	14875	10797	9142	13329	11841	12700
Rice -potato	17640	16646	10619	8200	12852	13925	13314
Rice -okra	10540	9661	8256	5631	8532	8859	8580
Mean	12748	11805	8754	6776	10063	10115	
Ajmer (Cowpea equivalent)							
Cow pea + maize (4:2) - coriander + cabbage (2:1)	2398	2414	2604	2916	2194	2786	2552
Cow pea + maize (4:2) - fennel + cabbage (2:1)	3930	3978	4193	4495	3678	4412	4114
Cow pea - fennel	3267	3294	3376	3599	3048	3527	3352
Cow pea - coriander	1664	1645	1728	1825	1480	1796	1690
Mean	2815	2833	2975	3209	2600	3130	
Almora(Finger millet equivalent)							
Grain Amaranth-wheat + lentil	3556	3158	1141		2049		2476
Fingermillet + black soybean-wheat + toria	3067	2723	1263		2120		2293
Mean	3312	2940	1202		2084		



Table 7.2.3: Influence of organic, inorganic and integrated package on soil physio-chemical properties (bulk density and electrical conductivity) at the end of cropping cycle at various locations

Locations/Treatments	Organic		Inorganic		Towards organic (Integrated)		Mean		Organic		Inorganic		Towards organic (Integrated)		Mean	
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]			Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]		
Bhopal																
Soybean-durum wheat									0.316	0.301	0.340	0.280	0.298	0.306		0.307
Soybean- mustard									0.312	0.287	0.273	0.304	0.316	0.300		0.299
Soybean- chick kpea									0.292	0.305	0.277	0.307	0.313	0.291		0.298
Soybean- linseed									0.311	0.314	0.307	0.288	0.313	0.302		0.306
Mean									0.308	0.302	0.299	0.295	0.310	0.300		
Dharwad (g cm-3)																
Pigeon pea +green gram (2:4)	1.33	1.22	1.37	1.34	1.38	1.43	1.35		0.05	0.03	0.1	0.09	0.07	0.04		0.06
Pigeon pea+soybean (2:4)	1.34	1.42	1.38	1.26	1.42	1.45	1.38		0.05	0.04	0.03	0.05	0.08	0.05		0.05
Pigeon pea +groundnut (2:4)	1.35	1.26	1.4	1.33	1.52	1.27	1.36		0.04	0.21	0.05	0.1	0.05	0.05		0.0
Cotton +green gram (1:1)	1.26	1.34	1.31	1.29	1.21	1.31	1.29		0.09	0.09	0.09	0.06	0.07	0.06		0.08
Cotton +soybean (1:1)	1.19	1.33	1.31	1.37	1.36	1.34	1.32		0.05	0.06	0.1	0.12	0.09	0.07		0.08
Mean (1:1)	1.29	1.31	1.35	1.32	1.38	1.36			0.06	0.09	0.07	0.08	0.07	0.05		0.07
Jabalpur																
Soybean- wheat									0.15	0.12	0.14	0.12	0.11	0.15		0.13
Soybean-mustard									0.22	0.23	0.20	0.17	0.14	0.12		0.18
green gram																
Soybean-berseem (fodder and seed)									0.19	0.14	0.17	0.15	0.10	0.22		0.16
Soybean-lentil-sorghum (fodder)									0.19	0.22	0.19	0.17	0.14	0.15		0.18
Mean									0.19	0.18	0.18	0.15	0.12	0.16		
Karjat																
Rice-brinjal																6.76
Rice-chickpea																6.69
Rice-field bean																6.74
Rice-onion (white)																6.75
Mean									6.72	6.75	6.76	6.74	6.67	6.78		
Ludhiana																
Basmati rice-chickpea-green manure									0.45	0.45	0.42	0.43	0.42	0.42		0.43
Basmati rice-wheat green manure									0.49	0.47	0.42	0.44	0.47	0.41		0.45
Kharif moong-wheat summer moong									0.38	0.35	0.35	0.33	0.32	0.38		0.35
Sesame-lentil									0.38	0.35	0.35	0.31	0.36	0.34		0.35
Mean									0.43	0.41	0.39	0.38	0.39	0.39		

Table 7.2.3: Influence of organic, inorganic and integrated package on soil physio-chemical properties (bulk density and electrical conductivity) at the end of cropping cycle at various locations

Locations/Treatments		pH			Organic carbon (%)										
		Organic		Inorganic		Towards organic (Integrated)		Mean	Organic		Inorganic		Towards organic (Integrated)		Mean
		Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]		Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	
Bajaura															
Frenchbean-cauliflower-frenchbean		7.00	6.90	6.70	7.00	6.90	7.00	6.92	1.62	1.40	0.92	1.18	1.26	1.24	1.27
Fallow-cauliflower-tomato		7.10	7.00	6.80	7.10	7.00	7.00	7.00	1.43	1.35	0.86	1.10	1.20	1.24	1.20
Black gram-cauliflower-summer squash		7.10	6.90	6.70	7.00	7.00	7.00	6.95	1.50	1.38	0.86	1.16	1.22	1.26	1.23
Okar-pea		7.00	7.00	6.90	7.10	6.90	7.00	6.98	1.46	1.38	0.89	1.12	1.22	1.24	1.22
Mean		7.05	6.95	6.78	7.05	6.95	7.00		1.50	1.38	0.88	1.14	1.23	1.25	
Bhopal															
Soybean-durum wheat		7.63	7.63	7.68	7.69	7.64	7.64	7.65	1.02	0.90	0.61	0.62	0.92	0.87	0.82
Soybean- mustard		7.63	7.66	7.68	7.66	7.67	7.65	7.66	1.00	0.91	0.60	0.63	0.90	0.84	0.81
Soybean- chickpea		7.63	7.66	7.66	7.69	7.63	7.64	7.65	1.02	0.97	0.61	0.65	0.89	0.86	0.83
Soybean- linseed		7.64	7.6	7.67	7.68	7.65	7.65	7.65	1.01	0.90	0.62	0.62	0.91	0.88	0.82
Mean		7.63	7.64	7.67	7.68	7.65	7.65		1.01	0.92	0.61	0.63	0.91	0.86	
Calicut															
Turmeric-Fallow		5.905.80	4.9		5.70	5.70		2.40	2.20	1.80		2.30	2.30		
Dharwad															
Pigeon pea +green gram (2:4)		6.92	7.05	6.99	6.85	6.91	6.8	6.92	0.82	0.77	0.52	0.53	0.78	0.69	0.69
Pigeon pea +soybean (2:4)		6.81	7.15	6.36	7.01	6.47	6.64	6.74	0.81	0.78	0.51	0.61	0.74	0.76	0.70
Pigeon pea +groundnut (2:4)		6.81	6.99	6.71	6.62	6.65	6.76	6.76	0.85	0.78	0.56	0.63	0.61	0.49	0.65
Cotton +green gram (1:1)		6.77	6.96	6.81	6.91	7.07	6.95	6.91	0.82	0.78	0.51	0.62	0.74	0.51	0.66
Cotton +soybean (1:1)		6.95	6.98	7.35	6.97	7.08	7.21	7.09	0.81	0.62	0.62	0.62	0.79	0.5	0.66
Mean		6.85	7.03	6.84	6.87	6.84	6.87		0.82	0.75	0.54	0.60	0.73	0.59	
Jabalpur															
Soybean- wheat		7.20	7.19	7.28	7.30	7.19	7.20	7.23	0.71	0.70	0.72	0.70	0.72	0.70	0.71
Soybean-mustard-green gram		7.21	7.19	7.27	7.31	7.21	7.20	7.23	0.71	0.70	0.71	0.70	0.72	0.70	0.71

Soybean-berseem (fodder and seed)	7.21	7.18	7.28	7.25	7.21	7.19	7.22	0.72	0.71	0.72	0.71	0.72	0.71	0.72
Soybean-lentil-sorghum (fodder)	7.21	7.19	7.27	7.27	7.21	7.19	7.22	0.71	0.70	0.73	0.70	0.71	0.70	0.71
Mean	7.21	7.19	7.28	7.28	7.21	7.20		0.71	0.70	0.72	0.70	0.72	0.70	
Karjat														
Rice –brinjal						6.76							1.11	
Rice – chickpea						6.69							1.19	
Rice – field bean						6.74							1.20	
Rice – white onion						6.75							1.15	
Mean	6.72	6.75	6.76	6.74	6.67	6.78		1.23	1.22	1.15	1.08	1.18	1.12	
Ludhiana														
Basmati rice-chickpea-green manure	7.60	7.30	7.30	7.20	7.40	7.40	7.37	0.56	0.53	0.49	0.44	0.52	0.54	0.51
Basmati rice-wheat-green manure	7.50	7.60	7.40	7.10	7.50	7.40	7.42	0.68	0.67	0.49	0.47	0.59	0.58	0.58
Kharif moong-wheat-summer moong	7.30	7.30	7.50	7.40	7.20	7.40	7.35	0.63	0.63	0.44	0.42	0.59	0.58	0.55
Sesame-lentil	7.80	7.50	7.20	7.20	7.40	7.60	7.45	0.60	0.60	0.45	0.43	0.55	0.54	0.53
Mean	7.55	7.43	7.35	7.23	7.38	7.45		0.62	0.61	0.47	0.44	0.56	0.56	
Modipuram														
Black rice –lentil – vegetable cowpea	7.67	7.87	8.00	8.06	7.95	7.93	7.91	0.82	0.69	0.33	0.41	0.64	0.35	0.54
Finger millet – barley – sesbania/rostrata green manure	7.77	8.05	8.22	8.20	8.09	8.11	8.07	1.03	0.97	0.53	0.53	0.89	0.87	0.80
Okra – vegetable pea – sesbania/aculeata green manure	8.11	8.05	8.13	8.13	8.10	8.13	8.11	0.97	0.97	0.54	0.65	0.85	0.82	0.80
Black gram – tomato – sunhemp green manure														
Mean	7.85	7.99	8.12	8.13	8.05	8.06		0.94	0.88	0.47	0.53	0.79	0.68	
Pantnagar														
Basmati rice - Wheat	7.83	7.43	7.71	7.93	6.92	7.54	7.56	1.44	1.34	0.83	0.95	1.19	1.27	1.17
Basmati rice – Mustard	7.12	7.12	7.69	7.91	6.93	7.43	7.37	1.46	1.3	0.88	0.91	1.2	1.27	1.17
Basmati rice – Vegetable pea (4 rows vegetable pea + 2 rows coriander)	7.63	7.11	7.93	7.98	6.72	7.42	7.47	1.48	1.35	0.91	0.96	1.21	1.3	1.20
Basmati rice – Potato	7.72	7.13	7.92	7.62	7.53	6.91	7.47	1.41	1.33	0.84	0.99	1.18	1.28	1.17
Mean	7.58	7.20	7.81	7.86	7.03	7.33		1.45	1.33	0.87	0.95	1.20	1.28	
Raipur														
Soybean-maize (sweet corn)								0.83	0.81	0.81	0.84	0.76	0.74	0.80
Soybean- french bean								0.81	0.77	0.80	0.84	0.77	0.76	0.79
Soybean-cabbage								0.81	0.81	0.80	0.83	0.78	0.77	0.80
Soybean-tomato								0.80	0.78	0.78	0.82	0.77	0.73	0.78
Mean								0.81	0.79	0.80	0.83	0.77	0.75	



[illegible]

Table 7.2.5: Influence of organic, inorganic and integrated package on soil available nitrogen at the end of cropping cycle at various locations

Locations/Treatments	Available Nitrogen (kg ha-1)						
	Organic		Inorganic		Towards organic (Integrated)		Mean
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	
Bajaura							
Frenchbean-cauliflower-frenchbean	263.7	261.8	250.3	261.8	261.8	255.5	259.2
Fallow-cauliflower-tomato	258.5	257.7	250.3	260.7	258.5	253.5	256.5
Black gram-cauliflower- summer squash	261.8	255.5	248.4	261.8	258.5	253.5	256.6
Okar-pea	263.7	258.5	247.5	265.4	261.8	258.5	259.2
Mean	261.9	258.4	249.1	262.4	260.2	255.3	
Bhopal							
Soybean-durum wheat	200.7	184.0	170.4	175.6	180.8	174.6	181.0
Soybean- mustard	192.3	172.5	168.3	174.6	175.6	167.3	175.1
Soybean- chickpea	186.1	179.8	165.2	162.0	179.8	184.0	176.2
Soybean- linseed	178.8	162.0	155.8	153.7	170.4	157.8	163.1
Mean	189.5	174.6	164.9	166.5	176.7	170.9	
Calicut							
Turmeric-Fallow	280.5	262.3	224.5		273.6	266.8	
Dharwad							
Pigeon pea +green gram (2:4)	267.0	260.0	271.0	232.0	249.0	263.0	257.0
Pigeon pea +soybean (2:4)	278.0	268.0	266.0	234.0	262.0	269.0	262.8
Pigeon pea +groundnut (2:4)	261.0	273.0	262.0	265.0	231.0	262.0	259.0
Cotton +green gram (1:1)	271.0	265.0	239.0	243.0	239.0	220.0	246.2
Cotton +soybean (1:1)	249.0	263.0	264.0	235.0	246.0	299.0	259.3
Mean	265.2	265.8	260.4	241.8	245.4	262.6	
Jabalpur							
Basmati rice – durum wheat-green manure	180.0	245.0	194.0	170.0	225.0	250.0	210.7
Basmati rice – chickpea - maize fodder	182.0	250.0	210.0	182.0	225.0	240.0	214.8
Basmati rice – berseem (fodder and seed)	185.0	220.0	198.0	175.0	237.0	205.0203.3	
Basmati rice – vegetable pea-sorghum (fodder)	188.0	243.0	224.0	184.0	240.0	212.0	215.2
Mean	183.8	239.5	206.5	177.8	231.8	226.8	
Karjat							
Rice –brinjal							252.5
Rice – chickpea							264.8
Rice – field bean							265.4
Rice – white onion							242.9
Mean	264.7	261.9	260.5	243.0	259.2	249.1	



Ludhiana							
Basmati rice-chickpea-green manure	370.4	367.8	327.4	325.2	360.9	362.8	352.4
Basmati rice-wheat-green manure	364.8	362.7	357.0	354.1	363.5	364.5	361.1
Kharif moong-wheat-summer moong	345.2	342.8	339.0	342.7	344.4	340.8	342.5
Sesame-lentil	362.0	360.6	328.4	328.6	352.2	358.9	348.5
Mean	360.6	358.5	338.0	337.7	355.3	356.8	
Modipuram							
Black rice –lentil – vegetable cowpea	364.0	351.0	314.0	309.0	343.0	318.0	333.2
Finger millet – barley – sesbaniastrata green manure	301.0	309.0	205.0	212.0	268.0	259.0	259.0
Okra – vegetable pea – sesbaniaaculeata green manure	305.0	293.0	230.0	237.0	289.0	268.0	270.3
Black gram – tomato – sunhemp green manure							
Mean	323.3	317.7	249.7	252.7	300.0	281.7	
Pantnagar							
Basmati rice - Wheat	171.5	169.9	175.4	165.3	169.7	168.4	170.0
Basmati rice – Mustard	169.8	171.4	171.9	169.3	172.8	164.3	169.9
Basmati rice – Vegetable pea (4 rows vegetable pea + 2 rows coriander)	174.3	167.8	163.6	167.5	173.4	171.2	169.6
Basmati rice – Potato	165.7	169.5	167.4	163.2	164.3	168.3	166.4
Mean	170.3	169.7	169.6	166.3	170.1	168.1	
Raipur							
Soybean-maize (sweet corn)	259.2	242.5	255.1	259.2	255.1	242.5	252.3
Soybean- french bean	250.9	230.0	242.5	255.1	242.5	242.5	243.9
Soybean-cabbage	230.0	225.8	225.8	246.7	225.8	225.8	230.0
Soybean-tomato	217.4	221.6	221.6	225.8	217.4	221.6	220.9
Mean	239.4	230.0	236.3	246.7	235.2	233.1	
Ranchi							
Rice -wheat							267.4
Rice -onion							268.2
Rice -potato							266.0
Rice -okra							266.0
Mean	350.5	273.7	220.5	249.5	253.9	253.4	
Ranchi							
Green gram-amaranth - fallow	183.5	167.8	172.5	183.5	175.7	174.1	176.2
Green gram -mustard - fallow	180.3	178.8	172.5	180.4	172.5	172.5	176.2
Groundnut-lucerne - lucerne	172.5	172.5	174.1	175.7	175.6	175.6	174.3
Mean	178.8	173.0	173.0	179.9	174.6	174.1	

Table 7.2.6: Influence of organic, inorganic and integrated management package on soil available phosphorus at the end of cropping cycle at various locations

Locations/Treatments	Organic		Inorganic		Towards organic (Integrated)		Mean
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	
Bajaura							
Frenchbean-cauliflower-frenchbean	77.6	74.3	51.5	62.1	79.1	74.3	69.8
Fallow-cauliflower-tomato	79.1	77.6	52.4	64.7	80.2	76.8	71.8
Black gram-cauliflower- summer squash	77.6	74.3	50.2	68.4	81.5	72.5	70.8
Okra-pea	74.3	73	50.2	60.4	79.6	73.6	68.5
Mean	77.2	74.8	51.1	63.9	80.1	74.3	
Bhopal							
Soybean-durum wheat	84.5	84.0	60.4	58.8	78.8	74.2	73.5
Soybean- mustard	86.0	83.2	59.8	57.1	81.3	77.4	74.1
Soybean- chickpea	85.2	83.5	57.6	55.7	79.2	80.1	73.6
Soybean- linseed	81.8	79.6	58.5	58.7	82.1	80.7	73.6
Mean	84.4	82.6	59.1	57.6	80.4	78.1	
Calicut							
Turmeric-Fallow	166.8	130.4	35.3		94.3	65.8	
Dharwad							
Pigeon pea +green gram (2:4)	63.0	51.0	56.0	59.0	36.0	40.0	50.8
Pigeon pea +soybean (2:4)	54.0	38.0	59.0	70.0	49.0	54.0	54.0
Pigeon pea +groundnut (2:4)	47.0	31.0	48.0	55.0	56.0	41.0	46.3
Cotton +green gram (1:1)	35.0	40.0	28.0	31.0	34.0	35.0	33.8
Cotton +soybean (1:1)	36.0	41.0	23.0	38.0	42.0	27.0	34.5
Mean	47.0	40.2	42.8	50.6	43.4	39.4	
Jabalpur							
Basmati rice – durum wheat-green manure	16.00	15.68	17.19	15.00	16.05	15.00	15.8
Basmati rice – chickpea - maize fodder	16.30	14.12	18.12	16.31	17.00	16.68	16.4
Basmati rice – berseem (fodder and seed)	17.30	17.12	16.00	15.00	14.12	16.00	16.1
Basmati rice – vegetable pea- sorghum (fodder)	16.00	15.33	18.12	16.30	15.80	14.82	16.1
Mean	16.4	15.6	17.4	15.9	15.7	15.6	
Karjat							
Rice –brinjal							26.2
Rice – chickpea							27.6
Rice – field bean							28.1
Rice – white onion							25.2
Mean	27.7	27.3	27.1	25.3	27.4	25.9	
Ludhiana							
Basmati rice-chickpea-green manure	47.9	47.4	41.9	40.1	45.2	49.2	45.3
Basmati rice-wheat-green manure	51.2	50.9	47.4	46.9	47.8	45.9	48.4
Kharif moong-wheat-summer moong	50.4	48.9	49.8	47.1	47.2	45.2	48.1
Sesame-lentil	48.5	46.0	45.4	43.6	47.1	47.1	46.3
Mean	49.5	48.3	46.1	44.4	46.8	46.9	



Modipuram							
Black rice –lentil – vegetable cowpea	41.0	37.0	22.0	23.0	32.0	25.0	30.0
Finger millet – barley – sesbania rostrata green manure	35.0	32.0	11.0	18.0	29.0	27.0	25.3
Okra – vegetable pea – sesbania aculeata green manure	36.0		28.0	14.0	20.0	24.0	21.023.8
Black gram – tomato – sunhemp green manure							
Mean	37.3	32.3	15.7	20.3	28.3	24.3	
Pantnagar							
Basmati rice - Wheat	26.9	24.9	22.3	21.8	24.9	24.8	24.3
Basmati rice – Mustard	27.9	25.7	19.3	20.2	26.1	25.9	24.2
Basmati rice – Vegetable pea (4 rows vegetable pea + 2 rows coriander)	24.8	24.9	20.2	20.1	27.3	24.7	23.7
Basmati rice – Potato	28.5	28.2	19.9	21.9	24.1	25.9	24.8
Mean	27.0	25.9	20.4	21.0	25.6	25.3	
Raipur							
Soybean-maize (sweet corn)	22.9	21.3	22.3	23.4	22.2	21.9	22.3
Soybean- french bean	22.7	21.4	22.5	23.5	21.8	21.8	22.3
Soybean-cabbage	23.1	21.5	22.7	24.1	22.1	21.9	22.6
Soybean-tomato	23.0	21.0	22.7	23.6	21.6	21.5	22.2
Mean	22.9	21.3	22.6	23.7	21.9	21.8	
Ranchi							
Rice -wheat							49.0
Rice -onion							49.7
Rice -potato							53.0
Rice -okra							47.2
Mean	55.9	54.4	49.9	44.9	47.9	45.3	
Narendrapur							
Basmati rice-broccoli-sesbania green manure	92.0	98.3	84.3	73.4	72.9	64.4	80.9
Rice-mustard-green gram	95.0	87.5	89.3	95.9	97.3	99.4	94.1
Rice-frenchbean-green gram	109.6	133.8	122.4	55.9	72.1	116.4	101.7
Rice-vegetable pea-sesame	196.0	171.8	102.5	103.0	122.8	139.7	139.3
Mean	123.1	122.9	99.7	82.0	91.3	105.0	
Sardarkushinagar							
Green gram-amaranth - fallow	21.6	21.8	20.2	23.9	22.8	21.6	22.0
Green gram -mustard - fallow	21.3	23.2	21.7	22.4	21.3	22.0	22.0
Groundnut-lucerne - lucerne	20.6	20.9	22.7	21.8	22.1	21.8	21.7
Mean	21.1	22.0	21.5	22.7	22.1	21.8	

Table 7.2.7: Influence of organic, inorganic and integrated management package on soil available potassium at the end of cropping cycle at various locations

Locations/Treatments	Available Nitrogen (kg ha-1)						
	Organic		Inorganic		Towards organic (Integrated)		Mean
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	
Bajaura							
Frenchbean-cauliflower-frenchbean	249.0	255.5	139.4	186.3	248.9	252.3	221.9
Fallow-cauliflower-tomato	251.9	254.5	140.0	194.9	256.8	255.5	225.6
Black gram-cauliflower- summer squash	255.7	241.2	138.6	190.9	264.1	257.2	224.6
Okar-pea	241.2	237.4	134.4	192.4	250.2	244.1	216.6
Mean	249.5	247.2	138.1	191.1	255.0	252.3	
Bhopal							
Soybean-durum wheat	699.0	662.0	650.0	616.0	679.0	616.0	653.7
Soybean- mustard	679.0	694.0	657.0	643.0	662.0	614.0	658.2
Soybean- chickpea	686.0	686.0	634.0	625.0	654.0	645.0	655.0
Soybean- linseed	690.0	698.0	637.0	643.0	656.0	728.0	675.3
Mean	688.5	685.0	644.5	631.8	662.8	650.8	
Calicut							
Turmeric-Fallow	504.1	423.2	562.2		467.3	489.9	
Dharwad							
Pigeon pea +green gram (2:4)	407.0	427.0	278.0	355.0	418.0	351.0	372.7
Pigeon pea +soybean (2:4)	386.0	397.0	386.0	422.0	424.0	460.0	412.5
Pigeon pea +groundnut (2:4)	344.0	369.0	377.0	338.0	387.0	359.0	362.3
Cotton +green gram (1:1)	611.0	597.0	422.0	463.0	608.0	434.0	522.5
Cotton +soybean (1:1)	559.0	584.0	467.0	544.0	573.0	424.0	525.2
Mean	461.4	474.8	386.0	424.4	482.0	405.6	
Jabalpur							
Basmati rice – durum wheat-green manure	274.0	252.0	259.0	254.0	275.0	260.0	262
Basmati rice – chickpea - maize fodder	270.0	261.0	259.0	252.0	258.0	259.0	260
Basmati rice – berseem (fodder and seed)	270.0	260.0	262.0	255.0	264.0	270.0	264
Basmati rice – vegetable pea- sorghum (fodder)	260.0	276.0	255.0	259.0	269.0	272.0	265
Mean	269	262	259	255	267	265	
Karjat							
Rice –brinjal							342.2
Rice – chickpea							351.6
Rice – field bean							355.8
Rice – white onion							347.7
Mean	361.7	359.3	358.4	323.3	353.7	339.5	



Ludhiana							
Basmati rice-chickpea-green manure	155.7	153.0	146.1	140.0	146.0	147.2	148.0
Basmati rice-wheat-green manure	158.7	155.9	147.7	146.8	149.9	150.7	151.6
Kharif moong-wheat-summer moong	152.8	147.1	142.8	146.2	147.5	145.9	147.1
Sesame-lentil	148.1	149.8	140.5	140.2	145.6	145.0	144.9
Mean	153.8	151.5	144.3	143.3	147.3	147.2	
Modipuram							
Black rice -lentil - vegetable cowpea	229	195	258	215	205	185	214.5
Finger millet - barley - sesbaniastrata green manure	214	191	183	196	185	169	189.7
Okra - vegetable pea - sesbaniaaculeata green manure	255	225	200	196	228	189	215.5
Black gram - tomato - sunhemp green manure							
Mean	232.7	203.7	213.7	202.3	206.0	181.0	
Pantnagar							
Basmati rice - Wheat	237.5	236.8	234.2	233.9	237.5	237.8	236.3
Basmati rice - Mustard	239.9	234.7	236.1	235.1	239.6	235.6	236.8
Basmati rice - Vegetable pea (4 rows vegetable pea + 2 rows coriander)	238.5	233.4	236.8	233.2	240.6	230.5	235.5
Basmati rice - Potato	241.4	233.7	234.7	234.3	241.8	236.9	237.1
Mean	239.3	234.7	235.5	234.1	239.9	235.2	
Raipur							
Soybean-maize (sweet corn)	388.8	390.7	389.3	387.2	393.9	395.2	390.9
Soybean- french bean	386.3	389.3	389.3	385.2	390.8	393.5	389.1
Soybean-cabbage	388.0	391.7	387.8	387.9	392.2	396.0	390.6
Soybean-tomato	390.2	392.1	396.0	388.5	393.3	395.5	392.6
Mean	388.3	391.0	390.6	387.2	392.6	395.1	
Ranchi							
Rice -wheat							201.1
Rice -onion							196.8
Rice -potato							204.4
Rice -okra							199.3
Mean	221.4	215.8	196.0	175.3	192.6	201.2	
Narendrapur							
Basmati rice-broccoli-sesbania green manure	324.5	330.5	284.5	354.3	477.9	354.0	354.3
Rice-mustard-green gram	213.1	251.7	240.4	166.2	261.3	276.1	234.8
Rice-frenchbean-green gram	171.4	179.0	152.9	183.2	169.7	132.3	164.8
Rice-vegetable pea-sesame	227.1	207.3	144.9	143.5	168.4	141.3	172.1
Sardarkushinagar							
Green gram-amaranth - fallow	183.5	167.8	172.5	183.5	175.7	174.1	176.2
Green gram -mustard - fallow	180.3	178.8	172.5	180.4	172.5	172.5	176.2
Groundnut-lucerne - lucerne	172.5	172.5	174.1	175.7	175.6	175.6	174.3
Mean	178.8	173.0	173.0	179.9	174.6	174.1	

Table 7.2.8: Influence of methods of organic, inorganic and integrated management practice on soil available micronutrients (Fe & Mn) at the end of cropping cycle at different locations

Locations/Treatments	Soil Available Iron (ppm)				Soil Available Manganese (ppm)			
	Organic		Inorganic		Organic		Inorganic	
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Bajaura								
Frenchbean-cauliflower-frenchbean	16.8	15.0	9.6	11.6	15.0	12.8	7.6	9.1
Fallow-cauliflower-tomato	16.6	14.1	10.6	12.4	15.4	13.5	8.0	10.0
Black gram-cauliflower-summer squash	18.8	15.5	10.0	13.5	18.5	15.9	7.6	9.0
Okar-pea	15.4	15.0	10.0	11.6	18.5	15.4	7.6	10.0
Mean	16.9	14.9	10.1	12.3	16.9	14.4	7.7	9.5
Calicut								
Turneric-Fallow	44.4	41.6	38.6		42.4	38.3	17.29	19.25
Dharwad								
Pigeon pea +green gram (2:4)	7.4	6.5	10.7	10.9	10.5	12.3	15.4	16.6
Pigeon pea +soybean (2:4)	6.5	7.6	16.3	8.0	13.0	10.9	16.5	18.5
Pigeon pea +groundnut (2:4)	7.7	7.9	14.4	11.8	13.4	12.2	18.3	16.3
Cotton +green gram (1:1)	10.5	9.7	11.5	10.0	10.1	10.0	16.2	16.7
Cotton +soybean (1:1)	9.7	8.8	9.3	10.2	9.9	8.7	15.9	15.9
Mean	8.4	8.1	12.4	10.2	11.4	10.8	16.5	16.8
Pantnagar								
Basmati rice - Wheat	32.72	32.65	32.69	32.63	32.67	32.69	8.23	8.25
Basmati rice - Mustard	32.75	32.85	32.65	32.64	32.69	32.75	8.21	8.22
Basmati rice - Vegetable pea (4 rows vegetable pea + 2 rows coriander)	32.74	32.65	32.68	32.63	32.66	32.74	8.22	8.25
Mean	32.88	32.65	32.67	32.87	32.67	32.63	8.19	8.24
Basmati rice - Potato	32.77	32.70	32.67	32.69	32.67	32.70	8.21	8.24
Mean								



Table 7.2.9: Influence of methods of organic, inorganic and integrated management practice on soil available micronutrients (Zn & Cu) at the end of cropping cycle

Locations/Treatments	Zinc (ppm)				Copper (ppm)				Mean			
	Organic		Inorganic		Organic		Inorganic					
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package				
	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]			Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]						
Bajaura												
Frenchbean-cauliflower-frenchbean	4.03	2.96	2.00	2.06	3.20	3.04	1.08	1.63	2.88	2.44	2.26	1.91
Fallow-cauliflower-tomato	3.48	2.96	1.85	2.30	3.36	3.00	1.14	1.80	2.83	3.83	2.54	2.42
Black gram-cauliflower-summer squash	3.79	3.24	1.95	2.96	3.03	2.87	1.10	1.17	2.97	1.80	1.60	1.40
Okar-pea	3.60	2.74	2.03	2.57	3.19	3.00	1.10	1.60	2.86	3.96	2.54	2.50
Mean	3.73	2.98	1.96	2.47	3.20	2.98	1.11	1.55		3.01	2.24	
Calicut												
Turneric-Fallow	5.74	6.24	2.51		4.82	4.85	0.86		7.51	6.36	3.99	
Dharwad												
Pigeon pea +green gram (2:4)	1.37	1.36	0.44	0.4	0.8	0.5	1.84	1.86	2.10	1.88	1.97	1.91
Pigeon pea +soybean (2:4)	1.35	1.23	0.37	0.5	0.8	0.5	2.77	1.86	2.08	2.11	1.97	2.10
Pigeon pea +groundnut (2:4)	1.41	1.22	0.41	0.5	0.5	0.5	2.09	1.99	1.91	2.12	2.05	2.06
Cotton +green gram (1:1)	0.61	1.18	0.68	0.7	0.4	0.5	2.00	1.95	1.72	1.97	2.01	1.94
Cotton +soybean (1:1)	0.84	1.32	1.18	0.9	0.7	0.6	2.00	2.28	1.73	1.60	1.92	1.90
Mean	1.12	1.262	0.616	0.6	0.6	0.5	2.14	1.99	1.91	1.94	1.97	
Pantnagar												
Basmati rice - Wheat	1.11	1.08	1.09	1.09	1.11	1.09	3.97	3.99	4.01	3.99	4.02	4.00
Basmati rice – Mustard	1.09	1.13	1.09	1.11	1.07	1.08	3.97	3.98	3.99	4.03	3.99	3.99
Basmati rice – Vegetable pea (4 rows coriander)	1.07	1.10	1.11	1.10	1.09	1.09	3.97	3.95	4.02	4.01	4.02	3.99
Basmati rice – Potato	1.07	1.12	1.07	1.09	1.10	1.09	3.97	3.95	4.03	4.03	3.99	4.00
Mean	1.09	1.11	1.09	1.10	1.09	1.09	3.970	3.968	4.013	4.003	4.005	



Table 7.2.10: Population of bacteria and fungi in rhizosphere soil as influenced by the different nutrient practices and cropping systems

