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जैविक खेती सूचना पत्र, राष्ट्रीय जैविक खेती परियोजना के अन्तर्गत जारी एक बहुभाषीय तिमाही प्रकाशन है। जैविक खेती के उत्थान, प्रचार प्रसार व इसके नियामक तंत्र से जुड़े लेख, नयी सूचनाएं, नये उत्पाद, विशेषज्ञों के विचार, सफल प्रयास, नयी विकसित प्रक्रियाऐ, सेमिनार-कान्फ्रेन्स इत्यादि की सूचना तथा राष्ट्रीय व अन्तर्राष्ट्रीय समाचार विशेष रूप से आमंत्रित हैं। सूचना पत्र में प्रकाशित विचार व अनुभव लेखकों के अपने हैं जिसके लिए प्रकाशक उत्तरदायी नहीं है।

Organic Farming Newsletter (OFNL) is a multilingual quarterly publication under National Project of Organic Farming. Articles having direct relevance to organic farming technology and its regulatory mechanism, development of package of practices, success stories, news related to conferences, seminars etc, and national and international events are especially welcome. Opinions expressed in articles published in OFNL are those of the author(s) and should not be attributed to the publisher.

From Editor's Desk

Dear Readers
Through Organic Farming Newsletter, I was associated with you since 2005 and during this period we have collectively witnessed the phenomenal rise of organic agriculture in India during first five years and then consolidation phase during last three years. In spite of some loss in area under certification during last two years, organic is consistently growing in terms of export, domestic market development and the reach of certification system. Introduction of Participatory Guarantee System under Government's institutional mechanism is likely to give further push to the movement and farmers will be able to access the market with affordable guarantee system. Interventions of Central and State Government programmes has provided much needed push and strengthened the confidence and sentiment of growers and market promoters.

Research Institutions have also made significant strides during this period and with multilocational and multidimensional experiments have proved that organic agriculture can also yield the comparable yields with no threat to food security of the Nation.

Besides area expansion and market development, country has also witnessed significant progress in development of organic input production industry, launching of various innovative inputs, rise in utilization of organic manures, improvement in manure qualities through mineral fortifications and introduction of regulatory framework for ensuring quality of commercialized organic inputs.

In my long association with the organic farming and Organic Farming Newsletter, I feel pride in having in-numerous friends in the form of my colleagues, scientists, contemporaries, technologists, industry entrepreneurs and above all the organic farmers who taught me the real spirit of organic farming and provided the strength in various ways to promote the cause nationally and internationally. I extend my heartfelt thank to all of you and wish an ever growing organic farming. As I shall be handing over the baton to my successor on 31st July 2012, I thank you all for the wonderful support, encouragement and recognition and request to continue the same to the future torch bearers.

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Organic Agriculture - The Possible Future

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Green economy

According to the United Nations Environment Programme (UNEP-2011), a GREEN ECONOMY is one that results in improved human well being and social equity, while significantly reducing environmental risks and ecological scarcities. The green economy agenda seeks to promote an economic system which increases human well being over the long term while maintaining natural capital and environmental resources so that future generations do not face significant environmental risks and ecological scarcities. Green economy activities include organic agriculture, renewable energy, building retrofits for energy efficiency, ecotourism, public transportation, community forestry, waste management and recycling, among others.

Organic agriculture in India and growth factors

From the state of an unknown opportunity in agriculture in the beginning to being talked about a viable alternative tool to address some of the ills of Indian agriculture, organic agriculture has made a credible performance during the past ten years. It is a combined effect of farmers' efforts, NGOs work, Govt interventions and market forces push to organic that Indian organic agriculture has reached a stage where it can swiftly move to occupy desired space in Indian agriculture. Both, the 11th plan document on organic sector and the Report of the National Commission on Farmers, have recommended it as a tool for second green revolution in the country, in particular for agro-ecozones comprising rain fed areas, hilly areas and areas experiencing ecological backlash of green revolution. The factors attracting attention to organic agriculture include;

i. Increasing prospects of organic agribusiness and demand for safe food.
ii. As an option to sustainable development of farming based rural livelihoods of small farmers.
iii. As an alternative option for those farmers who benefitted from irrigated green revolution farming but after decades are now facing ecological backlash, in the form of soil salinity and land degradation, which has increased cost of cultivation and in some cases it is leading to abandonment of farming.

