# जैविक खेती सूचना पत्र

# Organic Farming Newsletter


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## From Editors Desk

Dear Readers

With the phenomenonal growth in organic agriculture India is now among the top nations in the world in terms of total arable land, total number of farmers and organic cotton production. India now accounts for more than 50% of the organic farmers and 50% of the total organic cotton production in the world. The growth in area and increasing inclination of farmers, necessisates improved technologies not only for better productivity, but also for better quality. Lack of value addition facilities and non-availability of market linkages to most of the farmer groups are new emerging challenges. The present issue describes a farmer's perfected management approach. Developments at two international conferences at Bangalore are added attraction. Huge participation in these conferences is an indication of its growing importance. Partcipation by large number of scientists in validation, research and technology development is a new ray of hope. Developments are really encouraging and indicates towards a bright furure for organic agriculture

A.K. Yadav

# Organic Farming System An Integrated Approach

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**Introduction**

Organic agriculture has grown out of the conscious efforts by inspired people to create the best possible relationship between the earth and men. Since its beginning the sphere surrounding organic agriculture has become considerably more complex. A major challenge today is certainly its entry into the policy making arena, its entry into anonymous global market and the transformation of organic products into commodities. During the last two decades, there has also been a significant sensitization of the global community towards environmental preservation and assuring of food quality. After initial reluctance organic agriculture is now again being embraced by the mainstream and shows great promise commercially, socially and environmentally. While there is continuum of thought from earlier days to the present, the modern organic movement is radically different from its original form. It now has environmental sustainability and productivity at its core in addition to the founders concerns for healthy soil, healthy food and healthy people.

**Growing Crops under Organic Management**

**Philosophy -** Organic farming package is an integrated approach, where all aspects of farming systems are interlinked with each other and work for each other. A healthy biologically active soil is the source of crop nutrition, on-farm biodiversity controls pests, crop rotation and multiple cropping maintains the system's health and on-farm resource management with integration of cattle ensure productivity and sustainability. Organic management stresses on optimization of resource use and productivity.

**Management Principals -** A living soil is the basis of organic farming. A live, healthy soil with proper cropping patterns, crop residue management and effective crop rotation can sustain optimum productivity over the years, without any loss in fertility. Organic farming envisages a comprehensive management approach to improve soil health, the ecosystem of the region and the quality of produce. It includes all agricultural systems that promote environmentally sound production of food and fibres. These systems take local soil fertility as a key to successful production, by respecting the natural capacity of plants, animals and the landscape; they aim to optimize quality in all aspects of agriculture and environment. A living soil can be maintained by continuous incorporation of crop and weed biomass, use of animal dung, urine-based manures (FYM, NADEP, vermicompost), biofertilisers and bioenhancers, special liquid formulations (like vermiwash, compost tea etc) during a crop's duration.

As a thumb rule, crop residues should be returned to the plot, directly or indirectly. Cattle droppings may be returned to the field as compost. As a strategy, the quantity of biomass removed for human food and fiber, cattle feed or firewood from an organic farm should be replaced with any other bio-waste on the farm. But it is important to account for it for preparing the balance sheet of nutrients for each crop being cultivated on the farm. In phosphorous-deficient and acidic soils, some

# जैविक खेती प्रबंधन एक समन्वित मार्ग

अशोक कुमार यादव
राष्ट्रीय जैविक खेती केन्द्र
गाजियाबाद

## परिचय

पृथ्वी, मानव व पर्यावरण के बीच मधुर, परस्पर लाभदायी तथा दीर्घायु संबंधों की अवधारणा को आधार बनाकर आज की जैविक खेती की परिकल्पना की गई। समय के बदलते स्वरूप के साथ जैविक खेती अपने प्रारंभिक काल के मुकाबले अब और अधिक जटिल हो गई है और अनेक नये आयाम अब इसके प्रमुख अंग हैं। जैविक खेती का नीति निर्धारण प्रक्रिया में प्रवेश तथा अंर्तराष्ट्रीय बाजार में उत्कृष्ट उत्पाद के रूप में पहचान इसकी बढ़ती महत्ता का प्रतीक है। विगत दो दशकों में विश्व समुदाय में खाद्य गुणवत्ता सुनिश्चित करने के साथ पर्यावरण को स्वस्थ रखने हेतु जागरूकता बढ़ी है। शुरूआती हिचकिचाहट के बाद जैविक खेती अब विकास की मुख्य धारा से जुड़ रही है और भविष्य में आर्थिक, सामाजिक तथा पर्यावरणीय सुरक्षा के नये आयाम सुनिश्चित कर रही है। हालाँकि प्रारंभिक काल से अब तक जैविक खेती के अनेक रूप प्रचलित हुए हैं परन्तु आधुनिक जैविक खेती अपने मूल रूप से विल्कुल अलग है। स्वस्थ मानव, स्वस्थ मृदा तथा स्वस्थ खाद्य के साथ अधिक उत्पादन व टिकाऊ वातावरण के प्रति संवेदनशीलता आज इसके प्रमुख बिन्दु हैं।

## जैविक खेती प्रबंधन

**अवधारणा** – जैविक खेती प्रबंधन एक ऐसा समन्वित मार्ग है जहाँ खेती के समस्त अवयवों की प्रणालियाँ परस्पर एक-दूसरे से सम्बद्ध हैं तथा एक-दूसरे के लिए कार्य करती है। जैविक रूप से स्वस्थ एवं सक्रिय भूमि फसल पोषण का स्रोत है तथा खेत की जैव विविधता द्वारा नाशीजीव नियंत्रण होता है। फसल चक्र तथा बहु फसलीय कृषि प्रणाली मृदा स्वास्थ्य को बनाये रखती हैं। खेत पर उपलब्ध संसाधनों का प्रयोग तथा पशुधन समन्वय, उत्पादकता तथा स्थायित्व सुनिश्चित कराते हैं। जैविक प्रबंधन स्थानीय स्रोतों के अधिकतम् उपयोग तथा उत्पादकता पर बल देता है।

**प्रबंधन सिद्धांत** – जीवंत मृदा जैविक खेती का प्रमुख आधार है। जीवंत व स्वस्थ मृदा के साथ उपयुक्त फसल चयन, फसल अवशिष्ट प्रबंधन तथा फसल चक्र अपनाकर बिना किसी उर्वरता ह्रास के लम्बे समय तक उत्पादन प्राप्त किया जा सकता है। जैविक खेती की समन्वित प्रबंधन प्रक्रिया द्वारा मृदा का अक्षुण्ण स्वास्थ्य, उपयुक्त पारिस्थितिकी तथा स्वस्थ खाद्य उत्पादन सुनिश्चित किया जा सकता है। इस विधा में वे सभी कृषि प्रणालियाँ शामिल हैं जिनसे पर्यावरण संरक्षण के साथ स्वस्थ खाद्य व रेशे प्राप्त हों। इस विधा की सफलता में स्थानीय मृदा उर्वरता, पौधों व पशुओं की प्राकृतिक क्षमता तथा भूदृष्य इत्यादि को उचित सम्मान देते हुए कृषि तथा पर्यावरण के सभी अंगों के उचित विकास को महत्व दिया जाता है। पौध व खरपतवार अवशिष्ट को वापस मिट्टी को लौटाकर जीवंत मृदा का निर्माण व संधारण किया जाता है। पशु मल व मूत्र आधारित खाद, जैव उर्वरक, जैविक उत्प्रेरक, द्रवीय जैविक उत्पाद जैसे वर्मीवाश, कम्पोस्ट अर्क इत्यादि का प्रयोग भी मृदा उर्वरता संधारण में सहायक है।

जैविक खेती के मूल नियमानुसार फसल अवशिष्ट को सीधे या अपरोक्ष रूप में मिट्टी को लौटाना आवश्यक है। पशुमल को खाद बनाकर प्रयोग किया जा सकता है। नियमानुसार यह भी आवश्यक है कि जितना जैव अंश फसल उत्पाद, धान्य, चारा या लकड़ी इत्यादि के रूप में उत्पादित किया जाये उतना ही जैव अंश किसी अन्य रूप में भूमि को लौटा दिया जाये। प्रत्येक फसल के लिए पोषकों की उपलब्धता के लिए इसका लेखा-जोखा रखना आवश्यक है। अम्लीय तथा फास्फोरस की कमीं की अवस्थाओं में खनिज चूना या रॉक फास्फेट का प्रयोग किया जा सकता है। जैव उर्वरकों के प्रयोग से कम्पोस्ट खाद को समृद्ध किया जा सकता है। कुछ विशिष्ट आदान जैसे जैवगतिकीय कम्पोस्ट,

quantity of mineral grade rock phosphate and lime can also be added either by direct application to the field or through addition to compost. The compost can be further enriched by incorporation of biofertilisers, microbial inoculants, etc. Special composts like biodynamic compost, cowpat pit compost, biodynamic preparations such as BD-500 and BD-501, special formulations like Panchgavya, Dashgavya, Biosol etc are also useful and ensure optimum productivity. Use of EM formulation has also been found effective in soil enrichment and compost making. For high nutrient demanding crops and for intermittent soil enrichment use of oilcakes, poultry manure, concentrated manures (mixture of oil cakes, poultry manure and rock phosphate) can also be an ideal low-cost option of manuring.

**Important steps**

While turning towards organic it is essential that the basic requirements of the system and the area are properly understood and long term strategies are addressed first. In most part of the country poor soil health due to loss of organic matter and soil microbial load is a major problem. Reducing water availability and increasing temperature is further adding to the problems. Too much dependence on market for supply of inputs and energy has made the agriculture a cost intensive high input enterprise with diminishing returns. We need to address all these concerns and develop a system which is not only productive and low cost but also resource conserving and sustainable for centuries to come. To start with, following parameters need to be addressed in first stage

- Enrichment of soil
- Management of temperature
- Conservation of rain water
- Maximum harvesting of sun energy
- Self reliance in inputs
- Maintenance of natural cycles and life forms
- Integration of animals
- Maximum reliance on renewable energy sources, such as solar power and animal power

**How to achieve**

1. **Enrichment of soil** – Abandon use of chemicals, use crop residue as mulch, use organic and biological fertilizers, adopt crop rotation and multiple cropping, avoid excessive tilling and keep soil covered with green cover or biological mulch.
2. **Management of temperature** - Keep soil covered, Plant trees and bushes on bund
3. **Conservation of soil and rain water** – Dig percolation tanks, maintain contour bunds in sloppy land & adopt contour row cultivation, dig farm ponds, maintain low height plantation on bunds.
4. **Harvesting of sun energy** – Maintain green stand throughout the year through combination of different crops and plantation schedules.
5. **Self reliance in inputs** – Develop your own seed, ensure on-farm production of compost, vermicompost, vermiwash, liquid manures and botanical extracts.
6. **Maintenance of life forms** – Develop habitat for sustenance of life forms, never use pesticides, create enough diversity.
7. **Integration of animals** – Animals are important components of organic management and not only provide animal products but also provide enough dung and urine for use in soil.
8. **Use of renewable energy** – Use solar energy, bio-gas and bullock driven pumps, generator and other machine.

**Developing organic farm**

As organic management is an integrated approach, manipulation and adoption of one or few steps may not yield significant results. For optimization of productivity all the essential components need to be developed in a systematic manner. These steps include: (i) Habitat development, (ii) on-farm facilities for input production (iii) cropping sequence

काउपैट पिट कम्पोस्ट जैव गतिकीय उत्पाद जैसे बी.डी. ५०० व बी.डी. ५०१, पंचगब्य, दशगब्य बायोसोल इत्यादि उचित फसल उत्पादन में सहायक हैं। प्रभावी सूक्ष्म जीव उत्पाद (ई.एम.) मृदा व कम्पोस्ट संवर्धन में मद्द करते हैं। अधिक पोषण माँग वाली फसलों तथा समय-समय पर मृदा संवर्धन हेतु खलियों, मुर्गी खाद, सांद्र जैविक खाद (खली, मुर्गी खाद तथा रॉकफास्फेट मिश्रण) का उपयोग भी अच्छा विकल्प है।

**प्रमुख चरण**

जैविक परिवर्तन हेतु आवश्यक है कि प्रक्रिया एवं स्थान विशेष की मूलभूत आवश्यकताओं को ठीक से समझा जाये तथा दीर्घावधि योजना बनाई जाये। देश के अधिकांश भागों में मिट्टी में जैव कार्बन तथा सूक्ष्मजीव अंश के ह्रास से मिट्टी के स्वास्थ्य में लगातार गिरावट आ रही है। घटती जल उपलब्धता तथा बढ़ता तापक्रम समस्याओं को और भी जटिल बना रहे हैं। बाजार से क्रय किए जाने वाले आदानों तथा ऊर्जा खर्च ने कृषि को ऐसे उद्यम में बदल दिया है जिसमें उत्पादन लागत बढ़ती जा रही है और लाभ निरंतर घट रहे हैं। वक्त आ गया है कि अब इन सभी समस्याओं का निदान कर ऐसी प्रक्रिया स्थापित किया जाये जो उत्पादनक्षम् होने के साथ-साथ कम खर्चीली, संसाधनों का संरक्षण करने वाली तथा दीर्घावधि टिकाऊ हों। इसके लिए निम्न बिंदुओं पर ध्यान देना आवश्यक है।

**महत्वपूर्ण बिन्दु**

- मृदा की समृद्धशीलता
- तापक्रम प्रबंधन
- वर्षा जल का संधारण
- सूर्य ऊर्जा का अधिकतम् उपयोग
- आदानों (Inputs) में आत्मनिर्भरता
- प्राकृतिक चक्र एवं जीव स्वरूपों की सुरक्षा
- पशुओं का समन्वय तथा पशु शक्ति व स्थानीय स्रोतों पर अधिकाधिक निर्भरता

**कैसे प्राप्त करें?**

१. **मृदा समृद्धशीलताः-** रासायनिक आदानों (Inputs) के प्रयोग को नकारते हुए अधिकाधिक फसल अवशेष का उपयोग, जैविक तथा जैव खाद का प्रयोग, फसल चक्र तथा बहुफसलीय प्रणाली का अपनाया जाना, अधिक व गहरी जुताई का त्याग तथा मृदा को सदा जैविक पदार्थों या पौध अवशेषों से ढ़क कर रखना (मल्चिंग)।

२. **तापक्रम प्रबंधनः-** मृदा को ढ़क कर रखना तथा खेत की मेढ़ों पर वृक्ष तथा झाड़ियाँ लगाना।

३. **मृदा, जल को सुरक्षित रखनाः-** जल संधारण गड्ढे खोदना, मेंढ़ की सीमा-रेखा का रख-रखाव करना, ढ़लवाँ भूमि पर कन्टूर खेती करना, खेत में तालाब बनाना तथा मेढ़ों पर कम ऊँचाई वाले वृक्षारोपण करना।

४. **सूर्य ऊर्जा उपयोगः-** विभिन्न फसलों के संयोजन तथा पौध रोपण कार्यक्रम के माध्यम से पूरे वर्ष हरियाली बनाये रखें।

५. **आदानों में आत्मनिर्भरता**- अपने बीज का स्वयं विकास करें। कम्पोस्ट, वर्मी कम्पोस्ट, वर्मीवाश, तरल खाद तथा पौधों के सत/अर्क का फार्म पर उत्पादन करें।

६. **प्राकृतिक चक्र तथा जीव स्वरूपों की रक्षाः-** पक्षी व मित्र कीटों के जीवन यापन हेतु प्राकृतिक स्थान का विकास। कीटनाशी रसायनों के प्रयोग पर प्रतिबंध तथा जैवविविधता निर्माण।

७. **पशुधन समन्वयः-** जैविक प्रबंधन में पशु एक महत्वपूर्ण अंग हैं जो पशु उत्पाद ही उपलब्ध नहीं कराते बल्कि मृदा को समृद्ध करने हेतु पर्याप्त गोबर तथा मूत्र भी उपलब्ध कराते हैं।

८. **प्राकृतिक ऊर्जा उपयोगः-** सूर्य ऊर्जा, बायो गैस, बैल चालित पंप, जेनरेटर तथा पशुचालित अन्य यंत्रों का प्रयोग।

**जैविक फार्म का विकास**

जैविक प्रबंधन एक समन्वित प्रक्रिया है। एक या कुछ बिन्दु अपनाकर पर्याप्त परिणाम प्राप्त नहीं किये जा सकते हैं। उपयुक्त उत्पादन हेतु सभी आवश्यक बिंदुओं के क्रमबद्ध विकास की आवश्यकता है। ये अंग हैः-

१. जन्तु/पक्षी व पौधों के प्राकृतिक आवास का विकास व निर्माण।
२. आदानों के उत्पादन हेतु फार्म पर सुविधायें।
३. फसल क्रम तथा फसल परिवर्तन योजना।

and combination planning, (iv) 3-4 year rotation plan and (v) growing of crops suiting to the region, soil and climate.