Locations/Treatments		Bacteria (logcfu/g)				Fungi (logcfu/g)				Mean					
		Organic		Inorganic		Towards organic (Integrated)		Mean							
		Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	Mean	
Bajaura															
Frenchbean-cauliflower-frenchbean		23.0	26.0	14.3	18.0	19.4	23.8	20.8	21.2	23.8	15.6	19.8	19.2	23.2	20.5
Fallow-cauliflower-tomato		22.2	26.6	14.2	18.0	20.5	27.0	21.4	19.8	25.4	15.0	20.0	19.0	22.0	20.2
Black gram-cauliflower-summer squash		20.6	27.0	14.4	17.8	18.8	23.0	20.3	20	24.8	14.9	19.8	20.0	25.0	20.8
Okar-pea		23.2	26.2	14.3	18.0	19.4	23.4	20.8	21.4	24.0	15.4	20.0	19.2	23.6	20.6
Mean		22.3	26.5	14.3	18.0	19.5	24.3		20.6	24.5	15.2	19.9	19.4	23.5	
Dharwad															
Pigeon pea +green gram (2:4)		85.5	75.5	95.0	85.5	89.0	58.0	63.0	79.3	6.0	6.0	4.5	11.5	9.5	7.5
Pigeon pea +soybean (2:4)		7.5	8.8		83.0	74.0	54.5	95.5	96.5	79.8	7.0	3.5	9.0	9.0	14.5
Pigeon pea +groundnut (2:4)		69.5	54.5	94.5	83.0	75.5	81.0	76.3	5.0	9.0	6.0	10.0	10.5	6.5	7.8
Cotton +green gram (1:1)		91.5	75.0	80.5	79.0	90.0	85.0	83.5	6.0	6.0	8.5	7.0	8.5	7.0	7.2
Cotton +soybean (1:1)		71.0	53.5	84.5	75.5	88.5	71.5	74.1	6.0	8.0	6.0	8.5	11.0	6.5	7.7
Mean		78.6	72.2	83.8	76.2	81.5	79.4		6.0	6.5	6.8	9.2	10.8	7.4	
Jabalpur															
Basmati rice – durum wheat-green manure		42.79	42.68	42.44	42.56	42.90	42.90	42.7	40.33	39.69	40.33	40.59	40.11	40.26	40.22
Basmati rice – chickpea - maize fodder		42.64	41.82	42.52	42.00	43.00	42.88	42.5	39.72	39.97	40.82	40.23	40.35	41.28	40.40
Basmati rice – berseem (fodder and seed)		42.11	41.69	42.50	42.00	42.59	43.00	42.3	40.33	40.22	40.52	40.62	40.27	40.65	40.44
Basmati rice – vegetable pea-sorghum (fodder)		41.73	41.76	42.75	42.18	42.98	42.00	42.2	40.31	39.89	40.51	41.45	40.09	40.68	40.49
Mean		42.32	41.99	42.55	42.19	42.87	42.70		40.17	39.94	40.55	40.72	40.21	40.72	



Table 7.2.11: Population of actinomycetes and phosphorus solubilizing bacteria in rhizosphere soil as influenced by the different nutrient practices and cropping systems

Locations/Treatments	Soil actinomycetes (logcfu/g)						Mean	Phosphate solubilizing bacteria (logcfu/g)						Mean
	Organic		Inorganic		Towards organic (Integrated)			Organic		Inorganic		Towards organic (Integrated)		
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]		Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + NF practice]	100% inorganic No organic manures)	State recommendations or farmers package	Towards Organic-I [50% Organic +50% Inorganic nutrient's]	Towards Organic-II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]	
Bajaura														
Frenchbean-cauliflower-frenchbean	23.4	26.4	17.8	21.0	21.8	24.6	22.5	21.5	24.8	14.0	18.8	19.0	23.8	20.3
Fallow-cauliflower-tomato	24.4	26.0	17.2	21.6	22.0	25.8	22.8	20.8	26.4	14.2	19.0	19.2	24.6	20.7
Black gram-cauliflower-summer squash	26.3	27.0	17.8	20.6	21.0	26.0	23.1	22.7	24.0	13.4	19.6	20.6	21.6	20.3
Okar-pea	23.8	27.0	17.4	20.8	22.0	24.2	22.5	21.8	24.8	14.3	18.3	19.2	23.6	20.3
Mean	24.5	26.6	17.6	21.0	21.7	25.2		21.7	25.0	14.0	18.9	19.5	23.4	
Dharwad								(104cfu/g)						
Pigeon pea +green gram (2:4)	-	-	-	-	-	-	-	25.5	36.5	57.5	34.0	39.5	45.5	39.8
Pigeon pea +soybean (2:4)	-	-	-	-	-	-	-	41.0	49.0	50.5	31.0	32.0	58.5	43.7
Pigeon pea +groundnut (2:4)	-	-	-	-	-	-	-	50.5	65.0	55.0	23.5	63.0	42.5	49.9
Cotton +green gram (1:1)	-	-	-	-	-	-	-	57.5	39.5	29.5	44.0	38.0	44.5	42.2
Cotton +soybean (1:1)	-	-	-	-	-	-	-	56.0	52.0	43.5	24.0	48.0	53.5	46.2
Mean	-	-	-	-	-	-	-	46.1	48.4	47.2	31.3	44.1	48.9	
Jabalpur														
Basmati rice – durum wheat-green manure	13.85	13.74	13.83	13.00	14.00	13.12	13.59							
Basmati rice – chickpea - maize fodder	13.72	13.68	13.65	12.98	13.56	13.63	13.54							
Basmati rice – berseem (fodder and seed)	13.70	13.85	13.73	13.00	14.32	13.85	13.74							
Basmati rice – vegetable pea-sorghum (fodder)	13.00	13.58	13.85	13.58	14.00	13.75	13.63							
Mean	13.57	13.71	13.77	13.14	13.97	13.59								



Table 7.2.12: Influence of organic, inorganic and integrated management package on quality of crops at different locations

Locations	Crops	Quality parameter	Organic		Inorganic		Towards organic (Integrated)	
			Organic- I [100% as per NPOP standard]	Organic- II [50% nutrients through organic sources + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic- I [50% Organic +50% Inorganic nutrients]	Towards Organic- II [25% nutrients through organic +25% nutrients through inorganic source of nutrients + NF practice]
Bajura	French bean (kharif)	Protein (%)	9.0	8.9	8.7	9.1	9.2	9.3
	French bean (summer)		9.5	9.4	8.8	9.4	9.4	9.4
	Black gram		13.1	13.1	12.7	13.9	12.4	12.7
	Pea		13.0	12.9	12.9	13.3	13.2	13.1
	Tomato	TSS (0 Brix)	5.4	5.2	4.6	5.4	5.4	5.2
	Pea		14.2	14.0	13.0	14.0	14.2	14.2
	Tomato	Vitamin C (mg/100g)	34.5	33.8	30.0	33.2	34.4	34.2
	Cauliflower		46.7	45.3	42.2	45.2	45.7	45.5
Bhopal	Soybean	Oil (%)	18.0	18.0	18.1	18.1	18.1	18.0
		Protein (%)	35.8	35.1	35.7	35.7	35.8	35.0
		Methionine (g/16gN)	1.8	1.7	1.8	1.8	1.8	1.7
		Tryptophan (g/16gN)	1.8	1.8	1.8	1.8	1.8	1.8
Calicut	Turmeric	Oil (%)	5.2	5.3	5.0		5.5	5.6
		Oleoresin (%)	7.9	11.1	11.3		11.5	10.8
		Curcumin (%)	4.0	4.1	4.2		4.3	4.5
Coimbatore	Brinjal	Titration Acidity (%)	0.3	0.3	0.2	0.3	0.3	0.3
		Ascorbic acid (mg/100g)	15.2	14.8	13.5	14.6	14.1	14.5
	Chilli	TSS (°Brix)	5.8	5.6	4.7	5.2	5.4	5.5
		Ascorbic acid (mg/100g)	125.2	127.5	117.0	123.6	120.5	123.7
	Tomato	TSS (°Brix)	4.3	4.2	3.9	4.0	3.9	4.1
		Titration acidity (%)	1.2	1.1	0.9	1.0	1.0	1.1
Ajmer	Fennel	Essential oil (Fenchone)	13.09		11.74		12.87	
		Essential oil (trans anethole)	24.82		18.65		21.73	
	Coriander	linalool	72.12		65.28		68.28	



Table 7.2.13. Gross return and cost of cultivation of different crops and cropping system as influence by organic, inorganic and integrated production systems at various locations

Location/cropping systems	Gross returns (Rs/ha)			Cost of cultivation (Rs/ha)				Mean
	Organic	Inorganic	Towards organic (Integrated)	Organic	Inorganic	Towards organic (Integrated)	Towards organic (Integrated)	
	Organic- I [100% as per NPOP standard]	Organic- II [50% through organic sources + 25% NF practice]	Organic- I [50% through organic nutrients]	Organic- II [100% as per NPOP standard]	Organic- I [50% through organic sources + 25% NF practice]	Organic- II [50% through organic nutrients]	Organic- I [50% through organic nutrients]	Mean
Bajaura								
Frenchbean-cauliflower-frenchbean	7,68,875	7,51,813	4,61,950	3,89,291	3,43,575	2,68,496	4,48,497	3,14,298
Fallow-cauliflower-tomato	11,65,250	11,77,250	7,07,800	3,45,086	2,78,227	1,91,109	3,11,115	2,41,543
Black gram-cauliflower- summer squash	7,60,750	7,40,125	4,55,150	3,93,121	3,41,730	2,55,729	3,77,357	3,09,527
Okra-pea	4,43,000	4,68,000	3,02,500	1,91,274	1,76,311	1,44,140	2,34,140	1,68,021
Mean	7,84,469	7,84,297	4,81,850	3,29,693	2,84,961	2,14,869	3,42,777	2,57,337
Bhopal								
Soybean-wheat (durum)	93,448	80,710	82,817	58,691	55,821	59,690	59,835	53,987
Soybean- mustard	83,173	76,514	81,224	52,145	50,949	54,685	53,774	49,668
Soybean- chickpea	98,594	89,514	93,228	52,521	51,524	54,006	54,033	49,985
Soybean- linseed	1,16,643	1,08,994	1,07,928	53,729	52,064	54,487	54,479	50,473
Mean	97,965	88,933	91,299	54,272	52,590	55,717	55,530	51,455
Calicut								
Turneric-fallow	2,38,000	2,94,000	2,52,000	1,82,499	1,71,712	1,48,208		1,63,989
Coimbatore								
Brinjal - pearl millet-green manure (dhaincha) -	4,45,478	4,05,527	3,48,799	2,37,915	2,26,897	1,70,287	2,75,191	2,03,862
Chillies - barnyard millet-green manure (dhaincha)	4,24,603	3,77,325	3,41,327	2,17,516	2,11,719	1,86,961	2,40,335	2,03,972
Tomato -finger millet-green manure (dhaincha)	4,26,664	3,81,337	3,24,415	2,58,018	2,44,269	1,96,307	2,57,788	2,34,485
Mean	4,32,248	3,88,063	3,38,180	2,37,816	2,27,628	1,84,518	2,57,771	2,14,106
Dharwad								
Pigeon pea +green gram (2:4)	45,571	43,405	39,522	32,714	29,915	26,280	30,460	28,640
Pigeon pea +soybean (2:4)	1,25,724	1,18,252	1,19,065	34,714	31,915	28,280	32,460	30,640
Pigeon pea +groundnut (2:4)	75,538	70,566	76,866	38,714	35,915	28,587	35,330	32,280
Cotton +green gram (1:1)	45,708	43,185	41,396	44,174	40,250	35,237	36,852	33,962
Cotton +soybean (1:1)	1,25,919	1,14,852	1,18,767	40,250	39,237	29,816	40,852	37,962
Mean	83,692	78,052	79,123	38,128	34,444	27,756	35,191	32,697
Jabalpur								
Soybean- wheat	1,07,265	1,07,525	1,22,501	96,020	75,600	60,747	52,969	73,337
Soybean-mustard-green gram	1,19,935	1,43,997	1,80,417	1,30,784	1,05,010	77,586	65,600	85,373
Soybean-berseem (fodder and seed)	2,09,750	1,89,115	1,92,513	1,85,553	81,080	76,082	68,610	77,512
Soybean-lentil- sorghum (fodder)	91,943	83,600	79,703	82,937	93,080	88,420	77,329	89,279
Mean	1,32,223	1,31,059	1,43,784	97,595	84,968	75,709	66,127	81,375

Karjat	6,43,613	5,46,547	5,70,501	3,63,067	5,40,148	4,75,307	5,23,197	2,97,376	2,60,315	2,13,195	2,10,598	2,59,390	2,42,308	2,47,197
Rice-brinjal														
Rice-chickpea	2,44,359	2,01,480	1,64,539	1,55,248	1,98,305	1,79,949	1,90,647	1,43,447	1,29,139	1,08,263	1,07,183	1,29,877	1,20,202	1,23,019
Rice-field bean	2,45,809	2,12,834	1,75,150	1,63,172	2,05,578	1,78,780	1,96,887	1,53,763	1,39,693	1,18,817	1,18,213	1,39,955	1,31,232	1,33,612
Rice- onion (white)	6,51,921	4,53,109	4,59,252	3,56,942	5,49,272	4,22,438	4,82,156	2,61,784	2,25,437	1,79,025	1,77,026	2,23,200	2,05,880	2,12,059
Mean	4,46,426	3,53,493	3,42,361	2,59,607	3,73,326	3,14,119		2,14,093	1,86,646	1,54,825	1,53,255	1,88,106	1,74,906	
Ludhiana														
Basmati rice-chickpea-green manure	2,84,425	2,69,478	2,04,456	2,08,264	2,22,387	2,30,145	2,36,526	98,668	1,05,570	91,261	1,01,561	1,07,815	1,01,129	1,01,001
Basmati rice-wheat-green manure	3,25,790	3,17,099	2,89,290	2,94,303	2,65,652	2,81,483	2,95,603	94,078	99,468	87,238	97,438	1,01,617	96,630	96,078
Kharifmoong-wheat-summer moong	2,99,080	2,73,278	2,30,351	2,30,696	2,35,626	2,59,137	2,54,695	89,305	96,503	90,826	90,276	96,530	89,652	92,182
Sesame-lentil	1,64,850	1,46,900	1,42,320	1,34,797	1,26,721	1,48,291	1,43,980	59,688	63,716	58,468	58,568	63,307	59,127	60,479
Mean	2,68,536	2,51,689	2,16,604	2,17,015	2,12,597	2,29,764		85,435	91,314	81,948	86,961	92,317	86,635	
Modipuram														
Black rice -lentil - vegetable cowpea	1,44,021	1,16,576	98,400	91,736	93,847	88,220	1,05,467	75,180	83,035	64,887	64,887	68,604	78,262	72,476
Finger millet - barley - sesbaniastrata green manure	1,62,934	1,41,389	1,41,011	1,43,669	1,42,219	1,02,042	1,38,877	86,100	90,030	55,407	61,974	75,756	84,408	75,613
Okra - vegetable pea - sesbaniaaculeata green manure	3,02,130	2,66,986	2,36,131	2,31,294	2,40,791	2,03,362	2,46,782	94,000	97,630	67,765	77,672	83,545	91,503	85,353
Black gram - tomato - sunhemp green manure	5,01,853	4,07,285	4,53,735	4,77,026	4,47,029	3,38,765	4,37,616	1,25,100	1,25,530	92,669	1,04,015	1,11,571	1,17,266	1,12,692
Mean	2,77,735	2,33,059	2,32,319	2,35,931	2,30,972	1,83,097		95,095	99,056	70,182	77,137	84,869	92,860	
Pantnagar														
Basmati rice - wheat	3,69,215	3,03,325	2,93,058	3,12,413	3,20,018	2,61,180	3,09,868	79,323	73,823	68,225	70,725	82,100	72,694	74,482
Basmati rice - mustard	3,59,753	3,23,683	2,94,707	3,05,167	3,19,128	2,70,262	3,12,117	71,591	63,091	55,080	58,030	72,392	64,371	64,093
Basmati rice - vegetable pea (4 rows vegetable pea + 2 rows coriander)	4,29,709	3,85,127	3,05,088	3,14,402	3,25,537	3,05,309	3,44,196	79,201	74,981	68,946	71,446	78,094	72,640	74,218
Basmati rice - potato	4,20,940	3,54,169	2,85,647	2,85,866	3,15,755	2,93,185	3,25,927	77,775	71,975	72,288	74,788	77,087	71,244	74,193
Mean	3,94,904	3,41,576	2,94,625	3,04,462	3,20,109	2,82,484		76,973	70,968	66,135	68,747	77,418	70,237	
Raipur														
Soybean-maize (sweet corn)	5,51,501	3,54,552	3,95,822	5,28,251	3,71,155	3,08,731	4,18,335	1,38,095	1,72,360	99,948	1,01,948	1,19,029	1,21,858	1,25,540
Soybean- french bean	2,67,196	1,84,200	1,97,083	2,28,760	1,64,207	1,46,461	1,97,984	68,456	77,371	60,238	62,236	64,363	75,297	67,993
Soybean-cabbage	6,16,937	4,81,287	4,53,448	5,19,916	4,39,914	4,17,814	4,88,219	1,29,222	1,17,607	84,204	86,204	1,06,723	1,06,341	1,05,050
Soybean-tomato	7,71,236	5,36,441	6,06,784	6,28,589	5,51,332	5,07,967	6,00,392	1,67,634	1,56,019	1,23,357	1,25,357	1,45,506	1,44,938	1,43,802
Mean	5,51,718	3,89,120	4,13,284	4,76,379	3,81,652	3,45,243		1,25,852	1,30,839	91,936	93,936	1,08,905	1,12,109	
Ranchi														
Rice - wheat	1,93,835	1,69,203	1,41,610	1,05,319	1,30,062	1,29,996	1,45,004	1,01,443	90,238	62,491	55,761	82,413	84,957	79,551
Rice - onion	3,25,209	3,09,338	1,88,884	1,56,715	2,36,336	2,08,847	2,37,555	1,07,392	89,238	52,062	47,912	88,767	80,176	77,591
Rice - potato	4,49,735	4,24,812	2,24,871	1,68,464	2,66,118	2,89,773	3,03,962	1,18,649	1,02,337	67,664	67,878	1,05,894	96,453	93,146
Rice-okra	3,12,650	2,83,801	2,02,642	1,37,266	2,16,911	2,14,549	2,27,970	1,06,375	88,221	52,075	46,895	87,750	79,159	76,746
Mean	3,20,357	2,96,789	1,89,502	1,41,941	2,12,357	2,10,791		1,08,465	92,509	58,573	54,612	91,206	85,186	
Umiam														
Bhindi-Carrot	5,86,045	5,02,753	5,35,917		5,22,383		5,36,775	2,68,925	2,39,473	2,46,392		2,38,408		2,48,300
Bhindi-Potato	5,15,245	4,33,643	4,55,765		4,32,209		4,59,216	2,50,445	2,19,478	2,29,500		2,01,854		2,25,319
Bhindi-Tomato	5,37,565	5,09,092	5,20,090		4,90,443		5,14,298	2,38,145	2,11,512	2,20,090		2,01,543		2,17,823
Bhindi-Frenchbean	4,55,425	4,05,908	4,14,990		4,08,118		4,21,110	2,04,415	1,88,678	1,87,530		1,71,408		1,88,008
Mean	5,23,570	4,62,849	4,81,691		4,63,288			2,40,483	2,14,785	2,20,878		2,03,303		
Ajmer														
Cow pea + maize (4:2) - coriander + cabbage (2:1)	1,31,600	1,29,880	1,34,482	1,63,507	1,34,898	1,43,773	1,39,690	64,525	50,865	40,938	53,438	52,896	45,031	51,282
Cow pea + maize (4:2) - fennel + cabbage (2:1)	2,57,220	2,48,220	2,39,024	2,78,665	2,54,876	2,63,235	2,56,873	81,685	60,525	45,136	57,636	63,532	51,471	59,998
Cow pea - fennel	2,02,800	2,03,780	1,88,724	2,24,945	2,02,656	2,05,035	2,04,657	81,685	60,525	45,136	57,636	63,532	51,471	59,998
Cow pea - coriander	95,240	90,780	81,462	1,05,627	99,798	88,113	93,503	64,525	50,865	40,938	53,438	52,896	45,031	51,282
Mean	1,71,715	1,68,165	1,60,923	1,93,186	1,73,057	1,75,039		73,105	55,695	43,037	55,537	58,214	48,251	



Almora	1,24,888	1,12,887	48,904			89,578		94,064	72,271	77,853	51,132		63,895		66,288
Grain Amaranth-wheat + lentil															
Fingermillet + black soybean-wheat + toria	1,17,950	99,397	59,903			99,533		94,196	79,667	83,146	56,513		70,104		72,358
Mean	1,21,419	1,06,142	54,404			94,556			75,969	80,500	53,823		67,000		
Gangtok															
Maize+ginger(1:1)-french Bean	4,98,177	4,94,979							1,46,714	1,50,238					
Maize-soybean-buckwheat	2,09,933	1,93,261							76,993	78,830					
Maize+turmeric(1:1)-rajmash	4,29,752	4,41,497							1,25,299	1,28,978					
Maize-black gram (pahunlo dal)- toria	2,07,152	2,04,978							83,459	84,009					
Mean	3,36,253	3,33,678							1,08,116	1,10,514					
Narendrapur															
Paddy(Gobindobhog)-paddy(Swarna)-black gram	2,36,527	2,25,527	1,80,418			1,57,972		1,94,750	1,80,527	1,40,527	1,09,418		1,44,972		1,34,602
Paddy (IE14786)- Lathyrus (Ratan) -sesbania(GM)	1,87,122	1,78,456	90,976			1,07,549		1,28,041	1,00,122	73,456	54,976		77,549		70,541
Paddy(IE14786)- Red amaranthus/cucumber-green gram	3,71,817	3,90,567	2,71,212			2,79,014		3,16,498	2,44,817	1,68,567	1,11,212		1,78,014		1,58,164
Paddy (IE14786)- veg,pea-sesame	3,22,210	2,98,543	2,50,897			2,28,553		2,60,636	1,75,210	1,38,543	1,15,897		1,45,553		1,35,802
Mean	2,79,419	2,73,273	1,98,376			1,93,272		2,13,200	1,75,169	1,30,273	97,876		1,36,522		1,10,950
Sardarkrushinagar															
Green gram-amaranth - fallow	1,00,264	79,125	1,06,640			1,00,097		87,653	77,803	65,857	56,598		67,370		69,428
Green gram -mustard - fallow	99,500	82,563	1,08,160			1,03,958		90,916	72,624	64,227	58,813		65,888		68,821
Groundnut-lucerne - lucerne	2,68,138	2,38,808	2,70,079			2,69,918		2,59,310	1,08,918	1,04,678	1,01,688		1,05,558		1,08,847
Mean	1,55,967	1,33,499	1,61,626			1,57,991		1,35,334	86,448	78,254	72,366		79,605		74,833
Thiruvananthapuram															
Cassava-vegetable cowpea	7,19,047	4,61,518	3,56,524			4,70,720		4,74,110	2,13,050	1,98,370	1,71,670		2,24,993		2,05,143
Cassava-groundnut	7,19,047	4,61,518	3,56,524			4,70,720		4,74,110	2,13,050	1,98,370	1,71,670		2,24,993		2,05,143
Taro-blackgram	4,18,200	3,45,120	3,08,355			2,84,205		2,81,428	3,32,800	3,01,870	2,37,135		2,79,905		2,82,277
Taro-greengram	4,18,200	3,45,120	3,08,355			2,84,205		2,81,428	3,32,800	3,01,870	2,37,135		2,79,905		2,82,277
Mean	5,68,624	4,03,319	3,32,440			3,77,463		3,77,769	2,72,925	2,50,120	2,04,403		2,52,449		2,75,044
Udaipur															
Maize+blackgram (2:2)-wheat (durum)-sesbania(GM)	2,17,911	2,08,535	2,31,127			2,46,860		2,23,818	1,02,896	88,386	55,007		78,961		75,603
Blackgram - wheat (triticum)	1,76,505	1,69,604	1,86,294			2,03,540		1,82,838	69,926	67,487	44,820		57,399		57,118
Sweet corn + blackgram (2:2) - chickpea	2,04,996	1,91,325	2,15,125			2,34,862		1,79,370	1,02,406	97,555	72,366		87,407		86,523
Soybean - fenugreek	1,23,722	1,18,348	1,28,315			1,43,235		1,12,968	58,490	61,855	43,824		51,201		52,411
Mean	1,80,784	1,71,953	1,90,215			2,07,124		1,64,733	83,430	78,821	54,004		68,742		58,436

Table 7.2.14. Net return and net return per rupee invested of different crops and cropping system as influence by organic, inorganic and integrated production systems at different locations

Location/cropping systems	Net returns (Rs/ha)				Net return per rupee invested			
	Organic		Inorganic		Organic		Inorganic	
	Organic-I [100% as per NPOP standard]	Organic-II [50% nutrients through organic sources + 25% NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package	Towards Organic-I [50% nutrients through organic sources + 25% NF practice]	Towards Organic-II [25% nutrients through inorganic source of nutrients + NF practice]	100% inorganic (No organic manures)	State recommendations or farmers package
Bajaura								
Frenchbean-cauliflower-frenchbean	3,79,584	4,08,238	1,93,454	2,28,403	2,91,840	2,91,702	2,98,870	1,51
Fallow-cauliflower-tomato	8,20,164	8,99,023	5,16,691	8,92,285	8,03,868	7,82,057	7,85,681	3,87
Black gram-cauliflower- summer squash	3,67,629	3,98,395	1,99,421	4,30,643	4,28,336	4,23,823	3,74,708	2,14
Okar-pea	2,51,726	2,91,689	1,58,360	2,18,260	2,40,729	2,30,217	2,31,830	1,93
Mean	4,54,776	4,99,336	2,66,981	4,42,398	4,41,193	4,31,950		2,36
Bhopal								
Soybean-wheat (durum)	34,757	24,889	23,127	29,653	43,341	21,228	29,499	1,50
Soybean- mustard	31,028	25,565	26,539	27,559	40,449	20,428	28,595	1,51
Soybean- chickpea	46,073	37,990	39,222	39,563	58,084	32,308	42,207	1,73
Soybean- linseed	62,914	56,930	53,441	54,171	70,839	52,949	58,541	1,99
Mean	43,693	36,344	35,582	37,737	53,178	31,728		1,68
Calicut								
Turmeric-fallow	55,501	1,22,288	1,03,792		1,58,011	1,48,891	1,17,697	1,70
Coimbatore								
Brinjal - pearl millet-green manure (dhaincha) -	2,07,563	1,78,630	1,78,512	1,50,404	1,76,021	1,17,333	1,68,077	2,05
Chillies - barnyard millet-green manure (dhaincha)	2,07,087	1,65,606	1,54,366	1,70,140	1,50,490	1,20,737	1,61,404	1,83
Tomato -finger millet-green manure (dhaincha)	1,68,646	1,37,068	1,28,108	1,74,969	1,35,124	86,380	1,38,383	1,65
Mean	1,94,432	1,60,435	1,53,662	1,65,171	1,53,878	1,08,150		1,84
Dharwad								
Pigeon pea +green gram (2:4)	12,857	13,490	13,242	14,397	14,242	9,558	12,964	1,45
Pigeon pea +soybean (2:4)	91,010	86,337	90,785	1,01,681	97,495	81,348	91,443	4,21
Pigeon pea +groundnut (2:4)	36,824	34,651	44,586	38,881	40,376	34,799	38,353	1,96
Cotton +green gram (1:1)	5,458	7,948	15,580	11,275	11,821	7,894	9,996	1,23
Cotton +soybean (1:1)	81,669	75,615	88,951	91,810	85,372	75,348	83,128	2,93
Mean	45,564	43,608	50,629	51,609	49,861	41,789		2,25
Jabalpur								
Soybean- wheat	11,245	31,925	61,754	34,479	28,272	47,442	35,853	1,12
Soybean-mustard-green gram	14,925	53,887	1,02,831	50,082	40,321	24,432	47,746	1,14
Soybean-berseem (fodder and seed)	1,22,620	1,08,035	1,16,431	87,878	1,04,213	1,11,645	1,08,470	2,41
Soybean-lentil- sorghum (fodder)	-10,277	-9,480	-8,717	-6,095	-16,663	17,439	-5,632	0,90
Mean	34,628	46,092	68,075	41,586	39,036	50,240		1,39



Karjat	3,46,237	2,86,232	3,57,306	1,52,469	2,80,758	2,32,999	2,76,000	2,16	2,10	2,68	1,72	2,08	1,96	2,12
Rice-brinjal	1,00,912	72,341	56,276	48,065	68,428	59,747	67,628	1,70	1,56	1,52	1,45	1,53	1,50	1,54
Rice-chickpea	92,046	73,141	56,333	44,959	65,623	47,548	63,275	1,60	1,52	1,47	1,38	1,47	1,36	1,47
Rice-field bean	3,90,137	2,27,672	2,80,227	1,79,916	3,26,072	2,16,558	2,70,097	2,49	2,01	2,57	2,02	2,46	2,05	2,27
Rice- onion (white)	2,32,333	1,64,847	1,87,536	1,06,352	1,85,220	1,39,213		1,99	1,80	2,06	1,64	1,88	1,72	
Ludhiana														
Basmati rice-chickpea-green manure	1,85,757	1,63,907	1,13,194	1,06,703	1,14,572	1,29,016	1,35,525	2,88	2,55	2,24	2,05	2,06	2,28	2,34
Basmati rice-wheat-green manure	2,31,713	2,17,632	2,02,052	1,96,866	1,64,035	1,84,854	1,99,525	3,46	3,19	3,32	3,02	2,61	2,91	3,09
Khariymoong-wheat-summer moong	2,09,775	1,76,775	1,39,526	1,40,420	1,39,096	1,69,485	1,62,513	3,35	2,83	2,54	2,56	2,44	2,89	2,77
Sesame-lentil	1,05,163	83,184	83,853	76,230	63,414	89,164	83,501	2,76	2,31	2,43	2,30	2,00	2,51	2,39
Mean	1,83,102	1,60,375	1,34,656	1,30,055	1,20,279	1,43,130		3,11	2,72	2,63	2,48	2,28	2,65	
Modipuram														
Black rice -lentil - vegetable cowpea	68,841	33,541	33,513	26,849	25,243	9,958	32,991	1,92	1,40	1,52	1,41	1,37	1,13	1,46
Finger millet - barley - sesbaniaostrata green manure	76,834	51,359	85,604	81,695	66,463	17,634	63,265	1,89	1,57	2,55	2,32	1,88	1,21	1,90
Okra - vegetable pea - sesbaniaaculeata green manure	2,08,130	1,69,356	1,68,366	1,53,622	1,57,246	1,11,859	1,61,430	3,21	2,73	3,48	2,98	2,88	2,22	2,92
Black gram - tomato - sunhemp green manure	3,76,753	2,81,755	3,61,066	3,73,011	3,35,458	2,21,499	3,24,924	4,01	3,24	4,90	4,59	4,01	2,89	3,94
Mean	1,82,640	1,34,003	1,62,137	1,58,794	1,46,103	90,238		2,76	2,24	3,11	2,82	2,53	1,86	
Pantnagar														
Basmati rice - wheat	2,89,892	2,29,502	2,24,833	2,41,688	2,37,918	1,88,486	2,35,386	4,65	4,11	4,30	4,42	3,90	3,59	4,16
Basmati rice - mustard	2,88,162	2,60,592	2,39,627	2,47,137	2,46,736	2,05,891	2,48,024	5,03	5,13	5,35	5,26	4,41	4,20	4,90
Basmati rice - vegetable pea (4 rows vegetable pea + 2 rows coriander)	3,50,508	3,10,146	2,36,142	2,42,956	2,47,443	2,32,669	2,69,978	5,43	5,14	4,43	4,40	4,17	4,20	4,63
Basmati rice - potato	3,43,165	2,82,194	2,13,359	2,11,078	2,38,668	2,21,941	2,51,734	5,41	4,92	3,95	3,82	4,10	4,12	4,39
Mean	3,17,932	2,70,609	2,28,490	2,35,715	2,42,691	2,12,247		5,13	4,82	4,51	4,47	4,14	4,03	
Raipur														
Soybean-maize (sweet corn)	4,13,406	1,82,192	2,95,874	4,26,304	2,52,125	1,86,873	2,92,796	3,99	2,06	3,96	5,18	3,12	2,53	3,47
Soybean- french bean	1,98,741	1,06,829	1,36,845	1,66,524	99,844	71,164	1,29,991	3,90	2,38	3,27	3,68	2,55	1,95	2,95
Soybean-cabbage	4,87,715	3,63,680	3,69,244	4,33,713	3,33,191	3,31,473	3,83,169	4,77	4,09	5,39	6,03	4,12	3,93	4,72
Soybean-tomato	6,03,602	3,80,422	4,83,428	5,03,233	4,05,826	3,63,029	4,56,590	4,60	3,44	4,92	5,01	3,79	3,50	4,21
Mean	4,25,866	2,58,281	3,21,348	3,82,443	2,72,746	2,33,135		4,32	2,99	4,38	4,98	3,40	2,98	
Ranchi														
Rice - wheat	92,392	78,965	79,119	49,558	47,649	45,039	65,454	1,91	1,88	2,27	1,89	1,58	1,53	1,84
Rice - onion	2,17,817	2,20,100	1,36,822	1,08,803	1,47,569	1,28,671	1,59,964	3,03	3,47	3,63	3,27	2,66	2,60	3,11
Rice - potato	3,31,086	3,22,475	1,57,207	1,00,586	1,60,224	1,93,320	2,10,816	3,79	4,15	3,32	2,48	2,51	3,00	3,21
Rice-okra	2,06,275	1,95,580	1,50,567	90,371	1,29,161	1,35,390	1,51,224	2,94	3,22	3,89	2,93	2,47	2,71	3,03
Mean	2,11,893	2,04,280	1,30,929	87,330	1,21,151	1,25,605		2,92	3,18	3,28	2,64	2,31	2,46	
Umiam														
Bhindi-Carrot	3,17,120	2,63,280	2,89,525		2,83,975		2,88,475	1,05	0,92	1,11		1,02		1,02
Bhindi-Potato	2,64,800	2,14,165	2,26,265		2,30,355		2,33,896	0,77	0,77	0,65		0,96		0,79
Bhindi-Tomato	2,99,420	2,97,580	3,00,000		2,88,900		2,96,475	1,48	1,60	1,53		1,50		1,53
Bhindi-Frenchbean	2,51,010	2,17,230	2,27,460		2,36,710		2,33,103	1,01	0,79	0,98		1,01		0,95
Mean	2,83,088	2,48,064	2,60,813		2,59,985			1,08	1,02	1,06		1,12		
Ajmer														
Cow pea + maize (4:2) - coriander + cabbage (2:1)	67,075	79,015	93,544	1,10,069	82,002	98,742	88,408	2,04	2,55	3,29	3,06	2,55	3,19	2,78
Cow pea + maize (4:2) - fennel + cabbage (2:1)	1,75,535	1,87,695	1,93,888	2,21,029	1,91,344	2,11,764	1,96,876	3,15	4,10	5,30	4,83	4,01	5,11	4,42
Cow pea - fennel	1,21,115	1,43,255	1,43,588	1,67,309	1,39,124	1,53,564	1,44,659	2,48	3,37	4,18	3,90	3,19	3,98	3,52
Cow pea - coriander	30,715	39,915	40,524	52,189	46,902	43,082	42,221	1,48	1,78	1,99	1,98	1,89	1,96	1,85
Mean	98,610	1,12,470	1,17,886	1,37,649	1,14,843	1,26,788		2,29	2,95	3,69	3,44	2,91	3,56	