The first factor promotes organic as a niche area for agribusiness and better cash income to farmers and the second factor dominates organic farming priorities of small and marginal farmers in rained areas, who are looking for alternatives to reduce input costs in farming and options to farm their lands sustainably, for them it is a livelihood and food security opportunity.

In India, over the past 60 years, the focus of agricultural research and development has mainly been on maximizing yields, coupled with increasing specialization of production and ever larger farm sizes. Although yields have increased substantially, contributing to raising total production, farmers and the environment have had to pay the price for keeping up with this development. Of late Indian farmers have been experimenting to make a transition to practices that are more environmentally sound, and potentially contribute to the long term sustainability of agriculture. Organic agriculture is becoming an integral part of these practices. In a nationwide survey of organic farmers Partap et al (2008) reported that the factors that encourage individual farmers to adopt organic agriculture were continuing rising costs of agricultural inputs which is making farming increasingly unprofitable. Farmers are seeking new ways to increase farm income. While income considerations are predominant, environmental benefits, health aspects and farmers' empowerment are other important factors influencing farmers shift to organic agriculture (Partap, 2006; Partap et al 2008). There is no evidence to claim that organic agriculture can feed the world, but the evidence that it could not is unconvincing. In developing countries, organic agriculture with its focus on low external inputs has demonstrated potential for increasing the productivity of the millions of rain fed farmers who cannot afford conventional high input agriculture, and who have no access to inputs to begin with. Use of productivity per hectare as the criterion for rejecting the value of organic agriculture ignores the fact that it is one of the potential green technologies which can facilitate ushering in an era of green economy. What is more, organic agriculture holds much greater promise of achieving sustainable land use than conventional agriculture (Partap 2006). Under this background, this paper analyzes the economic, ecological and scientific potentials of organic agriculture, and advocates that it can be used as a tool for promoting green productivity and economy in the country.

How Organic Agriculture contributes to green economy

Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs. FAO promotes this understanding and perception about organic agriculture, in its own advocacy and programmes as well as among its member nations. Countries like USA, where organic agriculture, is mainstreamed, acknowledges, "organic farming as a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection". However, organic is not only about replacing inputs, which is the starting point of the process, it goes beyond, as enshrined in the four principles of organic farming advocated by IFOAM;

i. **Principle of health:** Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
ii. **Principle of ecology:** Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
iii. **Principle of fairness:** Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities
iv. **Principle of care**: Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

These ethical principles are aimed to inspire developing a holistic vision and strategies.

Organic Agriculture is environment friendly

Organic agriculture is generally perceived as a form of agriculture that is more favourable for the environment than conventional agriculture. Organic farming comes closest to an environment friendly agriculture with increased soil conservation and enhanced biodiversity. Organic farming depends upon ecological balances and favourable biological processes expressed in ecological services like pollination or pest control by natural predators. It creates more favourable conditions at the species and ecosystem level of floral and faunal diversity than conventional farming systems. Organic management could also be a key to bringing degraded land back into production and therefore significantly contribute to sustainable development. It has the potential to develop sustainable land use systems.

The main indicators of green agriculture, used in this section for advocating the case of organic agriculture as a tool include biodiversity, landscape, soil, quality of water resources, climate, air and energy.