**Development of farm facilities and habitat**

**Infrastructure** – Reserve 3-5% of farm space for utilities, such as space for cattle, vermicompost bed, compost tank, Vermiwash/ compost tea unit etc. 5-7 trees should be planted only on this space, as all utility infrastructure need shade. Irrigation well, water pumping infrastructure etc can also be in this utility area. Dig some percolation tanks (7x3x3mt or of any other size depending upon the rainfall and run-off pattern) for rain water conservation (1 pit per ha) at appropriate places depending upon slope and water flow. If possible develop a farm pond of preferably 20x10 mt size. Keep few 200 lit tanks (1 per acre) for liquid manure preparation and few containers for botanicals. For 5 acre farm, develop 1-2 vermicompost beds, 1 NADEP tank, 2 biodynamic compost beds, 2-3 compost tea/ vermiwash units, 5 liquid manure tanks, five cowpat pits and one underground cattle-urine collection tank. Efforts should also be made to produce sufficient quantities of BD-500 (cow horn manure) and BD-501 (cow horn silica). 10-12 horn products are sufficient for 5 acre farm. Use of biodynamic compost prepared with the use of BD-502-507 has also been found to be very effective.

**Habitat and biodiversity**- Management of an appropriate habitat for sustenance of different life forms is an essential component of organic farming. This can be achieved by ensuring crop diversity and by maintaining a wide variety of trees and bushes as per climatic suitability. These trees and bushes will not only ensure the nutrients from air and deep soil layers to surface layer but also attract the birds and predators, friendly insects and also provide the food and shelter. There may be some loss of productivity due to shading effect but that loss can be compensated with reduced pest problems and natural biological pest control system. In the plains, for a 10-acre farm, plant at least five to six neem trees (*Azadirachta indica*), one to two tamarind (*Tamarindus indica*), two gular (*Ficus glumerata*), eight to ten ber (*Zizyphus* Sp) bushes, one to two aonla (*Emblica officinalis*), one to two drumstick and 10–15 wild bushes.

More specifically, if we classify areas into wet and dry farms, then on the wet farms there should be five to six neem trees, one to two wood apples, one to two star fruit, eight to ten guava or sour soap, three to four drumstick, one to two fig and 10–15 bushes of mulberry, star gooseberry, curry leaf etc, and on the dry farms there must be at least five to six neem, one to two bael fruit, eight to ten ber or custard apple, one to two aonla , one to two drumstick and 10–15 bushes of sasaka, nirgundi (*Vitex negundo*), *Cassia auriculata*, *C. tora*, etc.

In hilly areas, *Alnus nepalensis* is considered to be a wonder tree as it fixes good amount of nitrogen. It is being promoted in a cropping system mode particularly in northeastern India. Bushes of Prunus, oak (*Quercus glauca*), Pinus species along the farm boundary and yarrow (*Achillea millifolium*), buck wheat (*Fagopyrum esculentum*), lupin (*Lupinus sativus*), Himalayan stinging nettle (*Urtica parviflora*), marigold, etc., in between the plots invite a lot of predators and also attract a large number of pests.

Fruit orchards also need to maintain adequate diversity with at least 3-5 types of fruit plants and few non-fruit trees (as listed above).

Major and minor plots should be separated by bunds about 1.5m wide and should be planted with Glyricidia, perennial Sesbania (jayanti), Leucaena leucocephala, Cassia siamea, etc. The internal hedgerow should consist of perennial pigeon pea, Crotalaria, seasonal Sesbania, etc. Lops from these trees will provide enough quantity of biologically fixed nitrogen.

३-४ वर्षीय फसल चक्र नियोजन।

५. जलवायु, मृदा व क्षेत्र की उपयुक्तता पर आधारित फसलों का चयन।

## सुविधाओं का निर्माण

३ से ५ प्रतिशत स्थान पशुधन के लिए, वर्मी कम्पोस्ट शैय्या, कम्पोस्ट टैंक, वर्मीवाश/कम्पोस्ट चाय इकाई आदि हेतु सुरक्षित (Reserve) करें। सिंचाई कुँआ, पम्पिंग सैट आदि का ढ़ाँचा भी इस क्षेत्र में हो सकता है। चूँकि इन सभी सुविधाओं हेतु छाया की आवश्यकता है अतः इस स्थान पर ५ - ७ वृक्ष लगाने चाहिए। पानी के बहाव तथा भूमि के ढ़लान पर निर्भर करते हुए कुछ जल शोषण टैंक (7x3x3 मी.) वर्षा जल के संधारण हेतु (एक टैंक प्रति हेक्टेयर की दर से) उचित स्थानों पर बनायें। यदि संभव हो तो 20x10 मीं. माप का एक तालाब भी फार्म पर बनायें। तरल खाद हेतु २०० ली. क्षमता के कुछ टैंक तथा कुछ पात्र वानस्पतिक सत हेतु तैयार करें। ५ एकड़ के फार्म हेतु १-२ वर्मी कम्पोस्ट शैय्या, एक नादेप टैंक, २ जैवगतिकीय कम्पोस्ट शैय्या २-३ कम्पोस्ट अर्क/वर्मीवाश इकाईयाँ, ५ तरल खाद टंकियाँ, ५ काउपैट पिट, एक गोमूत्र संग्रहण टंकी उपयुक्त मात्रा में बी.डी. ५०० तथा बी.डी. ५०१ जैव गतिकीय आदान उत्पादन की भी व्यवस्था करनी चाहिए। ५ एकड़ फार्म हेतु १०-१२ सींग उत्पाद पर्याप्त हैं। जैव गतिकीय कम्पोस्ट ( बी.डी. ५०२ - बी.डी. ५०७ का प्रयोग कर) का उत्पादन व प्रयोग भी प्रभावी पाया गया है।

## आवास एवं जैव विविधता निर्माण

विभिन्न जैव रूपों के पोषण एवं संधारण हेतु आवास निर्माण जैविक खेती का एक प्रमुख अंग है। प्राकृतिक अनुकूलता के अनुसार विभिन्न प्रकार के वृक्ष, झाड़ियों, विभिन्न प्रकार की फसलों इत्यादि का समावेश कर आवास निर्माण किया जाता है। इन वृक्षों व झाड़ियों द्वारा न केवल मित्र कीटों व पक्षियों का आवास निर्माण होता जो कीट प्रबंधन में सहायक है वरन् भूमि की गहराइयों से प्राप्त पोषक तत्व तथा वायुमंडलीय नत्रजन भी भूमि की ऊपरी सतह पर प्राप्त होते हैं। इनकी उपस्थिति से जो छाया होगी हो सकता है उससे उत्पादकता पर कुछ असर पड़े परंतु इनके द्वारा नाशीजीव प्रबंधन में दिये योगदान से उस घाटे की पूर्ति हो जायेगी।

मैदानी क्षेत्रों में १० एकड़ फार्म हेतु ५-६ नीम (*Azadirachta indica*), १-२ इमली (*Tamarindus indica*), ०२ गूलर (*Ficus glumerata*), ८-१० बेर (*Zizyphus* Sp), १-२ ऑवला (*Emblica officinalis*), १-२ सैंजना (Drum stick) तथा १०-१५ विभिन्न प्रकार की झाड़ियाँ लगायें।

यदि नम व शुष्क क्षेत्रों की बात करें तो नम क्षेत्रों में ५-६ नीम, १-२ बुड ऐपल (Wood apple), १-२ स्टार फल (Star fruit), ८-१० अमरूद या रीठा, ३-४ सैंजना, १-२ अंजीर (Fig) तथा कढ़ी पत्ता नीम तथा १०-१२ शहतूत के वृक्ष लगायें, शुष्क क्षेत्रों में ५-६ नीम, १-२ बेलपत्र (Bael fruit), ८-१० बेर या सीताफल (Custard apple), १-२ ऑवला, १-२ सैंजना तथा १०-१२ ससका, निर्गुंडी (Vitex nigundo), केसिया आरिकुलेटा (Cassis auriculata) व केसिया टोरा (Cassia tora) की झाड़ियाँ लगायें।

पहाड़ी क्षेत्रों में एलनस नेपालेन्सिस (Alnus nepalensis) सबसे उपयुक्त नत्रजन स्थिरीकरण वृक्ष है। उत्तर-पूर्वी पहाड़ी क्षेत्रों में इसका बड़े पैमाने पर हरी पत्ती खाद के रूप में प्रसार किया जा रहा है। इसके अलावा प्रुनस की कुछ प्रजातियाँ, ओक, यैरो, बक-गेहूँ, Lupin, गेंदा तथा Stinging Nettle इत्यादि को भी मेढ़ों पर लगाया जा सकता है।

फल उद्यानों में भी जैव विविधता का विशिष्ट ध्यान रखा जाना चाहिए तथा कम से कम ३-५ प्रकार के फल व अन्य वृक्षों (उपरोक्तानुसार) का मिश्रण रखना चाहिए।

सभी मुख्य मेढ़ों पर १.५ मी. चौड़ी पट्टी में ग्लिरिसिडिया, बारहमासी सेस्बेनिया (ढ़ैंचा) सुबसूल केसिया इत्यादि लगायें। आंतरिक मेढ़ों पर बारहमासी अरहर, क्रोटोलेरिया तथा ढैंचा के पौधे लगायें। समय-समय पर इन पौधों की पत्तियाँ इत्यादि तोड़कर खेत में डालते रहें इनसे अच्छी मात्रा में जैविक नत्रजन की उपलब्धि होती रहेगी।

ग्लिरीसिडिया पंक्ति के बीच में कीटनाशक मूल्य के पौधे जैसे एडेथोडा (Adathoda), निर्गुन्डी (Vitex nigundo), आक (Calotropis sp), धतूरा (Datura alba) तथा बेशरम

In between *Glyricidia/Sesbania* rows insert few plants of pesticidal value such as *Adathoda vesica, Vitax nigundo, Calotropis, Datura alba, Ipomea* (Besharam) etc. Surrounding the farm or garden, there should be hedgerows or a live fence of coppiced or pollarded, multipurpose, deep-rooted trees and shrubs and medicinal herbs such as Adathoda vasica, Vitex negundo, Jatropha curcas, etc. Ecological diversity is an essential component of any successful organic farming system.

Trees on utility space can be allowed to grow fully. Trees and bushes on farm bunds should be placed randomly at sufficient distance and pruned at repeated intervals.

A 400 mt long Glyricidia strip can provide 22.5 kg N/ha per year from the year 3 and up to 77 Kg N/ha from year 7 under rainfed conditions. This can be 75-100% higher under irrigated conditions. Three to four harvests can be made under irrigated conditions and two harvests under unirrigated conditions. Never allow them to grow above 5.5 ft to avoid shading effect. Lopping is used as green leaf manure. Simply harvest them and incorporate in soil before sowing or use as mulch.

**Conversion of soil to organic**

**Banning of chemicals-** It is widely known fact that some biological processes of plants involved in acquiring nutrients such as nitrogen e.g. $N_2$ fixation are generally inhibited by adding Nitrogen fertilizer. Soil scientists generally caution against non-judicious fertilizer use and encourage use of organic compost otherwise it may lead to deficiency of micronutrients. Therefore in organic farming systems there is no place for chemicals.

**Low input alternative** - In first year simultaneously sow three different types of legumes in strips, first of 60 days (like moong), second of 90-120 days (Cow pea or soybean) and third of more than 120 days (red gram) in strips. Apply mixture of Compost and vermicompost (2:1) @ 2.5 ton per acre enriched with 4 kg Azotobacter and 4 kg PSB biofertilizers or 4 kg consortia of customized cultures as basal dose at the time of sowing preferably in furrows below the seeds. Seeds of legumes should be treated with crop specific strains of Rhizobium biofertilizer. Mulch the entire surface with a thick layer of biological mulch and drench the biomass with Jivamrut @ 200 lit per acre. Seedlings will emerge from this layer. If soil is poor in phosphorus then apply 300 kg of low grade mineral rock-phosphate along with the compost. Apply second dose of Jivamrut after 25-30 days of sowing with irrigation water or during rains.

To add to diversity 100 plants/ acre of marigold or Hibiscus subdarifa may be planted randomly through out the field. Few seedlings of vegetables such as chillies, tomato, brinjal, etc and rhizomes of turmeric, ginger etc can be planted randomly for home consumption.

Harvest the pods/ fruits and use remaining biomass for mulch and drench with Jivamrut. Sow short duration leafy vegetables (such as fenugreek or spinach) in the space vacated by the first and second crop and mulch the surface with treated biomass. Harvest leafy vegetable and grains and incorporate remaining biomass in the soil at appropriate time.

In next season apply compost-vermicompost mixture @ 2.5 ton/ha and sow cereal crop with legume as inter or companion crop. After harvest use entire legume and remaining part of cereal crop as mulch. If irrigation facilities are there, take summer legume with some vegetable crop. Recycle entire residue as mulch. Use 3-4 application of liquid manure (such as Jivamruta) during each cropping season for soil application. Now the soil is ready for high value horticultural crops.