Pictures of different crops as influenced by management practice at different locations



Best performing management practice with black gram–cauliflower–summer squash at Bajaura



Best performing cropping system in term of system equivalent yield (cauliflower) & net returns at Bajaura



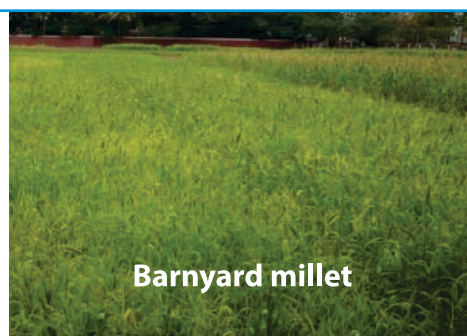
Soybean, wheat, chickpea, mustard and linseed under organic management practice at Bhopal



Brinjal



Pearl millet



Barnyard millet



Tomato



Finger millet



Chilli

Crops under organic practice at Coimbatore



Cotton + soybean (Organic practice)



Cotton + soybean (Inorganic practice)



Cotton + soybean (Integrated practice)



Green gram, Soybean and Pigeon pea under organic management practice at Dharwad





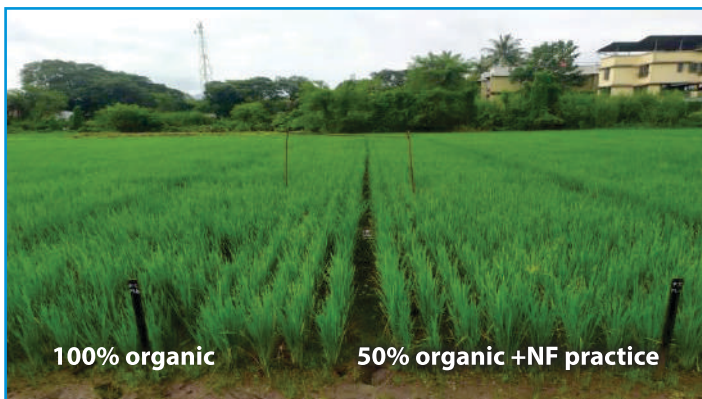
Soybean crop under organic and integrated practice at Jabalpur



Wheat crop under organic and inorganic condition at Jabalpur



Chickpea crop under organic and inorganic condition at Jabalpur



Rice crop at Karjat



Brinjal



Chickpea, white onion and field bean at karjat



Black rice, cowpea, barley and okra under organic management practice at Modipuram





Pea, Mustard and potato under organic management practice at Pantnagar



Coriander + Cabbage (2:1), Fennel + Cabbage (2:1) and Cow pea + Maize (4:2) at Ajmer



Rice (Swarna)

Lathyrus

Rice and Lathyrus at Narendrapur



Red Amaranthus + Cucumber



Vegetable Pea



Green gram



Sesame

Red amaranthus, pea, green gram and sesame at Narendrapur

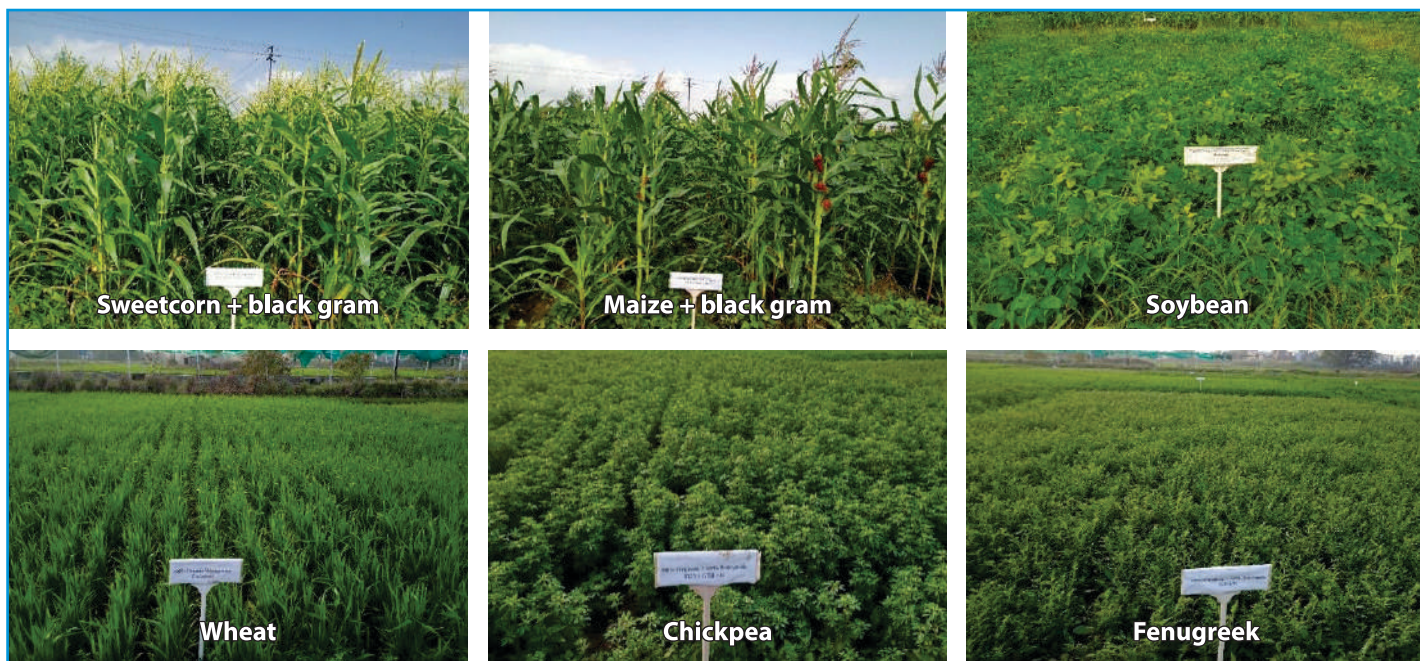


Green gram and Amaranthus under organic management practice at SK Nagar





Mustard, Lucerne and Groundnut under organic management practice at SK Nagar



Crops under organic management practice at Udaipur

7.2.2 Evaluation of response of different varieties of major crops for Organic Farming

Objectives

- To evaluate the response of varied duration and nutrient requiring varieties of major crops to organic production system
- To identify the suitable varieties of crops for organic management practices

Year of start: 2013-14

Locations: All the 20 centers in different ecosystem as mentioned in section 7.1 have conducted the experiments including 7 new centers started experimentation from 2015-16. Almora and Narendrapur not conducted the experiments.

Three to four groups of varieties based on crop duration, nutrient and water requirement and insect/disease tolerance was selected for evaluation. Two major varieties grown by the farmers in the region was also included. About 10-12 different varieties/ hybrids, which are popular in farmers or recommended by institutions were evaluated for potential cropping system of organic farming in 3 replications in RBD having the minimum Plot size 20 m². All the centers have taken up this experiment as it is especially important to identify the varieties which form the core of organic farming package.

Results:

Result for each center are presented and discussed

Bajaura (Table 7.2.2.1, 2 & 3)

Performance of maize: Significant differences among the varieties for all the traits were observed except, cob length cob diameter, no. of rows/cob and Stover yield. Among the maize varieties, Bajaura

Makkaand Girijarecorded higher grain yield of 5380 & 5180kg/ha, along with net return and B:C ratio respectively. However, plant height (241.8cm), cob length (21.8cm) and cob diameter (4.8cm) highest in variety L-315.

Performance of wheat: Although plant height and number of tillers/m² recorded higher in HPW-373 (96.4cm & 311.0 /m² but HPW-368 recorded significantly higher grain yield (3510 kg/ha) & 1000-grains weight (46.4 g) & followed by HPW-373 (3070 kg/ha & 45.8g), respectively among the wheat varieties. Further, the maximum net returns (Rs. 36061 /ha) and B:C (1.30) was found maximum in variety HPW-368.

Nutrient uptake by different maize and wheat varieties: Non-significant difference for N, P, and K uptake were observed. The variation of nutrients uptake by the different varieties of maize found in range between 67.6 to 70.3 kg/ha for N, 23.9 – 28.3 kg/ha for P and 58.3 – 61.0 kg/ha for K. Nitrogen uptake among maize varieties was found higher in Bajauramakka (70.3 kg/ha) & L-317(70.3 kg/ha) which was at par with L-315 (70.1 kg/ha). P uptake was higher in Early composte& L-317 (28.3 kg/ha) which was at par with PalampurSankarMakka II (27.0 kg/ha). K uptake was significantly higher in PalampurSankarMakka II (61.0 kg/ha). Among the wheat varieties HPW-368 was found higher N & K (41.4 & 36.6 kg/ha) which was at par HPW-373 (40.9 & 35.2 kg/ha) whereas, P uptake was highest in variety Girija.

Table 7.2.2.1: Yield attributes and yield of maize in under organic condition at Bajaura

Varieties	Plant height (cm)	Cob length (cm)	Cob diameter (cm)	No. of rows/cob	1000 Grain weight (g)	Grain yield (kg/ha)	Stover yield (kg/ha)	Net Returns (Rs. /ha)	B:C ratio
Early composite	223.8	20.5	4.6	14.0 2	22.7	4310	6460	6831	1.05
Girija	198.6	16.7	4.4	14.0	316.3	5180	6190	27571	1.22
Bajauramakka	204.7	19.4	4.7	15.3	316.7	5380	6550	33927	1.27
Palampursankarmakka II	209.8	18.5	4.8	14.0	293.7	4890	6430	21224	1.17
L-317	212.5	18.9	4.6	17.3	263.7	4570	6550	13691	1.11
L-II 315	241.8	21.8	4.8	14.0	299.3	4960	6640	23785	1.19
CD (P=0.05)	24.3	NS	NS	NS	18.3	650	NS	14774	0.12



Table 7.2.2.2: Yield attributes and yield of wheat under organic condition at Bajaura

Varieties	Plant height (cm)	Number of tillers/m ²	1000 Grain weight (g)	Grain Yield (kg/ha)	Straw yield (kg/ha)	Net Returns (RS. /ha)	B:C
HPW-368	93.4	304.7	46.4	3510	5150	36061	1.30
HS-507	89.8	289.3	42.1	2840	4770	11102	1.09
HS-562	88.0	303.0	41.3	2760	4740	8356	1.07
HPW-349	91.6	278.3	43.8	2900	4870	13890	1.11
HPW-373	96.4	311.0	45.8	3070	5340	23432	1.19
HPW-360	84.0	272.3	40.6	2610	4630	2620	1.02
CD (P=0.05)	6.9	NS	NS	480	NS	12632	0.11

Table 7.2.2.3: Total NPK uptake (kg/ha) by maize and wheat varieties under organic farming

Maize varieties	Wheat varieties	Kharif			Rabi		
		N	P	K	N	P	K
Early Composite	HPW-368	67.6	28.3	59.7	41.4	12.3	36.6
Girija	HS-507	69.5	26.7	58.3	38.5	15.3	33.3
BajauraMakka	HS-562	70.3	23.9	58.8	37.6	13.9	33.0
PalampurSankarMakka II	HPW-349	69.3	27.0	61.0	37.5	12.4	33.3
L-317	HPW373	70.3	28.3	58.6	40.9	11.9	35.2
L-315	HPW-360	70.1	26.7	59.5	36.6	13.9	32.4
CD (P=0.05)		NS	NS	NS	NS	NS	NS

Bhopal (Table 7.2.2.4 & 5)

Performance of groundnut: Among the varieties of groundnut grown under similar organic nutrient source and doses, the cultivar GPBD-5 out performed in terms of seed yield followed by GJG-17, DH-256, ICGV-16690. Plant height (37.9cm), Pods/plant (37.3), Seed yield (2111 kg ha⁻¹) and Biomass yield of GPBD-5 (4850 kg/ha) were found significantly higher than others.

Performance of Mustard: Twelve varieties of mustard were evaluated for their yield response to screen out promising varieties for organic management

practices for central India. Silique/plant of different varieties were not significantly affected under similar nutrient management under organic farming; however, different yield attributing parameter such as plant height, seeds/silique, test weight and yields significantly differ. Among the varieties of mustard grown under similar organic nutrient source and doses, the cultivar ARAVALI out performed in terms of seed yield followed by CS-52, MAYA, DRMR-150-35, NRCDR-2, PGN-229, PUSA MAHAK, DRMR-IJ – 31, NRCDR-601, NRCHB-101 and RH-749. Seed yield of ARAVALI (1223 kg ha⁻¹) and total biomass (4209 kg ha⁻¹) was found significantly higher than others

Table 7.2.2.4: Performance of different varieties of groundnut at Bhopal

Varieties	Plant height (cm)	Pods/plant	Seed yield (kg/ha)	Biomass yield (kg/ha)
ICGV-16697	33.7	28.3	1614	3213
GJG-17	35.2	34.7	1987	4386
DH-256	36.3	33.4	1964	4738
GJGHPS-1	33.9	25.0	1592	3695
GG-20	35.6	27.8	1133	3128
ICGV-16690	35.1	28.4	1911	4045
DH-86	28.9	29.0	998	2352

Varieties	Plant height (cm)	Pods/plant	Seed yield (kg/ha)	Biomass yield (kg/ha)
DH-101	31.4	24.8	1196	2593
GPBD-5	37.9	37.3	2111	4850
JL-24	32.3	32.6	1467	3084
DH-245	31.0	26.0	1036	3122
DH-232	31.8	28.4	1339	3385
CD (P= 0.05)	3.5	4.4	150	543

Table 7.2.2.5: Performance of different varieties of mustard in terms of yield at Bhopal

Variety	Plant height (cm)	Siliqua/plant	Seeds/siliqua	Test weight (g)	Seed yield (kg/ha)	Biomass Yield (kg/ha)
DRMR-IJ - 31	141	236	10.7	6.0	937	3253
NRCDR-2	134	217	10.3	5.3	1008	3687
NRCHB-101	126	190	10.0	5.5	774	3147
DRMR-150-35	140	211	11.3	5.5	1018	3560
NRCDR-601	136	202	10.0	5.3	849	3481
RH-749	124	214	9.3	6.0	703	2856
ARAVALI	146	228	12.7	6.1	1223	4209
PUSA MAHAK	142	218	11.3	5.9	973	3632
CS-52	143	228	12.3	6.0	1140	3967
MAYA	138	220	11.3	5.5	1028	3752
PM-22	135	218	10.3	5.3	1013	3572
PGN-229	132	225	10.7	5.9	985	3803
CD (P= 0.05)	5	NS	1.0	0.2	155	373

Calicut (Table 7.2.2.6)

Significant difference in oil, oleoresin and curcumin content in turmeric varieties was observed under organic management. Among the varieties significantly higher yield was recorded by Pragati (29200 kg/ha) followed by Suguna (26300 kg/ha) and Sudarsana (24800 kg/ha). Among the varieties significantly higher oil content was noticed in varieties Suvarna (6.10%) followed by Sobha (6.07%)

and Kanthi (5.77%). Aleppey Supreme variety was superior in oleoresin content (12.73%) and least was recorded in Sudarsana (4.50%) on comparison with other varieties. The variety Prabha (5.81%) recorded maximum curcumin followed by Prathibha (5.42%) and Kedaram (5.40%). The Pragati variety of turmeric achieved the highest net return, amounting to Rs. 5,10,125 per hectare, with B:C ratio of 2.80.

Table 7.2.2.6: Yield (kg/ha), quality and economics of different turmeric varieties under organic at Calicut

Varieties	Yield (kg/ha)	Oil (%)	Oleoresin (%)	Curcumin (%)	Cost of cultivation (Rs/ha)	Net Returns (Rs/ha)	B:C Ratio
Prathibha	6000	4.47	10.23	5.42	182499	104125	0.57
Aleppey Supreme	6900	5.13	12.73	4.77	182499	120750	0.66
Varna	18500	5.10	6.13	2.43	182499	322875	1.77
Shoba	19400	6.07	6.47	2.63	182499	338625	1.86
Sona	18600	5.57	7.13	2.42	182499	324625	1.78
Kanthi	18500	5.77	5.47	2.73	182499	322875	1.77
Suvarna	20500	6.10	5.60	2.60	182499	358750	1.97
Suguna	26300	4.97	4.80	4.56	182499	460250	2.52
Sudarsana	24800	4.50	4.50	4.78	182499	434000	2.38
Kedaram	6200	4.70	12.23	5.40	182499	107625	0.59
Prabha	10600	5.70	8.67	5.81	182499	184625	1.01
Pragati	29200	4.10	11.17	4.39	182499	510125	2.80
CD (P=0.05)	3590	0.45	1.06	0.42			



Coimbatore (Table 7.2.2.7-10)

Performance of rice: All the growth parameters showed significant difference among rice varieties evaluated under organic condition. The highest plant height at harvest was significantly recorded in Kuzhiadichan (164.9 cm), while Kullakar been smallest (98.7 cm). Variation in productive tillers recorded in range from 10.2 to 17.1. AthurKichili sambahad the maximum productive tillers (17.1 numbers/hill) while Garudan sambahad least numbers of productive tillers/ hill (10.2). The highest panicle length of 26.7 cm was recorded in Anaikomban, It was followed by Kuzhiadichan (25.4 cm), Illuppaipoo samba (24.5cm), which were comparable with each other. Grain yield difference was observed significantly among the rice varieties ranged from 2609 to 4560 kg/ha. AthurKichili sambarecorded highest grain yield (4560 kg/ha) while Poonkar had lowest grain yield (2609 kg/ha).

Economics of rice: Rice variety AthurKichili samba recorded the highest net return of Rs.1,29,336/ha followed by Thanga samba (Rs.1,22,752/ha). Lowest net return per hectare was observed in rice variety Poonkar (Rs.26,171/ha). Likewise benefit cost ratio was also obtained with AthurKichili samba of 3.37.

Major pests of rice: Twelve traditional varieties of rice assessed for their response to thrips, the minimum

damage (3.11%) was recorded in Poonkar, followed by AthurKichili samba (3.72%) whereas the maximum damage of 6.62 per cent observed in the Anaikomban. Regarding leaf folder damage at 40 DAT, Kuzhiadichan registered the lowest damage of 0.15 per cent as against the maximum of 2.68 per cent damage in Sornamasuri. With respect to stem borer damage, Anaikomban registered the lowest damage (0.11 per cent), followed by Milagu samba, as against the maximum 0.72 per cent in Kuzhiadichan.

Performance of green gram: All the growth parameters showed significant difference among green gram varieties evaluated under organic condition. Among the green gram varieties, highest plant height at harvest (56.9 cm), number of pods/plant (39.8), pod length (8.27 cm) and number of seeds/pod (11.3) were found highest in VBN-4, followed by VBN-2. Grain yield difference was observed significantly among the green gram varieties ranged from 645 to 989 kg/ha. VBN-4 recorded highest grain yield (989 kg/ha), followed by VBN-2 (937 kg/ha), while local had lowest grain yield (645 kg/ha). The variety VBN-4 yielded the highest net returns (Rs. 29,584 per hectare) and the highest Benefit-to-Cost ratio (1.75).

Table 7.2.2.7: Growth parameters and yield of rice varieties grown organically at Coimbatore

Varieties	Plant height at harvest (cm)	Productive tillers / m ²	Panicle length (cm)	Test weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest Index (%)
AthurKichili samba	117.7	17.1	22.6	18.5	4560	8505	0.35
Garudan samba	128.0	10.2	20.9	19.9	3607	8576	0.30
Illuppaipoo samba	118.4	15.8	24.5	15.8	2969	8189	0.27
Milagu samba	110.2	15.3	22.2	14.9	3436	6823	0.33
Poonkar	106.7	13.8	22.0	26.0	2609	6255	0.29
Sornamasuri	119.8	15.3	21.9	18.4	3953	7059	0.36
Thuaiyamalli samba	103.2	11.9	23.5	18.3	2966	6711	0.31
Thanga samba	105.3	14.7	21.5	20.9	4503	8010	0.36
Kuzhiadichan	164.9	12.0	25.4	27.0	4081	9860	0.29
Kullakar	98.7	15.5	22.0	22.2	3022	7845	0.28
Anaikomban	118.4	10.4	26.7	19.9	3949	8168	0.33
Thulasi vasa samba	120.1	11.1	23.7	14.0	3301	7290	0.31
CD (P=0.05)	15.57	4.05	1.62	1.55	704	1825	-

Table 7.2.2.8: Economics of rice varieties grown organically at Coimbatore

Varieties	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
AthurKichili samba	119923	249259	129336	2.08
Garudan samba	119923	201796	81873	1.68
Illuppaipoo samba	119923	168922	48999	1.41
Milagu samba	119923	188869	68946	1.57
Poonkar	119923	146094	26171	1.22
Sornamasuri	119923	215297	95374	1.80

Varieties	Cost of cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C ratio
Thuaiyamalli samba	119923	165071	45148	1.38
Thanga samba	119923	242675	122752	2.02
Kuzhiadichan	119923	228719	108796	1.91
Kullakar	119923	170689	50766	1.42
Anaikomban	119923	217881	97958	1.82
Thulasi vasa samba	119923	183267	63344	1.53

Table 7.2.2.9: Screening of rice varieties against major pests at Coimbatore

Traditional varieties	Thrips damage (%)	Leaf folder damage at 40 DAT (%)	Stem borer damage (%)
AthurKichili samba	3.72	1.12	0.49
Garudan samba	5.14	1.92	0.48
Illuppaipoo samba	4.78	0.98	0.54
Milagu samba	3.88	2.48	0.15
Poonkar	3.11	1.24	0.52
Sornamasuri	5.64	2.68	0.31

Traditional varieties	Thrips damage (%)	Leaf folder damage at 40 DAT (%)	Stem borer damage (%)
Thuaiyamalli samba	4.38	0.92	0.37
Thanga samba	3.79	0.71	0.43
Kuzhiadichan	5.37	0.15	0.72
Kullakar	5.63	0.82	0.23
Anaikomban	6.62	0.28	0.11
Thulasi vasa samba	4.28	1.71	0.16

Table 7.2.2.10: Growth parameters, yield and economics of green gram varieties grown organically at Coimbatore

Varieties	Plant height at harvest (cm)	Number of branches / plant	Number of pods / plant	Pod length (cm)	No. of seeds / pod	Yield (Kg/ha)	Cost of cultivation (Rs./ha)	Net return (Rs./ha)	B:C ratio
CO 7	52.4	3.6	38.4	8.17	10.6	867	39646	21044	1.53
CO 8	51.7	3.0	34.1	7.91	10.2	823	39646	17964	1.45
COGG-13-19	47.9	2.7	31.3	7.52	9.5	718	39646	10614	1.27
COGG-13-39	49.4	3.2	34.9	7.71	10.1	793	39646	15864	1.40
VRM 1	49.0	3.1	29.4	7.69	9.7	778	39646	14814	1.37
VBN 2	54.4	4.1	38.9	8.19	11.0	937	39646	25944	1.65
VBN 3	52.7	3.0	27.4	7.83	9.9	856	39646	20274	1.51
VBN 4	56.9	3.9	39.8	8.27	11.3	989	39646	29584	1.75
VGG-18-002	46.3	2.6	24.0	8.00	10.1	660	39646	6554	1.17
VGG-15-013	46.9	2.3	24.7	7.41	9.2	680	39646	7954	1.20
ADT 3	47.5	2.8	28.0	7.22	9.5	727	39646	11244	1.28
Local	46.0	2.7	22.3	7.20	9.1	645	39646	5504	1.14
CD (P=0.05)	2.80	0.54	6.19	0.53	1.00	59.8			



Dharwad (Table 7.2.2.11)

Performance of soybean and groundnut: Soybean and groundnut was undertaken to test the suitability under organic farming. Soybean varieties yielded between 980 to 1575 kg/ha, with DSB-34 achieving the highest yield (1575 kg/ha) and MACS 1188 (980 kg/ha) performing the lowest. Similarly, DSB-34 also

reported the highest net return of Rs. 27,657 per hectare and the best B:C ratio of 1.77. Among the groundnut varieties, Dh-245 achieved the highest seed yield of 2,260 kg/ha under organic conditions, while DBG-4 produced the lowest yield at 1,440 kg/ha. Additionally, Dh-245 also reported the highest net return of Rs. 74,805 and the best B:C ratio of 2.31.

Table 7.2.2.11: Grain yield and economics of soybean and groundnut varieties under organic production at Dharwad

Soybean				
Varieties	Yield (kg/ha)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)	Net return per rupee invested
DSb-21	985	36145	5,074	1.14
JS-93-05	1180	36145	11,281	1.31
MACS 1188	980	36145	3,321	1.09
DSb-23	1450	36145	24,672	1.68
DSb-34	1575	36145	27,657	1.77
CD (P=0.05)	37.0			

Groundnut				
Varieties	Yield (kg/ha)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)	Net return per rupee invested
Dh-256	2015	57285	59,987	2.05
DBG-3	1650	57285	38,175	1.67
DBG-4	1440	57285	28,740	1.50
Dh-245	2260	57285	74,805	2.31
Girnar-4	1610	57285	40,414	1.71
CD (P=0.05)	59.7			

Jabalpur (Table 7.2.2.12 & 13)

Twelve varieties of soybean and chickpea in system mode were evaluated for their performance and suitability under organic nutrient management.

Performance of soybean and chickpea varieties: Under the organic nutrient management system, there were significant variations in seed yield among soybean varieties. JS 20-116 achieved the highest seed yield at 1,056 kg/ha, followed by JS 20-94 with

877 kg/ha and JS 335 with 765 kg/ha. In contrast, JS 20-34 with 376 kg/ha and JS 20-29 with 408 kg/ha recorded the lowest yields. The seed yields of chickpea varieties ranged from 1143 to 1685 kg/ha. The highest yield of chickpea, 1685 kg/ha, was achieved with the variety Indira Chana, closely followed by JG 63 and JG 322, both yielding 1616 kg/ha. Conversely, the varieties JG 11, JG 24, and JAKI 9218 recorded the lowest seed yield at 1143 kg/ha.

Table 7.2.2.12: Productivity of different soybean and chickpea varieties under organic farming at Jabalpur

Soybean		Chickpea	
Varieties	Yield (kg/ha)	Varieties	Yield (kg/ha)
JS 20-29	408	JG 218	1212
JS 20-34	376	JG 11	1143
JS 20-69	445	JG 12	1281
JS 20-98	551	JG 14	1345
JS 20-116	1056	JG 16	1547
RVS 24	422	JG 24	1143
JS 20-94	877	JG 36	1281

Soybean		Chickpea	
Varieties	Yield (kg/ha)	Varieties	Yield (kg/ha)
JS 335	765	JG 63	1616
NRC 86	-	JG 130	1212
JS 97-52	514	Indira chana	1685
NRC-130	-	JG 322	1616
JS 21-72	468	JAKI 9218	1143
CD (P=0.05)	190.7		345.1

Karjat (Table 7.2.2.14-16)

Performance of rice and cowpea varieties: Fifteen rice varieties, categorized into early, mid-late, and late maturity groups (with four varieties in each category), including three popular ones among farmers, were assessed for their suitability under organic conditions. Variation for grain yield among the rice varieties ranged from 3090 to 4547 kg/ha. Among the rice varieties grouped in four categories, rice variety Sahyadri-4 (early maturing), Sahyadri-3 (mid-late maturing), Ratnagiri-8 (late maturing) and karjat-3 which is popular among farmers recorded significantly higher grain yield 4323 kg/ha, 4547 kg/ha, 3961 kg/ha, and 4214 kg/ha, respectively, compare to the other varieties. In contrast, Ratnagiri-1 recorded the lowest yield among the rice varieties, with grain yield 3090 kg/ha. Konkan Sadabahar variety of cowpea recorded the highest seed yield which was 1371 kg/ha, followed by Dalkhan Local, Phule Pandhari, and GC-5. However, the yields of these varieties were statistically similar to each other. The seed yields of other cowpea varieties ranged from 793 to 1371 kg/ha, with Panvel Red producing the lowest yield among them.

System equivalent yield and economic of rice-cowpea system (Table 7.2.2.14: The system Sahyadri-3 (rice) in *kharif* and Phule Sonali (cowpea) in *rabi* exhibited significantly higher rice equivalent yield (REY) of 10547 kg/ha, net return of Rs. 1,17,720/ha, and a benefit-cost ratio of 1.78 compared to other

varieties evaluated. The lowest system equivalent yield and net return were observed in the rice (Karjat-2) - cowpea (Panvel Red) combination, with yields of 7187 kg/ha and net returns of Rs. 31,640/ha, respectively.

Soil nutrient status in rice-cowpea system: Soil pH, electrical conductivity, organic carbon, nitrogen, phosphorus, and potassium were assessed after the harvest of the cowpea crop. Organic carbon ranged from 1.08% to 1.25%, available nitrogen from 204.8 to 259.1 kg/ha, available phosphorus from 17.29 to 21.68 kg/ha, and available potassium from 333.7 to 409.3 kg/ha. Among the varieties, Sahyadri-5 and Konkan Sadabahar had the highest organic carbon content (1.25%).

Nutrient uptake by rice-cowpea system (Table 7.2.2.16): A significant difference in nitrogen, phosphorus, and potassium uptake was observed among the various rice varieties grown under organic cultivation. The total nutrient uptake varied among different rice and cowpea varieties, ranging from 108 to 165.4 kg/ha for nitrogen, 14.9 to 23.6 kg/ha for phosphorus, and 91.5 to 136.4 kg/ha for potassium. Nitrogen, phosphorus, and potassium uptake were significantly higher in the Sahyadri-3-Phule Sonali system, with values of 165.4 kg/ha, 23.6 kg/ha, and 136.4 kg/ha, respectively. These values were at par to Sahyadri-4-GC-5 system, which had uptake rates of 164.2 kg/ha for nitrogen, 22.5 kg/ha for phosphorus, and 132.0 kg/ha for potassium.