Soil health

Since organic farming techniques have the potential to improve soil fertility, soil structure and soil moisture retention capacity, organic agriculture provides solutions to the problems associated with degradation of dry lands and desertification. Soil care is a main principle in organic farming. Studies show that organic farming tends to conserve soil fertility and system stability better than conventional farming (Stolze et al 200; Shepherd et al 2003). Organic soil management focuses on nutrient cycling with the aim of maximizing agro-ecosystem stability and homeostasis. Restoring the natural ecological balance is seen as essential by organic farmers because ecosystem functions are considered as a more productive 'input' (Shepherd et al 2003). The environmental relevance of organic matter content is based on its capacity to improve nutrient availability as well as biological activity and to reduce the vulnerability to physical damage. Soil organic matter strongly influences many soil properties including bulk density, water holding capacity, infiltration rate, hydraulic conductivity and aggregate stability (Alfoldi et al, 2000; Shepherd et al 2003). Soil organic matter (SOM) and humus are important components in the organic farming philosophy. Fertility is based on organic substances such as farmyard manure from animal husbandry, compost, green manure, plant residues and commercial organic nitrogen fertilizers. Consequently, there is an extensive supply of organic matter passing through aerobic decomposition processes. The research shows that soil organic carbon content is higher in organic systems than in conventional farming (Goldstein and Young 1987; Stolze et al 2000). The organic and agro-ecological systems can significantly help address problems of declining soil fertility by building up local productive capacity (both ecological and social), rather than relying upon external inputs. Chemical fertilizers cause extreme pH fluctuations in localized areas such as those near the fertilizer band (Cooke 1967). In contrast organic manure can increase the buffering capacity of soils, preventing swings in pH, because of additional organic matter. Utilization of composted manure, common in organic systems has a positive effect on the content of organic matter and helps to avoid soil acidification. Higher biological activity within the soil promotes metabolism between soil and plants and is an essential part of sustainable plant production management. The role of soil organisms, found abundantly in organic systems, is central to soil processes and fertility since they render available the elements in plant residues and organic debris entering the soil (Alfoldi et al 2002). Abundance of saprophytic soil fungi with a higher potential of decomposition of organic material and the degree of mycorrhizal root colonization is higher under organic conditions (Elmholt, 1996). The above research findings indicate the potential of organic farming to those areas where small and marginal farmers depend for their livelihoods on rain fed dry land agriculture.

Biodiversity

The higher level of agricultural intensity is feared to have resulted in a decrease in biological diversity all over the country. The destruction of biotypes, as well as the simplifications of crop rotations, and the increasing inputs of synthetic fertilizers and pesticides has been responsible for changes in the habitat of many valuable species. On the other hand, organic agriculture depends upon stabilizing agro- ecosystems, maintaining ecological balances, developing biological processes to their optimum and linking agricultural activities with the conservation of biodiversity (Alfoldi et al, 1992). Increased biodiversity improves and buffers ecological services such as pollination, pest control, maintenance of soil fertility, thus strengthening farming systems and practices. Building on that, some organic certification organizations have incorporated biodiversity requirements into their standards. The Swiss organic standards, for example, require farmers to keep 7% of their farmland as semi-natural habitats (Bio Suisse, 2001). It is possible that organic farming systems can be used by planners as a tool to balance conservation and production. A review of studies comparing the effects of organic farming on biodiversity (Hole et al, 2004) highlighted that organic farming particularly favours farmland wildlife, a chemical free habitat, sympathetic management of non-cropped habitats and preservation of mixed farming. Studies have so far demonstrated that species abundance and / or richness across a wide range of taxa tend to be higher in organic farms than in conventional farms in the same locality.