(Ipomea) इत्यादि पर्याप्त अंतराल से लगायें तथा समय-समय पर कटाई छँटाई करते रहें। फार्म के चारों तरफ मुख्य बाउंड्री पर कम फासले से ग्लिसीरीड़िया के पौधे लगाने चाहिए। फार्म के चारो तरफ की बाढ़ में बहुउपयोगी, गहरी जड़ वाले पौधे तथा झाड़ियाँ व औषधीय गुण पौधे जैसे ऐडेथोडा, निर्गुण्डी, रतनज्योत (Jatropha) इत्यादि उपयुक्त हैं। किसी भी प्रकार की जैविक खेती की सफलता में जैव विविधता का प्रमुख स्थान है।

सुविधास्थल पर लगाये वृक्षों को बढनें दें। अन्य मेंढ़ों पर वृक्षों व झाड़ियों को फैलाकर दूर-दूर लगायें तथा समय-समय पर उनकी कटाई-छंटाई करते रहें।

तीसरे वर्ष से ग्लिरीसिडिया की ४०० मीटर लंबी पट्टी २२.५ कि.ग्रा. नत्रजन/प्रति है. तथा सातवें वर्ष से ७७ कि.ग्रा. नत्रजन/है. प्रतिवर्ष उपलब्ध करा सकती है। यह मात्रा सिंचित दशाओं में ७५ से १०० प्रतिशत अधिक हो सकती है। सिंचित दशा में ३-४ बार तथा असिंचित दशा में २ बार कटाई छंटाई की जा सकती है।

छाया का कुप्रभाव रोंकने हेतु इन पौधों को साढे पाँच फुट से अधिक कभी न बढ़ने दें। हर तीसरे/चौथे महीने में छँटाई करते रहें और अवशेष को हरी खाद के रूप में प्रयोग करें। पत्तियों आदि की कटाई के बाद इन्हें मिट्टी में मिला दें अथवा मल्च के रूप में प्रयोग करें।

**मिट्टी का जैविक में रूपान्तरण**

**रसायनों के प्रयोग पर रोक** - यह सर्वविदित है कि कुछ मृदा जन्य जैविक प्रक्रियाऐं जैसे जैविक नत्रजन स्थिरीकरण इत्यादि पर रसायन प्रयोग का विपरीत प्रभाव होता है। मृदा वैज्ञानिक हमेंशा सावधान करते हैं कि रसायनों का असंतुलित प्रयोग टालते हुए अधिक से अधिक जैविक खाद का प्रयोग करें, अन्यथा सूक्ष्ममात्रिक पोषक तत्वों की कर्मी का खतरा उत्पन्न हो सकता है। इसी कारण जैविक खेती में किसी भी प्रकार के रसायनों के लिए कोई स्थान नहीं है।

**न्यून/कम आदान विकल्पः-** प्रथम वर्ष में विभिन्न अवस्थाओं वाली तीन भिन्न-भिन्न प्रकार की दलहनी फसलों की बुवाई करें जैसे मूँग (६० दिन), चौला या सोयाबीन (१२० दिन) तथा अरहर (१५० दिन से अधिक)। २.५ टन प्रति एकड की दर से कम्पोस्ट व वर्मीकम्पोस्ट मिश्रण (२ : १) को ४ किलो एजोटोबैक्टर ४ किलो फास्फोरस घोलक जीवाणु खाद (Phosphate solubilizing bacterial biofertilizer) या ४ किलो मिश्रित जीवाणु खाद के साथ बुवाई के समय नालियों में या मिट्टी में समान रूप से मिला दें। दलहनी बीजों को राइजोबियम जैव उर्वरक से उपचारित करें।

बुवाई के बाद पूरी सतह को फसल व अन्य पौध अवशिष्ट से ढ़क दें (मल्चिंग)। जैव अंश फैलाने के पश्चात् प्रति एकड़ २०० लीटर तरल खाद (जीवामृत या संजीवक) का छिड़काव करें। अंकुरण पश्चात पौधे इस परत से उपर आ जायेंगें। यदि मिट्टी की उर्वरता बहुत ही कम है तो लगभग ३०० किलो रॉक फास्फेट को कम्पोस्ट में मिलाकर प्रयोग करें। २५-३० दिन बाद तरल खाद (जीवामृत या संजीवक) की दूसरी खुराक सिंचाई के साथ दें।

जैव विविधता बढ़ाने के लिए प्रति एकड़ १०० पौधे गैंदे (Marigold) या लाल अम्बाडी (Hibiscus subderiffa) के पूरे खेत में फैलाकर लगा दें। घर के उपयोग हेतु कुछ सब्जी वाले पौधे जैसे मिर्च, टमाटर, बैंगन, अदरक, हल्दी इत्यादि भी फैलाकर जहाँ भी स्थान हो वहाँ लगा दें।

केवल फलियाँ/फल या दानें ही निकालें तथा शेष पूरे अवशेष को मल्चिंग के रूप में प्रयोग करें। फैलाने से पूर्व या बाद में इस अवशेष पर तरल खाद (जीवामृत या संजीवक) का छिड़काव अवश्य करें। कम आयु की फसल कटाई के बाद जो जगह खाली हुई है उसमें हरी पत्ती वाली सब्जियाँ जैसे मेथी, पालक व धनियां इत्यादि २-३ कतारों में लगा दें तथा बुवाई पश्चात् सतह को मल्च कर दें।

दूसरी ऋतु में प्रति हैक्टेयर २.५ टन कम्पोस्ट/वर्मी कम्पोस्ट का प्रयोग करें तथा धान्य फसल दलहनी फसल के साथ अंतः फसल अथवा सहयोगी फसल के रूप में बोयें। कटाई पश्चात् दलहनी फसल का पूरा तथा धान्य फसल का अनुपयुक्त भाग मल्च के रूप में प्रयोग करें। यदि सिंचाई उपलब्ध हो तो गर्मियों में दलहनी फसल के साथ, हरी सब्जियों की फसल लें। समस्त फसल अवशेषों का मल्च रूप में पुनर्चक्रण करें। प्रत्येक फसल के दौरान ३-४ बार तरल खाद का मृदा में प्रयोग करें। मिट्टी अब जैविक खेती हेतु तैयार है।

**High input alternative** – Incorporate per acre, 2.5-3.0 ton compost/ vermicompost or 1.5 ton of biodynamic compost, 500 kg crushed oil cakes, 500 kg rock phosphate, 100 kg neem cake, 5 kg Azotobacter and 5kg PSB biofertilizer or 4 kg consortia of customized cultures in soil through broadcasting or by drilling in furrows below the seeds. Sow 3-4 types of different crops in strips. 40% crop stand should be of legumes. Randomly plant 100-150 marigold and vegetable seedlings for increased diversity. After harvest incorporate entire residue in soil or use as mulch after sowing of the next crop. For second crop also use similar quantities of manures. Use liquid manure (Jivamruta) @ 200lit/acre 3-4 times during cropping season along with irrigation water. For increased productivity 2-3 sprays of vermiwash or vermiwash+cow urine or Panchgavya can also be provided.

In fruit orchards cultivate 3-4 types of legume mixtures as mixed or intercrop in inter spaces along with adequate quantity of manures (as specified above). After pod/ grain harvest mulch the entire soil surface with the left over biomass and drench the biomass with 2 applications of Jivamruta.

After about 12-18 months the soil will be ready for organic cultivation of any crop combination. For next two-three years, along with any crop incorporate legumes as inter or companion crops. Ensure that crop residue always have at least 30% residue from legumes. Also treat crop residue with liquid manure before incorporating into soil or using as mulch.

**Multiple cropping**

Entire farm should have at least 8-10 types of crops at all the times. Each field/ plot should have at least 2-4 types of crops out of which one should be legume. In case if only one crop is taken in one plot then adjacent plots should have different crops. For maintenance of diversity and pest control randomly plant 50-150/acre vegetable seedlings for home consumption and 100 plants/acre of marigold (Genda) in all crop fields. Even high nutrient demanding crops such as sugarcane can also be grown with suitable combination of various legume and vegetable crops with optimum productivity.

**Crop rotation**

Crop rotation is the back bone of organic farming practices. To keep the soil healthy and to allow the natural microbial systems working, crop rotation is must. Crop rotation is the succession of different crops cultivated on same land. Follow 3-4 years rotation plan. All high nutrient demanding crops should precede and follow legume dominated crop combination. Rotation of pest host and non pest host crops helps in controlling soil borne diseases and pest. It also helps in controlling weeds. It is better for improving productivity and fertility of soil. Crop rotations help in improving soil structure through different types of root system. Legumes should be used frequently in rotation with cereal and vegetable crops. Green manure crops should also find place in planning rotations.

Under Network Project on Organic Farming (NPOF of ICAR) important cropping systems, which were found economically better or at par with conventional system at different experimental stations in the country are as follows:

- Soybean - Berseem/ Mustard/ chickpea at Raipur, Chattisgarh
- Tomato/ Cabbage – cauliflower – pea and maize – garlic at Bajaura, Himachal Pradesh
- Rice – wheat/ potato/ mustard/ lentil at Ranchi, Jharkhand
- Groundnut – rabi Sorghum, soybean – durum wheat, potato – chick pea, chillil+ Cotton and maize – chick pea at Dharwad, Karnataka
- Soybean – durum wheat/ mustard/ chick pea/ isabgol at Bhopal, M.P.

**अधिक आदान विकल्प** – प्रति एकड २.५-३.० टन कम्पोस्ट/वर्मी कम्पोस्ट या १.५ टन बायोडायनेमिक कम्पोस्ट ५०० कि.ग्रा. खली चूर्ण खाद, ५०० कि.ग्रा. राक फास्फेट, १०० कि.ग्रा. नीम खली तथा ५ कि.ग्रा. एजोटोबैक्टर व ५ कि.ग्रा. पी.एस.बी. या ४ किलो मिश्रित जैव उर्वरक मृदा में प्रयोग करें। ३-४ प्रकार की विभिन्न फसलों की पंक्तियों में बुवाई करें। ४० प्रतिशत फसल दलहनी होनी चाहिए। जैव विविधता बनाये रखने हेतु १००-१५० गेंदे व सब्जियों के पौधे पूरे १ एकड़ खेत में फैलाकर लगा दें, फसल कटाई बाद समस्त अवशेष व ठूँठ आदि को मृदा में दबा दें या अन्य फसल बोने के बाद मल्च के रूप में प्रयोग करें।

दूसरी फसल हेतु भी खाद की उतनी ही मात्रा का प्रयोग करें। २०० ली./एकड़ की दर से तरल खाद सिंचाई जल के साथ फसल सीजन के दौरान ३-४ बार प्रयोग करें। अच्छी उत्पादकता के लिए २-३ बार वर्मीवाश या वर्मीवाश-गोमूत्र मिश्रण या पंचगब्य का पौधों पर स्प्रे रूप में प्रयोग करें।

फल उद्यानों में फल वृक्षों के बीच में उपयुक्त मात्रा में कम्पोस्ट व जैव उर्वरक का प्रयोग करें तथा ३-४ प्रकार की दलहनी फसलें सहफसलों के रूप में लगायें। फलियॉ तोड़ने के पश्चात् शेष फसल अवशिष्ट को तरल खाद से उपचारित कर मल्च रूप में प्रयोग करें।

लगभग १२-१८ माह बाद किसी भी प्रकार के संयोजन के साथ मृदा जैविक खेती के लिए उपयुक्त हो जायेगी। अगले २-३ वर्षों तक किसी भी फसल के साथ अंतः या सहयोगी फसल के रूप में दलहनी फसलों को अवश्य लें। सदैव यह सुनिश्चित करें कि फसल अवशिष्ट में कम से कम ३० प्रतिशत भाग दलहनी फसल का हो। मृदा में दबाने अथवा मल्च रूप में प्रयोग करने से पूर्व फसल अवशेष का तरल खाद से उपचार अवश्य करें।

**बहु फसल प्रणाली**

जैविक खेती में एकल फसल का कोई स्थान नहीं है। फार्म में सदैव ८-१० प्रकार की फसलें रखनी चाहिए। प्रत्येक खेत में २-४ फसलें रहनी चाहिए जिसमें एक फसल दलहनी होनी चाहिए। यदि एक ही खेत में २-३ फसलें लेना संभव न हो तो आस पास के खेतों में अलग-अलग फसलें लगायें तथा जैव विविधता व नाशी जीव प्रबंधन के लिये घर में उपयोग हेतु ५०-१५० सब्जियों के पौधे तथा १०० पौधे गेंदा के प्रत्येक फसल खेत में फैलाकर लगायें। गन्ना जैसी अधिक पोषण की मांग करने वाली फसल भी उपयुक्त दलहनी फसलों तथा सब्जी फसलों के साथ उगाई जा सकती है और अच्छी उत्पादकता प्राप्त की जा सकती है।

**फसल चक्र**

फसल चक्र जैविक खेती का आधारभूत स्तंभ है। मिट्टी की उर्वरता बनाये रखने और प्राकृतिक सूक्ष्म जीव प्रक्रियाओं की निरंतरता में फसल चक्र का महत्वपूर्ण योगदान है। एक ही खेत में अलग-अलग फसलों को एक के बाद एक एक चक्र रूप में उगाने की प्रक्रिया को फसल चक्र कहते हैं साधारणतया ३-४ वर्ष का फसल चक्र अपनाना चाहिए सभी उच्च पोषण मॉग वाली फसलों के पहले और बाद में दलहनी फसल आधरित फसल क्रम रखना चाहिए। फसल चक्र में विभिन्न फसलों के समावेश से मृदाजनित रोग तथा अन्य नाशीजीवों और खरपतवार नियंत्रण में मद्द मिलती है। इससे उत्पादकता तथा मृदा उर्वरता दोनो में सुधार होता है। विभिन्न फसलों की जड़ों के फैलाव से मिट्टी की भौतिक अवस्था में भी सुधार होता है। सभी धान्य व सब्जी फसलों के साथ दलहनी फसलों का फसल चक्र में समावेश किया जाना चाहिए। समय-समय पर हरी खाद फसलों को भी फसल चक्र में स्थान देना चाहिए।

भारतीय कृषि अनुसंधान परिषद के ''जैविक खेती का नेटवर्क कार्यक्रम'' के अंतर्गत विभिन्न फसल तंत्रों हेतु कुछ फसल चक्र सफल एवं लाभकारी पाये गये हैं। अध्ययनों में पाये गये कुछ महत्वपूर्ण फसल चक्र क्षेत्रानुसार निम्नप्रकार हैं:

- सोयाबीन -बरसीम/सरसों/चना (रायपुर, छत्तीसगढ़)
- टमाटर/बंद गोभी - फूल गोभी - मटर व मक्का - लहसुन (बजौरा, हिमाचल प्रदेश)
- धान -गेहूँ/आलू/सरसों/मसूर (रॉची, झारखंड)
- मूँगफली -रबी ज्वार, सोयाबीन - गेहूँ, आलू-चना, मिर्च+कपास+मक्का - चना (धारवाड़, कर्नाटक)
- सोयाबीन - गेहूँ/सरसों/चना/इसबगोल (भोपाल, मध्य प्रदेश)

- Rice – durum wheat/ berseem, rice – potato – Okra and rice – garlic, sorghum – berseem, maize – berseem – maize + coepea and sorghum + cluster bean – oats-cowpea at Ludhiana, Punjab
- Maize – cotton, chillies – onion and brinjal – sunflower at Coimbatore
- Sorghum – pea – okra at Modipuram, Uttar Pradesh
- Carrot/ rice (pre kharif) – rice (kharif), potato/rice (pre kharif) – rice (kharif), tomato/ rice (pre kharif) – rice (kharif), French bean/ rice (pre kharif) – rice (kharif) at Umiam, Meghalaya

**Status of rich and live organic soil**

A fertile and live organic soil ideally should have organic C between 0.8-1.5%. At any point of time it should have adequate quantity of dry, semi decomposed and fully decomposed organic matter for the use of micro-flora and fauna. Total microbial load (bacteria, fungi and actinomycetes) should be above 1 x $10^8$ /gm of soil. There should be at least 3-5 earth worms/cubic ft of soil. There should be enough quantity of small life forms and insects such as ants etc.