Table 7.2.2.14: Performance of different rice and cowpea varieties under organic management

Rice				Cowpea			System equivalent yield (kg/ha)	System gross returns (Rs./ha)	System Net returns (Rs./ha)	System B:C ratio
Group	Varieties	Yield (kg/ha)	Straw (kg/ha)	Varieties	Yield (kg/ha)	Straw (kg/ha)				
Early	Karjat - 4	3231	4408	GC-2	893	1349	7299	186128	34508	1.23
	Karjat-7	3325	4608	GC-3	875	1735	7411	188977	37357	1.25
	Ratnagiri-1	3090	4370	GC-4	1143	1386	8135	207452	55602	1.37
	Sahyadri-4	4323	6105	GC-5	1283	2135	10206	260249	109013	1.72
Mid-late	Karjat-5	3668	4965	GC-6	1182	1630	8951	228255	76405	1.50
	Karjat-6	3383	4383	PhulePandhari	1303	2054	9158	233530	81910	1.54
	Palghar-1	3516	4865	PhuleVithai	1249	2105	9134	232904	81284	1.54
	Sahyadri-3	4547	6365	PhuleSonali	1307	2122	10547	268956	117720	1.78
Late	Ratnagiri-2	3640	5181	PusaFalguni	891	1292	7767	198069	46219	1.30
	Ratnagiri-3	3588	5000	PCP-1131	1007	1663	8227	209792	58172	1.38
	Karjat-8	3514	4421	Dalkhan Local	1326	1665	9345	238309	86689	1.57
	Ratnagiri 8	3961	5586	Konkan Sadabahar	1371	1532	10075	256914	105678	1.70
Varieties grown by Farmers'	Karjat-3	4214	5801	Konkan Safed	1218	2063	9762	248926	97076	1.64
	Jaya	3327	4524	Panvel Local	945	1522	7625	194445	42595	1.28
	Karjat-2	3377	4403	Panvel Red	793	2381	7187	183260	31640	1.21
	CD (P=0.05)	124	246	CD (P=0.05)	122.0	187.0	541.0			

Table 7.2.2.15: Chemical properties of soil after completion of crop cycle

Kharif: Rice Varieties	Rabi-hot weather Cowpea varieties	Soil pH	Soil EC (dSm ⁻¹)	Organic carbon (%)	Available Nitrogen (Kg/ha)	Available P ₂ O ₅ (Kg/ha)	Available K ₂ O (Kg/ha)
Karjat - 4	GC-2	6.86	0.33	1.21	233.24	17.29	372.29
Karjat-7	GC-3	6.93	0.34	1.18	228.23	18.32	368.70
Ratnagiri-1	GC-4	6.83	0.32	1.18	217.36	18.84	362.43
Sahyadri-4	GC-5	6.86	0.34	1.21	221.54	18.07	365.12
Karjat-5	GC-6	6.71	0.33	1.16	223.21	18.07	354.37
Karjat-6	PhulePandhari	6.90	0.35	1.08	204.82	19.36	333.76
Palghar-1	PhuleVithai	6.87	0.35	1.22	241.60	18.58	391.55
Sahyadri-3	PhuleSonali	6.71	0.34	1.22	235.75	18.07	384.38
Ratnagiri-2	PusaFalguni	6.65	0.34	1.22	249.96	20.39	401.41
Ratnagiri-3	PCP-1131	6.97	0.34	1.16	216.52	17.81	352.58
Karjat-8	Dalkhan Local	7.00	0.35	1.21	244.11	18.84	386.62
Sahyadri-5	Konkan Sadabahar	6.84	0.35	1.25	259.16	21.68	409.47
Karjat-3	Konkan Safed	6.83	0.35	1.22	250.80	21.42	402.75
Jaya	Panvel Local	6.82	0.36	1.24	254.98	21.68	405.89
Karjat-2	Panvel Red	6.78	0.32	1.13	217.36	17.81	348.54
CD (P=0.05)		NS	NS	NS	11.84	2.30	9.39

Table 7.2.2.16: Effect of different treatments on N, P and K uptake of rice-cowpea system at Karjat

Cropping sequence		N Uptake (Kg/ha)			P Uptake (Kg/ha)			K Uptake (Kg/ha)		
		Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
Karjat – 4	GC-2	56.6	51.4	108.0	11.3	3.6	14.9	62.7	28.8	91.5
Karjat-7	GC-3	58.7	64.7	123.4	13.1	4.4	17.5	66.5	34.9	101.4
Ratnagiri-1	GC-4	53.7	57.9	111.6	11.9	4.4	16.3	62.3	32.6	94.9
Sahyadri-4	GC-5	81.4	82.8	164.2	16.6	5.8	22.5	86.8	45.2	132.0
Karjat-5	GC-6	67.8	68.9	136.7	14.8	4.9	19.7	71.0	36.9	107.9
Karjat-6	PhulePandhari	60.5	79.4	139.9	12.2	5.8	18.0	62.8	44.6	107.4
Palghar-1	PhuleVaidhai	63.8	79.8	143.7	13.6	5.5	19.1	69.7	44.4	114.1
Sahyadri-3	PhuleSonali	83.9	81.4	165.4	17.7	6.0	23.6	91.1	45.3	136.4
Ratnagiri-2	PusaFalguni	65.5	49.1	114.6	14.1	3.8	17.9	72.9	28.3	101.2
Ratnagiri-3	PCP-1131	63.8	61.9	125.7	13.1	4.5	17.6	71.4	35.4	106.8
Karjat-8	Dalkhan Local	62.0	70.4	132.4	13.1	5.3	18.4	63.8	38.5	102.3
Ratnagiri 8	KokanSadabhar	76.4	66.6	143.0	17.4	5.1	22.5	81.1	36.8	118.0
Karjat-3	Kokan Safed	73.9	77.3	151.2	16.1	5.7	21.8	82.0	43.8	125.7
Jaya	Panvel Local	60.1	61.3	121.4	13.3	4.6	17.9	65.2	33.2	98.5
Karjat-2	Panvel Red	60.3	78.1	138.4	12.6	5.8	18.4	63.0	45.4	108.4
CD (P=0.05)		5.45	5.5	10.6	14.0	1.5	0.8	1.9	4.0	4.2

Ludhiana (Table 7.2.2.17 & 18)**Performance of rice varieties (Table 7.2.2.17):**

The basmati rice variety Basmati 386 achieved the highest plant height (162.6 cm), which was statistically comparable to Basmati 370 and significantly greater than other varieties. The variety Punjab Basmati 7 recorded the highest number of effective tillers per square meter (338.9), which was significantly greater than all other varieties / genotypes. The longest panicle length (30 cm) was observed in Pusa Basmati 1718. Additionally, Pusa Basmati 1637 had the highest number of grains per panicle (63.6), which was significantly higher than that of all other varieties. Basmati rice grain yields ranged from 2167 to 3950 kg/ha. The genotype Punjab Basmati 7 gained the highest grain yield (3950 kg/ha), while the lowest yield of 2167 kg/ha was recorded for Basmati 386.

Performance of wheat varieties (Table 7.2.2.18):

The wheat variety C-306 exhibited the tallest plant height (122.3 cm), which was significantly greater than all other wheat varieties. In contrast, the shortest plant height was recorded for Unnat PBW 550 variety (92.2 cm). The highest number of effective tillers per square meter (348.5), spike length (9.7 cm), grains per spike (44.8), and 1000-grain weight (43.5 g) were observed in the Unnat PBW 550 variety. Wheat grain yields varied from 2370 to 4503 kg/ha across different varieties. The highest grain yield of 4503 kg/ha was observed in Unnat PBW 550, which was significantly greater than all other varieties. The lowest grain yield was recorded for Kandi Area Landmark at 2370 kg/ha. Additionally, Unnat PBW 550 had the highest straw yield (6173 kg/ha), which was statistically at par to BWL 3498 (6033 kg/ha).



Table 7.2.2.17: Performance of basmati rice varieties/genotypes under organic farming

Varieties/genotypes	Plant height (cm)	Effective tillers/m ²	Panicle length (cm)	Grains/panicle	1000-grain weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)
Punjab Basmati 7	113.5	338.9	28.4	63.1	26.1	3950	6960
Punjab Basmati 5	110.6	327.3	27.3	60.5	25.3	3533	6583
Punjab Basmati 4	98.6	331.4	29.5	62.2	26.6	3763	6800
Punjab Basmati 3	108.8	329.3	27.8	61.8	26.5	3683	6830
Punjab Basmati 2	121.5	315.2	26.6	56.3	26.1	3137	6243
Basmati 386	162.6	281.5	25.7	56.5	25.2	2167	5930
Basmati 370	158.3	289.7	26.2	57.3	25.8	2360	6020
CSR 30	135.4	310.3	26.7	59.0	25.1	2653	6283
Pusa Basmati 1121	118.3	322.8	26.9	60.6	26.7	3270	6213
Pusa Basmati 1509	95.6	333.4	29.6	62.7	27.1	3823	6763
Pusa Basmati 1718	118.5	334.2	30.0	63.5	27.4	3887	6837
Pusa Basmati 1637	108.4	335.5	29.7	63.6	27.6	3853	6827

Table 7.2.2.18: Performance of wheat varieties/genotypes under organic farming

Varieties/genotypes	Plant height (cm)	Effective tillers/m ²	Spike length (cm)	Grains / spike	1000 grain weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)
Unnat PBW 550	92.2	348.5	9.7	44.8	43.5	4503	6173
Unnat PBW 343	95.7	334.8	9.6	40.6	41.5	4013	5833
PBW 660	98.5	338.0	9.5	41.5	41.3	4150	5923
PBW 1 Zn	104.3	308.5	9.6	38.7	37.4	3430	5343
PBW 175	100.4	273.3	9.4	39.8	40.6	2743	4527
PBW 1 Chapati	98.4	291.1	9.0	39.3	40.3	3037	4867
BWL 3500	98.5	319.3	9.2	39.9	40.3	3753	5667
BWL 3498	103.2	340.5	9.6	41.2	41.3	4263	6033
C-306	122.3	258.9	9.0	39.2	41.0	2690	4337
Bansi Gold	99.3	257.7	9.3	35.7	37.4	2573	4260
Punjab Shingar	92.5	258.0	9.0	44.6	33.9	2667	4447
Kandi Area Landmark	95.0	250.9	9.2	44.3	35.4	2370	4220

Modipuram (Table 7.2.2.19 & 20)

Performance of brinjal varieties: Nine varieties of brinjal were evaluated in a brinjal-veg. pea system with identical nutrient sources and doses under organic conditions. Among the brinjal varieties tested, Pusa Hara Baigan recorded the highest yield at 19,742 kg/ha, followed by Kashi Uttam with 18,953 kg/ha and Navkiran with 17,653 kg/ha. The cost of cultivation was similar across the varieties, with the highest net return recorded by Pusa Hara Baigan at Rs. 1,53,226/ha, followed by Kashi Uttam at Rs. 1,43,364/ha and Navkiran at Rs. 1,27,114/ha.

Performance of vegetable pea varieties: Twelve varieties of vegetable pea were evaluated in a brinjal-vegetable pea system under organic conditions. Among these, the Prachi 10 variety recorded the highest yield at 5,842 kg/ha, followed by PS 1100 with 5,423 kg/ha and PS 10 with 4,321 kg/ha. The cost of cultivation was similar across the varieties, with Prachi 10 yielding the highest net return of Rs. 1,03,750/ha, followed by PS 1100 at Rs. 93,275/ha and PS 10 at Rs. 65,725/ha (Table 7.2.2.20)



Table 7.2.2.19: Yield and economics of different brinjal and pea varieties under organic farming at Modipuram

Brinjal					Pea				
Brinjal Varieties	Productivity (Kg/ha)	Cost of Cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs/ha)	Pea varieties	Productivity (Kg/ha)	Cost of Cultivation (Rs./ha)	Gross return (Rs./ha)	Net return (Rs/ha)
Hybrid F1-143	16345	93549	204313	110764	PB 89	4236	42300	105900	63600
Hybrid F1 Kritika	15679	93549	195988	102439	Improved king 50	2564	42300	64100	21800
Hybrid 992	14523	93549	181538	87989	PS 10	4321	42300	108025	65725
Navkiran	17653	93549	220663	127114	Mahima 3636	3412	42300	85300	43000
Bharat 798	15642	93549	195525	101976	Pusa Prabal	3865	42300	96625	54325
Hybrid F1 Pragti	10452	93549	130650	37101	Prachi 10	5842	42300	146050	103750
Kashi Uttam	18953	93549	236913	143364	Kashi Nandini	3125	42300	78125	35825
Pusa Uttam	15742	93549	196775	103226	PSM 3	3956	42300	98900	56600
Pusa Hara Baingan	19742	93549	246775	153226	Kashi Uday	2956	42300	73900	31600
					Bioseed Pea 10	3951	42300	98775	56475
					PusaPragati	3745	42300	93625	51325
					PS 1100	5423	42300	135575	93275

Pant Nagar (Tables 7.2.2.21, 22 & 23)

Total twelve varieties of rice during *kharif* and twelve varieties of wheat in *rabi* were evaluated under organic cultivation.

Performance of different rice varieties (Table 7.2.2.21):

Plant height among the different rice varieties ranged from 105 to 154 cm, with Kala Namak being the tallest and NDR-359 the shortest. The number of effective tillers/m² ranged from 249 to 271, with PR-121 producing the highest number (271), while KeshoPohu had the lowest (249). Among the different varieties, the 1000-grain weight was highest in PD-24 at 26.9 g, which was at par to HKR-47 (25.7 g). However, the highest rice grain yield was significantly observed in HKR-47 at 5880 kg/ha, while KeshoPohu recorded the lowest yield (208 kg/ha).

The relative economics of different rice varieties

under organic cultivation revealed that HKR-47 provided the highest net returns at Rs.1,76,838/ha and the highest B:C ratio of 4.57, followed by PD-24 with net returns of Rs. 1,68,092/ha and B:C ratio of 4.39.

Performance of wheat varieties (Table 7.2.2.22):

Among the various wheat varieties plant height ranged from 83.5 cm to 105 cm. The tallest variety was Sonalika (105 cm), followed by UP-2565 (97.8 cm), while the shortest was WH-1105 (83.85 cm). The number of spikes/m² among wheat varieties ranged from 314 to 368, while the test weight (1000-grain weight) varied from 28.0 to 35.3 gram. The grain yield of different wheat varieties ranged from 3239 to 4,319 kg/ha. The highest yield was observed in UP 2903 (4319 kg/ha), while the lowest was recorded in UP-262 (3239 kg/ha). The economic analysis of



different wheat varieties showed that UP-2903 had the highest net returns of Rs.76,049/ha and the highest B:C ratio of 3.56, followed by WB-2 with net returns of Rs.74,243/ha and B:C ratio of 3.49.

Nutrient uptake by different rice and wheat varieties (Table 7.2.2.23): Significant differences in nitrogen, phosphorus, potassium and sulfur uptake were observed among the various rice and wheat varieties under organic cultivation. The total nutrient uptake for different rice and wheat varieties in the rice-wheat cropping system ranged from 158 to 218 kg/ha for N, 41.4 to 60.7 kg/ha for P, 137.4 to 183.7 kg/ha for K, and 45.6 to 63.3 kg/ha for S, respectively.

In the rice-wheat system after wheat harvest, nitrogen, potassium, and sulfur uptake were significantly higher in the HKR-47-UP 2903 system, with values of 218.0 kg/ha, 183.7 kg/ha, and 63.3 kg/ha, respectively. This was followed by the PD-24-WH 1105 system, which had uptakes of 209.1 kg/ha for nitrogen, 178.5 kg/ha for potassium, and 58.2 kg/ha for sulfur. Phosphorus uptake was significantly higher in the PD-24-WH 1105 system (60.7 kg/ha), followed by the PR-121-WH 1142 system with 55.7 kg/ha..

Table 7.2.2.21: Response for yield attributes and economics of rice varieties under organic cultivation at Pantnagar

Rice varieties/hybrids	Plant Height (cm)	Effective tillers/m ²	1000-grains weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest Index (%)	Cost of Cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
TilakChandan	141	251	20.8	3643	5185	0.41	49561	90712	2.83
Hansraj	147	250	21.1	3541	6689	0.35	49561	86757	2.75
Kala Namak	154	270	14.7	3560	5587	0.39	49561	87518	2.77
KeshoPohu	119	249	24.4	3208	4494	0.42	49561	73943	2.49
HKR-47	111	270	25.7	5880	6375	0.48	49561	176838	4.57
PR-121	115	271	24.6	5402	6097	0.47	49561	158434	4.20
PD-24	125	255	26.9	5653	6551	0.46	49561	168092	4.39
NDR-359	105	255	23.1	5269	5920	0.47	49561	153301	4.09
PSD-25	136	254	23.0	4846	5120	0.49	49561	137026	3.76
PSD-27	108	264	23.4	5044	5467	0.48	49561	144631	3.92
CGZR-1	108	262	21.9	4396	5093	0.46	49561	119687	3.41
Zinco Rice	112	255	21.1	3486	4098	0.46	49561	84666	2.71

Table 7.2.2.22: Response for yield attributes and economics of wheat varieties under organic cultivation at Pantnagar

Wheat varieties/hybrids	Plant height (cm)	spikes/m ²	1000-grains wt. (g)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest Index	Cost of Cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
UP 2855	87.1	336	29.1	3780	4204	0.47	29762	62857	3.11
HD2967	96.3	343	33.7	3784	4268	0.47	29762	62936	3.11
UP 2565	97.8	314	30.9	3540	3989	0.47	29762	56968	2.91
DBW 62150	91.4	336	34.6	3755	4411	0.46	29762	62229	3.09
UP 2903	96.8	368	28.0	4319	4938	0.47	29762	76049	3.56
WH 1142	96.6	333	35.3	3548	4074	0.47	29762	57164	2.92
WH 1105	83.5	353	32.4	3740	4460	0.46	29762	61876	3.08
Black wheat	94.5	320	33.0	3433	4091	0.46	29762	54337	2.83
Sonalika	105.0	346	34.2	3718	4316	0.46	29762	61326	3.06
C-306	96.1	314	28.1	3306	3942	0.46	29762	51236	2.72
UP-262	97.0	318	34.4	3239	3755	0.46	29762	49587	2.67
WB-2	95.9	354	34.4	4245	4795	0.47	29762	74243	3.49



Table 7.2.2.23: Total N, P, K and S uptake in different varieties of rice and wheat under organic cultivation at Pantnagar

Rice varieties	Wheat varieties	N uptake (kg/ha)			P uptake (kg/ha)			K uptake (kg/ha)			S uptake (kg/ha)		
		Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
TilakChandan	UP 2855	94.6	81.7	176.3	29.4	18.1	47.5	84.9	63.7	148.6	19.9	26.2	46.1
Hansraj	HD2967	95.1	80.0	175.1	32.5	16.1	48.6	103.3	66.6	169.9	20.2	25.4	45.6
Kala Namak	UP 2565	88.7	75.8	164.5	27.6	16.5	44.1	88.9	61.4	150.3	20.1	25.8	45.9
KeshoPohu	DBW 62150	75.6	82.4	158.0	26.3	15.6	41.9	73.3	64.1	137.4	18.7	30.0	48.7
HKR-47	UP 2903	127.3	90.7	218.0	39.6	15.8	55.4	110.2	73.5	183.7	30.4	32.9	63.3
PR-121	WH 1142	121.4	75.9	197.3	44.1	11.6	55.7	106.8	59.1	165.9	27.0	26.2	53.2
PD-24	WH 1105	127.9	81.2	209.1	44.8	15.9	60.7	113.9	64.6	178.5	30.9	27.3	58.2
NDR-359	Black wheat	117.5	75.9	193.4	36.8	14.9	51.7	104.8	61.7	166.5	28.2	24.4	52.6
PSD-25	Sonalika	104.9	78.8	183.7	32.8	17.0	49.8	89.1	64.0	153.1	25.4	26.7	52.1
PSD-27	C-306	111.0	70.5	181.5	36.3	11.4	47.7	96.8	57.3	154.1	29.0	21.3	50.3
CGZR-1	UP-262	102.4	69.5	171.9	34.3	13.8	48.1	89.6	57.1	146.7	23.3	24.8	48.1
Zinco Rice	WB-2	81.0	89.1	170.1	26.4	15.0	41.4	69.0	70.5	139.5	19.1	30.8	49.9

Raipur (Table 7.2.2.24, 25 & 26)

The response of fifteen rice varieties, as well as eleven improved chickpea varieties, was assessed under an organic production system.

Performance of rice varieties (Table 7.2.2.24): Among the various traditional short-grain aromatic rice varieties, AmritBhog was the tallest (187.6 cm), which was at par with Chinni Kapoor (182.7 cm), SamundChini (182.4 cm), and TulsiManjari (181.9 cm). Regarding panicle length, TulsiManjari had the longest (33.1 cm), followed by SamundChini (31.6 cm) and AmritBhog (31.2 cm). The highest number of filled grains/panicle was observed in AatmaSheetal (150.7), which was comparable to SamundChini (150.5). The test weight was highest in CG Madhuraj 55 (27.3 g), followed by Sugandhmati (26.6 g). Among the rice varieties, grain yields ranged from 2056 to 3295 kg/ha. Indira SugandhitDhan 1 produced the highest grain yield, followed closely by CG Devbhog, which yielded between 3295 kg/ha and 3162 kg/ha. The lowest yield was recorded (2056 kg/ha) for the Chinni Kapoor variety. Indira SugandhitDhan 1 achieved the highest net return (Rs. 47,863/ha) with B:C ratio of 2.10. It was followed by CG Devbhog, which had a net return of Rs. 43,046/ha and B:C ratio of 1.99.

Performance of chickpea varieties (Table 7.2.2.25):

The number of pods/plant was highest in the JG-16 variety, averaging 41.80, which was statistically similar to Vijay (40.55) and RG2009-01 (40.51). Seed yield in chickpea was also significantly influenced by the variety grown under organic farming. The highest seed yield was recorded 878.1 kg/ha, for JG-16, which was statistically comparable to Vijay at 864.3 kg/ha and RG2009-01 at 864.1 kg/ha. The highest net return was achieved with JG-16, amounting to Rs 30,658 per hectare and benefit-cost ratio of 2.05. This was followed by RG2009-01, which had a net return of Rs 29,756 per hectare and B:C ratio of 2.02, and Vijay, with a net return of Rs 29,695 per hectare and B:C ratio of 2.01.

Soil nutrient status in rice-chickpea system (Table 7.2.2.26): Soil organic carbon, available nitrogen, phosphorus, and potassium in the soil after the harvest of chickpea crop did not significantly affect the availability of these nutrients in the soil. The organic carbon content ranged from 0.53% to 0.59%, while available nitrogen ranged from 205.5 to 211.9 kg/ha, available phosphorus from 18.2 to 19.06 kg/ha, and available potassium from 335.1 to 342.7 kg/ha. The RG2003-28 variety had the highest organic carbon content at 0.59%, while the Vijay variety of chickpea exhibited the highest nitrogen content



Table 7.2.2.24: Response of different traditional and improved scented and fortified varieties of rice at Raipur

Varieties	Plant height (cm) at harvest	Panicle length (cm)	Filled grains / panicle	Test weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index	Net return (Rs/ha)	B:C ratio
Chinni Kapoor	182.7	28.0	76.6	19.9	2056	6129	25.2	15203	1.35
LoktiMachhi	167.0	28.5	146.5	11.3	2378	5867	29.0	23136	1.53
TulsiManjiri	181.9	33.1	124.6	15.6	2235	6089	27.5	19717	1.45
AmritBhog	187.6	31.2	133.2	15.8	2090	5838	26.4	15777	1.36
SamundChini	182.4	31.6	150.5	14.4	2667	6129	30.4	30784	1.71
Lohandi	162.6	22.2	135.2	11.0	2595	6417	29.0	29236	1.67
AatmaSheetal	161.4	29.1	150.7	11.8	2370	5454	30.3	22532	1.52
Tarunbhog Selection 1	155.3	23.0	103.6	14.6	2609	6806	27.9	29982	1.69
C.G. Sugandhitbhog	97.4	19.4	121.0	25.1	3144	6195	33.7	42990	1.99
Indira SugandhitDhan 1	139.5	17.3	121.9	27.1	3295	7197	31.4	47863	2.10
CG Devbhog	94.2	18.2	103.6	24.0	3162	5768	35.4	43046	1.99
Sugandhmati	105.7	16.9	121.0	26.6	2348	7133	24.8	23636	1.55
Zinco rice MS	96.7	18.3	80.0	25.4	2901	5987	32.6	36595	1.84
Protezin	98.1	18.2	73.2	25.6	3121	6390	32.8	42602	1.98
CG Madhuraj 55	130.3	16.9	81.0	27.3	2934	7034	29.4	38492	1.89
CD (P = 0.05)	-	-	6.67	1.41	173	-	-	-	-

Table 7.2.2.25: Performance of yield and economics of chickpea varieties at Raipur

Varieties	No. of pods plant ⁻¹	Seed yield (kg/ha)	Net return (Rs/ha)	B:C ratio	Yield stability Index
Vaibhav	39.24	851.8	28907	1.99	0.66
JG-226	35.21	749.0	21878	1.75	0.57
Jaiki	33.18	705.8	18929	1.65	0.55
RG2009-01	40.51	864.2	29756	2.02	0.60
RG2009-16	37.21	807.8	25898	1.88	0.61
RG2003-28	34.96	746.0	21679	1.74	0.47
Vishal	36.48	773.1	23516	1.80	0.57
JG-16	41.80	878.1	30658	2.05	0.68
Vijay	40.55	864.3	29695	2.01	0.58
Daftari-21	32.46	704.8	18862	1.64	0.56
JG-14	37.73	825.0	27076	1.92	0.65
CD (P = 0.05)	5.80	108.8	-	-	-

Table 7.2.2.26: Available nutrient status after complete of cropping cycle (rice-chickpea) at Raipur

Chickpea varieties	Organic Carbon (%)	Available N (Kg/ha)	Available P (Kg/ha)	Available K (Kg/ha)
Vaibhav	0.55	209.20	18.36	339.27
JG-226	0.55	209.08	18.83	341.01
Jaiki	0.56	208.95	18.62	336.39
RG2009-01	0.58	211.33	18.62	339.43
RG2009-16	0.53	211.45	18.78	337.64
RG2003-28	0.59	208.20	18.82	341.11
Vishal	0.58	206.84	19.06	339.96
JG-16	0.53	210.23	18.88	339.09
Vijay	0.56	211.91	19.02	342.70
Daftari-21	0.56	208.62	18.39	337.03
JG-14	0.57	205.59	18.29	335.16
CD (P = 0.05)	NS	NS	NS	NS
Initial value	0.42	204.6	15.9	341.8

Ranchi (Table 7.2.2.27, 28 & 29)

Ten varieties of rice and ten varieties of wheat were assessed for their suitability in organic farming system

Performance of rice and wheat varieties (Table 7.2.2.27): Significant differences were observed in the yield and system equivalent yield among the rice and wheat varieties. The highest grain yield for rice of 4286 kg/ha, was achieved with the MTU1010 variety, which was significantly superior to all other rice varieties. For wheat, the maximum grain yield of 2503 kg/ha was recorded with the K-1006 variety. The Kalazeera rice variety produced the lowest grain yield at 2829 kg/ha, while the DBW-187 wheat variety yielded the least at 1924 kg/ha. The highest system equivalent yield was observed in the MTU1010-DBW-107 system which was 6744 kg/ha, whereas the lowest was recorded in the Govindbhog-DBW-187 system (4982 kg/ha).

Economics of different varieties of rice and wheat (Table 7.2.2.28): Among the rice varieties, the Lalat variety recorded the highest net return of Rs 81,083/ha, while the MTU1010 variety had the highest B:C ratio (1.53). In case of wheat, the K-1006

variety achieved the highest net return of Rs 23,991/ha with a B:C ratio of 0.44. In the rice-wheat system, the highest net return was observed in the MTU1010-DBW-107 combination, amounting to Rs 86,833/ha with B:C ratio of 0.94. This was followed by the Lalat-HI-1563 combination, which yielded a net return of Rs 80,957 with B:C ratio of 0.88.

Soil nutrient status at the end of cropping cycle (Table 7.2.2.29): There was an improvement in soil pH, organic carbon, and the availability of nitrogen, phosphorus, and potassium among the rice and wheat varieties compared to their initial values. Among the various rice and wheat combinations, the rice (BVS-1) – wheat (K-1006) system recorded the highest pH & organic carbon content (6.30 & 0.72%) an increase from the initial values of 5.95 & 0.42%. After the completion of the cropping cycle, the highest soil nitrogen availability was observed in the rice (Naveen) – wheat (BG-3) system, at 268.42 kg/ha, followed by the IR-64-JKW-261 system. However, the highest phosphorus availability was found in the rice (MTU1010) – wheat (DBW-107) combination, while the highest potassium availability was recorded in the rice (BVS-1) – wheat (K-1006) system..



Table 7.2.2.27: Performance of different varieties under rice-wheat cropping system

Name of varieties		Rice yield (kg/ha)	Wheat yield (kg/ha)	REY of the system (kg/ha)
Rice	Wheat			
BVS-1	K-1006	3810	2503	6513
Govindbhog	DBW-187	2905	1924	4982
Badshahbhog	DBW-14	3248	2143	5562
Kalazeera	DBW-252	2829	2095	5091
BVD 203	HD-9232	3029	2190	5394
IR-64	JKW-261	3190	2219	5587
MTU1010	DBW-107	4286	2276	6744
Sahbhagidhan	HD-2967	3505	2305	5994
Naveen	BG-3	4114	2124	6408
Lalat	HI-1563	4248	2295	6726
CD (P=0.05)		185.9	155.3	368.7

Table 7.2.2.28: Net return (Rs/ha) of different varieties and cropping systems

Name of Variety		Rice		Wheat		System	
Rice	Wheat	Net Return	B:C ratio	Net Return	B:C ratio	Net Return	B:C ratio
BVS-1	K-1006	55051	1.24	23991	0.44	79043	0.86
Govindbhog	DBW-187	33789	0.76	16217	0.30	50007	0.54
Badshahbhog	DBW-14	43351	0.97	13677	0.26	57028	0.62
Kalazeera	DBW-252	32756	0.74	12574	0.24	45330	0.49
BVD 203	HD-9232	37218	0.84	17936	0.33	55154	0.60
IR-64	JKW-261	40285	0.90	15427	0.29	55712	0.60
MTU1010	DBW-107	68332	1.53	18501	0.34	86833	0.94
Sahbhagidhan	HD-2967	47332	1.06	8974	0.18	56306	0.61
Naveen	BG-3	63646	1.43	15672	0.29	79319	0.86
Lalat	HI-1563	81083	1.51	13939	0.27	80957	0.88
CD (P=0.05)	4891.22	0.11	3955	0.08	6764	0.07	

Table 7.2.2.29: Soil physio-chemical status at the end of cropping cycle (Rice-Wheat) at Ranchi

Varieties of rice	Varieties of wheat	pH	O.C (%)	Nutrients in soil (kg/ha)		
Rice	Wheat			Available N	Available P	Available K
BVS-1	K-1006	6.30	0.72	264.7	41.2	225.3
Govindbhog	DBW-187	6.20	0.69	256.3	42.4	206.4
Badshahbhog	DBW-14	6.05	0.67	253.2	42.1	213.3
Kalazeera	DBW-252	6.08	0.66	251.3	44.5	202.3
BVD 203	HD-9232	6.08	0.68	255.4	43.9	211.8
IR-64	JKW-261	6.17	0.71	267.5	44.0	222.1
MTU1010	DBW-107	6.06	0.67	249.5	45.7	204.4
Sahbhagidhan	HD-2967	6.09	0.69	265.4	41.9	216.7
Naveen	BG-3	5.98	0.70	268.42	45.0	199.5
Lalat	HI-1563	6.03	0.68	252.12	40.3	195.3
CD (P=0.05)	0.19	0.01	3.42	1.42	3.08	
Initial	5.95	0.42	230	32.25	162	

Umiam: Groundnut and mustard varieties were evaluated for their performance under organic production. Among the groundnut varieties, yield of groundnut recorded ranged from 536 to 1500 kg/ha, with genotype ICGV 91114 being the highest yielded variety followed ICG 576 and JL 501 which

Groundnut varieties	Yield (kg/ha)	Rapeseed mustard varieties	Yield (kg/ha)
TPG 41	909	PM 25	427
TG37 A	1283	NRCHB	333
ICG576	1321	PT-303	277
ICGV00350	772	Bhawani	403
JL 501	1320	DRMR 15	447
Girnar	983	Ragini	293

Ajmer (Table 7.2.2.30 & 31)

The total eight varieties each of black gram, moth bean during *kharif* and Fenugreek, nigella during *rabi* were assessed under organic cultivation.