Genetic diversity

Considering genetic diversity, species diversity and habitat diversity issues of biodiversity on the organic farms, available evidence of past few decades shows that the adoption of high yielding , uniform breeds and varieties has led to a considerable reduction in the number of species and in the number of varieties/ breeds within species, used in agriculture (Alfoldi et al , 2002). Even while, indigenous seeds have been shown to perform better under drought conditions in rainfed areas, the systems for promoting their wider use are not in place. Scientists only use indigenous crop varieties as a valuable source of genetic materials for improving the commercial varieties because of high degree of natural resistance to insects, diseases and drought stress. Since 1995, the world over, organic farming has been indirectly instrumental in establishing a rescue process for threatened species, varieties and breeds. Since organic agriculture very often promotes the use of rare native breeds, hence it is making an important contribution to the in situ conservation, restoration and maintenance of agricultural biodiversity. Thus organic farming areas may become potential reservoirs and future sources of genetic diversity to sustain agriculture. There is always a richer floral diversity under organic agriculture, which has positive impacts on faunal diversity, for it offers over wintering sites, refuges and areas with network of links to other habitats (Shepherd et al 2003). While in conventional farming weeds are considered harmful to crop yield, in organic farming they are considered useful to a certain degree as they provide ecological services (Alfoldi et al 2002). In the context of pollinators, which greatly benefit from a diversity of flowers, flowering weeds are more diverse and abundant on organic farms (Frieben and Kopke, 1996). Uncultivated land, hedgerows inside crops, in allied crops and in neighbouring areas can serve as refuge for beneficial insects such as parasitoids of aphids (Verkerk et al, 1998). Organic farming aims for a greater diversity of crops in the rotation of domesticated species. Wide crop rotations are essential as a means of disease and pest prevention. They also contribute to maintaining soil fertility, particularly if N-fixing legumes are a part of the rotation. While organic farming standards recommend cultivating site adapted crop varieties, farmers are free to use high yielding varieties and breeds also. Nevertheless, the preservation of old land varieties and breeds is an important function of organic agriculture (Stolze et al 200). Most information available on faunal diversity under organic farming, is about soil fauna and birds. In most cases organic farming displays more faunal diversity than conventional agriculture. The key factors for this are: greater fauna-friendly crop protection management, organic fertilization regimes, more diversified crop rotations, and more structured landscapes with semi-natural habitats and field margins (Stolze et al 2000). Landscape structures are essential for the survival of many invertebrates, specially due to favourable food and over wintering conditions.

Abundance of soil improving invertebrates - Earthworms have many positive direct and indirect effects on soil quality, both in terms of their effect on soil physical properties and nutrient cycling. They are vital to soil organic matter turn over (Shepherd et al 2003). They are highly suitable bio indicators of soil fertility, and they are known for their sensitivity to synthetic pesticides and to many agricultural practices (Mader et al, 1996). Earthworms help improve soil structure and provide a high concentration of nutrients in a form accessible to plants. Scientific studies have shown that organically managed soils have greater number of earthworms compared to conventional farmlands. A possible reason for this could be that organic production depends more on a high, sustained supply of organic substances from plant residues and manure than conventional farming. Pesticides can adversely affect earthworms, and beneficial arthropods either directly via contamination or through alteration of the microhabitat and a reduction of their prey. Researchers have also found greater diversity and abundance of soil and surface living arthropods such as spiders, beetles, parasitic flies and wasps and many other invertebrate species in organic farming systems compared to conventional farming systems (Feber et al 1997, 1998, Stolze et al 2000; Tybrik et al 2004).

Diversity of landscapes and birds for ecological functions

Organic farming generally provides a good potential for landscape diversity. Stockdale et al (2001) indicated that semi-natural habitats are intrinsic in organic regimes/ landscapes where their management is central to the philosophy. They are also of great functional importance for nutrient cycling and processes of succession e.g. colonization (Tybrik et al, 2004). Organic farming does indeed tend to have a positive influence on habitat diversity, within parameters of limitations. Birds are well suited indicator organisms that show the environmental status and landscape infrastructure, including agricultural land. There is always higher bird density on organic farm lands than on conventional agriculture areas (Rhone-Poulnec, 1997; Alger 1998). Because of increased food and prey availability (Brown, 1999) small mammals were greater in organic than conventional agriculture fields.

Carbon sequestration functions

Global climate change (green house effect) is considered one of the most threatening environmental problems. On a global scale agriculture is responsible for roughly 15% of the trace gas emissions (Stolze et al 2000). However on a per hectare scale, most studies found lower (up to 40-60%) CO_2 emissions from organic systems (Burdick 1994), the main reason being disuse of chemical fertilizers and pesticides. Therefore, sustainable agricultural strategies including recycling of organic matter, tightening nutrient cycles, and low tillage practices may rebuild organic matter and reduce losses from the system. The diversity of organic crop rotations protect the fragile soil surface and may even counteract climate change by restoring the organic matter content (Haas and Kopke ,1994). The carbon sink idea of Kyoto Protocol may therefore be accomplished efficiently by farming organically (Alfoldi et al 2002). There is a huge potential for CO_2 sequestration in India. Agro-forestry holds the highest potential of agricultural carbon sequestration in our country.