**Seed/ Planting material Treatment**

In organic management, protection measures are used only in the case of problematic situations. Use of disease free seed stock and resistant varieties is the best option. There is no standard formulation or treatment methodology, available as on today, but farmers use different methods. Few of such innovative seed treating formulations are as follows:

- Hot water treatment at 53$^0$C for 20-30 min.
- Cow urine or cow urine-termite mound soil paste
- Beejamrut
- Asphoetida 250gm in one lit. of water for 10 kg seed
- Turmeric rhizome powder mixed with cow urine
- Panchgavya extract
- Dashparni extract
- *Trichoderma viride* (4gm/kg seed) or *Pseudomonas fluorscens* (10gm/kg seed)
- Biofertilizers (Rhizobium/ Azotobacter +PSB)

**Preparation of Beejamruta –** Put 5 kg fresh cow dung in a cloth bag and suspend in a container filled with water to extract the soluble ingredients of dung. Suspend 50 g lime in 1 lit water separately. After 12 – 16 hours squeeze the bag to collect extract and add 5 lit cow urine, 50 gm virgin forest soil, lime water and 20 lit water. Incubate for 8-12 hours. Filter the contents. The filtrate is used for seed treatment.

**Manuring and soil enrichment**

During conversion period, soil fertility can be improved and maintained initially through use of organic inputs like well decomposed organic manure/ vermicompost, green manure and biofertilizers in appropriate quantity. These organic inputs are used for feeding the soil. Well fed healthy soil rich in microflora and microfauna takes care of the crop nutrient requirement. Plant biomass, FYM, Cattle dung manure, enriched compost, biodynamic compost, Cow-pat-pit compost and vermicompost are key sources of on-farm inputs. Among off-farm inputs, important components are non-edible oil cakes, poultry manure, biofertilizers, mineral grade rock phosphate and lime etc.

Lopping from Glyricidia and other plants grown on bunds, on-farm produced compost and vermicompost, animal dung and urine and crop residue should form the major source of nutrient and concentrated manures such as crushed oil cakes, poultry manure, vegetable market waste compost and other novel preparations such as biodynamic formulations etc can be used in appropriate quantity.

- धान - गेहूँ/बरसीम, धान-आलू-भिंडी तथा धान - लहसुन, ज्वार - बरसीम, मक्का - बरसीम - मक्का+चौला, ज्वार+ग्वार - जई -चौला (लुधियाना, पंजाब)
- मक्का -कपास, मिर्च -प्याज तथा बैंगन - सूर्यमुखी (कोयम्बटूर, तमिलनाडु)
- मक्का -मटर - भिंडी (मोदीपुरम, उत्तर प्रदेश) गाजर/धान (खरीफ पूर्व) - धान(खरीफ), आलू/धान -धान/टमाटर/धान-धान/फ्रैंच बीन/धान - धान (उमियम, मेघालय)

**समृद्ध तथा जीवंत मृदा**

एक उर्वर तथा जीवंत मृदा में जीवाशं (जैव कार्बन) का स्तर ०.८ से १.५ प्रतिशत के बीच रहना चाहिए। समस्त अवधि में सूक्ष्म जंतुओं व जीवों के प्रयोग हेतु इसमें पर्याप्त सूखा, अर्द्ध-अपघटित तथा पूर्ण अपघटित जैविक द्रव्य रहना चाहिए। मिट्टी में कुल सूक्ष्म जीवाणुओं (बैक्टीरिया, फफूँद तथा एक्टोनोमाइसिटीज) की मात्रा $1x10^8$ प्रति ग्राम से अधिक होनी चाहिए। कम से कम ३-४ केंचुए प्रति घन फिट हों। पर्याप्त मात्रा में छोटी जीवन अवधि वाले कीट पंतगे तथा चींटी आदि भी होने चाहिए।

**बीज पौध व कंद उपचार**

जैविक प्रबंधन में केवल समस्याग्रस्त क्षेत्रों/अवस्था में बचाव के उपाय किये जाते हैं। रोग रहित बीज तथा प्रतिरोधी प्रजातियों का प्रयोग सबसे अच्छा विकल्प हैं। यद्यपि अभी कोई भी मानक सूत्र उपचार विधि उपलब्ध नहीं है परंतु कृषक विभिन्न विधियों का प्रयोग करते हैं। कुछ अग्रणीं किसानों के बीज उपचार सूत्र निम्न प्रकार हैं:-

- ५० से.ग्रे. तापक्रम पर २०-३० मिनट तक गरम जल उपचार।
- गोमूत्र अथवा गौ-मूत्र-दीमक टीला मृदा पेस्ट।
- बीजामृत।
- हींग (Asphoetida) २५० ग्रा./१० कि.ग्रा. बीज की दर से।
- हल्दी पाउडर गौ-मूत्र में मिला कर भी बीज उपचार हेतु प्रयोग किया जा सकता है।
- पंचगव्य सत
- दशपर्णी सत
- ट्राईकोडर्मा विरीडी (०४ ग्रा./कि. बीज) या स्यूसोडोमोनास (Pseudomonas fluorscense) (१०० ग्रा./१ कि. बीज)
- जैव उर्वरक (राईजोबियम/एजोटोबैक्टर. पी.एस.बी.)

**बीजामृत बनाने की विधि**

५ किलो गाय के ताजा गोबर को एक कपड़े के थैले में डालकर १० लीटर पानी में लटका दें ताकि गोबर के सभी घुलनशील तत्व पानी में आ जायें। इसी प्रकार ५० ग्राम चूना १ लीटर पानी में डालकर रखें। १२-१८ घंटे बाद गोबर थैले को निचोड़कर अलग कर दें। अब इसमें ५ ली. गोमूत्र, चूना जल तथा ५०० ग्राम जंगल की मिट्टी मिलाकर ८-१२ घंटे तक रखें। छानकर बीज उपचार हेतु प्रयोग करें।

**मृदा समृद्धिकरण तथा खाद प्रयोग**

परिवर्तन कालावधि में भूमि उर्वरता में सुधार के लिए जैविक आदान जैसे अच्छी तरह सड़ी हुई गोबर खाद, कम्पोस्ट, वर्मीकम्पोस्ट, हरी खाद, जैव उर्वरक इत्यादि का उपयुक्त मात्रा में प्रयोग किया जाता है। ये सभी जैविक आदान फसलों के लिए पोषण स्रोत न होकर भूमि उर्वरता सुधारक अधिक होते हैं। अच्छी प्रकार पोषित मृदा, सूक्ष्म जीव व अन्य मृदा जन्य जीवों से समृद्ध होकर सभी प्रकार की फसलों का पोषण करने में सक्षम् है। फसल अवशिष्ट, गोबर खाद, पशुमल खाद, समृद्ध कम्पोस्ट, जैवगतिकीय कम्पोस्ट, काउपैटपिट कम्पोस्ट, वर्मीकम्पोस्ट ऐसे प्रमुख आदान हैं जो किसान के खेत पर ही तैयार किये जा सकते हैं। बाहर से लाये जाने/क्रय किये जाने वाले जैविक आदानों में प्रमुख हैं: विभिन्न प्रकार की खलियाँ, मुर्गी बीट खाद, जैव उर्वरक, रॉक फास्फेट, चूना इत्यादि।

मेढों पर लगे ग्लिरीसिडिया व अन्य पौधों के अवशेष, खेत पर उत्पादित कम्पोस्ट, वर्मीकम्पोस्ट, गोबर, गोमूत्र व फसल अवशिष्ट पोषण के प्रमुख स्रोत होने चाहिए। सांद्र जैविक खाद, खलियाँ, मुर्गीखाद अन्य कम्पोस्ट तथा जैव गतिकीय उत्पादों का भी उचित मात्रा में प्रयोग किया जाना चाहिए।

Use of high quantities of manures should be avoided. Changing crop rotations and multiple crops ensure better utilization of resources. Depending upon the type of crop and requirement of nutrients for different crops, the quantity of externally produced inputs is determined.

Application of liquid manure (for soil enrichment) is essential to maintain the activity of microorganisms and other life forms in the soil. 3-4 applications of liquid manure is essential for all types of crops. Vermiwash, compost tea, cow urine, Pachgavya and Biosol etc are excellent growth promoters when used as foliar spray. 3-5 sprays after 25-30 days of sowing ensure good productivity. Use of Biodynamic preparations, such as BD-500 and BD-501 as foliar spray has also been found to be effective in growth promotion.

**Use of Biofertilizers and microbial cultures**

Biofertilizers viz: Rhizobium, Azotobacter, Azospirillum, PSB and Pseudomonas etc have been found to be very effective tools of fertility management and biological nutrient mobilization. Recently customized consortia of such biofertilizer organisms, better adapted to local climatic conditions have also been developed and are available commercially. Efficiency of such microbial formulations is much higher under no-chemical use situations, therefore application of such inputs need to be ensured under all cropping situations.

**Some important formulations for soil enrichment**

**Preparation of liquid manures**

Many variants of liquid manures are being used by farmers of different states. Few important and widely used formulations are given below:

**Sanjivak** – Mix 100 kg cow dung, 100 lit cow urine and 500 gm jaggary in 300 lit of water in a 500-lit closed drum. Ferment for 10 days. Dilute with 20 times water and sprinkle in one acre either as soil spray or along with irrigation water.

**Jivamrut** – Mix cow dung 10 kg, cow urine 10 lit, Jaggary 2 kg, any pulse grain flour 2 kg and Live forest soil 1 kg in 200 lit water. Ferment for 5 to 7 days. Stir the solution regularly three times a day. Use in one acre with irrigation water.

**Amritpani** - Mix 10 kg cow dung with 500 gm honey and mix thoroughly to form a creamy paste. Add 250 gm of cow desi ghee and mix at high speed. Dilute with 200 lit water. Sprinkle this suspension in one acre over soil or with irrigation water. After 30 days apply second dose in between the row of plants or through irrigation water.

**Panchgavya** – Mix fresh cow dung 5 kg, cow urine 3 lit, cow milk 2 lit, curd 2 lit, cow butter oil 1 kg and ferment for 7 days with twice stirring per day. Dilute 3 lit of Panchgavya in 100 lit water and spray over soil. 20 lit panchgavya is needed per acre for soil application along with irrigation water.

**Enriched Panchgavya (or Dashagavya)** – Ingredients - cow dung 5 kg, cow urine 3 lit, cow milk 2 lit, curd 2 lit, cow deshi ghee 1 kg, sugarcane juice 3 lit, tender coconut water 3 lit, banana paste of 12 fruits and toddy or grape juice 2 lit. Mix cow dung and ghee in a container and ferment for 3 days with intermittent stirring. Add rest of the ingredients on the fourth day and ferment for 15 days with stirring twice daily. The formulation will be ready in 18 days. Sugarcane juice can be replaced wit 500 g jaggery in 3 lits water. In case of non-availability of toddy or grape juice 100g yeast powder mixed with 100 g jaggery and 2 lit of warm water can also be used. For foliar spray 3-4 lit dashgavya is diluted with 100lit water. For soil application 50 lit dashagavya is sufficient for one ha. It can also be used for seed treatment.

जैविक खादों का अत्यधिक प्रयोग नहीं किया जाना चाहिए। बदलते फसल चक्र, मिश्र फसल इत्यादि द्वारा संसाधनों का बेहतर उपयोग होता है।

फसलों के प्रकार तथा उनकी पोषण मॉंग के अनुरूप वाह्य आदानों के प्रयोग की मात्रा निर्धारित की जानी चाहिए।

विभिन्न सूक्ष्मजीवों व जीव रूपों के संधारण हेतु तरल खाद का प्रयोग अतिआवश्यक है। प्रत्येक फसल में ३-४ बार तरल खाद का प्रयोग किया जाना चाहिए। वर्मीवाश कम्पोस्ट अर्क पंचगब्य, बायोमोल तथा गोमूत्र भी अच्छे वृद्धिकारक हैं इनका स्प्रे रूप में प्रयोग लाभकारी है। बुवाई से २५-३० दिन बाद से ३-५ बार स्प्रे किया जाना चाहिए। जैव गतिकीय उत्पाद जैसे बी.डी. ५०० तथा बी. डी. ५०१ का भी स्प्रे रूप में प्रयोग लाभकारी पाया गया है।

**जैव उर्वरक व जीवाणु खाद**

उर्वरण प्रबंधन में जैव उर्वरकों (जैसे राइजोबियम, एजोटोबैक्टर, एजोस्पिरिलम, पी.एस.बी., स्यूडोमोनास) की प्रमुख भूमिका है। हाल ही में विकसित मिश्रित जैव उर्वरक भी प्रभावी पाये गये हैं। सभी सूक्ष्मजीव आदान रसायनिक आदानों की अनुपस्थिति में अधिक प्रभावी होते हैं अतः जैविक खेती में इनका प्रयोग सभी फसलों हेतु आवश्यक रूप से सुनिश्चित रुप से करना चाहिए।

**कुछ प्रमुख तरल खादों की निर्माण विधि**

विभिन्न राज्यों के किसानों द्वारा अनेक प्रकार के तरल खाद प्रयोग किये जा रहे हैं। कुछ महत्वपूर्ण वृहत् रूप से प्रयोग किये जाने वाले सूत्रों का विवरण नीचे दिया जा रहा है:-

- **संजीवक** - १०० कि.ग्रा. गाय का गोबर. १०० ली. गौ-मूत्र तथा ५०० ग्राम गुड़ को (५०० ली. क्षमता वाले मुह बन्द ड्रम में ) ३०० ली. जल में मिलाकर १० दिन हेतु सड़ने/गर्म होने दें। २० गुना पानी मिलाकर एक एकड़ क्षेत्र में मृदा पर स्प्रे करें अथवा सिंचाई जल के साथ प्रयोग करें।

- **जीवामृत** - १० कि.ग्रा. गाय का गोबर. १० ली. गौ-मूत्र. २ कि.ग्रा. गुड़. २ कि.ग्रा. किसी दाल का आटा. १ कि.ग्रा. जीवंत मृदा को २०० ली. जल में मिलाकर ५-७ दिनों हेतु सड़ने दें। नियमित रूप से दिन में ३ बार मिश्रण को हिलाते रहें। एक एकड़ क्षेत्र में सिंचाई जल के साथ प्रयोग करें।

- **अमृतपानी** - १० किलो गाय के ताजा गोबर में ५०० ग्राम शहद डालकर अच्छी प्रकार मिलायें। अब इसमें २०० ग्राम देशी घी मिलाकर तेजी से फेंटें। २०० लीटर जल में मिलाकर प्रयोग करें। यह मिश्रण एक एकड़ मृदा हेतु उपयुक्त है। बुवाई पूर्व सिंचाई जल के साथ या भूमि पर छिडककर प्रयोग करें। ३० दिन पश्चात सिंचाई जल के साथ दूसरी खुराक दें।

- **पंचगव्य** - गाय गोबर घोल ४ कि.ग्रा.. गाय का ताजा गोबर १ कि.ग्रा. गौ-मूत्र ३ ली.. गाय दूध ३ ली. छाछ २ ली तथा गाय घी १ कि.ग्रा. को मिलाकर ७ दिन तक सड़ने (किण्वन) दें। प्रतिदिन २ बार हिलायें। ३ ली. पंचगव्य को १०० ली. पानी में घोलकर मृदा पर छिड़काव करें। २० ली. पंचगव्य सिंचाई जल के साथ एक एकड़ मृदा हेतु उपयुक्त है।

- **समृद्ध पंचगव्य (या दशगव्य)** - सामग्री - ५ कि.ग्रा. ताजा गाय का गोबर, ३ ली. गौ-मूत्र, २ ली. गाय का दूध, २ ली. छाछ, १ ली. गाय का घी, ३ ली. गन्ना रस, ३ ली. नारियल पानी, १२ पके केले व २ लीटर ताडी तथा अंगूर का रस। गोबर और घी को मिलाकर तीन दिन तक सडायें। बीच-बीच में मिश्रण को हिलाते रहें। चौथे दिन बाकी सभी सामग्री इसमें मिला दें और १५ दिन तक रखें। बीच-बीच में हिलाते रहें दशगब्य लगभग १८ दिन में बनकर तैयार हो जाता है। गन्ने के रस के स्थान पर गुड़ को ३ लीटर पानी में घोलकर प्रयोग किया जा सकता है। ताडी व अंगूर रस के स्थान पर १०० ग्राम गुड़ को पानी में घोलकर १०० ग्राम खमीर चूर्ण के साथ मिलाकर प्रयोग कर सकते हैं। ३-४ लीटर दशगव्य १०० लीटर पानी में मिलाकर प्रयोग किया जाता है। एक एकड़ हेतु ५० लीटर दशगव्य पर्याप्त है। बीज उपचार हेतु भी दशगव्य का प्रयोग किया जा सकता है।

**Management of Temperature**

Temperature in summer season is quite high and need to be managed. It can be achieved by keeping soil covered with biological mulch. Surface mulch has been reported to conserve soil moisture and improve water use efficiency. In a long term experiment at ICRISAT, it has been reported that mulch applied in this manner on the hottest day of summer (April 30) in 2002 the soil temperature at 5 and 10 cm depth in the mulch applied plots was 6.5 to 7.3° C lower than in control plot. Temperature control can also be achieved by planting different types of trees like neem, amla, tamarind, gular, zizipus bushes, gliricidia etc on bunds.