Performance of black gram and moth bean (Table 7.2.2.30): Among the black gram varieties, Kota Urd-4 achieved the highest yield at 628.3 kg/ha, followed by IPU-11-02, while the lowest yield was observed in the IPU-13-11 variety, at 543.3 kg/ha. For moth bean varieties, CZM-2 variety recorded higher yield (250.0 kg/ha) followed by RMO-423 and RMO-225.

Performance of fenugreek and nigella (Table 7.2.2.30): Among the fenugreek varieties, HisarSonali recorded the highest yield (2126.7 kg/ha), followed by Ajmer Fenugreek-5, while the RMT-143 variety

was at to each other but significantly higher to others, while GG 7 yielded the lowest. Among the Mustard varieties evaluated, yield of mustard ranged between 277 kg/ha to 447 kg/ha. DRMR 15 being the highest yielded variety whereas PT 303 recorded the least performing variety.

Groundnut varieties	Yield (kg/ha)	Rapeseed mustard varieties	Yield (kg/ha)
GJG 31	604	Binoy	393
GG 7	536	PM 28	423
ICGV 91114	1500	YSH 401	423
Kadiri 9	992	TL 15	330
GPVD 5	783	Topeswari	330
GJG 18	1066	PM 26	420

had the lowest yield at 1825.0 kg/ha. For nigella varieties, the NDBC-10 variety yielded the highest (531.7 kg/ha), followed by Indra Nigella-1 and Ajmer Nigella-1.

Oil and protein content in nigella and fenugreek (Table 7.2.2.31): Significant differences were found among the nigella and fenugreek varieties under organic conditions. For nigella, the Pant Krishna variety had the highest total oil content (38.56%), followed by Ajmer Nigella-1 and Azad Kalonji. Meanwhile, the Ajmer Nigella-4 variety had the highest protein content at 18.69%, surpassing all other varieties. In fenugreek, the highest total oil content (36.00%) and protein content (24.88%) were recorded in the Ajmer Fenugreek-1 variety

Table 7.2.2.30: Performance of black gram, moth bean, fenugreek and nigella varieties under organic production at Ajmer

Black gram		Moth bean		Fenugreek		Nigella	
Varieties	Varieties (kg/ha)	Varieties	Yield (kg/ha)	Varieties	yield (kg/ha)	Varieties	yield (kg/ha)
Mukundra-2	575.0	CZM-2	250.0	Ajmer Fenugreek-1	1943.3	Ajmer Nigella-1	471.7
Kota Urd-3	583.3	RMO-435	158.3	Ajmer Fenugreek-2	1988.3	Ajmer Nigella-20	438.3
Pratap Urd-1	608.3	RMO-2251	218.3	Ajmer Fenugreek-3	1880.0	Ajmer Nigella-19	430.0
Kota Urd-4	628.3	RMO-257	180.0	Ajmer Fenugreek-4	2016.7	Ajmer Nigella-4	423.3
IPU-10-26	585.0	RMO-423	238.3	Ajmer Fenugreek-5	2080.0	Indra Nigella-1	501.7
IPU-11-02	620.0	RMO-225	230.0	HisarSonali	2126.7	Pant Krishna	470.0
IPU-13-11	543.3	RMB-25	176.7	RMT-361	2046.7	Azad Kalonji	462.3
Pant Urd-31	546.7	RMO-453	215.0	RMT-143	1825.0	NDBC-10	531.7
CD (P=0.05)	55.0	CD(P=0.05)	45.6	CD(P=0.05)	153.5	CD(P=0.05)	90.6



Table 7.2.2.31: Quality parameters (oil and protein) in nigella and fenugreek at Ajmer under organic production

Nigella				Fenugreek			
Varieties	Total oil %	Protein %	Varieties	4 Hydroxyisoleucine (4-OHlle) (%)	Diosgenin (%)	Total oil %	Protein %
Ajmer Nigella-1	37.00	18.63	Ajmer Fenugreek-1	1.09	1.88	36.00	24.88
Ajmer Nigella-20	33.20	17.75	Ajmer Fenugreek-2	1.10	1.87	35.53	24.63
Ajmer Nigella-19	29.60	17.94	Ajmer Fenugreek-3	0.99	1.89	32.00	24.06
Ajmer Nigella-4	24.73	18.69	Ajmer Fenugreek-4	1.02	1.99	35.53	22.06
Indra Nigella-1	22.73	18.44	Ajmer Fenugreek-5	0.69	2.10	28.87	21.38
Pant Krishna	38.56	18.25	HisarSonali	0.67	1.65	30.67	24.69
Azad Kalonji	35.20	16.31	RMT-361	0.76	1.69	28.40	23.94
NDBC-10	33.60	18.13	RMT-143	0.75	1.72	21.73	23.88
CD (P=0.05)	2.16	0.28	CD(0.05)	0.12	0.21	3.54	0.54

Gangtok (Table 7.2.2.32, 33 & 34)

Performance of maize (Table 7.2.2.32): Yield attributes and yield of maize cultivars were significantly affected by organic management conditions. Maximum plant height at flowering stage was recorded with Setimakkai (307.2 cm) which is statistically similar with Baiguinimakkai (298.9) but significantly superior over other remaining cultivars. Significantly higher dry matter accumulation at tasseling stage was found under Ratomakkai (82.8 g/plant) as compared to other cultivars. Highest value of leaf area index (4.7) was recorded under Vivek Sankul-35 which was statistically at par with Baiguinimakkai & Ratomakkaibut significantly higher than other cultivars. Maximum cob length (16.6 cm) was recorded under RCM 1-1 which was statistically at par with Ratomakkai, Baigunimakkai but significantly higher than other cultivars. Significantly higher value of cob girth (14.7 cm) was registered under Vivek sankul-31 compared to other cultivars, but it was remained statistically at par with Vivek Sankul-35 and Vivek Sankul-37. Maximum number of grains row⁻¹ (37.9) was observed under Kalomakkai which was statistically at par with Ratomakkai, Vivek

Sankul-31 but significantly higher than other cultivars. Significantly higher value of grain yield (4.1t ha⁻¹) was observed under Vivek Sankul-31 and Vivek Sankul-35 as compared to other cultivars but remained statistically at par with Setimakkai.

Economics of maize varieties: Economics of different cultivars of maize influenced significantly under organic management condition revealed that maximum gross returns (79.4 (₹×103 ha⁻¹), net return (₹×36.3 ha⁻¹), returns rupee⁻¹ invested (1.84) and PE (10.9 kg/ha/365) was observed in maize variety Vivek sankul-35 as compared to other cultivars which was statistically at par with Vivek sankul-31, Seti makkai, and significantly higher than other remaining cultivars.

Performance of buckwheat (Table 7.2.2.34): Grain yield and economics of buckwheat cultivars were influenced significantly. Among the buckwheat varieties, IC 49671 took 126.3 days to maturity while IC 104727 took 109 days as minimum days to maturity. Differences among the buckwheat varieties for yield ranged from 920 to 2190 kg/ha. Maximum grain yield (2190 kg ha⁻¹) was recorded under Local Meethay which was statistically at par with IC-109433, IC109729, IC49671 but significantly

higher than remaining cultivars. Highest gross return ($84.3 \text{ ₹} \times 10^3 \text{ ha}^{-1}$), net return ($40.7 \text{ ₹} \times 10^3 \text{ ha}^{-1}$) rupee⁻¹ invested (1.94), PE (5.8 kg/ha/365), profitability (111.6 ₹/ha/day) and LUE (35.1%) was recorded

under IC 109433 which was statistically at par with IC 49671 but significantly superior over all remaining cultivars.

Table 7.2.2.32: Performance of maize composite under organic management condition at Gangtok

Cultivars	Plant height at flowering stage (cm)	Dry matter accumulation at tasseling (g plant ⁻¹)	LAI at Silking stage	Days to 50% tasseling	Cob length (cm)	Cob girth (cm)	No. of rows cob ⁻¹	No. of grains row ⁻¹	Grain yield (t ha ⁻¹)
SetiMakkai	307.2	73.8	3.3	76.2	15.4	12.6	12.8	31.9	3.9
PahenloMakkai	239.5	52.1	3.5	71.5	15.3	12.9	12.8	35.4	3.6
RatoMakkai	280.5	82.8	4.5	75.3	16.0	12.8	12.4	37.6	3.4
BaiguniMakkai	298.9	45.2	4.6	74.6	15.6	12.8	12.8	32.9	3.6
KaloMakkai	261.6	48.3	3.7	70.6	14.0	11.8	10.1	37.9	3.1
Sathya	266.4	47.1	3.9	66.2	13.4	12.0	10.9	28.9	3.3
RCM 1-1	221.4	48.0	3.9	69.3	16.6	11.9	11.8	30.8	3.8
RCM 1-3	227.4	46.5	3.7	71.4	15.0	12.7	12.7	28.1	3.9
RCM 75	233.8	50.9	4.2	15.0	12.9	12.8	13.2	33.4	3.8
Vivek Sankul-31	151.6	24.0	3.6	66.0	13.6	14.7	12.9	35.8	4.1
Vivek Sankul-37	159.0	25.8	4.0	65.7	11.4	13.5	13.7	32.0	3.9
Vivek Sankul-35	140.2	32.8	4.7	65.2	11.5	14.6	14.6	31.9	4.1
CD (P=0.05)	27.8	3.1	0.1	2.7	1.2	1.6	2.0	3.0	0.4

Table 7.2.2.33: Economics of maize composite under organic management condition at Gangtok

Cultivars	Gross Return ($\text{₹} \times 10^3 \text{ ha}^{-1}$)	Net Return ($\text{₹} \times 10^3 \text{ ha}^{-1}$)	Return rupee ⁻¹ invested	PE (kg/ha/365)	Profitability (Rs/ha/day)	LUE (%)
SetiMakkai	76.6	33.4	1.78	10.5	91.6	34.3
PahenloMakkai	68.4	25.3	1.59	9.4	69.2	33.2
RatoMakkai	66.2	23.0	1.53	9.1	63.1	33.9
BaiguniMakkai	67.4	24.3	1.56	9.2	66.5	31.5
KaloMakkai	64.2	21.1	1.49	8.8	57.8	36.9
Sathya	63.9	20.7	1.48	8.7	56.8	35.6
RCM 1-1	72.0	28.8	1.67	9.9	78.9	36.9
RCM 1-3	74.0	30.8	1.71	10.1	84.5	36.7
RCM 75	69.1	26.0	1.60	9.5	71.1	38.6
Vivek Sankul-31	78.1	35.0	1.81	10.7	95.8	37.3
Vivek Sankul-37	75.1	32.0	1.74	10.3	87.7	35.0
Vivek Sankul-35	79.4	36.3	1.84	10.9	99.3	35.6
CD (P=0.05)	8.03	3.93	0.19	1.10	21.99	1.35



Table 7.2.2.34: Performance of buckwheat under organic management condition at Gangtok

Cultivars	Yield (kg)	Days to maturity	Grossreturn (₹×10 ³ ha ⁻¹)	Netreturn (₹×10 ³ /ha ⁻¹)	Return rupee ⁻¹ invested	PE (kg/ha/365)	Profitability (₹/ha/day)	LUE (%)
Local Meethay	2190	111.4	75.2	31.7	1.73	5.2	86.7	30.4
Local Teethay	1250	113.5	73.1	29.6	1.68	5.0	81.1	32.1
IC 104727	1180	108.9	75.7	32.1	1.74	5.2	88.0	29.6
IC 36805	1330	119.7	71.0	27.5	1.63	4.9	75.3	34.2
IC 109729	1930	117.6	47.2	21.9	1.86	3.2	59.9	32.1
IC 15393	1320	111.1	63.5	23.9	1.61	4.4	65.6	31.5
IC 109433	2140	122.4	84.3	40.7	1.94	5.8	111.6	33.2
IC 49671	1930	126.3	82.9	39.4	1.90	5.7	107.9	34.2
IC 2018742	1270	119.3	70.4	26.9	1.62	4.8	73.6	32.9
PRB -1	920	122.0	59.5	24.9	1.72	4.1	68.2	32.9
VL- UGAL	980	124.3	42.5	12.2	1.40	2.9	33.4	34.2
SANGLA B-1	1020	116.3	51.5	21.2	1.70	3.5	58.1	31.5
CD (P=0.05)			4.81	4.73	0.12	0.33	12.80	1.14

Sardarkrushinagar (Table 7.2.2.35, 36 & 37)

Five varieties of each crop were cultivated in a cowpea-wheat system to evaluate their performance under organic farming conditions.

Performance of cowpea (Table 7.2.2.35): Yield attributes, yield, and economics of different cowpea varieties showed significant variations, while plant height and Stover yield did not show significant differences. Gujarat Cowpea 4 recorded a yield of 1394 kg/ha, a net return of ₹10,160/ha, and a benefit-cost ratio of 0.25, which were at par to Gujarat Cowpea 3 (national check). In contrast, the Gujarat Cowpea 5 variety exhibited the lowest yield at 535 kg/ha and performed poorly in economic parameters under organic management practices. The highest cowpea equivalent yield was also observed in the Gujarat Cowpea 4 variety.

Performance of amarnath (Table 7.2.2.36):

Among different variety of amaranth, grain yield and

straw yield showed significant variation. Grain yield, straw yield, amaranth equivalent yield and economics performance, Gujarat Amaranth 5 variety outperformed better and recorded highest grain yield (1042 kg/ha), straw yield (2583 kg/ha), amaranth equivalent yield (1060 kg/ha), gross return (72,906 ₹/ha), net return (21,688 ₹/ha) and B:C ratio (0.42) as compared to other amaranth varieties. Variety BGA 2 (National check) was the least performer variety in term of yield and economics.

Energy analysis of cowpea - amaranth sequence (Table 7.2.2.37): Energy analysis of the cowpea-amaranth system revealed that the Gujarat Cowpea 6 - Gujarat Amaranth 5 combination outperformed others, recorded the highest net energy returns (152,038 MJ/ha), energy use efficiency (17.34), energy productivity (0.25 kg/MJ), and specific energy (36.21 MJ/kg).

Table 7.2.2.35: Yield, AEY and economics of different cowpea varieties

Genotypes	Plant height (cm) at harvest	Test weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C Ratio	Cowpea equivalent yield (kg/ha)
Gujarat Cowpea 3 707(National check)	42.20	9.83	646	1373	39868	48601	8732	0.22	
Gujarat Cowpea 4	43.70	10.92	667	1394	39868	50028	10160	0.25	728
Gujarat Cowpea 5	42.20	8.43	535	1248	39868	40906	1038	0.03	595
Gujarat Cowpea 6	43.80	9.76	606	1368	39868	46113	6245	0.16	671
Gujarat Cowpea 7	40.90	7.31	549	1303	39868	42108	2239	0.06	612
CD (P=0.05)	NS	1.59	99	NS	-	-	-	-	-



Table 7.2.2.36: Yield, AEY and economics of different amaranth varieties

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Amaranth equivalent yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	B:C Ratio
BGA 2(National check)	796	1900	810	51219	55696	4477	0.09
Gujarat Amaranth 1	850	2192	865	51219	59502	8283	0.16
Gujarat Amaranth 3	984	2206	1000	51219	68739	17520	0.34
Gujarat Amaranth 5	1042	2583	1060	51219	72906	21688	0.42
Gujarat Amaranth 6	998	2259	1014	51219	69720	18502	0.36
CD (P=0.05)	NS	179		-	-	-	-

Table 7.2.2.37: Energy analysis of cowpea - amaranth sequence in organic farming at SK Nagar

Kharif	Rabi	Input energy (MJ/ha)	Output energy (MJ/ha)	Net energy returns (MJ/ha)	Energy use efficiency	Energy productivity (kg/MJ)	Specific energy (MJ/kg)
Guj. Cowpea 3	Guj.Amaranth 1	32824	149064	116240	14.57	0.22	43.23
Guj. Cowpea 4	Guj.Amaranth 2	32824	163179	130355	15.75	0.22	43.23
Guj. Cowpea 5	Guj.Amaranth 3	32824	164455	131631	15.46	0.23	39.18
Guj. Cowpea 6	Guj.Amaranth 5	32824	184862	152038	17.34	0.25	36.21
Guj. Cowpea 7	Guj.Amaranth 6	32824	168403	135579	15.86	0.24	38.48

Thiruvananthapuram (Table 7.2.2.38)

Performance of greater yam (Table 7.2.2.38): Four varieties of greater yam suitable for organic management practices were evaluated, each differing in duration and nutrient requirements. The

tuber yield for these varieties ranged from 6.77 to 8.62 t/ha. Among them, Orissa Elite variety achieved the highest yield of 8.62 t/ha, with a net return of Rs. 1,24,395/ha and a benefit-cost ratio of 1.41, which is at par to Da-340 variety.

Table 7.2.2.38: Yield and economics of greater yam varieties under organic management at Thiruvananthapuram

Varieties	Tuber yield (t ha ⁻¹)	Net income (Rs ha ⁻¹)	B:C ratio
SreeKeerthi	7.58	72476	1.24
SreeKarthika	6.77	31670	1.10
Da-340	8.40	113416	1.37
Orissa Elite	8.62	124395	1.41
CD (P=0.05)	NS	NS	NS

Udaipur (Table 7.2.2.39-40)

Yield and economics of different varieties of maize (Table 7.2.2.39): Among the maize varieties, Pratap Hybrid Maize -3 delivered the highest yield(5915 kg/ha), followed by Pratap QPM Hybrid -1 and Sugar 75. In term of maize equivalent yield, gross return and net return, Sugar -75 recorded significantly higher maize equivalent yield (8554 kg/ha), gross return (195735) and net return (116915) whereas, VL Amber recorded highest net return per rupee

invested of 1.85. Compared to other varieties.

Performance of wheat varieties (Table 7.2.2.40):

Twelve wheat varieties were evaluated under organic management practices. Among the wheat varieties, HI-8713 performed the best, achieving the highest grain yield of 5700 kg/ha, straw yield of 8850 kg/ha, and net return of Rs. 1,67,355/ha. It was followed by HI-8663 and MP-3288. However, the Lok-1 variety recorded the highest harvest index.



Table 7.2.2.39: Yield and economics of different varieties of maize grown at Udaipur

Varieties	Grain yield (kg/ha)	Fodder yield (kg/ha)	MEY (kg/ha)	Gross return (Rs/ha)	Net return (Rs/ha)	Net return per rupee invested
Pratap QPM Hybrid -1	5645	7715	5645	143779	87909	1.57
PM – 9	4400	5800	4400	110980	55110	0.99
Pratap Hybrid Maize -3	5915	8405	5915	152293	96423	1.73
Sugar 75	5275	7350	8554	195735	116915	1.48
Madhula	4055	5595	6576	150185	71365	0.91
Misty	4500	6100	7297	166110	87290	1.11
PM- 3	1455	2070	3303	71667	16047	0.29
PM- 5	1305	1780	2963	63888	8268	0.15
VL Amber	3180	4600	7219	157020	101960	1.85
Amber	1800	2540	4086	88554	33494	0.61
Navjot	4255	6190	4255	110287	54967	0.99
Farmers selection	3900	5450	3900	99945	44625	0.81
CD (P=0.05)	442.36	619.85	576.02	13721.64	13721.64	0.22

Table 7.2.2.40: Yield and economics of different wheat varieties at Udaipur

Varieties	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest Index	Cost of cultivation (Rs/ha)	Net return (Rs/ha)
HI-1531	4510	6500	0.41	45620	120920
MP-3288	4800	7700	0.38	45620	135930
Raj-3765	3460	6520	0.35	45620	90580
Raj-4037	4070	5850	0.41	45620	104585
Raj-4120	3950	6860	0.37	45620	106660
HI-8627	4600	8200	0.36	46620	131880
HI-8663	5460	8300	0.40	46620	157370
HI-8713	5700	8850	0.39	46620	167355
MPO-1215	4240	7260	0.37	46620	116270
HI-1500	3750	5865	0.39	46620	94388
Lok-1	3540	6770	0.52	45120	94785
C-306	4180	6530	0.39	45120	112015
CD (P=0.05)	432.49	723.66	0.40		-

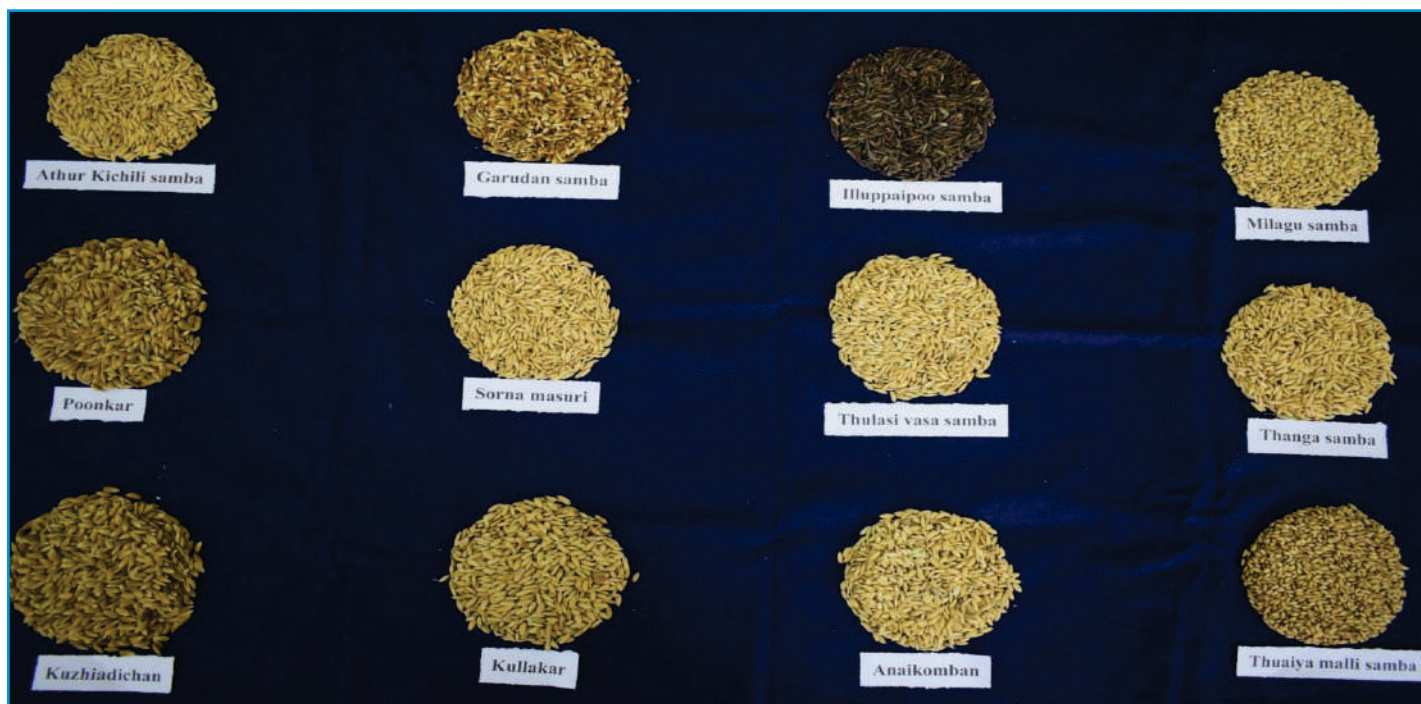
Performance of different variety of major crops at different locations



Maize and wheat variety at Bajaura



Best performing variety Suguna & other turmeric varieties at Calicut



Physical appearance of the paddy grains of different varieties at Coimbatore



Field view of green gram varieties at Coimbatore



Arial view of different rice varieties at Karjat



Cowpea variety Konkan sadabahar



Bio-fortified rice variety Zinco rice (Pantnagar)



Best performing wheat variety (Pantnagar)



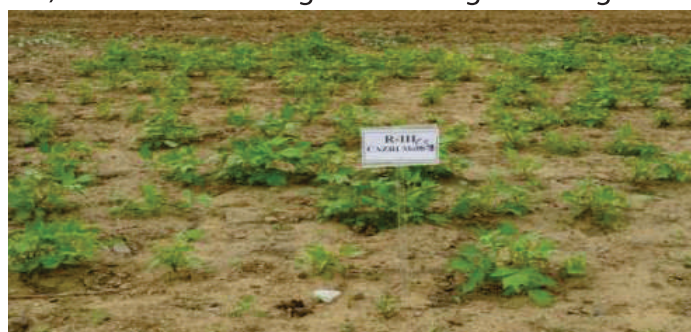
Field view of green gram varieties at Coimbatore



Most remunerative cowpea (GC4) and amaranth (GA5) varieties under organic farming at SK nagar



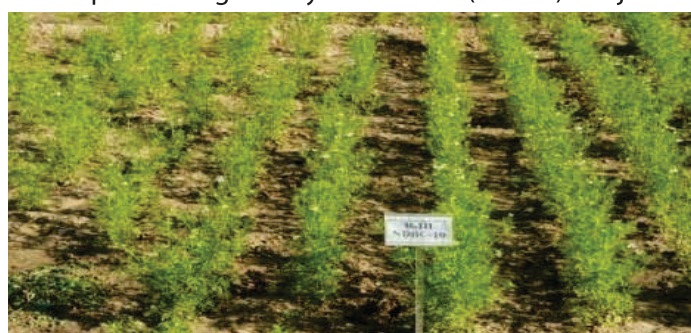
Best performing variety urd bean (Kota Urd-4) at Ajmer



Best performing variety moth bean (CZM-2) at Ajmer

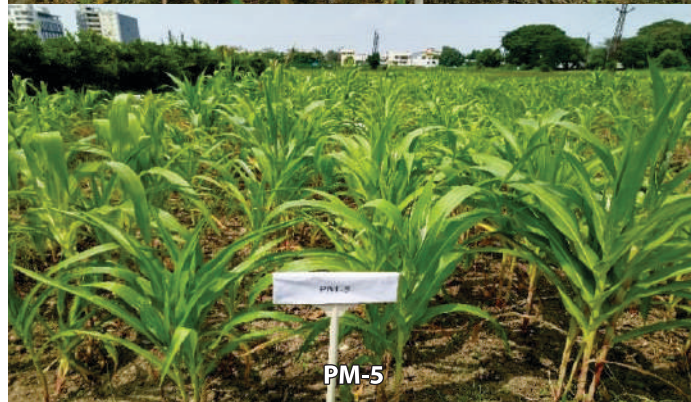
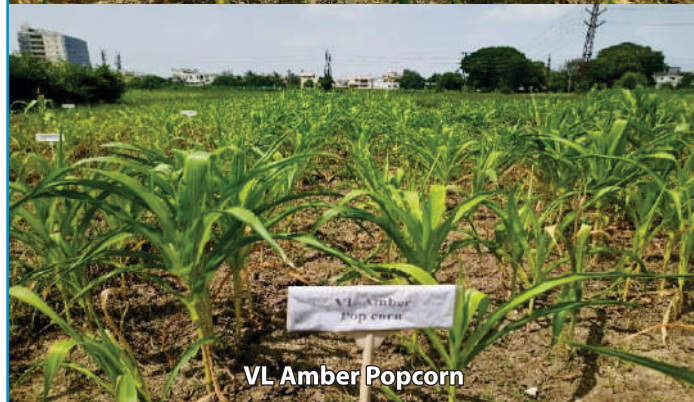


Best performing variety fenugreek (HisarSonal) at Ajmer



Best performing variety Nigella(NDBC-10) at Ajmer





Field performance of different varieties of maize and wheat under organic farming at Udaipur



7.2.3: Evaluation of organic management practices for insect pest in various crops

Objective

- To evaluate the organic management practices for reducing the incidence of insect pests in major crops
- To identify the package of insect pest management for organic production system

Year of start: 2015-16

Location: Fournamely, Almora (Uttarakhand), Ajmer and Udaipur (Rajasthan) and Gangtok (Sikkim). Udaipur not reported Centre wise results for each centre are presented below

Almora

The experiment evaluated in lab as well as in field to test the efficacy of different bio-pesticides for management of sucking pest in soybean and toria

Laboratory evaluation of botanicals and bio pesticides against pest of soybean (Table 7.2.3.1).

Among the pest management modules tested in laboratory as well as field condition, application of *melia azedarach* extract (10%), *nimbecidine* @ 3 ml/l and *beauveria bassiana* 3g/l provided at par reduction of the sucking bug population however, cartap hydrochloride 1g/L resulted in significantly reduced the sucking pest in soybean.

Table 7.2.3.1: Effect of organic pest management of sucking bug for soybean at Almora

Plant extract and Concentration	Laboratory mortality (%)	Field mortality (%)
T-1 Melia azadirachextract 5%	54.20	45.4
T-2 Melia azadirachextract 10%	63.50	58.7
T-3 Nimbecidine 3 mL/L	60.00	59.3
T-4 Beauveria bassiana 3g/L	68.40	45.8
T-5 Parthenium extract 5%	56.77	51.6
T-6 Cartap hydrochloride 1g/L	100.00	96.8
T-7 Control	5.76	6.67



Soybean Sucking bug (Chauliopschoprai)

Effect of different insect management options on Toria Aphid (*Lipaphis erysimi*): Among the different botanicals and bio-pesticides, *acetamiprid* at a concentration of 0.25 g/l resulted in significantly higher control of aphids on toria (100% and 96.7%)

followed by *Nimbecidine* at a concentration of 3 ml/l, which controlled 63.3 and 54.3% of aphid infestation under laboratory and field conditions respectively. *Acetamiprid* found to be the most effective treatment against toria aphids (Table 7.2.3.2).



Table 7.2.3.2: Effect of botanicals and bio-agents on toria aphids in laboratory and field conditions

Treatments	Laboratory mortality (%)	Field mortality (%)
Chitinolytic bacteria UKCH83	37.0	23.3
Chitinolytic <i>Bacillus thuringiensis</i>	43.0	27.0
Botanical extract from Pine @5%	33.3	26.7
Nimbecidine @ 3ml/l	63.3	54.3
Biocontrol agent- <i>Beauveria</i> @ 3g/L	50.00	33.3
Biocontrol agent- <i>Metarhizium</i> @ 3g/L	56.67	43.3
Insecticide- Acetamiprid @ 0.25 g/l	100.0	96.7
Control	6.7	3.3



Toria Aphid

Ajmer

Evaluation of integrated pest management modules against sucking pests infesting in coriander and fennel

Treatments details of IPM module

Module combinations	Module combinations
M1 : Sanitation + stickytrap 25 no./ha.+ neem guard (fermented) 3 ml/lit.	M4: Datura leaf extract 10ml/lit +cow urine + butter milk 50% + <i>Verticillium lecanii</i> 5g/lit.
M2: Field sanitation+ NSKE 5ml/lit +Ker extract 10 ml/lit.	M5; Neem oil 3 ml/lit + Castor leaf extract 10ml/lit + tumba fruit extract 10ml/lit.
M3: Garlic extract 10 ml/lit + azadirachtin 0.03% EC @ 5ml/lit + tumba fruit extract 10ml/lit.	M6: Untreated Control

Effect of different organic IPM modules for management of aphid and thrips in coriander and fennel (Table 7.2.3.3):

Six organic based IPM modules (including control) evaluated to test their efficiency against aphid and thrips on coriander and fennel. The maximum per cent reduction in population of aphid and thrips was recorded in module M3 as foliar application of garlic extract 10 ml/lit + *azadirachtin* 0.03% EC @ 5ml/lit + tumba fruit extract 10ml/lit, Population of aphid and thrips was reduced to the tune of 69.7 & 73.3% and 70.5 & 68.6% in coriander and fennel respectively. In

case of yield of seed spice i.e. coriander and fennel followed the same trend and recorded significantly higher yield with module M3 of 848 and 2038 kg/ha respectively followed by module M2 which recorded of 779 and 1635 kg/ha in coriander and fennel respectively. Lowest yield recorded with module M6 i.e. untreated check. Yield of coriander was increase with module-3 by 45, 8.9, 60.3 and 37.90% over to module M1, M2, M4 and M5 respectively whereas yield of fennel increased by 46.8, 24.6, 33.6 and 31.6% against module M1, M2, M4 and M5 respectively.

Table 7.2.3.3: Effect of different IPM module on yield and infestation (percent reduction) of sucking-pests

IPM module	% reduction of aphid and thrips population in Coriander		% reduction of aphid and thrips population in Fennel		Yield (kg/ha)	
	Aphid	Thrips	Aphid	Thrips	Coriander	Fennel
M1	58.75	57.14	61.81	56.17	585	1388
M2	66.30	66.20	67.59	66.66	779	1635
M3	69.74	73.31	70.48	68.55	848	2038
M4	63.57	64.05	65.86	63.80	529	1525
M5	65.78	59.37	66.27	58.04	615	1548
M6	0.00	0.00	0.00	0.00	360	1208

Evaluation of plant extracts and bio-pesticides against sucking pests on coriander under organic production system (Table 7.2.3.4): Eight plant extracts and bio-pesticides evaluated for management of sucking pests on coriander. Among the different botanical extracts and bio-pesticides, application of *Nimbecidine* 0.03EC- 5ml/lit (T6)

resulted in significantly higher percent of reduction for sucking pest such as thrips, aphids and white fly (66.26, 70.76 and 60.34% respectively). Plant extracts treatments T7, & T4 was the next best performer in term of percent reduction of population of thrips, aphids and white flies but on par to each other.