Efficiency and Productivity Potentials of Organic Agriculture

A large proportion of the Indian agricultural land is dependent on erratic rainfall. As a result of global warming, this proportion is likely to increase a great deal. Therefore, organic farming with its attention to SOM content, could well be a much more resilient and safe form of agriculture with respect to global food security than conventional farming. If productivity under conventional agriculture is achieved under unsustainable conditions of high subsidies, high fertilizer dosages, unsustainable groundwater use, frequent chemical sprayings, and unacceptable externalized effects (e.g. surface water pollution), then counting organic agriculture is less productive, than such unsustainable forms of conventional agriculture, does not hold true on grounds of ecological economics of farming (Roling, 2006). Instead of treating organic agriculture as an inconsequential niche market of products produced only for select consumers, agricultural research institutions should consider it as a rich opportunity for innovative research. Organic agriculture is far behind in research investment, even though the opportunities for its development are much greater than the outcome of squeezing the last little drops out of the conventional approach. The preoccupation of scientific community with productivity per hectare, ignores the increasing evidence that it is not supply factors, such as productivity per hectare, but demand factors, such as market opportunities, that determine agricultural development outcomes in our country. The green revolution technologies, tend to ignore the need to cultivate and nourish the ecological services on which we and other higher life forms depend. These ecological services include: provision of food, fuel, and fibre; a stable climate; protection against cosmic rays; the provision of clean and safe drinking water through healthy hydrological systems; an effective carbon cycle; biodiversity; purification of the air, etc. In conventional agriculture the focus on crop ecology got replaced by a focus on farming as a measure of increasing productivity. A comparison of the three systems: a conventional grain based farming system, an animal-based organic system, and a legume-based system, highlights relevance of ecological services (Rodale Institute) as follows:

- Because of the greater organic matter content in the soil, and hence the increase of water retention, both maize and soybean in the organic systems did much better during drought years, than in the conventional system.
- Although the input of organic material was roughly the same for all three systems, the organic animal and legume systems retained more carbon in the soil resulting in an annual soil carbon increase of respectively 981 and 574 kg per ha, compared to only 293 kg in the conventional system.
- In 2004, soil organic carbon content was respectively 2.5 and 2.4% in the organic systems, versus 2.0% for the conventional. Soil nitrogen content was also higher for the organic systems.
- Nitrate leaching did not differ a great deal between the three systems. But soils farmed with the two organic systems had greater populations of arbuscular mycorrhizae fungi than did conventional system soils, and greater biodiversity in terms of earthworms, etc.
- Abundant biomass above and below ground in the organic systems helped to enhance biological controls and to increase crop pollination. In the case of maize production, the inputs of energy in terms of fossil fuels, for machinery, fertilisers, seeds and herbicides, were respectively 28% and 32% less for the organic animal and legume systems than for the conventional system. Crop rotations and cover cropping, typical of organic agriculture, reduced soil erosion.
- Conclusion: benefit of 'ecologisation' of conventional agriculture are cost effective.