**Protection to all life forms**

Practice of maintaining enough biomass and mulching with crop and weed residue will ensure the protection to all life forms in soil. Another important practice of banning the chemical fertilizers and pesticides in farming definitely helps in protecting the life forms in soil. For the survivability of different life forms the field must have dry organic matter as a food for small insects and small animals in soil, semi decomposed organic matter as food for earthworms and fully decomposed organic matter for micro organisms in the soil at all times. These insects, small animals, earthworms and microorganisms are the tireless natural employees of the soil, wherein small animals and insects feed on the larvae of pests and thus controlling the pest ,earthworms makes the soil porous thus creating the more aerobic conditions in soil and also decompose the half digested organic residue and release locked nutrients into soil. Soil rich in organic carbon contain ample quantity of beneficial micro flora which plays an important role in recycling of nutrients and nitrogen fixation, phosphate solubilization and photosynthesis activity, cellulolytic activity. Therefore protection to all life forms in soil should be ensured at all time.

**Pest management**

As in organic farming management use of synthetic chemicals are prohibited, the pest management is done by: (i) cultural or agronomic (ii) mechanical (iii) biological or by (iv) organically acceptable botanical extract or some chemicals such as copper sulphate and soft soap etc.

**Cultural alternative** - Use of disease free seed or stock and resistant varieties are best preventive practice in organic pest management. Maintenance of biodiversity, effective crop rotation, multiple cropping, habitat manipulation and use of trap crops are also effective practices which can keep the population of pests below economical threshold limit (ETL).

**Mechanical alternative** - Removal of affected plants and plant parts, collection & destruction of egg masses and larvae, installation of bird perches, light traps, sticky colored plates and pheromone traps are most effective mechanical methods of pest control.

**Biological alternative** - Use of pest predators and pathogens has also proved to be effective method of keeping pest problem below ETL. Inundative release of *Trichogramma sp*. @ 40,000 to 50,000 eggs per hectare, *Chelonus blackburni* @15,000 to 20, 000 eggs per hectare, *Apanteles* sp.@15,000 to 20,000 eggs per ha and *Chrysoperla sp*.@ 5,000 eggs per ha., after 15 days & others parasites & predators after 30 days of sowing, can also effectively control pest problem in organic farming .

**Use of Biopesticides -** *Trichoderma viride* or *T. harazianum* or *Pseudomonas fluorescence* formulation @ 4gm/kg seed either alone or in combination, manage most of the seed borne & soil borne diseases. There are other formulations viz. *Beauvaria bassiana*, *Metarizium anisopliae*, *Numeria rileyi*, *Verticillium* sp, which are available in the market and can manage their specific host pest.

**तापमान प्रबंधन**

गर्मियों में उच्च तापमान से भी मृदा की सुरक्षा जरूरी है। मृदा को हमेशा जीवांश से ढ़ककर (मल्चिंग) रखने से मृदा तापमान को नियंत्रित किया जा सकता है। सतही आच्छादन से नमी संधारण में मदद मिलती है और जल उपयोग क्षमता में सुधार होता है। अंर्तराष्ट्रीय अनुसंधान संस्थान इक्रीसेट के दीर्घावधि परीक्षणों में पाया गया कि सतह आच्छादन से मृदा में ५ तथा १० से.मी. की गहराई में ६.५ से ७.३ डिग्री से.ग्रे. तक तापमान में कमी आती है। तापमान नियंत्रण में मेढों पर लगाये गये वृक्ष जैसे नीम, ऑवला, इमली, गूलर, बेर, ग्लिरीसिडिया इत्यादि भी मद्दगार हैं।

**सभी जीव स्वरूपों की रक्षा**

मृदा में उपयुक्त जीवांश तथा फसल व खरपतवार अवशिष्ट द्वारा सतही आच्छादन से मृदा में उपस्थित जीव स्वरूपों की रक्षा होती है। रासायनिक खादों एवं कीटनाशी रसायनों के प्रयोग पर प्रतिबंध से भी जीव स्वरूपों की रक्षा सुनिश्चित होती है। विभिन्न जीव रूपों की रक्षा एवं संधारण हेतु आवश्यक है कि मृदा में सूखा अवशिष्ट अर्द्ध अपघटित अवशिष्ट व पूर्ण अपघटित अवशिष्ट हर समय उपलब्ध होना चाहिए। कुछ जीव जैसे दीमक सूखा अवशिष्ट खाती है। केंचुए और अनेक प्रकार के फफूँदों हेतु अर्द्धगला जीवांश आवश्यक है जबकि मित्र सूक्ष्मजीव पूर्ण रूप से अपघटित अवशिष्ट से पलते हैं। ये सभी मित्र कीट, फफूँद, केंचुए तथा सूक्ष्मजीव मिट्टी में अनवरत कार्यरत रहते हैं और अपनी जैविक प्रक्रिया द्वारा मिट्टी को उर्वरा बनाते हैं, नाशीजीवों की रोकथाम करते हैं, पौध अवशिष्ट को कम्पोस्ट में परिवर्तित करते हैं तथा विभिन्न पोषक तत्वों को उनके अनुपलब्ध स्वरूपों से उपलब्ध स्वरूप में परिवर्तित करते हैं। जैव अंश से भरपूर मिट्टी में सभी मित्र सूक्ष्म जीव जैसे नत्रजन स्थिरीकारक, फास्फोरस घोलक, सैल्यूलोज अपघटक इत्यादि जीव विभिन्न पोषक तत्व चक्रण में सहायक हैं और उनकी निरंतर उपलब्धता सुनिश्चित करते हैं अतः इन सभी जीव स्वरूपों की हर हाल में रक्षा की जानी चाहिए।

**नाशी जीव प्रबंधन**

जैविक खेती प्रबंधन में रासायनिक कीटनाशकों का प्रयोग वर्जित है अतः नाशी जीव प्रबंधन प्रथमतया निम्न विधियों द्वारा किया जाता है:-

१. जुताई व्यवस्था

२. यांत्रिक

३. जैविक, तथा

४. स्वीकार योग्य वैकल्पिक जैव रसायन या पौध अर्क।

- **जुताई विकल्प** (Cultural Alternative):- रोग रहित बीज तथा प्रतिरोधी प्रजातियॉं जैविक जीव नाशी प्रबंधन की सबसे अच्छी बचाव विधि है। जैव विविधता का रख-रखाव, प्रभावी फसल चक्र, बहु फसल, कीटों के प्राकृतिक वास में बदलाव तथा ट्रैप फसल का प्रयोग भी प्रभावी विधियाँ है जिससे नाशी जीवों की जनसंख्या को नियंत्रित रखा जा सकता है।
- **यांत्रिक विकल्प** - रोग प्रभावित पौधे तथा रोग ग्रस्त भाग को अलग हटाना। अंडा तथा लार्वा समूहों को इकट्ठा करके नष्ट करना, चिड़ियों के बैठने के स्थान की स्थापना, प्रकाश पिंजरा (Light Traps), चिपचिपी रंगीन पट्टी तथा फैरोमेन ट्रेप्स आदि नाशी जीव नियंत्रण की सबसे अधिक प्रभावशाली विधियॉं हैं।
- **जैविक विकल्प** - नाशी जीवों का भक्षण करने वाले जीव-जंतु तथा रोधी प्रजातियॉं नाशी जीव नियंत्रण में सबसे अधिक प्रभावी सिद्ध हुई है। ट्राईकोग्रामा ४०-५० हजार अंडे/हेक्टेयर, *चैलोनस ब्लैक बर्नी (Chelonus blackburni)* १५-२० हजार अंडे/हेक्टेयर एपानटेलिस (Apanteles sp.) १५-२० हजार अंडे/है. तथा क्राईसोपरला (Chrysoperlla) के ५ हजार अंडे/हेक्टेयर बुवाई के १५ दिन बाद तथा नाशी जीवों का भक्षण करने वाले जीव जंतु (Predators) तथा अन्य परजीवी बुवाई के ३० दिन बाद प्रयोग करने से जैविक खेती में नाशी जीव समस्या का नियंत्रण प्रभावशाली ढंग से हो सकता है।
- **जैविक नाशीजीव नाशकों का प्रयोग** - ट्राईकोडर्मा विरीडी या ट्राईकोडर्मा हारजिएनम *(Trichoderma viride or T. harazianum)* या स्यूडोमोनास *(Pseudomonas fluorescence)* ४ ग्रा./कि. बीज अकेले अथवा संयुक्त रूप से अधिकांश बीज जनित या मृदा जनित रोगों के नियंत्रण में प्रभावी है। बाजार में उपलब्ध बवेरिया वैसीआना *(Beauvaria bassiana)*, मेटाराईजियम एनीसोप्लीआई (Metarizium anisopliae) आदि विशेष नाशीजीव समुदाय का प्रबंधन कर सकते हैं।

*Bacillus thurengensis stenebrionis and B.thurengensis sandigo* are effective against coleopterans as well as some other insect species. Bt. has been used in the management of diamond back moth on crucifers and vegetables @ 0.5-1.0 kg. formulation per ha. Viral biopesticides of baculovirus group viz. granulosis viruses (GV) and nuclear polyhedrosis viruses provided a great scope in plant protection field. Spray of nuclear polyhedrosis viruses (NPV) of *Helicoverpa armigera* (H) or *Spodoptera litura* (S) @ 250 larval equivalents are very effective tools to manage the *Helicoverpa* sp. or *Spodoptera* sp. respectively.

**Botanical pesticides**

Many plants are known to have pesticidal properties and the extract of such plants or its refined forms can be used in the management of pests. Among various plants identified for the purpose, neem has been found to be most effective.

**Neem (*Azadirachta indica*)** – Neem has been found to be effective in the management of approximately 200 insects, pests and nematodes. Neem is very effective against grasshoppers, leaf hoppers, plant hoppers, aphids, jassids, and moth caterpillars. Neem extracts, are also very effective against beetle larvae, butterfly, moth and caterpillars such as Mexican bean beetle, Colorado potato beetle and diamondback moth. Neem is very effective against grasshoppers, leaf minor and leaf hoppers such as variegated grasshoppers, green rice leaf hopper and cotton jassids. Neem is fairly good in managing beetles, aphids and white flies, mealy bug, scale insects, adult bugs, fruit maggots and spider mites.

**Some other pest control formulations**

Many organic farmers and NGOs have developed large number of innovative formulations which are effectively used for control of various pests. Although none of these formulations have been subjected to scientific validation but their wide acceptance by farmers speak of their usefulness. Farmers can try these formulations, as they can be prepared on their own farm without the need of any purchases. Some of the popular formulations are listed below:

**Cow urine –** Cow urine diluted with water in ratio of 1: 20 and used as foliar spray is not only effective in the management of pathogens & insects, but also acts as effective growth promoter for the crop.

**Fermented curd water** – In some parts of central India fermented curd water (butter milk or *Chaach*) is also being used for the management of white fly, jassids aphids etc.

**Dashparni extract** – Crush neem leaves 5 kg, Vitex negundo leaves 2 kg, Aristolochia leaves 2 kg, papaya (Carica papaya)leaves, 2 kg, Tinospora cordifolia leaves 2 kg, Annona squamosa (Custard apple) leaves 2 kg, Pongamia pinnata (Karanja) leaves 2 kg, Ricinus communis (Castor) leaves 2 kg, Nerium indicum 2 kg, Calotropis procera leaves 2 kg, Green chilly paste 2 kg, Garlic paste 250 gm, Cow dung 3 kg and Cow Urine 5 lit in 200 lit water ferment for one month. Shake regularly three times a day. Extract after crushing and filtering. The extract can be stored up to 6 months and is sufficient for one acre.

**Neem-Cow urine extract** - Crush 5 kg neem leaves in water, add 5lit cow urine and 2 kg cow dung, ferment for 24 hrs with intermittent stirring, filter squeeze the extract and dilute to 100 lit, use as foliar spray over one acre. Useful against sucking pests and mealy bugs.

**Mixed leaves extract** - Crush 3 kg neem leaves in 10 lit cow urine. Crush 2 kg custard apple leaf, 2 kg papaya leaf, 2kg pomegranate leaves, 2 kg guava leaves in water. Mix the two and boil 5 times at some interval till it becomes half.