Table 7.2.3.4: Effect of plant extracts and bio-pesticides against sucking pests on coriander

Plant extracts and bio-pesticides	Per cent reduction in population		
	Thrips	Aphids	White fly
T1- Lantana camera leaf extract-10%	46.67	47.56	41.52
T2- Chrysanthemum leaf extract-10%	49.08	46.99	42.99
T3- Datura leaf extract-10%	51.62	61.78	50.75
T-4 Neem leaf extract – 10%	58.95	63.47	54.12
T5- Castor leaf extract-10%	48.33	52.58	44.48
T6- Nimbecidine 0.03EC- 5ml/lit. (standard check)	66.26	70.76	60.34
T7- Verticilliumlecani- 5g/lit.	61.24	68.42	48.74
T8-Cow urine -20%	53.79	44.59	57.62
T9- Control	0.00	0.00	0.00

Gangtok

Organic insect pest and disease management in maize (Table 7.2.3.5): Major insect pest that cause infestation in maize are mainly army worm and stem borer. Among all the tested biopesticides, spinosad 45 SC showed the best result with the lower per cent leaf feeding by army worm (9.8) and reduction in the per cent dead heart (0.65 %). The second best treatment was *Beauveria bassiana* with 14.5 % leaf feeding by army worm and stem borer dead heart (2.98%). The leaf injury rating was lowest in maize plots treated with Spinosad 45 SC (2.5) followed by *Metarhiziumanisopliae* and Petroleum oil based agrospray (5.8).

Among all the tested bio-pesticides, *Spinosad* 45 SC

showed the best result in stem borer infestation with 86.75% damage control and increase in grain yield of maize (3.07 t/ha) followed by *Beauveria bassiana* @ 7 g/l stem borer infestation with 84.20 % damage control and increase in grain yield of maize (2.76 t/ha) as compared to control. Similar trend was followed in the lowest percent damage before spray, percent damage after spray and damage control by stem borer infestation was observed. The lowest disease incidence was observed in the Spinosad 45 SC @ 0.3 ml/l (13.25 %) followed by *Beauveria bassiana* @7 g/l (15.80%). The TLB disease scoring was done using 1-9 scale suggested by Payak and Sharma (1983) on five random plants in each line at the time of tasseling and at 20 days after tasseling.



Table 7.2.3.5: Biopesticide on insect pest and disease management in maize

Treatments	Army worm		SBR (%)		(LIR)	TLB IS (1-9 scale)	Stem borer infestation (%)				
	LF %	LFR	PI (%)	DH (%)			% DBS	% DAS	% DC	% DI	GY (t/ha)
Neem oil (1500 ppm)	20.55	2.4	32.40	5.15	8.2	3.4	8.62	5.58	69.37	30.63	1.89
Beauveria bassiana @ 7 g/l	14.05	1.5	30.20	2.98	7.0	1.4	7.86	4.92	84.20	15.80	2.76
Metarhiziumanisopliae @5 ml/l	19.87	1.2	35.07	5.40	5.2	3.2	8.18	5.62	72.56	27.44	2.14
Petroleum oil based agrospray @ 10 ml/l	48.52	2.2	50.47	4.8	5.8	4.6	9.45	6.46	65.35	34.65	2.25
Petroleum oil based hortispray @ 10 ml/l	18.43	1.2	36.5	4.18	6.0	1.8	7.06	5.33	78.32	21.68	1.86
Bacillus thuringiensis @ 2 g/l	32.45	1.9	24.74	4.52	6.2	4.2	9.1	6.17	66.12	33.88	1.79
Spinosad 45 SC @ 0.3 ml/l	9.8	1.0	8.48	0.65		1.0	5.2	3.71	86.75	13.25	3.07
Control						5.0	10.5	6.64	58.13	41.87	1.21
Mean						3.08	8.25	5.55	72.60	27.40	2.12
CD (P=0.05)						0.85	1.02	0.64	7.21	9.87	0.27

Note*SBR %: Stem borer infestation, LIR: Leaf Injury Rating, LF: Leaf Feeding %, LFR: Leaf feeding rating, PI %: Plant infestation %, DH %: Dead heart %, * IS: Insect Score, % DBS: Percent damage before spray, % DAS: Percent damage after spray, % DC: Percent damage control, GY: Grain Yield & DI: Disease incidence.



Damages caused by stem borer in maize crop

Coimbatore

Evaluation of organic production practices for the management for insect-pest in cotton and maize

Crop	Details
Cotton	Studies on the effect of cow urine based extracts of ginger, garlic and green chilli for the management of major insect pests T1 : Ginger extract 5 % T2 : Garlic extract 5 % T3 : Green chilli extract 5 % T4 : Ginger extract 5 % + Garlic extract 5 % + Green chilli extract 5 % T5 : Cow urine alone 5 % T6 : Neem Seed Kernel Extract 5 % (Standard check) T7 : Untreated check (Water spray)

Crop	Details
Bhendi	Studies on the effect of cow urine based extracts of ginger, garlic and green chilli for the management of major insect pests T1 : Ginger extract 5 % T2 : Garlic extract 5 % T3 : Green chilli extract 5 % T4 : Ginger extract 5 % + Garlic extract 5 % + Green chilli extract 5 % T5 : Cow urine alone 5 % T6 : Neem Seed Kernel Extract 5 % (Standard check) T7 : Untreated check (Water spray)
Maize	Studies on the effect of herbal leaf extracts for the management of fall army worm in maize T1:Agniasthra 10 % T2:Cow dung - Cow urine extract 10 % T3:Five leaf herbal extract 10 % T4:Lantana-Calotropis extract 10 %T5:Arappu - Buttermilkextract 10 %T6:3G extract 10 %T7:Cow urine alone 10 % T8: Neem Azal (1 %) 2ml/litT9:Thiodicarb 75 % WP 2g/litT10:Untreated check (Water spray)

Results (Table 7.2.3.6):Among the ITKs evaluated, Ginger, Garlic and Green chilli extract @ 5 % was effective against sucking pests viz., aphids, leafhoppers, thrips, whiteflies and defoliator viz. leaf roller infesting cotton and bhendi with the maximum seed cotton (1493 kg/ha) and fruit yield (11964 kg/ha), respectively. Among the different ITKs tested, maize treated with 3G extract @ 5 % recorded the highest yield of 4,986 kg/ha with 56.28 per cent

reduction in fall armyworm damage over untreated control. In bhendi, brinjal, tomato and chilli, organic IPDM module treated plots recorded maximum reduction in pest incidence. Maximum yield per hectare of 11964 kg/ha, 17628 kg/ha, 16140 kg/ha and 13183 kg/ha, respectively was recorded in bhendi, brinjal, tomato and chilli in the OIPDM module treated plots when compared to other treatments.

Table 7.2.3.6: Best performing treatment under of organic insect &pest management practices in various crops

Name of the Crop	Insect pest	Best performing treatment	Reduction in incidence compared to control (%)	Yield (kg/ha)
Cotton	Leafhoppers	Ginger, garlic and green chilli extract @ 5 %	58.48	1493
	Thrips		48.32	
	Whiteflies		52.18	
	Aphids		72.26	
	Leaf roller		58.32	
Bhendi	Leafhoppers	Ginger, garlic and green chilli extract @ 5 %	52.55	11964
	Thrips		38.48	
	Whiteflies		56.14	
	Aphids		68.42	
	Leaf roller		51.25	
Maize	Fall armyworm	Ginger, garlic and green chilli extract @ 5 %	56.28	4986



Bhendi	Leafhoppers	OIPDM module	72.88	11964
	Aphids		69.25	
	Whiteflies		58.44	
	Leaf roller		57.55	
	Fruit borer		52.75	
Brinjal	Shoot and fruit borer	OIPDM module	72.88	17628
	Brown Leafhoppers		58.50	
Tomato	Thrips	OIPDM module	65.25	16410
	Whiteflies		72.45	
Chilli	Aphids	OIPDM module	81.20	13183
	Thrips		58.20	
	Whiteflies		68.25	

Evaluation of organic management practice for diseases in crops (Table 7.2.3.7)

- In bhendi, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with Bacillus subtilis @ 0.5 % followed by foliar application of panchagavya 3 % performed better in reducing the incidence of yellow vein clearing disease (62.88 % reduction over control) with the maximum yield of 11964 kg/ha.
- In brinjal, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with Bacillus subtilis @ 0.5 % followed by foliar application of panchagavya 3 % recorded the maximum reduction in the incidence of little leaf diseases 52.58 % reduction over control) with the maximum yield of 17628 kg/ha.
- In tomato, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with Bacillus subtilis @ 0.5 % followed by foliar application of panchagavya 3 % performed better in reducing the incidence of leaf blight (62.5 % reduction over control), Tomato leaf curl virus (88.75 % reduction over control), Tomato spotted wilt virus (92.50 % reduction over control) which resulted in higher yield of 16,410 kg/ha.
- In chilli, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with Bacillus subtilis @ 0.5 % followed by foliar application of panchagavya 3 % performed better in reducing the incidence of yellow leaf curl disease (58.84 % reduction over control) and the yield was also higher (13183 kg/ha) in the OIPDM module.

Table 7.2.3.7: Evaluation of organic management practice for diseases in crops

Name of the Crop	Disease	Best performing treatment	Reduction in incidence compared to control (%)	Yield (kg/ha)
Bhendi	Yellow vein clearing disease (Virus)	OIPDM	62.88	11964
Brinjal	Little leaf disease (MLO)	OIPDM	82.58	17628
Tomato	Early blight (Fungal)	OIPDM	62.50	16410
	Tomato leaf curl virus	OIPDM	88.75	
	Tomato spotted wilt virus	OIPDM	92.50	
Chilli	Yellow leaf curl disease (Virus)	OIPDM	58.84	13183

7.2.4: Evaluation of organic management practice for diseases in crops

Objective:

- To evaluate the management practices for management of diseases in high value crops
- To identify the suitable package for management of important diseases in selected crops

Year of start: 2015-16

Locations: Three; Ajmer (Rajasthan) Coimbatore (Tamil Nadu) and Gangtok (Sikkim).

Results: Centre wise results for each centre is presented below

Ajmer

Management of Sclerotium rot of coriander and Ramularia blight of fennel

i. Effect of different botanicals on Ramularia blight of fennel (Table 7.2.4.1): Five treatments comprising foliar spray of neem oil (0.5%), castor oil (0.5%), garlic

extract (0.5%), onion extract (0.5%) with control treatment were evaluated for management of *Ramularia* blight in fennel and powdery mildew in coriander. Among all the treatments management for *Ramularia* blight and powdery mildew, application of garlic extract with 0.5% was found most effective in term of per cent disease incidence (5.7 & 4.9) followed by neem oil (PDI, 7.5 & 5.4%) which recorded lowest incidence of Ramularia blight and powdery mildew resulted in maximum yield of fennel and coriander (1910 and 790 kg/ha respectively). Application of garlic extract (0.5%) for management of *Ramularia* blight and powdery mildew found to be more effective by 31.6 & 10.2%, 100 & 22.4%, and 75.4 & 49% over neem oil spray (0.5%), castor oil spray (0.5%) and onion extracts spray (0.5%) respectively.

Table 7.2.4.1: Per cent disease incidence of Ramularia blight, powdery mildew disease and seed yield of fennel and coriander as influenced by different botanicals

Treatments	Fennel		Coriander	
	Ramularia blight (PDI)	Yield (kg/ha)	Powdery (PDI)	Yield (kg/ha)
Neem oil (0.5%)	7.5	1640	5.4	720
Castor oil (0.5%)	11.4	1420	6.0	700
Garlic extract (0.5%)	5.7	1910	4.9	790
Onion extracts (0.5%)	10.0	1450	7.3	590
Control	15.3	1220	11.9	440

*PDI= Per cent disease incidence

ii. Management of Sclerotium rot of coriander (Table 7.2.4.2): Four treatments comprising soil solarization (21 days), *Trichoderma* (soil & seed application), neem and castor cake @ 0.5 t/ha each was evaluated for management of *Sclerotium* rot in coriander. Effect of different treatments for management of *Sclerotium* rot were found in order to soil solarisation (21 days) > neem cake (0.5 t/ha) > *Trichoderma* (soil & seed application) > castor cake (0.5 t/ha). Among the

all treatments, effect of soil solarization (21 days) on *Sclerotium* rot was found most effective (PDI, 4.5) followed by *Trichoderma* (soil & seed app) (PDI, 5.50). Similarly, the maximum yield of coriander (720 kg/ha) was recorded with the treatments soil solarization 21 days in summer followed by application of neem cake (0.5 t/ha) of 710 kg/ha.



Table 7.2.4.2: Effect of different treatments on Sclerotium rot and powdery mildew of coriander

Treatments	Sclerotium rot (PDI)	No. weeds / M2	Yield (kg/ha)
Soil solarization (21 days)	4.50	62	720
Trichoderma (soil & seed appl.)	5.50	129	700
Neem cake (0.5 t/ha)	5.30	112	710
Castor cake (0.5 t/ha)	6.60	123	590
Control	9.3	145	443

Coimbatore

Evaluation of organic management practice for diseases in crops (Table 7.2.4.3):

- In bhendi, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with *Bacillus subtilis* @ 0.5 % followed by foliar application of panchagavya 3 % performed better in reducing the incidence of yellow vein clearing disease (62.88 % reduction over control) with the maximum yield of 11964 kg/ha.
- In brinjal, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with *Bacillus subtilis* @ 0.5 % followed by foliar application of panchagavya 3% recorded the maximum reduction in the incidence of little leaf diseases 52.58 % reduction over control) with the maximum yield of 17628 kg/ha.
- In tomato, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with *Bacillus subtilis* @ 0.5 % followed by foliar application of panchagavya 3 % performed better in reducing the incidence of leaf blight (62.5 % reduction over control), Tomato leaf curl virus (88.75 % reduction over control), Tomato spotted wilt virus (92.50 % reduction over control) which resulted in higher yield of 16,410 kg/ha.
- In chilli, the OIPDM module with erection of bird perches, yellow sticky traps, pheromone traps @ 5 per acre, border cropping with cow pea, barrier cropping with sorghum, foliar spray of azadirachtin 10,000 ppm @ 2 ml per litre, fermented buttermilk with *Bacillus subtilis* @ 0.5 % followed by foliar application of panchagavya 3 % performed better in reducing the incidence of yellow leaf curl disease (58.84 % reduction over control) and the yield was also higher (13183 kg/ha) in the OIPDM module.

Name of the Crop	Disease	Best performing treatment	Reduction in incidence compared to control (%)	Yield (kg/ha)
Bhendi	Yellow vein clearing disease (Virus)	OIPDM	62.88	11964
Brinjal	Little leaf disease (MLO)	OIPDM	82.58	17628
Tomato	Early blight (Fungal)	OIPDM	62.50	16410
	Tomato leaf curl virus	OIPDM	88.75	
	Tomato spotted wilt virus	OIPDM	92.50	
Chilli	Yellow leaf curl disease (Virus)	OIPDM	58.84	13183

7.2.5: Evaluation and validation of Natural Farming practices in different agro-ecologies

Objectives

1. To document the natural farming practices adopted by farmers in different regions,
2. To characterize the inputs used in natural farming,
3. To study the influence of natural farming practices on crop productivity, soil health, and economics in different agro-ecologies,
4. To evaluate and integrate natural farming inputs into organic farming packages

Year of Start: The experiment was originally planned during November 2019 in the Annual Group Meeting to extend the study on natural farming practices on different crops in various regions to identify the crops and regions where the low input-based Natural Farming (NF) practices can be recommended. The study was initiated in *Kharif* 2020. Studies were undertaken at 20 locations

covering 16 states.

A total of 210 natural farming farmers located in 46 blocks under 20 districts covering 16 States were surveyed under geo-referenced characterization for natural farming farmers. *Jeevamrit*, *Ghanjeevamrit*, *Beejamrit*, *Neemastra*, *Bramhastra*, and *Dasparni* extract are major sources of input used for crop production. Difficulty in preparation of natural farming input, self-life of organic inputs is very low, and selling of product are the major constraints. Details are presented in chapter 7.1.1.

Physicochemical and biological characterization of input components which are used for preparing the concoctions and final product such as *Beejamrit*, *Ghanjeevamrit* & *Jeevamrit*, and other inputs such as *Agniastra*, *Neemastra*, and *Brahmastra* were characterized at Calicut, Coimbatore, Ludhiana, Narendrapur, and Udaipur. Details are presented in chapter 7.1.3.

Detail of treatments: Treatments: 9, Replications: 3, Design: RBD, Plot size: Minimum 100 m²/ treatment/ replication.

Treatments	Details
T1	Control (No addition of any inputs except labour for operations including weeding)
T2	Complete NF (1. Beejamrit + Ghanjeevamrit + Jeevamrit; 2. Crop residue mulching; 3. Intercropping; 4. Whapasa)
T3	AI-NPOF package
T4	Integrated Crop Management (50% nutrient application through organic manures and 50% nutrient application through inorganic sources with the use of Neemastra, Agniastra, Brahmastra, and Dashparni ark for pest management)
T5	Integrated Crop Management (50% nutrient application through organic manures and 50% nutrient application through inorganic sources with application of need-based pesticides for pest management)

Locations and cropping systems: 20 centers with 08 major commonly practiced cropping systems were undertaken. Location-wise details of cropping systems and mulching materials are as under:

Locations	Cropping system	Mulching material
Ajmer, Udaipur and SK Nagar	Groundnut + sesame – fennel + cabbage	Stover of fennel during Kharif and leaves of fennel during Rabi
Almora, Bajaura, and Gangtok	Soybean + maize (2:1) – garden pea + green coriander (2:1)	Wheat straw during Kharif & maize straw during Rabi
Bhopal, Jabalpur, and Raipur	Soybean + maize – wheat + mustard	Mustard residue mulch during Kharif and soybean residue mulch in Rabi
Coimbatore and Dharwad	Cotton + green gram – sorghum + chickpea	Maize stover @ 5 t/ha in both the seasons



Locations	Cropping system	Mulching material
Calicut and Umiam	Turmeric + cowpea	Dried coconut leaves / other plants as per availability
Karjat, Ranchi and Narendrapur	Rice + dhaincha – maize grain/ sweet corn + cowpea	Azolla in Kharif Rice straw in Rabi
Ludhiana, Modipuram and Pantnagar	Maize + cowpea – wheat + chickpea	Rice straw @ 5 t/ha in both the seasons
Thiruvananthapuram	Cassava + vegetable cowpea – green gram	Residue mulching @ 5 t/ha as per availability

The results of each center are presented and discussed (Table 7.2.7.1 & 7.2.7.5)

Ajmer: Groundnut + sesame – fennel + cabbage cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 2173 kg/ha which was 29.37% and 57.01% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.36% which was 12.5% higher than the

AI-NPOF package but was nearly the same as that of the ICMP package. Further, the cost of cultivation & net return was INR 52,487 & INR 67,063 per ha. These were 44.26% & 23.51% and 10.71% & 67.98% lower than that of the AI-NPOF and ICMP packages, respectively.



Inputs preparation and application in NF plots at ICAR-NRCSS, Ajmer

Udaipur: Groundnut + sesame – fennel + cabbage cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 3966 kg/ha which was 43.84% and 59.02% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was

observed at 0.69% which was 6.76% and 4.17% lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 68,485 & INR 159,069 per ha. These were 36.78% & 24.31% and 46.31% & 55.35% lower than that of the AI-NPOF and ICMP packages, respectively.



Groundnut+sesame under complete NF



Groundnut+sesame under AI-NPOF package



Fennel + cabbage under complete NF(Udaipur)



Fennel + cabbage under AI-NPOF package (Udaipur)

Sardarkrushinagar: Groundnut + sesame – fennel + cabbage cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 3762 kg/ha which was 5.29% and 16.70% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.12% which was 17.01% and 16.44%

lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 95,874 & INR 118,767 per ha. The cost of cultivation was 41.91% & 29.29% lower, while the net returns were 93.03% higher & 2.68% lower than that of the AI-NPOF and ICMP packages, respectively.



Groundnut + Sesame under complete NF (SK Nagar)



Fennel + Cabbage under AI-NPOF package (SK Nagar)

Almora: Soybean + maize – garden pea + green coriander cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 12706 kg/ha which was 23.54% and 26.51% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 1.16% which was 12.78% and 3.33%

lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 102,826 & INR 127,230 per ha. The cost of cultivation was the same for all the practices, while the net returns were 25.21% & 37.53% lower than that of the AI-NPOF and ICMP packages, respectively.





Soybean +maize during kharif under complete NF & AI-NPOF at Almora

Bajaura: Soybean + maize –pea + green coriander cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 4562 kg/ha which was 14.02% and 26.07% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.74% which was 10.84% and 5.13%

lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 197,068 & INR 341,120 per ha. The cost of cultivation was 27.14% and 9.06% lower, while the net returns were 4.27% & 7.82% less than that of the AI-NPOF and ICMP packages, respectively.



Soybean+ maize system under complete NF and AI-NPOF at Bajaura



Vegetable pea+ green coriander under complete NF and AI-NPOF at Bajaura

Gangtok: Soybean + maize – garden pea + green coriander cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 11796 kg/ha which was 3.96% greater than the AI-NPOF package. Under complete natural farming, soil organic carbon (SOC) was observed at 1.54% which was 1.28% lower than the AI-NPOF system. Further, the cost of cultivation & net return was INR 100,210 & INR 200,610 per ha. These were 38.08% & 11.84% higher than that of the AI-NPOF package.

Bhopal: Soybean + maize – wheat + mustard cropping system was evaluated. Complete natural

farming recorded a system equivalent yield of 2918 kg/ha which was 19.97% and 32.25% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.65% which was 10.96% and 1.52% lower than the AI-NPOF and ICMP, respectively. Further, the cost of cultivation & net return was INR 35,036 & INR 28,459 per ha. The cost of cultivation was 32.96% and 32.32% lower, while the net returns were 9.16% & 43.82% less than that of the AI-NPOF and ICMP packages, respectively.



Soybean + maize – wheat + mustard under complete natural farming at Bhopal

Jabalpur: Soybean + maize – wheat + mustard cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 2588 kg/ha which was 24.35% and 44.49% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.62% which was 10.14% lower but

1.64% higher than the AI-NPOF and ICMP systems, respectively. Further, the cost of cultivation & net return was INR 83,261 & INR 37,056 per ha. The cost of cultivation was 19.47% and 8.37% lower, while the net returns were 30.42% & 68.96% less than that of the AI-NPOF and ICMP packages, respectively.



Soybean +maize under complete NF and AINP-OF at Jabalpur

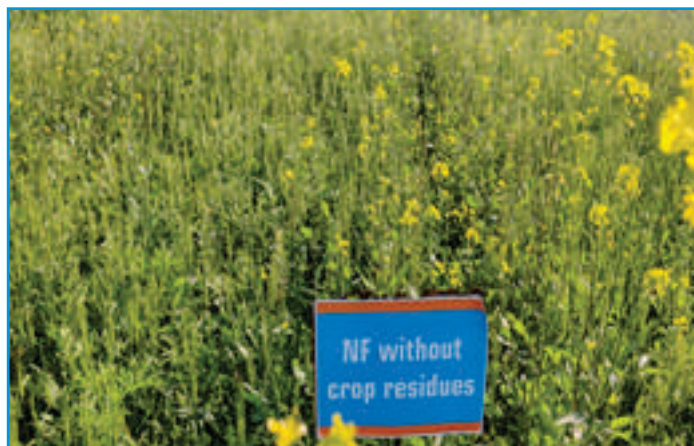


Raipur: Soybean + maize – wheat + mustard cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 1766 kg/ha which was 19.10% and 28.56% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.62% which was 1.64% higher than

both AI-NPOF and ICMP. Further, the cost of cultivation & net return was INR 94,370 & INR 48,802 per ha. The cost of cultivation was 13.72% and 29.59% higher, while the net returns were 23.60% lower & 9.25% higher than that of the AI-NPOF and ICMP packages, respectively.



Soybean+ maize (Raipur)



Wheat+ mustard (Raipur)

Coimbatore: Cotton + green gram – sorghum + chickpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 1862 kg/ha which was 5.32% higher and 14.86% less than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.63% which was 1.79% & 19.20% higher than the AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 76,250 & INR 137,025 per ha. The cost of cultivation was 52.37% and 50.65% lower, while the net returns were 410.15% & 112.11% higher than that of the AI-NPOF

and ICMP packages, respectively.

Dharwad: Cotton + green gram – sorghum + chickpea cropping system was evaluated. Under complete natural farming, soil organic carbon (SOC) was observed at 0.58% which was 21.62% & 15.94% lower than the AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 44,122 & INR 6,283 per ha. The cost of cultivation was 29.18% and 21.38% lower, while the net returns were 222.86% & 36.60% lower than that of the AI-NPOF and ICMP packages, respectively.



Cotton and green gram crops at Dharwad

Calicut: Turmeric + cowpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 23860 kg/ha which was 4.79% lower and 26.11% higher than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.95% which was 1.04% lower than both AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 185,300 & INR 302,700 per ha. The cost of cultivation was 16.42% and 2.11% lower, while the net returns were 8.30% & 60.07% higher



Natural Farming (Umiam)

than that of the AI-NPOF and ICMP packages, respectively.

Umiam: Turmeric + cowpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 11447 kg/ha which was 47.87% and 43.08% lower than the AI-NPOF and ICMP, respectively. The cost of cultivation & net return was INR 59,675 & INR 85,765 per ha. The cost of cultivation was 27.02% and 33.94% lower, while the net returns were also 51.98% & 41.56% lower than that of the AI-NPOF and ICMP packages, respectively.



NPOF Package (Umiam)

Karjat: Rice + dhaincha – maize grain/sweet corn + cowpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 9734 kg/ha which was 38.68% and 33.91% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 1.04% which was 0.95% lower than

both AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 161,592 & INR 36,986 per ha. The cost of cultivation was 26.15% and 13.12% lower, while the net returns were 64.78% & 67.68% less than that of the AI-NPOF and ICMP packages, respectively.





Preparation of Jeevamrit and Ghanjeevamrit at Karjat



Preparation of Leaf extract

Ranchi: Rice + dhaincha – maize grain/sweet corn + cowpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 7067 kg/ha which was 1.70% and 14.35% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.64% which was 1.59% and 18.52% higher than AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 66,796 & INR 127,400 per ha. The cost of cultivation was 6.02% and

13.59% lower, while the net returns were 1.71% higher and 14.58% less than that of the AI-NPOF and ICMP packages, respectively.

Narendrapur: Rice + *dhaincha* – maize grain/sweet corn + cowpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 6610 kg/ha. The soil organic carbon (SOC) was observed at 0.53%. Further, the cost of cultivation & net return was INR 50,889 & INR 81,042 per ha, respectively.



Maize + Cowpea intercropping (1:1)
at NF plot (Narendrapur)



Multivariate cropping (MVC) of sunn hemp, okra, marigold,
cowpea, sesame and greengram at NF plot

Ludhiana: Maize + cowpea – wheat + chickpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 6400 kg/ha which was 43.71% and 53.76% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.48% which was 5.88% lower than the

AI-NPOF, while it was nearly the same as that of the ICMP system. Further, the cost of cultivation & net return was INR 87,587 & INR 87,679 per ha. The cost of cultivation was 56.45% and 41.00% lower, while the net returns were 21.05% and 47.23% less than that of the AI-NPOF and ICMP packages, respectively.



Maize +cowpea under complete natural farming



Wheat + chickpea under complete NF and AINP-OF at Ludhiana

Modipuram: Maize + cowpea – wheat + chickpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 2517 kg/ha which was 68.88% and 70.28% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.60% which was 13.04% & 10.45% lower

than the AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 79,360 & INR -8928 per ha. The cost of cultivation was 38.07% and 21.42% lower, while the net returns were 110.64% and 106.90% less than that of the AI-NPOF and ICMP packages, respectively.



Maize+ cowpea under complete NF and AI-NPOF package at Modipuram





Wheat+ chickpea under complete NF and AI-NPOF package at Modipuram

Pantanagar: Maize + cowpea – wheat + chickpea cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 3087 kg/ha which was 19.80% and 23.08% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.46% which was 4.17% lower than both

the AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 48,870 & INR 145,310 per ha. The cost of cultivation was 36.89% and 37.66% lower, while the net returns were 6.58% and 20.75% less than that of the AI-NPOF and ICMP packages, respectively.



Maize+ cowpea under complete NF and AI-NPOF package at Pantnagar



Wheat+ chickpea under complete NF and AI-NPOF package at Pantnagar

Thiruvananthapuram: Cassava + vegetable cowpea – green gram cropping system was evaluated. Complete natural farming recorded a system equivalent yield of 23970 kg/ha which was 25.77% and 45.84% lower than the AI-NPOF and ICMP, respectively. Under complete natural farming, soil organic carbon (SOC) was observed at 0.92%

which was 22.67% and 35.29% higher than both AI-NPOF and ICMP systems. Further, the cost of cultivation & net return was INR 241,470 & INR 477,018 per ha. The cost of cultivation was 29.76% and 27.81% lower, while the net returns were 23.61% and 51.94% less than that of the AI-NPOF and ICMP packages, respectively.