A Vision for Organic agriculture in India

Under the backdrop of the parallel growth of organic farming approaches, one, by the small farmers in rain fed areas as a food security and livelihood strategy, two, ecological backlash in green revolution areas, and three, as agribusiness and export opportunity, India needs to define a long term vision and growth strategies for organic agriculture in India. Further, variety of concerns making different countries promote organic agriculture for different reasons, help us understand priorities India should frame with respect to organic agriculture. The international experiences and ongoing developments in organic sector and emerging agricultural scenario in the country, lead us to identify the following corner stones of the foundation on which we can build the organic sector in this country;

i. Organic agriculture becomes low cost sustainable option of farming in the country, particularly by the small farmers in rain fed areas and helps improve their food and income security.
ii. Organic agriculture gets mainstreamed and helps achieve ecological and economic sustainability of Indian agriculture in general i.e. clean water, environment and helps preserve biodiversity.
iii. Organic agriculture helps produce and supply adequate safe and nutritious food to the producers (farmers of India) and consumers of the nation.

iv. Organic becomes a foreign exchange earner for the country and that India is able to take at least 3% share of global organic market. It will lead to organic agriculture becoming an agribusiness/ entrepreneurship opportunity and provide employment opportunities down the supply chain.

Organic agriculture mission

Moving towards the organic vision requires defining a mission to move ahead. The mile stones of this organic mission can be;

i. Mainstreaming organic farming to reduce cost of production, and reduce the need for subsidies on chemical fertilizers.
ii. Over 10 million hectares is brought under organic agriculture by 2020. It will have saved over Rs 10,000 crores on subsidies on fertilizers and other related inputs.
iii. Profitability increased by reducing input costs. Nation too benefits by savings on fertilizers.
iv. Produce Rs 30,000 crores worth of organic commodities by 2020; wherein 80% production is for domestic and 20% for export.
v. Build strong institutional capacities and human resources in the country to implement appropriate organic strategies both at the national and state level so as to achieve the mission targets. Weak institutional capacities are the biggest challenge India faces today in moving forward to mainstream organic sector.
vi. India becomes main producer and supplier of a variety of niche organic commodities, so much in demand in the international market.

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Status of Organic Agriculture In India 2010-11

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Growth in area

Emerging from 42,000 ha under certified organic farming during 2003-04, the organic agriculture grew 29 fold during the period up to 2008-09. By March 2011 India had brought more than 4.43 million ha area under organic certification process. Out of this cultivated area accounts for 0.77 million ha while remaining 3.65 million ha was wild forest harvest collection area. It was combined effect of enthusiastic farmers, NGOs, Central and State Governments and market forces push. Now practically all 30 states are represented on organic agriculture map of India. Both the streams of organic; certified and non-certified are growing and projects in spite of being continuously organic are opting in or out of third party certification system depending upon the need for certification in direct marketing. Area under organic certification process which has seen rapid growth till the year 2008-09 is now under consolidation phase. Absence of effective marketing channels, withdrawal of some Central and State Government support programmes and introduction of complicated TRACENET system for certification under NPOP has pushed some of the grower groups (may be temporarily) out of certification system. Year-wise growth of total cultivated area under organic certification process is shown in Table 1. State-wise details of cultivated and wild harvest collection area during 2010-11 are given in Table 2 and total production of raw organic commodities from total area under organic certification process are given in Table 3.

Export of organic commodities - In spite of dwindling area and threat of BT cotton to organic cotton the export of organic commodities continued to grow in double digit. The growth in export, in terms of total quantity, in terms of total value in INR and in terms of total value in US$ was 22, 33 and 41% respectively. Details of various category of products exported to different countries are given in Table 4.

As per the information provided by APEDA, Ministry of Commerce, details of various organic products exported to different countries was as follows for the year 2010-11.

1. 19 Categories; >300 products
2. Exported quantity - 69837 MT
3. Value of export quantity - Rs. 699 Crores (USD 157.22 million)
4. Top exported products (in decreasing order) : Oilseeds, Cotton & textiles, Processed Food, Basmati Rice, Tea

Export Destinations

1. EU : 44% by volume; 52% by value
2. Canada : 22% by volume ; 14% by value
3. US : 19% by volume ; 17% by value
4. Asia : 13% by volume ; 15% by value

Domestic Organic Market

With more than 5 lakh farmers and more than 0.77 million ha cultivated area under organic certification, India produces practically all types of organic commodities. As per the estimates during 2009-10, India produced various organic commodities valuing at Rs. 5640 crores (at Farm Gate prices, based upon the produce data of certification bodies as calculated by NCOF). Out of this only limited quantity was marketed under organic brand.