- बैसिलस बैक्टीरिया के नाशीजीव नाशक कुछ अन्य कीट जातियों के विरूद्ध प्रभावी हैं।
- **विषाणु जैव कीटनाशक** – *वैक्यूलोवाइरस (Baculovirus)* समूह जैसे *ग्रेनूलोसिस वायरस* (जी. वी) *(Granulosis viruses)* (G.V) तथा न्यूक्लियर पोली हेड्रोसिस वायरस एन.पी.वी. (Nuclear Poly - hedrosis Viruses) (N.P.V.) का प्रयोग *हैलीकोवर्पा आर्मीजेरा (Helicoverpa armigera)* तथा *स्पीडोपटेरा लिटूरा (Spodoptera)* २५० इल्ली समकक्ष (larval equivalent) के नियंत्रण में बहुत प्रभावी है।

**वानस्पतिक कीटनाशक** – बहुत से वृक्ष कीटनाशी गुणों के कारण जाने जाते हैं। ऐसे वृक्षों की पत्तियों/बीजों का सत्/अर्क नाशीजीवों के प्रबंधन में प्रयोग किया जा सकता है। अनेक प्रकार के वृक्ष व पौधे इस उद्देश्य से चिन्हित किये गये हैं जिनमें नीम सर्वाधिक प्रभावशाली पाया गया है।

### नीम (*Azadiracta indica*)

नीम २०० नाशी जीव कीटों तथा सूत्रकृमियों के प्रबंधन में प्रभावी पाया गया है। ग्रास हौपर, लीफ हौपर, प्लांट हौपर, एफिड, जैसिड तथा मौथ, इल्ली के लिए नीम अर्क व तेल बहुत प्रभावी है। नीम अर्क बीटल लार्वा, बटर फ्लाई, मौथ व कैटर पिलर जैसे कौक्सिकन बीन बीटल, *कोलोरेड़ो पुटेटो* बीटल तथा ड़ाइमंड बैक मोथ के लिए भी बहुत प्रभावी है। नीम ग्रास हौपर, लीफ माइनर, तथा लीफ हौपर जैसे वैरीएगिटिड़, ग्रास हौपर, धान की हरी पत्ती का हॉपर तथा कपास का जैसिड़ नियंत्रण में भी बहुत प्रभावी है। बीटल, एफिडस् सफेद मक्खी, मिली बग, स्केल, कीट वयस्क बग गैमोट तथा स्पाइड़र का प्रबंधन भी नीम अर्क द्वारा किया जा सकता है।

### कुछ अन्य नाशी जीव प्रबंधन सूत्र

बहुत से जैविक किसान तथा गैर सरकारी संगठनों ने बड़ी संख्या में अग्रणी सूत्र विकसित किये हैं जो विभिन्न नाशी जीवों के प्रबंधन हेतु प्रयोग किये जाते हैं। यद्यपि इन सूत्रों की वैज्ञानिक रूप में वैधता नहीं है, फिर भी उनका किसानों द्वारा बड़े पैमाने पर प्रयोग किया जाना उनकी उपयोगिता का द्योतक है। किसान इन सूत्रों को प्रयोग करने का प्रयास कर सकते हैं क्योंकि ये बिना क्रय के उनके खेत पर ही तैयार किये जा सकते हैं। कुछ लोकप्रिय सूत्र निम्न प्रकार सूचीबद्ध किये गये हैं:-

- **गौ-मूत्र** – एक लीटर गोमूत्र २० ली. पानी में मिलाकर पर्णीय छिड़काव से अनेक रोगाणुओं तथा कीटों के प्रबंधन के साथ-साथ फसल वृद्धि नियामक (Groth Promoter) का कार्य भी करता है।
- **सड़ा हुआ छाछ पानी** – मध्य भारत के कुछ भागों में सड़ा हुआ छाछ पानी, सफेद मक्खी, एफिड़ आदि के प्रबंधन में सहायक पाया गया है।
- **दश पर्णी सत्** – ५ कि. नीम पत्ती + २ कि. निर्गुन्डी पत्ते + २ कि. सर्प गंधा पत्ते + २ कि. गुडुची पत्ते + २ कि शरीफा के पत्ते + २ कि. करंज पत्ते + २ कि. एरंड पत्ते + २ कि. कनेर पत्ते + २ कि. आक पत्ते + २ कि. हरी मिर्च लुगदी + २५० ग्राम लहसुन लुगदी + ५ ली. गौ-मूत्र + ३ कि. गाय गोबर को २०० ली. पानी में कुचलें और एक माह तक सड़ने दें। दिन में दो से तीन बार हिलाते रहें। सत् को कुचलने के बाद छानें। सत् छः माह हेतु भंडारित किया जा सकता है तथा एक एकड़ क्षेत्र में स्प्रे हेतु पर्याप्त है।

**नीम-गोमूत्र अर्क** – ५ कि. नीम पत्ती पानी में कुचलें। इसमें ५ ली. गौ-मूत्र तथा २ कि. गाय का गोबर मिलायें। २४ घंटे तक सड़ने दें। थोड़े-थोड़े अंतराल से हिलायें। सत् को निचोड़कर छानें तथा १०० ली. पानी में पतला करें। एक एकड़ क्षेत्र में पर्णीय छिड़काव हेतु प्रयोग करें। इससे चूसने वाले कीटों तथा मिली बग का नियंत्रण किया जा सकता है।

**मिश्रित पत्ती अर्क** – (१). तीन किलो नीम पत्ती को १० ली. गौ-मूत्र में कुचलें। (२). २ कि. शरीफा के पत्ते + २ कि. पपीता पत्ती + २ कि. अनार पत्ती + २ कि. अरंडी पत्ती + २ कि. अमरूद (Guava) पत्ती को पानी में कुचलें। दोनो मिश्रण को मिलायें। थोड़ी-थोड़ी देर के अन्तराल पर (५ बार) तब तक उबालें जब तक कि यह घटकर आधा न रह जाये।

Keep for 24 hrs, then filter squeeze the extract. This can be stored in bottles for 6 months. Dilute 2-2.5 lit of this extract to 100 lit for 1 acre. Useful against sucking pests, pod/fruit borers.

**Chilli-garlic extract** - Crush 1 kg Ipomea (besharam) leaves, 500 gm hot chilli, 500 gm garlic and 5 kg neem leaves in 10 lit cow urine. Boil the suspension 5 times till it becomes half. Filter squeeze the extract. Store in glass or plastic bottles. 2-3 lit extract diluted to 100 lit is used for one acre. Useful against leaf roller, stem/fruit/pod borer

**Broad spectrum formulation - 1 -** In a copper container mix 3 kg fresh crushed neem leaves and 1 kg neem seed kernel powder with 10 lit of cow urine. Seal the container and allow the suspension to ferment for 10 days. After 10 days boil the suspension, till the volume is reduced to half. Ground 500 gm green chillies in 1 lit of water and keep overnight. In another container crush 250gm of garlic in water and keep overnight. Next day mix the boiled extract, chilli extract and garlic extract. Mix thoroughly and filter. This is a broad spectrum pesticide and can be used on all crops against wide variety of insects. Use 250 ml of this concentrate in 15 lit of water for spray.

**Broad spectrum formulation - 2** Suspend 5 kg neem seed kernel powder, 1kg Karanj seed powder, 5 kg chopped leaves of besharam (*Ipomea* sp.) and 5kg chopped neem leaves in a 20lit drum. Add 10-12 lit of cow urine and fill the drum with water to make 150 lit. Seal the drum and allow it to ferment for 8-10 days. After 8 days mix the contents and distil in a distiller. Distillate will act as a good pesticide and growth promoter. Distillate obtained from 150lit liquid will be sufficient for one acre. Dilute in appropriate proportion and use as foliar spray. Distillate can be kept for few months without any loss in characteristics.

## Norman Borlague – A Great Visionary

**(March 25, 1914 – September 12, 2009)**

The Union Minister of Agriculture, Consumer Affairs, Food and Public Distribution Shri Sharad Pawar has condoled the death of eminent agriculture scientist Norman Borlaug. In his condolence message he said that Borlaug's contribution will always be remembered for the world peace he heralded through increasing food supply and saving over 245 million lives worldwide. India amongst many other nations of the world owes a debt of gratitude to this outstanding personality.

Following is the text of Shri Pawar's Condolence massage:
"*In the death of Norman Borlaug, the world today has lost not only an eminent agriculture scientist but a man dedicated to the cause of humanity. Father of the Green Revolution, Norman Borlaug is credited with what he himself described as "a temporary success in man's war against hunger and deprivation*."

Recipient of the Nobel Peace Prize and the Padma Vibhushan, Borlaugh's contribution will always be remembered for the world peace he heralded through increasing food supply and saving over 245 million lives worldwide. India amongst many other nations of the world owes a debt of gratitude to this outstanding personality. As India moves towards the 2nd Green Revolution, his enduring vision will be a source of inspiration and sustenance for all of us.

२४ घंटे रखने के बाद निचोड़कर छानें। यह बोतलों में छः माह तक भंडारित किया जा सकता है। २-२.५ ली. सत् में १०० ली. पानी मिलाकर यह घोल एक एकड़ हेतु पर्याप्त है। यह रस चूसने वाले तथा तना व फल छेदक कीटों के नियंत्रण में लाभकारी है।

**मिर्च लहसुन अर्क** - १ कि. बेशरम (Ipomea) पत्ती + ५०० ग्राम हरी तीखी मिर्च + ५०० ग्राम लहसुन + ५०० ग्राम नीम पत्ती। सबको १० ली. गौ-मूत्र में कुचलें। इसे तब तक उबालें जब तक कि यह घटकर आधा न रह जाये। सत् को निचोड़ कर छाने। शीशे या प्लास्टिक बोतलों में भंडारित करें। २-३ ली. सत् में १०० ली. पानी मिलायें। यह एक एकड़ छिड़काव हेतु पर्याप्त है। यह अर्क पत्ती लपेट कीट, तना, फल तथा फली छेदक के नियंत्रण में लाभकारी है।

**बहुउपयोगी सूत्र -१** - एक तॉबे के पात्र में ३ किलो नीम पत्ती, १ किलो निंबोली चूर्ण १० लीटर गोमूत्र में कुचलें और १० दिन के लिए सड़ने दें। १० दिन प्श्चात् इस मिश्रण को तब तक उबालें जब तक कि द्रव आधा न रह जाये। एक अलग पात्र में ५०० ग्राम हरी मिर्च को एक लीटर पानी में कुचलें, एक और पात्र में २५० ग्राम लहसुन को पानी में कुचलें तथा १२ घंटे तक छोंड़ दें। अगले दिन सभी अर्कों को एक साथ मिलाकर छान लें। यह बहुउपयोगी नाशीजीव नाशक अर्क अनेक प्रकार के नाशीकीटों के प्रबंधन में सहायक है। १५ लीटर पानी में २५० मि.ली. अर्क मिलाकर स्प्रे करें।

**बहुउपयोगी सूत्र -२** - ५ किलो निंबोली चूर्ण, एक किलो करंज बीज चूर्ण, ५ किलो बेशरम की पत्तियॉं तथा ५ किलो नीम की पत्तियों को १०-१२ लीटर गोमूत्र में कुचलें तथा पानी मिलाकर १५० लीटर कर दें। ८-१० दिन तक ढककर छोड़ दें और सड़ने दें। ८ दिन पश्चात् अच्छी प्रकार मिलायें और आसवन पात्र में डालकर आसवन करें। १५० लीटर मिश्रण से प्राप्त आसवित द्रव एक एकड़ हेतु पर्याप्त है। इस द्रव को ६ माह तक भंडारित किया जा सकता है। १५ लीटर पानी में एक लीटर अर्क मिलाकर स्प्रे करें।

## Norman Borlague – A Legend

**(March 25, 1914 – September 12, 2009)**

**Norman Ernest Borlaug** an American agronomist, humanitarian, and Nobel laureate died after a prolonged illness on September 12, 2009. The deemed father of the Green Revolution, Borlaug was one of only six people to have won the Nobel Peace Prize, the Presidential Medal of Freedom and the Congressional Gold Medal of USA. He was also a recipient of the Padma Vibhushan, India's second-highest civilian honor. Borlaug's discoveries have been estimated to have saved over one billion lives worldwide. Borlaug received his Ph.D. in plant pathology and genetics from the University of Minnesota in 1942. He took up an agricultural research position in Mexico, where he developed semi-dwarf, high-yield, disease-resistant wheat varieties. During the mid-20th century, Borlaug led the introduction of these high-yielding varieties combined with modern agricultural production techniques to Mexico, India and Pakistan. As a result, Mexico became a net exporter of wheat by 1963. Between 1965 and 1970, wheat yields nearly doubled in India and Pakistan, greatly improving the food security. These collective increases in yield have been labeled the Green Revolution, and Borlaug is often credited with saving over a billion people from starvation. He was awarded the Nobel Peace Prize in 1970 in recognition of his contributions to world peace through increasing food supply. Later in his life, he helped apply these methods of increasing food production to Asia and Africa.

# India Organic News

**Rich Inside – Karnataka Farmers Slowly Switching to Organic Farming –** The Dyamakkanavara in the Sula Village, on the outskirts of Hubli, are among the many certified organic farming households in the district. The joint family converted its 26 acre land into an organic farm three years ago. The five brothers grow traditional crops like chilli, cotton, wheat and Bengal gram, using organic inputs and methods. "We have benefitted from this" says Mallappa's son Kamlesh who studied Agriculture in college. The family does not buy seeds. They save a portion of crop to be used as seed. They do not buy any fertilizer either. Nutrient management is done by using compost, vermicompost and algae in the soil and crops. Having a mid size dairy in his backyard helps. They choose native breeds of crops which are disease and pest resistant. Protect crops by spraying neem oil and other organic pesticides. "We save lot of money as we make our own inputs" says Kamlesh. The experience of growing 12 crops over three years has shown that organic farming is labour intensive. Increased labour cost tend to make organic produce costlier compared to conventional which are being subsidized heavily. The other problem is of market linkages. The Government of Karnataka is aware of such constraints and is confident that this problem will be solved in due course. "We are not only training farmers in organic practices, but are also trying to provide them market linkages", say Teerthahalli Anand, Chairman of the Karnataka Organic Farming Mission. We are creating awareness through NGOs, SHGs and farmer clubs. We have identified a nodal NGO in each district. The NGOs and Agriculture Department officials will organize lectures through experts, demonstration by organic farmers and study tours he said. According to Mr Anand, Agricultural Universities will soon start training farmers in organic farming. The Mission has set a target of motivating 300 farmers in each of the 175 Talukas to switch to organic farming in next 3-5 years. Most Small and Marginal farmers use organic methods now. We just want to make sure they do it systematically. We are confident that once they realize its benefits, they will slowly adopt it. The Organic Farming Institute in the UAS, Dharwad has taken up research, development and extension of organic methods. Five years of research has revealed that organic methods have made soil fertile. We have also developed methods that could help convert chemical farming areas into organic fields, H.B. Babalad, Senior Scientist at the Institute said. (Source – The Times of India, Bangalore, September 11, 2009)

**Subsidy for organic fertilizers necessary for food security –** For fostering sustainable development Green Peace India is organizing various seminars and public hearings. In one of such hearings aimed at gathering grass root level responses to the fertilizer subsidy reforms proposed by the Central Government, Bharatesh Reddy, District President of Karnataka State Organic Farming Mission, said: "Every year the Central Government spends crores of rupees on chemical fertilizer subsidies. The budget allocation for 2009-10 for fertilizer subsidies is Rs.49,980/- crores. "Organic farmers who contribute to food security of the country with minimum damage to the environment are kept out of the subsidy benefits. However, the Karnataka Government provides subsidy for organic farming. This model can be adopted by the centre." Ganapathi, a soil scientist from the Organic Farming Research Institute, added: "Soil is the capital for the farmer and this needs to be protected through encouraging eco-friendly agricultural practices. Over dependence on chemical fertilizers should be avoided as it can jeopardize food security of the country."