7.2.5.1 Yield of main and inter crops under different Natural Farming Practices in different agro-ecologies

Cropping System	Locations	Yield main and inter crop Kharif (kg/ha)												Yield main and inter crop rabi (kg/ha)																											
		Control				Complete NF				AI-NPOF package				Integrated Crop Management + NF based pest control methods (ICMNF)				Integrated Crop Management + chemical pesticides (ICMP)				Control				Complete NF				AI-NPOF package				Integrated Crop Management + NF based pest control methods (ICMNF)				Integrated Crop Management + chemical pesticides (ICMP)			
		Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop	Main crop	Inter crop						
Groundnut + sesame – Fennel + cabbage	Ajmer	530	342	548	373	580	478	601	529	590	500	609	873	444	912	819	1442	2013	27513	1968	2817																				
	Udaipur	470	200	280	180	666	247	715	169	750	280	1355	4060	940	3220	1925	4965	2010	5180	2150	5320																				
	Sardarkrushinagar	612	265	904	518	755	390	849	399	810	423	454	5832	618	8501	1060	9131	1317	11433	1223	11304																				
	Almora	2034	712	3775	852	4734	874	5073	618	6148	637	5619	445	6640	291	8777	1002	8805	759	8527	951																				
	Bajaura	951	2443	1269	3358	1553	3680	1871	3940	1889	3986	4683	2139	5744	2330	6565	2901	7492	3183	7632	3092																				
	Gangtok	1580		2030	3640	2650							4875		6014	612	7298																								
	Bhopal	385	246	480	285	567	310	635	328	642	331	1293	80	1506	93	2205	108	2516	168	2764	170																				
	Jabalpur	1117	998	1238	1171	1341	1414	1536	1383	1442			1112	270	1364	329	2122	548	2528	565	3016	1028																			
	Raipur	531	1527	578	2655	615	3423	670	3696	706	3836	555	264	683	385	780	410	788	430	555	264																				
	Cotton + greengram – Sorghum + chickpea	Coimbatore	685		1364	311	1768		2278		2187		1515		2278	320	2510		2795		2719																				
Turmeric – fellow	Dharwad	285		359	95	366		379		444		709		851	285	1078		1119		1187																					
	Calicut	16640		23500	600	25060		19200		18920																															
	Umiam	9600		11400	117	21960		20810		20110																															
	Karjat	1470	2900	2294	3480	3109	4000	3511	4150	3421	4080	4976	94	6146	122	10902	219	12151	276	12070	260																				
	Ranchi	2331		2947		2994		3326		3110		3552	1225	4643	1721	4123	1334	5644	1478	5865	1622																				
	Narendrapur	2650		2610								2625		2750																											
	Ludhiana 3047	16603	2689	14823	3691	20952	3975	23118	4269	23432	2093	738	1585	596	3807	1112	4348	1411	4483	1514																					
	Modipuram	2567	1420	1218	738	5922	1643	6825	1482	7073	1429	1643	169	1233	44	3166	96	4498	94	4638	82																				
	Pantnagar 3180	9610	4510	11832	5450	12862	7620	14498	6578	13446	462	254	996	374	1496	420	1961	502	1567	437																					
	Cassava+ vegetable cowpea – green gram	Thiruvananthapuram	15600		17660	2180	31910		44250		43690		90		120		91		161		137																				

Table 7.2.5.2: System equivalent yield (Kg/ha) of various cropping systems as influenced by different natural farming practices

Cropping system	Locations	Control	Complete NF	AI-NPOF package	Integrated crop management + NF based pest control methods (ICMNF)	Integrated crop management + chemical pesticides (ICMP)	SEY increase/decrease (%)	
							AI-NPOF	ICMP
Ground nut + sesame – fennel + cabbage	Ajmer	2321	2173	3077	5184	5055	-29.37	-57.01
	Udaipur	5337	3966	7062	7198	7780	-43.84	-49.02
	S K Nagar	2380	3762	3972	4665	4516	-5.29	-16.70
Soybean + maize – garden pea + green coriander	Almora	9777	12706	16618	16176	17205	-23.54	-26.15
	Bajaura	3605	4562	5306	6097	6171	-14.02	-26.07
	Gangtok	9852	11796	12282			-3.96	-
Soybean + maize – wheat + mustard	Bhopal	2397	2918	3646	4152	4307	-19.97	-32.25
	Jabalpur	2059	2588	3421	3963	4662	-24.35	-44.49
	Raipur	1367	1766	2183	2377	2472	-19.10	-28.56
Cotton + green gram – rabi sorghum + chickpea	Coimbatore	685	1862	1768	2278	2187	5.32	-14.86
	Dharwad (Not Reported)							
Turmeric + cowpea – green gram	Calicut	16640	23860	25060	19200	18920	-4.79	26.11
	Umiyam	9600	11447	21960	20810	20110	-47.87	-43.08
Rice + dhaincha – maize grain/ sweet corn + cow pea	Karjat	6153	9734	15874	14967	14728	-38.68	-33.91
	Ranchi	5687	7067	7189	8191	8251	-1.70	-14.35
	Narendrapur	6613	6610					
Maize + cowpea – wheat + chickpea	Ludhiana	7740	6400	11370	13110	13840	-43.71	-53.76
	Modipuram	4353	2517	8089	8247	8468	-68.88	-70.28
	Pantnagar	1884	3087	3849	4771	4013	-19.80	-23.08
Cassava + vegetable cowpea – green gram	Thiruvanthapuram	15970	23970	32290	44920	44260	-25.77	-45.84

Table 7.2.5.3: Cost of cultivation (Rs/ha) of various crop and intercrops as influenced by different natural farming practices

Cropping system	Locations	Control	Complete NF	AI-NPOF package	Integrated Crop Management + NF based pest control methods (ICMNF)	Integrated crop management + chemical pesticides (ICMP)	CoC increase / decrease (%)	
							AI-NPOF	ICMP
Ground nut + sesame – fennel + cabbage	Ajmer	33740	52487	94160	68429	68615	-44.26	-23.51
	Udaipur	59425	68485	108325	90075	90475	-36.78	-24.31
	S K Nagar	63055	95874	165056	132360	135597	-41.91	-29.29
Soybean+ maize - pea+ green coriander	Almora	102826	102826	102826	102826	102826	0.00	0.00
	Bajaura	159622	197068	270488	218340	216694	-27.14	-9.06
	Gangtok	57408	100210	72574			38.08	NA
Soybean + maize – wheat + mustard	Bhopal	42389	35036	52262	56750	51767	-32.96	-32.32
	Jabalpur	58003	83261	103389	94966	90866	-19.47	-8.37
	Raipur	65545	94370	82985	78688	72823	13.72	29.59
Soybean + maize - wheat + mustard	Coimbatore	82450	76250	160100	172235	154520	-52.37	-50.65
	Dharwad	31392	44122	62304	52886	56118	-29.18	-21.38



Cropping system	Locations	Control	Complete NF	AI-NPOF package	Integrated Crop Management + NF based pest control methods (ICMNF)	Integrated crop management + chemical pesticides (ICMP)	CoC increase / decrease (%)	
							AI-NPOF	ICMP
Turmeric + cowpea - green gram	Calicut	154700	185300	221700	196800	189300	-16.42	-2.11
	Umiam	54786	59675	81768	92543	90330	-27.02	-33.94
Rice + dhaincha – maize grain/ sweet corn + cow pea	Karjat	138223	161592	218816	185894	186004	-26.15	-13.12
	Ranchi	60100	66796	71076	77192	77304	-6.02	-13.59
	Narendrapur	54525	50889				NA	NA
Maize + cowpea - wheat + chickpea	Ludhiana	81785	87587	201135	148676	148442	-56.45	-41.00
	Modipuram	56750	79360	128150	100647	100997	-38.07	-21.42
	Pantnagar	30997	48870	77440	74004	78389	-36.89	-37.66
Cassava + vegetable cowpea – green gram	Thiruvananthapuram	210850	241470	343800	332498	334498	-29.76	-27.81

Table 7.2.5.4: Net returns of crop and intercrops as influenced by different natural farming practices

Cropping system	Locations	Control	Complete NF	AI-NPOF package	Integrated crop management + NF based pest control methods (ICMNF)	Integrated crop management + chemical pesticides (ICMP)	Net Return increase / decrease (%)	
							AI-NPOF	ICMP
Ground nut + sesame – fennel + cabbage	Ajmer	93880	67063	75105	216656	209440	-10.71	-67.98
	Udaipur	246110	159069	296261	323213	356233	-46.31	-55.35
	S K Nagar	72704	118767	61527	143029	122034	93.03	-2.68
Soybean+ maize - pea+ green coriander	Almora	97146	127230	170107	180741	203674	-25.21	-37.53
	Bajaura	184746	341120	356340	362162	370045	-4.27	-7.82
	Gangtok	729360	200610	179380			11.84	NA
Soybean + maize – wheat + mustard	Bhopal	10974	28459	31328	39873	50656	-9.16	-43.82
	Jabalpur	36855	37056	53253	86919	119400	-30.42	-68.96
	Raipur	30858	48802	63879	59716	44669	-23.60	9.25
Cotton + green gram - sorghum + chickpea	Coimbatore	7499	137025	26860	52092	64600	410.15	112.11
	Dharwad	9537	6283	-5114	6392	9910	-222.86	-36.60
Turmeric + cowpea - green gram	Calicut	178100	302700	279500	187200	189100	8.30	60.07
	Umiam	69231	85765	178610	145300	146760	-51.98	-41.56
Rice + dhaincha – maize grain/ sweet corn + cow pea	Karjat	-12707	36986	105007	119425	114442	-64.78	-67.68
	Ranchi	96927	127400	125264	148019	149146	1.71	-14.58
	Narendrapur	89400	81042					
Maize + cowpea – wheat + chickpea	Ludhiana	130014	87679	111051	143849	166141	-21.05	-47.23
	Modipuram	53276	-8928	83899	121068	129441	-110.64	-106.90
	Pantnagar	78315	145310	155542	228666	183351	-6.58	-20.75
Cassava + vegetable cowpea – green gram	Thiruvananthapuram	267852	477018	624471	1014337	992552	-23.61	-51.94

Table 7.2.5.5: Soil organic carbon at the end of crop cycle as influenced by different natural farming practice

Cropping system	Locations	Control	Complete NF	AI-NPOF package	Integrated crop management + NF based pest control methods (ICMNF)	Integrated crop management + chemical pesticides (ICMP)	SOC increase/decrease (%)	
							AI-NPOF	ICMP
Ground nut + sesame – fennel + cabbage	Ajmer	0.26	0.36	0.32	0.40	0.36	12.50	0.00
	Udaipur	0.64	0.69	0.74	0.72	0.72	-6.76	-4.17
	S K Nagar	0.12	0.12	0.15	0.15	0.15	-17.01	-16.44
Soybean+ maize - pea+ green coriander	Almora	1.04	1.16	1.33	1.14	1.20	-12.78	-3.33
	Bajaura	0.68	0.74	0.83	0.78	0.78	-10.84	-5.13
	Gangtok	1.51	1.54	1.56			-1.28	-
Soybean + maize - wheat + mustard	Bhopal	0.61	0.65	0.73	0.68	0.66	-10.96	-1.52
	Jabalpur	0.60	0.62	0.69	0.63	0.61	-10.14	1.64
	Raipur	0.61	0.62	0.61	0.60	0.61	1.64	1.64
Cotton + green gram - sorghum + chickpea	Coimbatore	0.48	0.63	0.62	0.56	0.53	1.79	19.20
	Dharwad	0.56	0.58	0.74	0.72	0.69	-21.62	-15.94
Turmeric + cowpea - green gram	Calicut	0.95	0.95	0.96	0.95	0.96	-1.04	-1.04
	Umiam (Not reported)						NA	NA
Rice + dhaincha - maize/sweet corn + cowpea	Karjat	1.00	1.04	1.05	1.05	1.05	-0.95	-0.95
	Ranchi	0.32	0.64	0.63	0.53	0.54	1.59	18.52
	Narendrapur	0.49	0.53					
Maize + cowpea - wheat + chickpea	Ludhiana	0.46	0.48	0.51	0.48	0.48	-5.88	0.00
	Modipuram	0.61	0.60	0.69	0.65	0.67	-13.04	-10.45
	Pantnagar	0.45	0.46	0.48	0.47	0.48	-4.17	-4.17
Cassava + vegetable cowpea – green gram	Thiruvanthapuram	0.54	0.92	0.75	0.78	0.68	22.67	35.29



Table 7.2.5.6: Total weed density as influenced by different natural farming practice

Cropping System	Locations	Weed density kharif (g/m ²)					Weed density rabi (g/m ²)				
		Control	Complete NF	AI-NPOF package	Integrated Crop Management + NF based pest control methods (ICMNF)	Integrated Crop Management + chemical pesticides (ICMP)	Control	Complete NF	AI-NPOF package	Integrated Crop Management + NF based pest control methods (ICMNF)	Integrated Crop Management + chemical pesticides (ICMP)
Ground nut + sesame – fennel + cabbage Soybean+maize - pea+ green coriander Soybean + maize - wheat + mustard Cotton + green gram - sorghum + chickpea Turneric + cowpea - green gram Rice + dhaincha - maize/sweet corn + cowpea Maize + cowpea - wheat + chickpea Cassava+ vegetable cowpea – green gram	Ajmer	15.6	6.3	16.3	15.0	12.5	42.9	33.0	32.4	13.1	18.1
	Udaipur		21.0	75.0	13.0	10.0	9.0	19.0	35.0	10.0	12.09.0
	S K Nagar										
	Almora										
	Bajaura	3.2	3.0	3.5	3.4	3.4	2.1	1.6	2.5	2.5	2.5
	Gangtok	76.8	54.6	58.5			26.8	14.7	19.8		
	Bhopal	77.0	97.3	42.5	35.7	29.5	87.0	98.3	73.0	45.0	38.0
	Jabalpur										
	Raipur	23.5	11.8	18.6	17.6	17.3	18.6	27.2	28.8	25.0	18.6
	Coimbatore	33.5	7.3	21.7	28.3	26.8	46.2	11.6	25.0	35.4	32.6
	Dharwad	14.3	11.1	11.5	11.4	12.5	-	-	-	-	-
	Calicut	85.0	76.0	79.0	81.0	83.0	-	-	-	-	-
	Umiam	54.0	40.0	30.0	32.0	32.0	-	-	-	-	-
	Karjat										
	Ranchi	76.0	38.0	67.0	73.0	68.0	78.0	26.0	53.0	68.0	73.0
	Narendrapur										
Ludhiana	36.5	80.2	35.0	34.4	34.8	74.5	99.1	66.5	63.3	69.6	
Modipuram	301.0	1997.0	349.0	425.0	394.0	50.2	54.3	57.1	61.6	53.2	
Pantnagar		13.0	74.0	11.0	11.0	8.0	10.0	11.0	94.0	8.0	7.010.0
Thiruvananthapuram	31.0	18.0	29.0	32.0	34.0	24.0	18.0	25.0	30.0	32.0	

7.2.6: Farmer participatory validation of Organic and Natural Farming practices in farmers' field under SCSP/STC sub plans

Objective: To evaluate and integrate the natural farming inputs in to organic farming packages

Approach: Validation of natural farming practices in farmer's field under SCSP / STC sub plans

Locations: 7; Bajaura (HP), Coimbatore (TN), Gangtok (SK), Ranchi (JH), Thiruvananthapuram (KL), Udaipur (RJ), and Umiam (ML).

Year of start: 2020

Treatments	Details
T ₁	Farmers package
T ₂	AI-NPOF package
T ₃	NF practice (Beejamrit, Ghanjeevamrit, Jeevamrit, Neemaster, Brhamaster and Dashparni ark) Number of farmers: Minimum 8

Centre wise results of each centres are presented below. Treatments are same for all locations and minimum 8 farmers covered under the programme.

Bajaura: Tomato-cauliflower cropping system was undertaken in Baag, Ukhal, Pipsu and Palsher villages located in Banjar and Balichowki block of District Kullu and Mandi in Himachal Pradesh, covering 7 farmers. Natural farming practices resulted in reduction in yield of tomato and cauliflower by 20.4 & 23.4% over organic (AINP-OF package) and 33.0 and 38.5% lower than the farmers practice respectively. Natural farming practice resulted in reduction in cost of cultivation by 22.5% over organic (AI-NPOF Package) and it was 18.0% lower than the farmers practice. However, the net return under natural farming is reduced by 20.5% over AINPOF and 40% over farmers practice.

Coimbatore: Groundnut-fodder sorghum-dhaincha GM cropping system was undertaken in villages of Pethikuttai, Pallarpalayam, Mooduthurai, Allapalayam, Ambothi, Karuppanur, Vadakalur, Ottakamandalam, Konarpalayam, Pillaiyappampalayam, Allapalayam located in Karamadai and Annur block of district Coimbatore, Tamil Nadu. Total 8 farmers were covered. Natural farming practice recorded yield of groundnut and sorghum fodder of 2168 and 1575 kg/ha which is 30.8 and 13.8% higher than farmers practice but recorded 10.5 and 10.4%

lower than the AI-NPOF package. Cost of cultivation recorded under Natural Farming is Rs. 64795 for groundnut-sorghum fodder system which is 7.1% higher than farmers practices, and 14.4% lower than the AI-NPOF package. However, the net return under natural farming is 35.6% higher over farmers practice and 8.8% lesser than AINP-OF package.

Gangtok: Maize+ soybean - vegetable pea+ coriander cropping system was undertaken in the villages of Timpyem located in Rumtek-Martam block in East District of Meghalaya. Total 5 farmers were covered. Natural Farming practice recorded yield of *kharif* crop (2620 kg/ha) which is 5.1% lower than the farmer practice and 25.1% lower than AINPOF. On the other hand, the yield of *rabi* crop under natural farming is recorded 21.9% higher over AINP-OF and, 139.8% higher farmers practice. In *Kharif*, Natural Farming practice recorded cost of cultivation Rs. 82000/ha which is significantly higher by 9.7% over farmers practice but found to be lower by 3.6 % over AINP-OF. Net return of the system under NF practice was Rs 205000/ha which is 42.9% higher over farmer practice, but it was 5.4% lower than ANIP-OF.

Ranchi: Rice-wheat cropping system was undertaken in the villages of Beyasi, Madai and Chutiyo located in Chanhoo block in Ranchi district of Jharkhand. Total 42 farmers were covered. In rice,



grain yield under NF practice recorded 1256 kg/ha which is 23.1% higher than farmers practices and 17.7% lower than the AINPOF package of practice. Similarly, in wheat, grain yield under NF practice was recorded at 1064 kg/ha which is 23% higher than farmers practices and 34.7% lower than the AINPOF package of practice. Cost of cultivation recorded under Natural Farming is Rs. 43500/ha which is 6.9% higher than farmers practices, and 34.9% lower than the AI-NPOF package. However, the net return under natural farming is 34.4% higher over farmers practice and 10.8% lesser than AINP-OF package.

Thiruvananthapuram: Cassava + vegetable cowpea-green gram cropping system was undertaken covering 10 farmers in the village of Ezhamkulam, Erath& Kodumon located in block Adoor in Pathanamthitta district of Kerala. Natural Farming practice recorded yield of *kharif* crop (43208 kg/ha) which is 154.2% higher than the farmer

practice and 30% lower than AINPOF. Other data on rabi crop, cost of cultivation and net return is not available.

Udaipur: Maize-wheat cropping system was undertaken at 2 villages namely Basiwada and Judli, in Jhadole block in Udaipur district of Rajasthan. Total 5 farmers were covered. Among the management practices, Natural Farming practice recorded yield of maize and wheat (1600 and 2780 kg/ha respectively) which is 12.3 and 14.9% higher than farmers package whereas, a reduction in yield of maize and wheat is recorded by 33.3 and 30.5% over AINP-OF package respectively. Cost of cultivation recorded under Natural Farming is Rs. 57150/ha which is 34.3% higher than farmers practices, and 26.3% lower than the AI-NPOF package. However, the net return under natural farming is 7.8% higher over farmers practice and 26.5% lesser than AINP-OF package.

Table 7.2.6.1: Details of farmers, crops undertaken for validation of organic and natural farming practices in farmers field under SCSP/STC sub plans at different locations

States	Centres	Cropping system adopted by farmer	Number of farmers covered	Name of village & blocks	Name of district surveyed
Himachal Pradesh	Bajaura	Tomato-cauliflower	7	Village: Baag, Ukhal, Pipsu, Palsher Block: Banjar, Balichowki	Kullu and Mandi
Tamil Nadu	Coimbatore	Groundnut - fodder sorghum - dhaincha	8	Village: Pethikuttai, Pallarpalayam, Mooduthurai, Allapalayam, Ambothi, Karuppanur, Vadakalur, Ottakamandalam, Konarpalayam, Pillaiyappampalayam, Allapalayam Block: Karamadai and Annur	Coimbatore
Sikkim	Gangtok	Maize + soybean-vegetable pea + coriander	5	Village: Timpyem Block: Rumtek-Martam	East District Sikkim
Jharkhand	Ranchi	Rice-wheat	42	Village: Beyasi, Madai and Chutiyo Block: Chanho	Ranchi
Kerala	Thiruvananthapuram	Cassava + vegetable cowpea-green gram	10	Village: Ezhamkulam, Erath& Kodumon Block: Adoor	Pathanamthitta
Rajasthan	Udaipur	Maize-wheat	5	Village: Basiwada Judali Block: Jhadole	Udaipur

Table 7.2.6.2: Yield (kg/ha) of major crops, cost of cultivation and net return in farmers field under AINPOF and Natural farming condition at different locations

Centers	Cropping systems adopted by the farmers	Yield of kharif crop (kg/ha)			Yield of rabi crop (kg/ha)			Cost of cultivation (Rs/ha)			Net return (Rs/ha)		
		Control	AI-NPOF package	Natural Farming package	Control	AI-NPOF package	Natural Farming package	Control	AI-NPOF package	Natural Farming package	Control	AI-NPOF package	Natural Farming package
Bajaura	Tomato-Cauliflower	14578	12263	9765	16245	13030	9984	300090	317650	246120	899490	678730	539460
Coimbatore	Groundnut - Fodder sorghum – dhaincha GM	1658	2422	2168	1388	1758	1575	60,475	75,705	64,795	1,22,735	1,82,491	1,66,372
Gangtok	Maize +Soybean Vegetable Pea + Coriander	2760	3500	2620	930	1830	2230	74760	85100	82000	143500	216800	205000
Ranchi	Rice-wheat	1020	1526	1256	865	1630	1064	40700	66800	43500	30050	45300	40400
Thiruvananthapuram	Cassava + vegetable cowpea-green gram	17000	61725	43208	-	-	-	-	-	-	-	-	-
Udaipur	Maize-wheat	1425	2400	1600	2420	4000	2780	42550	77596	57150	72750	106750	78450
Umiam	Not reported	-	-	-	-	-	-	-	-	-	-	-	-



Objective To evaluate the modules of organic production system to develop integrated organic farming system

Locations: (10) Calicut, Thiruvananthapuram (Kerala), Coimbatore (Tamil Nadu), Gangtok (Sikkim),

Ludhiana (Punjab), Pantnagar (Uttarakhand), Raipur (Chhattisgarh), Sardarkrushinagar (Gujrat), Udaipur (Rajasthan) and Umiam (Meghalaya). Centres Ludhiana (Punjab) and Pantnagar (Uttarakhand) did not report the results.

Year of start: 2013-14

Farming system modules

Module	Components
Crop	Identified high value crops of organic farming + required quantity of fodder for livestock
Livestock	Cow/Buffalo/Goat/Poultry depending upon the location and size of the model
Complimentary enterprises	Biogas, Vermi-compost unit, live fencing, seed/planting material production unit & boundary plantation

Results of each centre is described below

Calicut and Thiruvananthapuram (Kerala)

Calicut

The plot with spices, fodder and vegetables combination was evaluated at Chelavoor farm under IOFS model. The crops were black pepper, turmeric, fodder grasses (CO-3, CO-4), Tapioca, Banana, cowpea, Coconut, were planted and established. Two cows and their calves were maintaining.

Turmeric 500 kg, Banana 70 kg, Tapioca 75 kg and vegetable cowpea 30 kg, coconut 1300 nos. were harvested. Fodder grass fed to the cows that are maintained at ICAR-IISR farm. Net profit of Rs 1,43,556 was received from one-acre IOFS model. Employment generated Man days/year is 322 (Table 7.4.1). Maximum income shares 91.4% was came from livestock (dairy) followed by cropping systems (17.19%) and horticulture (1.41%).

Table 7.3.1: Area, yield and income from IOFS model at Calicut

Integrated organic farming system Enterprises	Crop/Livestock	Area (ha)	Area share (%)	Yield (Kg)/L/ Nos	Unit Rate (Rs)	Income (Rs)	Income share (%)
Cropping Systems	Coconut (55 Nos)	0.26	-	1300 nos.	30	39,000	17.19
	Fodder (Co3, Co4, DHN6, Congo Signal)	0.06	-	12800 kg	-	00	
	Turmeric	0.04	-	500 kg	60	30,000	
	Total	0.36	90	-	-	69,000	
Livestock (2 Cows)	Milk	-	-	5444 L	60	3,26,640	81.40
	Total	0.01	2.5	-	-	3,26,640	
Horticulture	Banana	0.01	-	70 Kg	25	1750	1.41
	Tapioca	0.005	-	75 Kg	30	2250	
	Veg cow pea	0.0025	-	30 Kg	55	1650	
	Total	0.03	7.5	-	-	5660	
Grand Total						4,01,290	100
Total Expenditure (Rs)						2,57,734	
Net Profit (Rs)						1,43,556	
Employment generation Man days/year						322	

Thiruvananthapuram

Net returns of Rs. 3,27,108 was achieved from tuber crop-based farming system, tuber equivalent yield of 41.8 tons obtained from IOFS model involving tuber crops from an area of 75 cents. Total 10646 liter/kg

milk yield was produced. The % share of area and income of the various components of IOFS is given in Table 7.3.2 and 7.3.3. Maximum income share was achieved from dairy component of 75.7% followed by crop component which is 22.75%.

Table 7.3.2: Income generation from crop, horticulture and dairy components

Name of particulars	Total yield (kg)	TEY (kg)	Income (Rs.)
Bhindi	100.9	100.9	3026.4
Amaranthus	354.8	709.6	21289.3
Cucumber	260.9	260.9	7826.7
Vegetable cowpea	10.2	27.2	814.4
Tomato	2.0	2.7	80.0
Drumstick	22.6	22.6	677.7
Watermelon	8.2	8.2	245.1
Sesbania flower	125.0	500.0	15000.0
Banana	420.3	700.4	21013.0
Maize	56.5	94.2	2825.0
Taro	50.0	100.0	3000.0
Elephant foot yam	105.5	158.3	4747.5
Brinjal	10.5	14.0	420.0
Sword bean	125.7	125.7	3770.4
Pineapple	70.4	117.3	3518.3
Cassava	750.0	750.0	22500.0
Fodder grass	35000.0	5833.3	175000.0
Lemon grass	600.0	100.0	3000.0
Total		9625.1	288754.0
Milk	10646	19589	587674
Cow dung	56030	1868	56030
Cow urine	32120	10707	321200
Total		32163	964904

Table 7.3.3: Area, income share and economics of IOFS model at Thiruvananthapuram

Enterprises	Components	Area (Cent)	% area share	% income share
Cropping system (food crops + horticulture)	Taro + maize	10	13	0.46
	Cassava	5	7	2.60
	Banana + (amaranthus – elephant foot yam)	10	13	2 . 4 4



Enterprises	Components	Area (Cent)	% area share	% income share
	Vegetables: (bhindi, amaranthus, tomato, cucumber, cluster bean, sword bean, winged bean,	20	27	1.69
Fruit crops	Pineapple	5	7	0.28
Fodder crops	Hybrid Napier grass	5	7	13.73
Dairy unit	9 cows + 3 calves	10	13	76.99
Hedge crops	Agathi (Sesbania sp.)	3	4	1.18
Hedge tree	Moringa	2	3	0.05
Pest repellent crops	Lemon grass	3	4	0.24
Nutrient recycling unit	Vermi compost unit	2	3	0.35
Production from IOFS on equivalent basis (t)	Base crop: Cassava	41.78 tons from 0.3 ha		
Labour cost (Rs)				4,70,950
Input cost (Rs.)				4,76,600
Total cost (Rs)				9,47,550
Gross income (Rs.)				12,74,658
Net returns (Rs)				3,27,108
B:C ratio				1.35
Energy input (MJ)				30426
Energy output (MJ)				234016





Different component of IOFS model at Thiruvananthapuram



Coimbatore (Tamil Nadu):

Table 7.3.4: Component wise yield and income of IOFS model at Coimbatore

Modules	Particulars	Area (ha)	% share of area	Yield (kg)			Gross return (Rs.)	Cost of cultivation (Rs.)	Net return (Rs.)
				kharif	Rabi	Cotton equivalent yield			
Cropping systems	1. Okra-maize-green manure (Dhaincha)	0.14	35	11694	4986	5620	81,204	57,156	24,048
	2. Cotton-sorghum-green manure (Dhaincha)			1493	3389 G 4770 F	3109	45,955	39,101	6,854
	3. Fodder grass CO (CN) 5 and Desmanthus-viragatus	0.06	15	15500+4000		fed to the cattle's	-	-	-



Modules	Particulars	Area (ha)	% share of area	Yield (kg)			Gross return (Rs.)	Cost of cultivation (Rs.)	Net return (Rs.)
				kharif	Rabi	Cotton equivalent yield			
Livestock (Jersey cross breed - 2 nos. + 2 calves)	Milk + three animals culled & earned Rs 50,000	0.008	2	1063 litres			1,13,750	99,840	13,910
Compost production	Cow dung pit - 1 No., Compost pit - 1 No. and Silpaulin vermicompost units - 4 Nos.	0.004	1	3245			7215	2,531	4,684
Boundary plantations	Coconut (East coast tall), Teak (Local), Banana (Poovan and Karpooravazhi), Annual moringa (PKM 1), Curry leaf, Glyricidia	0.002	5	1748 nuts per year (production on coconut equivalent basis)			25,727	5,333	20,394
	Agroforestry (14 trees)	0.016	4				2,73,851	2,03,961	69,890
	Pest repellent plants: (44 plant species)	0.008	2						
	Bee keeping (4 Indian bee - Apis cerana indica hives)	0.004	1						
	Total	0.40	100						
	Energy Input (MJ)				58601				
	Energy Output (MJ)				87453				
	Sustainable Value Index (based on previous 5 years data)				0.18				

A one-acre IOFS model includes crop components, dairy, perennial horticultural crops, agro-forestry, pest repellent cafeteria, residue recycling unit and beekeeping. The dung collected from the cattle was used as manure to the model field. The insect pests of this model were managed through various kinds of cow urine based herbal extracts by utilizing the pest repellent cafeteria. The glyricidia, perennial leguminous plants maintained at the borders of the model act as bio fencing, the green biomass harvested from the plants were used for cattle feed and green leaf manure. Cropping systems comprising of two cropping systems viz., okra – maize - green manure (*Dhaincha*) and cotton - sorghum - green manure (*Dhaincha*) each with an allotted area. System productivity in term of cotton equivalent was recorded higher with okra – maize - *dhaincha* of 5620 kg as compared to cotton-sorghum-*dhaincha* cropping system which recorded CEY of 3109 kg. Among the systems, there was 80.8% higher system productivity in okra-maize-*dhaincha*

over cotton-sorghum-*dhaincha*. Through crop component, an income of Rs.30,902 was obtained. Two numbers of Jersey cross bred were maintained at IOFS model and produced 1063 litre of milk and realised of Rs. 63,780 as return. Fodder grass cumbu napier CO (CN) 5 and desmanthus (*Deamanthus varigatus*) was raised in the IOFS model field, harvested 24.6 tonnes at regular intervals and being fed to the cattle. Annually 12.64 tonnes of cow dung and 9486 litres of urine were obtained from livestock which were applied to the crops to boost the yield. From this manure 82.2 kg of N, 34.8 kg of P₂O₅ and 110.7 kg of K₂O with the value of Rs.6065 was saved. Recycling of the on-farm resources such as crop residues and litters collected from the IOFS model were converted into compost, from these units on an average 3245 kg of compost per annum was produced of the value of Rs. 7215. Various perennial boundary plants viz., coconut, banana, annual moringa and curry leaf was integrated properly with farm enterprises. The yield of the boundary crops

were expressed in coconut equivalent basis. In this system 1748 nuts per year was harvested with the average cost of Rs.21.3 per nut. The annual gross income realized of Rs.25726 with the cost of Rs.5333 and Rs 20,394 was obtained as net income generated

from boundary plantation. From this IOFS model, gross income of Rs. 2,73,851 was obtained with total cost of the Rs. 2,03,961 per annum and the net return of Rs.69,890 was realized. (Table 7.4.7).



Live fence - Glyricidia



Annual Moringa & Banana



Curry leaf



Crop component



Silpaulin vermicomposting



Fodder grass - Co (CN) 5



Dairy



Pest repellent cafeteria



Green manure cafeteria



Agro-forestry

Gangtok (Sikkim):

An IOFS model was developed in 0.6 ha area at research farm of ICAR-Sikkim Centre, Tadong, Sikkim. The IOFS model comprising fishery, dairy, poultry, large cardamom nursery, field crops, etc.. From an 0.6 ha IOFs model, net return of Rs 77,002 was received by crop component from 0.47 ha area, Rs 64,676 was

received by dairy (0.05 ha), Rs 22,320 and 7,404 obtained from poultry and fishery, whereas Rs 6000 was received from vermicomposting. From large cardamom, Rs 17,000 was received. From this 0.60 ha IOFS model, gross income of Rs. 3,10,144 was obtained with total cost of the Rs. 1,32,744 per annum resulted in net return of Rs. 1,77,400 was realized with BCR of 3.05 (Table 7.4.5).



Table 7.3.5: Component wise area, production and economics of IOFS model at Gangtok

Modules	Particulars	Area (ha)	Production	Total cost of production (Rs)	Gross return (Rs)	Net return (Rs)	B: C ratio
Maize-based cropping system	Maize-Pahenlo dal-Vegetable pea Maize-Pahenlo dal-Buckwheat	0.32	Maize: 3500 kg Pahenlo dal: 1000 kg Vegetable pea: 7000 kg Buckwheat: 950 kg	27,920	50,213	22,293	1.80
Vegetable-based cropping system	Cauliflower-Spinach-Coriander-Broccoli-Fenugreek	0.08	Cauliflower: 4500 kg Spinach: 1500 kg Coriander: 1000 kg Broccoli: 5000 kg Fenugreek: 1000 kg	34,414	72,123	37,709	2.10
	Large cardamom	0.07	10.4 kg/year	3,000	20,000	17,000	6.67
Livestock	Dairy (1 milch cow + 1 calf)	0.05	2170 lit/year	43,890	1,08,564	64,674	2.47
	Vermicompost	0.03	16.3 t/ha	5,000	11,000	6,000	2.20
	Poultry (25 Vanaraja birds)	0.01	83.4 kg meat/year and 3000 egg/year	15,800	38,120	22,320	2.41
	Fishery (Composite)	0.04	24.9 kg/year	2,720	10,124	7,404	3.72
Total	Total	0.60		1,32,744	3,10,144	1,77,400	3.05



IOFS model at Gangtok

Raipur (Chhattisgarh)

Integrated farming system research model consisting cropping system, horticultural system, fishery and poultry enterprises including dairy component, vermin-compost units, biogas units have also been taken under operation in addition to

the aforesaid components. A gross income of Rs 4,89,336/-ha was generated from the whole IOFS model area from different components/enterprises and the net income of Rs 2,05,491/- was achieved from different components/enterprises of Integrated Farming System (Table 7.3.6 & 7).