Stressing that complete shift from synthetic to organic nitrogen farming is feasible, Gopikrishna S.R. of Greenpeace India said: "We will be organizing similar public hearings in different parts of the country. The ideas and suggestions generated would be compiled and presented to the centre." (Source – Samay Live Thu, 27 Aug 2009)

**Organic practices more profitable for farmers -** Organic Farming Institute researchers at the University of Agricultural Science (UAS) in Dharwad have found that organic farm practices in soybean, rain-fed wheat, groundnut, chili and cotton give the same yield as those given by modern inorganic practices. However, they found that farmers adopting organic technology took two to three years to make a complete switch-over. Findings of the five-year-long research were made public at a workshop held at UAS earlier this week. UAS Director of Research, Dr P M Salimath, told `The Times of India' that the institute now plans to create awareness about this among farmers by taking up field trials. He said since many ryots in Karnataka were adopting organic farming methods, they needed extensive information on organic farming techniques. The institute has undertaken the research as part of a programme of the Indian Council of Agricultural Research. Dr Salimath said as organic farming is gaining popularity nationally and internationally, the government was also promoting it as a mission since 2004. The institute has developed crop management, nutrition management and pest control techniques in accordance with the national guidelines. It also emerged at the workshop that since many farmers in Karnataka were opting for BT cotton in irrigated areas of the state, those in the semi-arid rain-fed areas were also tempted to adopt BT cotton in view of the fact that it was proving economically more viable. Scientists suggested that such farmers could get additional income by taking up inter-cropping. Coriander, vegetables or green gram can be sown in between rows of BT cotton. These crops will not harm the main crops and will bring additional income ranging from Rs 58,000-Rs 67,000 per hectare. They said inter-crops did not require long-term investment or large-scale farm labour input. Vegetable crops and coriander were ready for harvest in 30 to 35 days. Beans could be harvested in 50 days and green gram in 70 to 75 days. Such practices would make farming more profitable. (Source: The Times of India, Hubli 28/08/2009)

**India aims to raise organic farming area to 2 mn hectares by 2012-**The area under organic farming is growing steadily and is likely to touch 20 lakh hectares by 2012, an agriculture promoting body today said. The area under organic farming witnessed nearly 39 per cent growth during 2008-09 to 12 lakh hectares compared to 8.65 lakh hectares in the year-ago period, International Competence Centre for Organic Agriculture (ICCOA) President, Mukesh Gupta told reporters here. "We are targeting the acreage under organic farming to go up to 20 lakh hectares by 2012," he said. Besides, ICCOA is also aiming the organic food exports to grow to Rs 4,500 crore, taking the country's total global share to 2.5 per cent from the current 0.2 per cent, Gupta said. Gupta said around Rs 60,000 crore worth food goes waste every year at a time when the country is reeling under drought and escalating price rise. Organic farming can help reduce the amount of wastage as the shelf life of produce is higher, he added. The country exports about Rs 450 crore worth organic food, he said, adding that 9.5 lakh farmers in the country have registered as organic farmers. Gupta pointed out that organic farming, using improved variety of seeds is the best option to fight drought like situation. "Organic farming improves soil health and ensures food safety," he said. (Source: Press Trust of India / New Delhi August 27, 2009)

**Organic farming in Assam -** Assam is embracing organic farming in a big way with

the help of the Central Government. In a historic move, two companies, to promote organic cultivation in Assam's hilly Karbi Anglong district have been launched recently. The main aim of the companies is to help tribal people belonging to the Karbi tribe realize better returns from their land. This initiative is designed to promote organic cultivation of turmeric, ginger and chilli in the district on a large-scale and also to promote processing and export. The State Agricultural Department initiated a pilot scheme jointly with the Government of India in 2004 for organic farming in the districts of Udalguri, Sonitpur and North Lakhimpur covering an area of 91 hectares and involving 154 farmers. This scheme led to the production of 133 MT of Joha rice in the year 2007 and last year it produced 60 MT of this aromatic variety of rice. The Geneva-based SGS India certified the products of the scheme and with the help of the Haryana based Sunstar Overseas Limited export process of this aromatic rice to Germany, Switzerland and the UK has started. (Source: Part of an article by S. P. Saikia published on easternpanorama.in)

**Farmers say no to GM fruits, veggies-** MARGAO: Navelchea Xetkariancho Ekvott (NXE), a farmers' club from Navelim, at its meeting held recently, resolved to oppose any moves by the government to introduce genetically modified (GM) fruits and vegetables in Goa. Expressing concern over the dangers of using GM food products , the NXE urged all farmers to be vigilant and not to allow the entry of such food items into Goa. Joseph Vaz of the Navelim Civic and Consumer Forum, who addressed the meeting, sought to stress upon the farmers how "the whole farming activity, will be controlled by a few private companies". "The interest of a majority of people will be controlled by a few capitalists. Thus, we should be vigilant and protect our freedom and reject GM vegetables and fruits outright," Vaz was quoted as saying at the meeting in a press note issued by the NXE. Concerned over the "indiscriminate" use of inorganic fertilizers by farmers, NXE further urged all farmers and agro-entrepreneurs to desist from using chemical fertilizers "which kill the natural organisms present in the soil" and to use local traditional organic manures instead. "The farmers noted that indiscriminate use of chemical fertilizers had drastically reduced the population of frogs. Tadpoles eat mosquito larvae, hence the mosquito population is controlled naturally. Excess fertilizers also flow into various water bodies and affect the fishes and other living organisms thus disturbing the ecological chain," the press note says. The farmers noted the drought condition in other parts of India and the rising food prices and urge all the fellow Goans to cultivate their land and not keep it fallow. (Source: The Times of India, Goa dated 02/09/2009)

**Nagaland signs MoU to promote organic agri-business -** With an attempt to promote organic agri-business in the state and discourage the farming community to use chemical fertilizers, the Nagaland Government has signed an MoU with the Bangalore-based International Competence Centre for Organic Agriculture (ICCOA). As part of the ongoing Organic Cluster Project, the MoU was signed recently between the Department of Agriculture and the company for joint implementation of the scheme with an immediate effect for 250 hectares of land on various crops for a period of three years, an official release said here today. The selected crops included potato, maize, large cardamom, ginger and tea. A joint team of officials led by the Joint Director of Agriculture E H Lotha have already completed the preliminary survey. During the three-year period, ICCOA would focus on prioritised activities such as training of farmers on package of practices, training on plant protection measures, organic certification of crops and market linkages, the release said. The main objectives of the three-year project are to promote organic agriculture and its trade, helping farmers get market for their

organic products, organic food processing and value addition, arranging buyer-seller meetings, working together for developing organic programmes, it added. (Source: indopia.in).

**Participatory Guarantee System (PGS) taking roots in India** – Participatory Guarantee System initiated under DAC-NCOF-FAO's Technical Capacity Programme is gradually taking shape. To implement the PGS certification system, a PGS Organic India Council (PGSOIC) has already been constituted and is proposed to be registered as "Society" under Societies Registration Act 1986 in the State of Andhra Pradesh. One representative of each of the ten different PGS facilitation Councils in India would be its foundation members. These 10 PGS-FCs are IIRD, OFAI, Keystone Foundation, DDS, Chetna Vikas, CCD, Timbaktu Collective, Grassroots, Thanal and GREEN Foundation. The Executive Committee consists of Joy Daniel, Miguel Braganza and Mathew John as President, Secretary and Treasurer. So far 290 farmer groups are participating in the programme with 3605 farmers. One member of the Executive Committee is proposed to represent India in the IFOAM Committee on PGS. (The Living Field Issue 9 July 2009)

**Organic farmers demand separate market** - The organic farmers have appealed to the Government to establish an 'organic bazaar' in the district of Tiruvenvelli (Tamil Nadu) to sell the organic farm produces to the public. During an awareness workshop held at Palayamkottai on Friday, the organic farmers noted that the district administration, apart from allocating adequate number of shops in the Farmers' Markets to sell the organic farm produces, should establish a bazaar to sell exclusively the organic farm produces and the organic farm inputs. Since the farmers had used inorganic fertilizers and pesticides for the past 50 years, the agriculturists had been forced to increase the quantity of fertilizers to get attractive yield. The Government should also fix minimum support price for the products produced with natural farming procedures and give additional incentives and subsidies to them. To store the organic farm produces, the Government should establish a cold storage facility separately. (Source – The Hindu, September 19, 2009)

**Organic Farming Beat Recession** - Export of organic spices to Europe is seen withstanding the recessionary pressures and growing, while exports to US market have slowed a bit, traders said. "Turning organic seems to have helped spice farmers resist the recessionary pressure in pepper, coffee and cashew, while cocoa has tanked a little due to lower demand for chocolates," Shiny George of Indian Organic Farmers' Producer Company Ltd (IOFPCL) told. IOFPCL is farmers' collective formed in 2004 to promote the cultivation and export of organic produce. Shiny George of IOFPCL foresees more pressure from buyers on price, while the volume could grow given the small size of the market. Thomas Chacko of Peermade Development Society feels that the market for organic spices would continue to grow at 15% annually. Realization from organic pepper is 40-50% above the spot market rate for ordinary pepper and combined with the nominal farming cost, farmers are better equipped to deal with the slowdown in demand, traders said. "Organic farmers benefit from lower production cost and assured returns. Ordinary pepper goes through five-seven rounds of pesticide and fertilizer spraying," PJ Chackochan, a member of 'Organic Wayanad', a farmer's collective in the Wayanad district said. While the self-help groups and NGOs involved in promoting organic farming manage to market the small volume, things may turn difficult when volumes increase, experts report. Spices Board expects to export organic spices worth Rs 240-260 crore by the year 2012. (Source – Financial Express, Sept 2009)

# Global Organic

**The World of Organic Agriculture – 2009**
**Summary –**

**Area** - Organic agriculture has spread to more than 141 countries with 32.2 million hectares of agricultural land being managed organically by more than 1.2 million producers, including smallholders (2007). In addition to the agricultural land, there are 0.4 million hectares of certified organic aquaculture. The regions with the largest areas of organically managed agricultural land are Oceania, Europe and Latin America. Australia, Argentina and Brazil are the countries with the largest organically managed land areas. The highest shares of organically managed land are in Europe: Liechtenstein, Austria and Switzerland. The countries with the highest numbers of producers are Uganda, India and Ethiopia. Almost half of the world's organic producers are in Africa. About one third of the world's organically managed land – almost 11 million hectares - is located in developing countries. Most of this land is in Latin American countries, with Asia and Africa in second and third place. Countries with the largest area under organic management are Argentina, Brazil, China, India and Uruguay. Besides this there is almost 31 million hectares organic wild collection areas and for bee keeping. The majority of this land is in developing countries – quite the opposite of agricultural land, of which two thirds is in developed countries. Almost two thirds of the land under organic management is grassland (20 million hectares). The cropped area (arable land and permanent crops) constitutes 7.8 million hectares - a quarter of the organically managed land. Compared with the previous survey, there is a clear trend for cropland to increase. Relatively high shares for some crops have been achieved; organically managed coffee and olive areas reported, for instance, account for more than five percent of the total harvested areas, and in some countries the shares are even higher – 30 percent of Mexico's coffee is organic. On a global level, the organic land area increased by almost 1.5 million hectares compared to the data from 2006. Twenty-eight percent (or 1.4 million hectares) more land under organic management was reported for Latin America (including 0.9 million hectares of in-conversion land in Brazil for which no data had been available previously). In Europe, organically managed land increased by 0.33 million hectares (+ 4 percent) and by 0.18 million hectares (+27 percent) in Africa.

**Market** - Global demand for organic products remains robust, with sales increasing by over five billion US Dollars a year. Organic Monitor estimates international sales to have reached 46.1 billion US Dollars in 2007. Consumer demand for organic products is concentrated in North America and Europe; according to Organic Monitor these two regions comprise 97 percent of global revenues. Asia, Latin America and Australasia are important producers and exporters of organic foods. Exceptionally high growth rates have led supply to tighten in almost every sector of the organic food industry: fruits, vegetables, beverages, cereals, grains, seeds, herbs and spices. With the financial crisis, Organic Monitor expects positive market growth rates to continue, albeit at lower rates than previous years.

**Standards and regulations -** On January 1, 2009, the completely revised Regulation on Organic Production - EU Regulation (EC) 834/2007 - and its implementation rules came into force. Farmers in Europe, as well as those from importing countries, will have to deal with the new regulation and its changed rules. Currently, 71 countries have implemented regulations on organic farming, and 21 countries are in the process of drafting a regulation. 481 organizations worldwide offer organic certification services. Most

certification bodies are in the European Union, the United States, Japan, South Korea, China, Canada, and Brazil.

The UNCTAD-FAO-IFOAM International Task Force on Harmonization and Equivalence in Organic Agriculture (ITF) has worked from 2003 to 2008 to reduce technical barriers to trade in organic agricultural products that result from the lack of harmonization and interoperability of organic regulations, private standards and certification requirements. At a launch in Geneva in October 2008, two tools that were developed by the ITF were presented to the public: the Tool for Equivalence (EquiTool), an international guideline for determining equivalence of organic standards and the International Requirements for Organic Certification Bodies (IROCB). A 'Beyond ITF' project is envisaged to promote uptake of the ITF recommendations and tools and assist developing countries. (**The World of Organic Agriculture – Statistics and Emerging Trends 2009, Published by IFOAM and FiBL in support with ITC and BioFach**)

**USA: Organic Food Market up 16 % in 2008 -** Despite the economic crisis that started in the second half of 2008, market growth in the USA was an astonishing 16 % last year (2008). The growth rates in each of the preceeding years had been about 20 %. Sales of organic food and drinks meanwhile amount to some 23 billion US dollars, and as much as 24.6 billion US dollars (2008) if the non-food sector is included (natural cosmetics, eco-textiles, pet food, etc.). The fastest growing segments were bread and grain products with 35 % and the drinks segment with 31 %, according to the "2009 Organic Industry Survey", the annual report published by the Organic Trade Association (OTA). The non-food sector experienced a real boom and expanded by approx. 40 % to over 1.6 billion US dollars. The organic share of total spending on food is 3.5 %, about the same as in Germany (BioFach Newsletter, 206, September 2009).

**Certified Naturally Grown (CNG) A grass root alternative to USDA Organic Certification –** When the National Organic Program (NOIP) was implemented in USA in 2002, small scale marginal farmers faced with a difficult decision: refrain from calling their produce "Organic" or become "Certified Organic" through certification granted by an accredited certification agency, authorized under the NOP. It was a difficult choice for small farmers because organic certification is a cumbersome process with prohibitively high cost. To overcome the problem, Certified Naturally Grown (CNG) was created by such farmers six years ago for small scale direct marketing. Today nearly 700 farmers from 47 states are Certified Naturally Grown. The certification process involves an application, on-farm inspections and a signed grower declaration that's publicly posted on CNGs website. CNGs growing standards are based on the same practices as the NOP – no synthetic fertilizers, pesticides, herbicides or fungicides and no genetically modified seeds are used – but with a greater emphasis on improving the soil through composting and cover crops. CNGs livestock standards include some improvements and clarifications regarding living standards and access to pasture requirements. Rather then employing third party inspectors, CNG inspections are carried out by other farmers in the program who live nearby. To discourage fradulant trading of inspections, a farmer is not allowed to inspect the farm of the farmer that inspected his farm. There are real advantage of this peer review approach. First local networks naturally develop and the information sharing and collaboration strengthens the movement. Second neighbouring faremr-inspectors are more likely to regularly and randomly visit their neighbours, and they are intimately familiar with local pest pressures, so they can be more aware of cheating – and thus serve as better deterrents. The CNG program is unique for its high level of transprancy. All participating farms have publicly-available profiles on the

CNG website www.naturallygrown.org. (Organic News, 1(2) September 2009)

**New IFOAM PGS Committee** – In its August Meeting the IFOAM Executive Board has selected members for the new PGS Committee, now a permanent body witin IFOAM structure. The following members have been selected to sit on the PGS committee. (1) Eva Torremocha (Spain), (2) Ron Khosla (USA), (3) Chris May (New Zealand), (4) Mathew John (India) and Janet Haupfleish (South Africa). According to the PGS Committee terms of reference, members have been nominated for a three year term, starting August 2009. IFOAM is happy with the geographic and professional balance of the committee and also pleased to count 2 women on the committee.

**Better cotton threading its way towards global markets-Gland, Switzerland -** The first batch of sustainable cotton – to be produced with a fraction of the water and traditional methods of cotton cultivation – is expected to reach global markets starting next year. The Better Cotton Initiative (BCI), a partnership between major corporations such as Adidas, IKEA, GAP, and H&M, and NGOs such as WWF, recently created a new set of criteria to make cotton cultivation more economically, environmentally, and socially sustainable. The Better Cotton System outlines mechanisms to mitigate the negative impacts of one of the world's most water and chemical intensive crops, which is often grown in semi-arid and water scarce areas. Cotton cultivation covers more than 2.4 percent of global arable land, involving about 30 million farmers. Cotton is produced in more than 65 countries worldwide, mainly in the developing world. "The Better Cotton Initiative aims to make global cotton production better for the people who produce it and better for the environment it grows in" said Walter Wagner, WWF Switzerland, newly elected Vice-Chair of the BCI. Pilot projects are slated to test the BCI system in Pakistan, India, Africa, and Brazil to provide sustainable cotton to textile makers and buyers starting next year. For example, the initiative aims to reduce water and pesticide use. Projects underway in Pakistan and India led by WWF and IKEA have led to 75 percent reduction in water and pesticide use, while increase the net revenue to cotton producers by 70 percent. "BCI endeavors to initiate global change in the mass market, with long-term benefits for the environment, farmers and other people dependent on cotton for their livelihood," according to its website. (Source: coralrose.com)

**Cebu organic farming gets P10-million boost** - Efforts to make organic farming a viable business in Cebu got a P 10-million boost from the Department of Agriculture in Central Visayas (DA-7). "Organic faming is a long-fought advocacy done by private volunteer individuals in partnership with the provincial Government," said Gov. Gwendolyn Garcia in Cebuano at the Cebu International Convention Center in Mandaue City. She spoke during the Go Green Organic Forum on Friday before more than a hundred participants of the DA assistance. Her father former Governor Pablo Garcia started a Farmer Scientist Training Program with Dr. Romulo G. Davide during his term. "Despite efforts of the local Government and private volunteer organizations, Cebu has a long way to go before it can supply organic products even to local industries," said Abigail Salvador of Tabefa's Organically Grown Vegetables. Samson Tiu, a trustee of the Mandaue Chamber of Commerce and Industry, agreed. He said other provinces like Bohol and Negros were already doing organic farming. Garcia said the P10 million aid from the DA would be used in the campaign for organic farming at the local Government unit level. "It will not be an easy battle against conventional farming," warned Gil Carandang, president of Organic Inspectors Association of the Philippines and owner of Herbana Farms Philippines. Many farmers still prefer using chemical fertilizers it would accelerate crop growth and increase yields. But organically

grown products are gaining popularity here and abroad due to an increasing concern for health and well being. (Source - globalnation.inquirer.net/cebudailynews)

**Poor farmers escape poverty by going organic, says Progressio -** As debate rages in Britain about the relative benefits of organic food, international development charity Progressio says that 'going organic' is changing the lives of poor farmers and their families across the developing world. Following a recent report by the UK's Food Standards Agency, which suggested that organic food has little difference in nutritional value and "no health benefits", debate has been raging about whether organically grown produce is superior to non-organic food. But Progressio's work with poor farmers shows that a key aspect of organic food has been forgotten - how the use of natural pesticides, fertilisers and seeds is leading to bigger harvests, less indebtedness and higher standards of living in the developing world. "I recently returned from visiting organic farmers in Ecuador - where 40% of the population live on less than $2 a day - and it seems a vital group of people are being forgotten in the debate about the relative benefits of organic food", said Progressio's Campaign Officer, Brie O'Keefe. Brie continued: "Poor farmers around the world are lifting themselves out of poverty by going organic. Farmers like Alfredo Ruiz and his fellow villagers in the tiny hamlet of El Cristal in the Andean foothills told me how they have stopped forking out for expensive chemicals in favour of traditional methods of growing which they haven't used for decades." She concluded: "Communities are re-learning how to manage their natural resources and producing more reliable, bigger crops and a better living wage". Alfredo now sells his produce at the local market and has even started converting his neighbours to organics. In Malawi, another farmer, Angelina Ngoza, is also reaping the rewards of going organic. "Before I knew about organic farming I was forced to buy high-priced chemical fertilisers to make my crops grow. But I could never afford all I needed. I was taught to use pesticides and herbicides too, but they killed small animals and left burns on my arms. A year ago Progressio helped Angelina and 40 of her neighbours switch to organic production. So instead of spending most of the profit from their crops paying for the fertilisers and chemicals used to grow them, they became self-sufficient. Angelina said: "After only one year of being organic, I am already harvesting one extra bag of maize for my family and I know my harvests will get bigger in future. Organic farming doesn't harm the soil, it is healthier and I can charge more for my vegetables in the market." One of Angelina's neighbours, Grace, added: "We are now in control of our farming. It means we have more food to eat, more food to sell, it is disease free and nutritious." Tim Aldred, Progressio's Advocacy Manager, said: "For many of the world's 1.4bn small-scale farmers, the benefit of organics is clear: better food security and a better life. It is really important that the public debate on organics takes note of positive stories like Alfredo's and Angelina's." (Source - www.indcatholic news.co)

## India Emerging as Major Organic Producer

As per the latest statistics compiled by the National Centre of Organic Farming for the year 2008-09, it emerged that, with 1.2 million ha cultivated arable land under organic certification process, 0.71 million producers and 8.00 million ha wild harvest collection, India has emerged as an important country in organic agriculture. Organic agriculture has increased almost 29 fold during last five years. During 2007-08 India produced more than 77,000 tons of organic cotton which is more than 50% of world's total organic cotton.

# National and International Events

**International Seminar on 'India Organic- Strategies to Surge Ahead'** - In an attempt to discuss and deliberate upon a holistic and assimilated strategy towards organic farming, a two day International Seminar on 'India Organic- Strategies to Surge Ahead' was held from 10th to 11th Sep 2009 at University of Agricultural Sciences (UAS), Bangalore. Parallely a South Asia Conference on 'Outstanding Agriculture Techniques' was also organized. These mega-organic events were organized by ICCOA and OFAI jointly with National Centre for Organic Farming (NCOF), Ministry of Agriculture, Govt. of India and University of Agricultural Sciences (UAS), Bangalore. The International Seminar was also supported by Ministry of Food Processing Industries (MoFPI).

The seminar was aimed to focus on better technologies for organic production, organic processing, and linkage to markets and on promising regions and crops for organic farming to improve the net income for small and medium scale farmers. Such a strategy needs interaction amongst various organic policy makers, agricultural experts, farmers, researchers as well as supply chain players. The targeted audiences were the policy makers/Central Govt. / State Govt. officials, researchers, scientists and faculty from institutions and universities and students. Traders, trade associations & entrepreneurs, organic input producers / suppliers / promoters, exporters & importers, banks and financial institutions, certifying bodies' personnel of quality analysis laboratories and consumers.

The Introductory addresses were given by Mr. Mukesh Gupta, President, ICCOA and Mr. DD Bharamagoudra, President, OFAI on International Seminar and South Asia Conference respectively. Dr. A K Yadav, Director, NCOF updated the audience with development in the organic sector. Mr. Andre Leu, Vice President, IFOAM spoke as international Guest of Honour. In his inaugural address, Dr. S.K. Pattanayak spoke of the increasing adoption of organic agriculture by the Indian farmers and the support of Ministry of Agriculture, Govt. of India to organic farming. Dr. P.G. Chengappa Vice Chancellor, UAS, Bangalore delivered the Presidential address, and the vote of thanks was given by Dr. Raju, ex- Registrar, UAS, Bangalore.

The two-day International Seminar had six technical sessions focusing on important issues such as strategies and technologies for improving organic crop management, standards and regulations to simplify export/ trade, processing with care-post- harvest handling, processing and market access issues for growing markets in India and Asia and success stories from progressive farmers. These topics were presented by renowned speakers representing the Govt., scientific community, NGOs, certifying bodies, agri-business companies, etc. The seminar was attended by around 285 delegates consisting of policymakers Govt. officials, researchers, NGOs, students, farmers, various stake holders and consumers. The seminar also involved exhibition, buyer seller meets and poster presentation.

In conclusion, there was a plenary session for compilation of various presentations for discussing and formulating the strategies to surge ahead and it was concluded and enumerated that: (a) more research on focus crops in key areas like pest/diseases and nutrient management to be encouraged, (b) mixed or intercropping system to be encouraged, (c) state wise crop zoning and base line data required, (d) need for proper compilation and documentation in local languages/dialects, (e) State Govt. to develop policies for promotion of organic farming, (f)

identification of accreditation of certifying agencies on region basis, (g) synergy among NGOs, Govt. Intervention, farmers and market force, (h) to maintain nutrient diversity and quality during processing, (i) to maintain hygiene and retain nutrient content during processing, (j) to develop a common sector standard and regulation for all the region of the country, (k) mutual recognition among Asian countries, (l)web based monitoring for database, (m) strengthen accreditation system, (n)synergy between grass roots activities and business entrepreneurs and (o)organic standards need in a form which is easily understandable and easy to follow. It was further added that it was high time to make concerted efforts to educate about the advantages of the traditional Indian agrarian system. Thus these suggested strategies provides a focused and well directed development of organic agriculture and quality products between all the persons involved in the promotion of organic agriculture.

To officially close the two-day event there was a valedictory function which was attended by all the participants of the seminar, and those persons involved in the promotion of organic agriculture were felicitated and honoured. Thus this seminar brought together national and international representatives, scientific community, policy makers, NGOs certifying bodies, agri-business companies and consumers to a common platform in view of the importance of adopting strategies for 'India Organic- Strategies to Surge Ahead'.

**South Asia Conference and International Seminar on Organic Agriculture** - The Organic Farming Association of India, or simply OFAI, that brings people together for the love of plants grown naturally, embarked on an ambitious mission to conduct the very first South Asia Conference on Organic Agriculture Techniques on 10 and 11 September, 2009, with an equally path-breaking and multi-organization networking "Organic Mela" at Lal Bagh with the Jaivik Krushi Society. The South Asia Conference on Organic Agriculture Techniques was initially scheduled for Gandhi Jayanti at Pune. At the request of Dr. A.K. Yadav of NCOF, OFAI agreed to advance the date, change the venue to Gandhi Krishi Vigyana Kendra [GKVK] and partner with UAS Bangalore and ICCOA for the inauguration of the twin events.

There were more than fifty international delegates belonging to Nepal, Bhutan, Bangladesh, Sri Lanka, China, Ethiopia, Malaysia and UK. Five times as many participated from across the India for this unique conference. The South Asia Conference broke away from the academic format or power point presentations to have live method of demonstrations. Dr. K. Natrajan from Erode-Tamil Nadu demonstrated the technique of making mal-odour-free Panchagavya, while Deepak Suchde from Bhopal-Madhya Pradesh demonstrated the preparation of Amrut Mitti. Molecular Biologist turned coffee planter, Sujata and Anurag Goel explained the defence mechanisms against disease-causing organisms. The young experts like Mr. J. Jaferali and his wife Salma from Kerala demonstrated the preparation of herbal extracts for insect management while Mr. Sanjay Maruti Patil exhibited more than a hundred varieties of rice conserved by tribal communities in Maharashtra. Ms. Sangita Sharma from Bangalore held forth on open-pollinated seeds while Ms. Deepika Kundaji from Auroville and Sunita Rao from Sirsti explained the techniques of seed storage and distribution. Dr. Sultan Ismail showed how all people can support "global worming" to combat global warming, while Ms. M. Revathi explained reclamation of saline soils and Dr. N. Deva Kumar explained the yield difference when different techniques are used to support soil helath. Ms. Kamal Melvani from Sri Lanka also made a presentation. There were wide ranging interactions among the delegates at the venue, over lunch, tea, dinner, breakfast and even during the travel from the venue to the hostels for rest.

The two day mega event was concluded on 11th September 2009. The valedictory session was again a jampacked auditorium with never dying enthusiasms of organic promoters, practictioners and developers.

**Biofach India together with India Organic 2009, Nov. 18th to 20th 2009, Mumbai - Press Launch -** First BioFach India together with India Organic 2009 is going to be held in month of November 2009 at Bombay Exhibition Centre, Mumbai. The Press Launch of BioFach India together with India Organic 2009 was held at Mumbai and Delhi during 26-27 August 2009, in presence of Dr. A.K. Yadav, Director, NCOF, Mr. Mukesh Gupta, President ICCOA; Mr. B. Steinruecke, Director General Indo German Chamber of Commerce; Mr. Manoj Kumar Menon, Executive Director ICCOA; Mr. Frank Venjakob and Ms. Rubi Vatcha, Fair Representative IGCC. ICCOA is the co-organizer and this fair is supported by National Centre of Organic Farming (NCOF), Ministry of Agriculture, Govt. of India and Agricultural Processed Foods Export Development Authority, Ministry of Commerce, Govt of India. The sponsor of the BioFach subsidiary in Mumbai is IFOAM.

**State Level Seminar on Organic Farming for Environmental Safety and Agriculture Sustainability** – The Navsari Chapter of Indian Society of Agronomy is propose to organize a two days "State Level Seminar on Organic Farming for Environmental Safety and Agriculture Sustainability" during 17-18th November 2009 at NAU Campus, Navsari, Gujarat. The seminar attempts to bring all the available information at one place and come to some conclusions about the feasibility of organic farming at state level, so that efforts can be made in right direction for its adoption in niche areas. Scientists working in the field of organic farming are invited to participate and share their experiences in the seminar. For further details and participation contact Dr. M.K. Arwadia, Secretary Navsari Chapter, ISA, Deptt of Agronomy, Navsari Agricultural University, Navsari, Gujarat – 396 450, Phone 02637-282771-75 Ext 302. Email marvadia@rediffmail.com.

**Storage Techniques and Methods for Organic Products** – The Uttaranchal Organic Commodity Board (UOCB), Dehradun, is working for the promotion of organic farming in the state of Uttaranchal under the auspices of Department of Agriculture. The major activities of UOCB are training, marketing and implementation of Internal Control System (ICS). In the sector of marketing UOCB has made several inroads, especially in case of hill regions by establishing sustained links with producers and buyers. One of the major changes in supply chain of organic products is storage, be it primary or secondary. However, there are a number of traditional and modern systems, which can make possible storage in the organic sector, the information is scattered and these methods need to be compiled and used systematically. To concertize the information and knowledge the UOCB convened a one day Stakeholder's workshop on "Storage Techniques and Methods for Organic Products" on 15th September 2009 at Dehradun. Major issues of discussuions were: (1) Storage methodology for quality control of organic grains, (2) Designs of Godwns/ warehouses for organic storage, (3) New initiative for organic storage (technology, methods) and (4) Indegenous technological knowledge (ITKs) for organic storage. Further details can be obtained from Sr. Programme Manager, Uttaranchal Commodity Board, 201/1 Vasant Vihar, Dehradun, Uttarakhand.

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