Table 7.3.6: Total productivity (TP) cost and net return of different cropping system in IOFS model at Raipur

Cropping System	Area (ha)	Total Productivity (kg)	Total cost (Rs)	Total Net Return(Rs)*
1 Rice-sweet corn-green gram	0.2	1849	22203	13690
2 Rice-wheat-green gram	0.2	1725	18592	14887
3 Rice-onion+coriander-green manure	0.06	858	7858	8797
4 Rice-cabbage-green manure	0.05	792	7495	7878
5 Rice-tomato-green manure (sunken bed)	0.05	902	8244	9273
6 Maize-potato-green gram (raised bed)	0.05	1227	10367	13442
7 Sorghum-berseem+mustard-maize (fodder)	0.1	527	5625	4604
Total	0.71	7880	80385	72569

Table 7.3.7: Component-wise economics, energy, water productivity of IOFS model at Raipur

IOFS Component	Cost of cultivation	Net return	Employment Generation (man days)	Residue recycle worth (Rs)	Sustainable value index	Energy inputs (MJ)	Energy output (MJ)	Net Energy (MJ)	Energy productivity (Kg MJ ⁻¹)	Water Productivity (REY kg/m ³)
Cropping System	80,385	72,569	116.1	28144	0.41	37819	372339	334519	0.79	0.53
Dairy	75,989	42,221	93	18900	0.37	468852	56398	-412454	0.004	46.35
Fishery	8,554	9,671	18	-	0.52	3001	6751	3750	0.04	0.42
Goatry	34,600	30,594	85	2894	0.55	106102	2707	-103395	0.002	383.42
Poultry	35,418	11,872	11	2340	0.25	6396	2303	-4093	0.02	1832
Vermi-compost unit	17,202	16,156	11	23358	0.14	-	-	-	-	-
Biogas/compost pit	6,017	6,323	-	-	0.52	-	-	-	-	-
Horticulture (Kitchen garden +Boundary plantation)	25,680	16,085	35	6325	0.06	8976	110943	101968	0.001	0.77
Total	2,83,845	2,05,491	379	81961	0.72	631145	551441	-79704	0.19	1.14



Sardarkrushinagar (Gujarat)

Components of IOFS model at SK Nagar

Module	Components	Area (ha)
Crops	1. Cowpea-wheat- pearl millet	0.12
	2. F. sorghum- amaranth- green gram	0.12
	3. Groundnut- F. oat- Green gram	0.14
Livestock	2 Cow (Kankrej)	0.01
Jeevamrit + Ghanjeevamrit unit		0.003
Nutrient recycling unit		0.006
Azolla unit		0.001
Complimentary enterprises	Boundary plantations: Ardusa, lemon grass, napier grass Repellent plants: Lemongrass, Coriander, Marigold, Onion, Basil, Chrysanthemums, Citronella grass	
Total		0.40

IOFS model is comprised of different components viz., crops (0.38 ha), boundary plantation, livestock unit and allied component (0.02 ha). Data presented in table 7.3.8 revealed that total net profit of ₹38612 was received by crop component from 0.38 ha area, ₹8560 was received by from boundary

plantation. ₹-4266 was loss in livestock and allied component due to dry period of cow for long spell. Total net profit from all the components of IOFS model including boundary plantation was ₹42906 from 0.40 hectare area.

Table 7.3.8: Yield and economics of IOFS Model at Sardarkrushinagar (Gujarat)

Farming system components	Total Area (ha)	GEY (kg/ha)	Cost of cultivation (₹/unit)	Net Returns (₹/unit)	Input energy (MJ/ha)	Output energy (MJ/ha)	Energy productivity (kg/MJ)
Cropping systems	0.38	1359	58270	38612	103885	1875759	100.12
Boundary plantation	-	158	2720	8560	220	170640	11.21
Livestock and allied component	0.02	1694	125039	-4266			
Total	0.40	3211	186029	42906			
System productivity	8.80 kg/day						
System profitability	294(₹/day/ha)						
Employment generation	0.38(Mandays/ha/day)						





Integrated Organic Farming systems Model at Sardarkrushinagar

Udaipur (Rajasthan)

An integrated organic farming system model for 0.45 ha comprising of field crops sweet corn + black gram– wheat (0.25 ha) fodder crops maize fodder + cowpea – berseem (0.05 ha) –*sesbania* green manuring, vegetables in 0.10 ha (okra and cauliflower), fruit crop guava (0.04 ha) and compost

unit in 0.01 ha were evaluated. Total maize equivalent yield of 6841 kg/ha recorded from the IOFS model. Net return of Rs. 86,460 /ha was obtained from the integrated organic farming system model by the cost of Rs. 42,850 with 2.02 NRPRI (Table 7.3.9).

Table 7.3.9: Yield and economics of different components of organic farming system at Udaipur

Farming system components		Area (ha)	Yield (kg)	MEY (kg)	Cost of cultivation (Rs)	Gross return (Rs./ha)	Net return (Rs/ha)	Net return per rupee invested
1. Crops								
Kharif	Sweet corn + blackgram	0.25	485 (Sweetcorn) +105 (blackgram)	1297	12520	30445	17925	1.43
Rabi	Wheat		1627	2550	12000	57375	45375	3.78
2. Fodder								
Kharif	Fodder maize + cowpea	0.05	Fodder maize + cowpea	668	4250	12358	8108	1.90
Rabi	Berseem		5721	1670	3780	30894	27115	7.17
Zaid	Sesbania		Used as a green manuring					
3. Vegetable								
Kharif	Okra		138	224	2300	4144	1844	0.80
Rabi	Pea	0.10	207	335	4500	6197	1698	1.37
			45	97	1200	1795	595	0.50
4. Fruits	Guava	0.04	138	224	2300	4144	1844	0.80
	Total			6841			86460	
5. Compost unit	NADEP compost	0.01	2000 kg					
	Vermi-compost		7500 kg					
	Compost		1500 kg					
	Vermi-wash		155 lit					
	BD 500		1.6 kg					
	BD 501		1.3 kg					

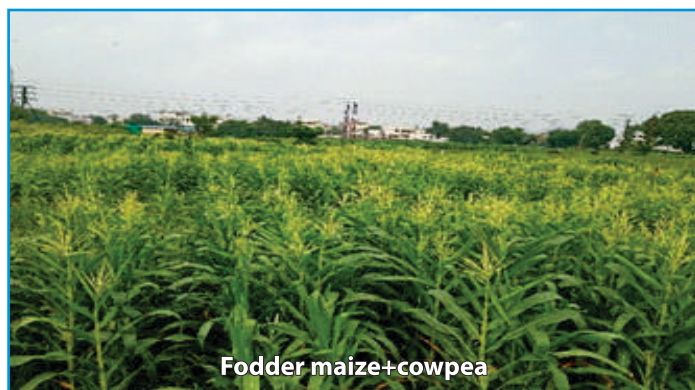




Fruits (Guava)



Vegetable component



Fodder maize+cowpea



Berseem

Umiam (Meghalaya)

The IOFS model comprising crops, dairy, horticulture, dairy, fishery etc at farm of Umiam centre. From this

IOFS model, with total cost of the Rs. 69,462 per annum resulted in net return of Rs. 90,360.

Farming System	Area (ha)	Details (Name or value as applicable)
Crops	0.373	Rice, Maize, finger millet, mustard, ground nut, soybean, lentil, buck wheat
Horticulture	0.185	Carrot, Tomato, French bean, cabbage, tomato, cauliflower, broccoli, palak, coriander radish, lai patta, pea, bottle gourd, bitter gourd, pumpkin etc.
Dairy	0.004	2 cow, 1 calf
Fishery	0.05	
Duckery	0.002	20 ducks
Pest repellent plants	0.05	20 nos.
Other components (Please specify)	Neem, Hedgerow, banana, pineapple, peach, Assam lemon	
Production from IOFS on equivalent basis (t) (Mention the base crop)	10.65 t rice equivalent yield	
Market input cost excluding labour	-	
Value of recycling excluding family labour (Rs)	13,562	
Cost of labour (Rs)		
Total Cost (Rs)	69,462	
Net returns (Rs)	90,360	
B:C ratio	2.30	

The IOFS model was also replicated in farmers' field through participatory mode in cluster approach in several villages covering about 110 ha area and 340 households.

- Three villages were selected in cluster approach under NPOF-TSP
- Identification of suitable land for developing IOFS near the household
- Rainwater harvesting structure (jalkund/) farm ponds created and vertical cropping over it
- Construction of compost pit / vermicomposting units
- Development of organic kitchen garden for cultivation of year round vegetables
- Introduction of improved breeds of pig and poultry for better productivity and income
- Certification and marketing of organic produce

Table 7.3.10: Farmers having for IFOS model in villages and their economic return

Farmers name	Farming components	Water source	Area (ha)	Net return ha ⁻¹ year ⁻¹ without premium price
Jril Makdoh	Maize + Vegetables + Ginger + Dairy + Poultry + Pisciculture + Mushroom	Jalkund	0.27	48,200
Lahun Lapang	Fruit Trees (Pineapple, Assam lemon, Pomelo) + Vegetables + Piggery + Poultry	Jalkund	0.20	24,500
Judy Wahlang	Rice + Vegetables + Poultry + Pisciculture + Bamboo	Pond	0.32	29,500
Pynsanlang Rynghang	Maize + Vegetables + Ginger + Poultry + Apiculture	Jalkund	0.18	18,750
Lamphrang Rympei	Rice + Vegetables + Turmeric + Piggery + Poultry + Pisciculture	Pond	0.29 0.29	35,670
Ban War	Fruit Trees (Pineapple, Assam lemon, Banana) + Piggery + Vegetables	Jalkund	0.35	41,590
Skola Kurbah	Maize + Soybean + Vegetables + Turmeric + Piggery + Poultry + Apiculture	Jalkund	0.21	32,430
Hynniew Rynghang	Sweet Potato + Vegetables + Piggery + Poultry + Dairy + Turmeric	Jalkund	0.26	33,500



Selection of land for IOFS



Rainwater harvesting structure (Jalkund)



Compost pit / vermicomposting units





Selection of land for IOFS



Rainwater harvesting structure
(Jalkund)



Compost pit / vermicomposting units



Selection of land for IOFS



Rainwater harvesting structure
(Jalkund)



Compost pit / vermicomposting units

Programme: Capacity building including policy support to Central and State agencies

Title: Value chain development with aggregation model for organic farming

Objective

- Value chain development with aggregation model for organic farming conceive and demonstration

Locations: 5; Calicut, (Kerala), Coimbatore (Tamil Nadu), Pantnagar (Uttarakhand), Raipur (Chhattisgarh) and Umiam (Meghalaya). Year of start: Kharif 2021

Table: State, location, name of group formed and brief interventions activity at different location under Value chain development with aggregation model for organic farming

Name of State	Name of District	Name of the village	Name of block	Number of farmers identified	Name of group if formed	Crops/ Commodities covered	Brief progress of interventions and activities
Chhattisgarh	Raipur	Nishada	Aarang	60	Aarug FPO	Scented rice	Linkage with FPO for organic production system and time to time advice for different problems related to organic farming and market.
Kerala	Kozhikode	Chelannur	Chelannur	57	Parappara SC colony	Turmeric	Turmeric variety Prathiba was cultivated in an area of 1 ha (Parappara SC colony) by providing turmeric seed rhizomes, neem cake, Bio capsules etc. Improved TNAU turmeric boiler, polisher and polarizer was supplied (Under the SCSP programme of the institute). A demonstration on boiling of turmeric using TNAU improved turmeric boiler was conducted and several lectures on cultivation of organic turmeric and processing was also organized.
Meghalaya	RiBhoi	Mynsain	Bhoirymbong	18		Rice, Maize, Broccoli, Cabbage, Cauliflower, Pea, Carrot, Brinjal, Tumeric, Ginger	
Tamil Nadu	The Nilgiris	Hubbathala, Yedappalli, Kotagiri, Nedugula	Coonoor and Kotagiri	100	Ooty Farmers Producer Organization	Vegetables, tea and coffee	Interventions Capacity building on • Soil health management under organic farming • Use of biofertilizers in organic farming • Nutrient management under organic farming • Weed management under organic farming • Pest and disease management under organic farming • Management of nematodes under natural farming • Scope and Importance of organic certification • Schemes related to promotion of organic farming in the Nilgiris Inputs distribution Vermicompost, biofertilizers, bio-pesticides, panchagavya, fish amino acid, 3G and Five Leaves Extract
Uttarakhand	Nainital	Dhamar Devi, Ginitiganw, Hawal Kota, Kalyanpur, SanzulaNar Singh, Nathujala, Bhandari Simal, Mayarampur	Kotabagh	50		Basmati rice and Wheat	



Table 7.4.2:Preparation of State level action plan for policy support to reduce mineral fertilizers

Location and State	Name of the districts for which action plan prepared	Crops covered	Crops/Commodities covered	Brief progress on preparation of report
Calicut (Kerala)	Kozhikode	Turmeric	Turmeric	GRB 35 was supplied to turmeric growers to reduce mineral fertilizer and to enhance growth and yield of turmeric.
Dharwad (Karnataka)	1. Bagalkot 2. Bidar 3.Chitradurga 4. Dharwad 5. Gadag. 6. Gulburga 7. Kolar 8. Tumkur 9. Vijayapura 10. Uttara Kannada	Pulses/legumes(Greengram, Blckgram,Cowpea, Soybean, Pigeonpea,Chickpea) Oilseeds(Groundnut,Soybean,Sa fflower) Millets (Foxtail, Little, Fingermillet) Spices (Turmeric, Pepper, Ginger, Garlic, Chilli) Plantations (Sugacane) Horticulture crops (Drumstick, Mango, Guava, Sapota)	Sugarcane/Organic Jaggery Millets / Processing and value addition Pulses / Processing units, Dhal processing Spices / Organic turmeric unit	Discussion meetings with Organic Federations (15) of each district regarding district organic action plans. And these are under progress and later it will be finalised in consultation with Organic Cell, Department of Agriculture, Govt. of Karnataka, Bengaluru.

8.1 Publications

8.1.1: Research Papers

Ajmer

Lal G, Lal S, Chaudhary N, Saxena SN, Choudhary MK & Shekhawat Neha. 2022. Development of garam masala powder using organic seed spices and its storability under different packaging materials. *Journal of Agriculture and Ecology*, 14: 77-83. Naas rating 4.36.

Lal, G., Lal, S., Chaudhary, N., Choudhary, M.K., Meena, S.S. and Kumar, N. (2022). Performance of Green Gram Varieties under Organic Production System. *Legume Research*. DOI: 10.18805/LR-4970. Naas rating 6.7

Lal, S., Lal, G., Meena, N.K., Meena, R.D., Chaudhary, N. Choudhary¹ M.K. and Saxena¹, S. N. 2023. Stability analysis of yield, yield attributes and essential oil content in fennel (*Foeniculum vulgare* Mill.) evaluated under a long-term organic production system. *Journal of Horticultural Sciences*, 18(1): 90-97. Naas rating. 5.08

Bhopal

Shubham Singh, A. B. Singh, A. Mandal, J. K. Thakur, A. Dash and P. S. Rajput (2023) Chemical and microbiological characterization of organic supplements and compost used in agriculture. *Emergent Life Sciences Research*. Communicated. NAAS Rating 5.41

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Coimbatore

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(<https://doi.org/10.29321/MAJ.10.200717>). Naas rating 4.52



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8.2 Human Resources Development

8.2.1: Student guided

Sardarkrushinagar

PG Guidance

SN	Particulars Awarded degree	Period	Completed	Continue
1.	M.Sc. (Agri.) in Agronomy	2022-23	1	1
2	Ph.D. in Agronomy	2022-23	2	2

8.2.2: Training organised:

Bhopal

As a Course director organized Training programme on Soil Testing and Organic Farming at ICAR	ICAR-IISS Bhopal	11-16 July 2022.
As a Course director organized Training programme on Natural Farming and Soil Health at ICAR	ICAR-IISS Bhopal	29-31 August 2022.
As Advisory board member, organized National Conference on Agro Ecology based Agri food Transformation Systems	ICAR-IISS Bhopal	27-28 January, 2023
As Director, organized National Symposium on Digital Farming: The Future of Indian Agriculture at ICAR	ICAR-IISS Bhopal	23 January 2023.
As a Coordinator organized one day workshop on Natural and Organic Farming under Annadata Devo Bhava under Azadi ka Amrit Mahotsav at ICAR	ICAR-IISS Bhopal	23rd April, 2022
As convener National Campaign on Cow, Compost, Carbon and Climate at ICAR	ICAR-IISS Bhopal	22 August 2022 .

Coimbatore

Title of the Training Organized	Period	Category of Participants	No. of Participants
Training to the Extension Officers of State Department of Agriculture	28.11.22 - 30.11.22	EOs of State Department of Agri & Horti	30
Paid training programme on "Organic Farming"	07.12.22	Farmers, Home gardener, Agri entrepreneurs	28
Training on Organic and Natural Farming	23.12.22	Farmers	50
Training on "Organic Farming"	4.01.23	EOs of State Department of Agri & Horti	30
Training on "Organic Farming"	9.01.23-11.01.23	EOs of State Department of Agri & Horti	30
Training on "Organic Farming"	23.01.23 - 25.01.23	EOs of State Department of Agri & Horti	30
Training on "Organic Farming"	30.01.23 - 1.02.23	EOs of State Department of Agri & Horti	30
Training on "Organic Farming"	6.02.23 - 8.02.23	EOs of State Department of Agri & Horti	30
Training on "Organic Farming"	20.02.23 - 22.02.23	EOs of State Department of Agri & Horti	30
Training on "Organic Farming"	27.02.23 - 01.03.23	EOs of State Department of Agri & Horti	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Pappalapatty	07.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Pappalapatty	08.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in Sandhiyur, Salem	10.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Sirugamani	16.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Needamangalam	17.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Vridhachalam	20.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Tindivanam	21.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Madurai	23.03.23	Farmers	30
Training on IOFS and awareness creation in TNIAMP Sub-basins in KVK, Vamban	24.03.23	Farmers	30

Gangtok

Title	Date & Venue	Level of Participation/ Stakeholders	No. of Participants
Technological Intervention cum Input Distribution Programme for Doubling the Farmer's Income (DFI)	March 07, 2023 Phenzong Timpyem, East Sikkim	Farmers	38
Training cum Input Support Programme for Promoting Improved Technology of Maize Production	23/03/2023 KVK, East Sikkim	Farmers	49
Three days training programme on organic farming for farmers of Sikkim	March, 25-27 2023 ICAR- Sikkim Centre	Farmers	29
FRONTLINE DEMONSTRATION cum Input Support Program on Organic Farming for Tribal Farmers under TSP and NPOF Project	September 28, 2022 ICAR- Sikkim Centre	Farmers	42



Jabalpur

Name of the training	Date (s)	Number of participants	Venue of training
Online Training Programme on Organic farming for RAWA students, farmers and staff of JNKVV	21st September 2022	500	Organized by Department of Agronomy, College of Agriculture, JNKVV, Jabalpur
Training on Natural Farming for the PG & Ph.D. students (TSP)	24-25 March, 2023	50	College of Agriculture, JNKVV, Jabalpur

Karjat

Name of the training	Date (s)	Number of participants	Venue of training
Training programme on Organic rice production system	30th May, 2022	60	Kalamgaon, Tal. Shahapur, Dist. Thane
Krishi Din Programme	1st July, 2022	40	Karjat, Dist. Raigad
Awareness programme on Organic farming	12th Aug., 2022	65	Karjat,, Dist. Raigad
Workshop on Natural Farming	25th Aug., 2022	45	Rabgaon, Tal. Sudhagad
Training programme on Preparation of inputs in Organic and Natural Farming	14th Oct., 2022	100	Dahigaon, Tal. Sudhagad
Sheti shalla on pulses and vegetables	11th Jan., 2023	55	Usroli Tal. Kalyan Dist. Thane
Kisan Gosti programme	2nd March, 2023	85	Dodamarg, Dist. Sindhudurg
Training programme on Natural Farming and Millets	19th March, 2023	110	Takipathar, Tal. Shahapur, Dist. Thane

Karjat

Name of the training programme	Date & Place	Number of participants
Training course on, "Organic Farming (Vermicompost and use of bio fertilizers for enhancing crop yield and soil fertility)" for farmers and farm women organized by School of Organic Farming, PAU, Ludhiana in collaboration with SDC, PAU, Ludhiana.	August 8-12, 2022 (Online)	38
Awareness campaign on, "Organic farming" organized by School of Organic Farming, PAU, Ludhiana in collaboration with ICAR-IIFSR, Modipuram, Meerut under the aegis of AINPOF.	August 06, 2022 (Online)	100
Coordinated exposure visit of students of Police DAV Public School, PAU, Ludhiana to School of Organic Farming, PAU, Ludhiana	August 29, 2022	102
Coordinated exposure visit of farmers from KVK, Tarntaran to School of Organic Farming, PAU, Ludhiana	March 6 & 7, 2023	38
Training course on, "Organic Farming (Vermicompost and use of bio fertilizers for enhancing crop yield and soil fertility)" for farmers and farm women organized by School of Organic Farming, PAU, Ludhiana in collaboration with SDC, PAU, Ludhiana.	April 24-28, 2023	50
Training camp for PAU Organic Farmers Club (Regd.) members organized by SDC and School of Organic Farming, PAU, Ludhiana as technical coordinator	June 12, 2023	56

Modipuram

Name of the training	Date (s)	Number of participants	Venue of training
Certified Farm Advisor on Organic Farming: Module-II (Batch 1)	2 to 7 May 2022	32	ICAR-IIFSR, Modipuram
Certified Farm Advisor on Organic Farming: Module-II (Batch 2)	23-28 May 2022	30	ICAR-IIFSR, Modipuram
Certified Farm Advisor (CFA) on Organic Farming: Module-II (Batch 1)	06-20 December, 2022		ICAR-IIFSR, Modipuram
Certified Farm Advisor (CFA) on Organic Farming: Module-II (Batch 2)	07-21 February 2023		ICAR-IIFSR, Modipuram
Capacity Building and Skill Upgradation Programme for Technical Staffs on "Farm Management	22-28 February 2023	25	ICAR-IIFSR, Modipuram

Narendrapur

Name of the training	Date (s)	Number of participants	Venue of training
A Regional Awareness Campaign in collaboration with Sasya Shyamala Krishi Vigyan Kendra (SSKVK), to celebrate the Azadi Ki Amrit Mahotsav as a part of 75th Year of India's Independence	12 August, 2022	75	(Virtual) Organic Farming Centre, Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Narendrapur,
XVII Annual Group Meeting (AGM) of All India Network Programme on Organic Farming (AINP-OF) in collaboration with ICAR-Indian Institute of Farming Systems Research (ICAR- IIFSR), Modipuram, India	28-30 December, 2022	56	Ramakrishna Mission Vivekananda Educational and Research Institute (RKMVERI), Narendrapur

Ranchi

Name of the training	Date (s)	Number of participants	Venue of training
Kisan gosthis	06/07/2022	35	Village-Ulihatu, District- Khunti

Thiruvananthapuram

Name of the training	Date (s)	Number of participants	Venue of training
Launching of SCSP programme for 2023-24, Training on organic farming/natural farming & Distribution of agricultural implements (Inaugurated by Shri. Chittayam Gopakumar, Deputy Speaker, Kerala Legislative assembly	05 October 2023	85	Parakkode, Pathanamthitta



Udaipur

Name, date, duration, etc.	Number of participants
ICAR sponsored 21 days training programme on Natural Farming: Perspectives and Prospects in Changing Agriculture Scenario. 09 to 29 November, 2022. DOR, MPUAT, Udaipur	29
राष्ट्रीय षि विकास योजना के तहत "जैविक खेती में उद्यमशीलता" पर सात दिवसीय प्रशिक्षण कार्यक्रम, अनुसंधान निदेशालय महाराणा प्रताप षि एवं प्रोद्योगिकी विश्वविद्यालय 14 20 फरवरी, 2023	10
अखिल भारतीय जैविक खेती नेटवर्क परियोजना अनुसूचित जनजाति उपयोगना के अन्तर्गत एक दिवसीय प्रशिक्षण कार्यक्रम 'अधिक उत्पादन हेतु जैविक खेती की उन्नत तकनीकें एवं आदान वितरण' अनुसंधान निदेशालय, महाराणा प्रताप कृषि एवं प्रोद्योगिकी विश्वविद्यालय, उदयपुर (राज.) Saturday 01st July, 2023	30
Environmental and Social Safeguard Component, Institutional Development Plan (IDP), NAHEP, MPUAT, Udaipur. Two Days Training Programme on Natural Farming for Sustainable Agriculture 30th June to 01st July, 2023. Directorate of Research, Maharana Pratap University of Agriculture & Technology, Udaipur (Rajasthan)	40
जैविक खेती के तहत अधिक उत्पादकता एवं लाभ हेतु तकनीकियाँ. Technologies for Higher Productivity and Profitability under Organic Farming. Directorate of Research, Maharana Pratap University of Agriculture & Technology, Udaipur (Raj.) on Thursday 04th August, 2022	25
National Awareness Campaign on Organic Farming under ICAR- All India Network Project on Organic Farming on 22nd August, 2022 at Directorate of Research, Maharana Pratap University of Agriculture & Technology, Udaipur (Rajasthan)	30
Brain Storming Workshop on Developing Syllabus & Curricula on Natural Farming at Under Graduate & Post Graduate Level on 17-18 June, 2023 at Directorate of Research, Maharana Pratap University of Agriculture & Technology, Udaipur (Rajasthan)	45

8.2.3: Radio talk/Television talks

Bhopal

- All India Radio/Doordarshan – As an Expert in KrishiDarshanProgramme (MradaAwasth Par Vishesh Karykram), Date of Broadcasting 5th December 2022.
- All India Radio/Doordarshan – As an Expert in Krishi Darshan Programme (Kharif Fasalo me Jaivik Khad Ki Upyogita), Date of Broadcasting 17th August 2022
- All India Radio/Doordarshan – As an Expert in Krishi Darshan Programme (Kenchuakhad ka mahatv), Date of Broadcasting 12th April 2023
- All India Radio/Doordarshan – As an Expert in Krishi Darshan Programme (Kharif fasalo ki jaivik kheti avam mridaswasth), Date of Broadcasting 03 June 2023.

Ludhiana

Radio Talks

- Kanak di jaivik kheti. AIR Jalandhar. 28.10.2022
- Jaivik kheti liye mapdhand ate pramikaran. AIR

Jalandhar. 10.01.2023

- Jaivik kheti samen dhyan yog gallan. AIR Jalandhar. 12.02.2023
- Jaivik kheti vich dhyan rakhan yog gallan. AIR Jalandhar. 4.07.2023

TV Talks

- Fertilizer and weed management in wheat. DD Punjabi. 15.01.2023
- Jaivik kheti de miar ate parmanikaran. DD Jalandhar. 15.02.2023
- Green manuring and its importance in organic farming, DD Punjabi. 20.03.2023
- Jaivik kheti kiven shuru kariye. DD Jalandhar. 20.04.2023
- Jaivik kheti, DD Jalandhar. 19.07.2023



Details of crops and varieties used in evaluation of organic, inorganic and integrated production systems at various locations

Location	Crop	Variety
Bajaura	Black gram (Kharif) Okra (Kharif) French bean (Kharif) Cauliflower (Rabi) Pea (Rabi) French bean (Summer) Summer squash (Summer) Tomato (Summer)	Palampur- 93 Palam Komal Falguni Madhuri Pb-89 Shakira Angelina Hybrid 537
Bhopal	Soybean Durum wheat Mustard Chickpea Linseed	JS-2034 HI-8737 Pusa Bold RVG-203 JL-9
Calicut	Ginger	Varada
	Turmeric	Prathibha, Alleppey Supreme, Varna, Sobha, Sona, Kanthi, Suvarna, Suguna Sudarsana, Kedaram, Prabha, Pragathi
Coimbatore	Daincha	Local
	Chillies Brinjal Pearlmillet Barnyard millet Tomato Finger millet	CO1 Hybrid CO 2 CO(Cu) 10 CO(KV) 2 PKM 1 ATL 1
Dharwad	Pigeonpea	ICP-8863
	Greengram Sorghum Groundnut Hy. cotton Maize Soyabean	DGGV 2 SPV 2217 GPBD 4 DCH-32 DWR 2006 DSB 21
Karjat	Rice	Karjat-4
	Brinjal Chickpea Field bean Onion (White)	Krishna F1 Vijay Konkan wal-1 Alibag local
Jabalpur	Soyabean	JS 20-98
	Wheat Lentil Berseem Mustard Green gram Sorghum fodder	JW 3382 IPL 316 J B - 1 Pusa Agrani Shikha MP Chari



Location	Crop	Variety
Ludhiana	Basmati rice	Panjab basmati 7
	Sesame	Punjab TilNo. 2
	Moong (summer)	SML 832
	Moong (Kharif)	ML2056
	Wheat	UnnatPBW343
	Chickpea	PBG 8
	Lentil	LL1373
Modipuram	Basmati rice	PB-6
	Rice	Saket-4
	Maize Grain	Bajaura pop corn/Madhuri sweet corn
	Green cob	Madhuri
	Wheat	HI - 8498
	Okra	Arka Anamika
	Potato	Chipsona-3
	Barley	DWRB-91
	Green gram	Pusa vishal
	Mustard	Pusa bold
Pantnagar	Sesbania	Ses pant-1
	Basmati rice	Pusa basmati-1
	Wheat	UP-2572
	Chickpea	Pant kabuli chana-1
	Vegetable Pea	Arkel
	Potato	Kufri jyoti
	Coriander	Harit RS-5
	Sesbania	Pant Ses-1
	Rice	Pusa-1509
	Soybean	PS 1347
	Maize	PSM-3
	Pigeon pea	UPAS 120
	Cowpea	PL-3
	Mustard	Toria
Raipur	Soybean	JS – 9752
	Sweet corn	Sugar-75
	Field pea	Pant sabji matar" (PSM 3)
	Cabbage	Godavari F1
	Tomato	Laxmi F1 Hybrid
Ranchi	Rice	Birsamati
	Wheat	K- 9107
	Onion	Arka niketan
	Potato	Kufri Ashoka
	Okra	Aprajita
Umiam	Rice (sunken bed) kharif	Megha Aromatic-2, Lampnah, Ngoba, Shahsarang-1
	Bhindi	
	Carrot	New Koroda
	Potato	Kufri jyoti
	French bean	Naga local
	Tomato	Rocky

Location	Crop	Variety
Ajmer	Cabbage	Golden Acre
	Fennel	AF-2
	Coriander	ACr-2
Almora		
Gangtok	Maize(Pre-kharif)	RCM-1-1
	Ginger(Pre-kharif)	Gorubuthane
	Turmeric(Pre-kharif)	RCT-10
	Soybean(kharif)	RCS-1-10
	Black gram (Pahenlo Dal) (kharif)	SK-PD-3 (Pahenlo dal)
	Buckwheat (Rabi)	Local Teethay
	Rajmash (Rabi)	SKR-57
	French bean (Rabi)	-
	Toria (Rabi)	TS-38
Narendrapur	Paddy	Satabdi,Gobindobhog
	Broccoli	Princess
	Vegetable Pea	MS10
	Mustard	B9
	French Beans	Falguni
	Green gram	Samrat
	Sesame	Tilotomma
Sardar Krushinagar	Groundnut	TG 37 A
	Green gram (kharif)	GM 4
	Wheat	GW 451
	Coriander	GDLC1
	Fennel	GF 12
	Green gram (summer)	GM 4
	Vegetable cowpea	Swati
Thiruvananthapuram	Cassava	Sree Vijaya
	Groundnut	Co-7
	Taro	Sree Kiran
	Black gram	Co-6
	Green gram	Co-8
	Vegetable cowpea	Anaswara
Udaipur	Sweet corn	Sugar 75
	Blackgram	PU 31
	Maize	Pratap QPM Hybrid-1
	Fodder Maize	Pratap Makka 6
	Cowpea	Doli
	Clusterbean	Gayatri-71
	Wheat (Durum)	HI 8713
	Wheat (Aestivum)	Raj 4120
	Gram	GNG 1581
	Fenugreek	RMT-305
	Soyabean	RKS-24



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ACRONYMS



ALE : Aquous leaf extract	N : Nitrogen
ASE : Aquous seed extract	NF : Natural Farming
BBF : Broad bed and furrow	NC : Neem coated
B: C : Benefit: Cost	NEOC : Non edible oil cakes
BD : Biodynamic	NPV : Nuclear Polyhedrosis virus
CC : Cost of cultivation	NR : Net returns
CDM : Cowdung manure	NRPRI : Net return per rupee invested
Cu : Copper	OC : Organic carbon
DSR : Direct seeded rice	P : Phosphorus
DTPA : Diethylene triamine penta acetic acid	PG : Panchagavya
EC : Enriched compost	pH : Negative logarithum of hydrogen ionconcentration
ECe : Electrical conductivity	PMDS : Pre Monsoon Dry Sowing
Fe : Iron	PPM : Parts per million
FB : Flat bed	RBD : Randomized block design
FYM : Farm yard manure	RP : Rock phosphate
GLM : Green leaf manure	RSB : Raised and sunken bed
GM : Green manure	SRI : System of rice intensification
GR : Gross returns	SSP : Single super phosphate
IOFS : Integrated organic farming system	TSP : Tribal sub plan
ITK : Indigenous technical knowledge	VC : Vermicompost
K : Potassium	Zn : Zinc
KC : Karanj cake	
Mn : Manganese	
MOP : Muriate of potash	



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