Table – 1 Growth of area under organic management

S.No.	Years	Area in ha under organic certification process	
		Cultivated (organic+in-conversion)	Wild harvest
1.	2003-04	42,000	NA
2.	2004-05	76,000	NA
3.	2005-06	1,73,000	NA
4.	2006-07	5,38,000	24,32,500
5.	2007-08	8,65,000	24,32,500
6.	2008-09	12,07,000	30,55,000
7.	2009-10	10,85,648	33,96,000
8.	2010-11	7,77,517	36,50,000

Table – 2 State-wise total area (in ha) under organic certification process during the year 2010-11 (as on March 2011)

State Name	**Organic Cultivated**	**In-conversion cultivated**	**Wild Area (in Hac)**
Andhra Pradesh	6070.90	6279.72	2000
Arunachal Pradesh	243.10	0.00	0
Assam	2001.76	45.33	0
Andman	0.00	334.68	0
Bihar	0.00	1303.62	0
Chhattisgarh	321.99	126.94	8000
Damna & Diu	0.00	0.00	0
Delhi	127.50	138.82	0
Goa	13044.65	259.05	0
Gujarat	42267.48	6251.43	0
Haryana	2343.06	12420.55	0
Himachal Pradesh	2265.46	1781.41	627855.12
J&K	640.50	135.98	0
Karnataka	9128.01	10400.63	69200
Kerala	3870.27	2727.38	0
Lakshadweep	0.00	12.13	0
Madhya Pradesh	270955.70	27407.18	2568209
Jharkhand	0.00	0.00	24300.00
Maharashtra	124547.04	50298.44	2500
Manipur	2336.72	455.31	0
Meghalaya	1564.05	855.62	0.0001
Mizoram	4471.60	8072.53	0
Nagaland	654.00	949.54	
Orissa	16883.73	6218.56	1315.26
Punjab	2118.22	3907.57	0
Rajasthan	57566.93	9145.26	151000
Sikkim	1391.04	27.31	308
Tamilnadu	3244.61	829.98	30803.5
Tripura	203.56	144.83	0
Uttar Pradesh	17212.43	23800.40	70632
UTTARAKHAND	9513.76	2073.03	93879.2
West Bengal	5014.94	1110.78	0
TOTAL	**600003**	**177513.98**	**3650002.075**

Table 3. State-wise details of total area under organic certification process and total production of raw organic commodities (both cultivated and wild harvest) during the year 2010-11.

State Name	Total Area Under Certified Organic Cultivation (in Million Hectares)	Total Production (in MT)
Andhra Pradesh	14350.62	59470.76
Arunachal Pradesh	243.10	2127.29
Assam	2047.09	14716.95
Andaman & Nicobar	334.68	4189.10
Bihar	1303.62	15153.35
Chhattisgarh	8448.93	1695.82
Delhi	266.32	2172.26
Goa	13303.70	28262.50
Gujarat	48518.91	191667.84
Haryana	14763.61	119789.39
Himachal Pradesh	631901.99	74973.30
J&K	776.48	10382.95
Karnataka	88728.64	220901.31
Kerala	6597.65	58177.29
Lakshadweep	12.13	22.55
Madhya Pradesh	2866571.88	1220809.58
Jharkhand	24300.00	0.00
Maharashtra	177345.48	694275.26
Manipur	2792.03	19239.25
Meghalaya	2419.67	15674.64
Mizoram	12544.13	177509.02
Nagaland	1603.54	6627.47
Orissa	24417.55	166183.41
Punjab	6025.78	68177.83
Rajasthan	217712.19	265341.01
Sikkim	1726.34	5174.44
Tamil Nadu	34878.09	41640.73
Tripura	348.39	527.25
Uttar Pradesh	111644.83	294156.10
Uttarakhand	105465.98	79765.04
West Bengal	6125.72	28393.48
TOTAL	4427519.06	3887197.19

As per the study conducted by Organic Trade Association of India (OTA) presented at BioFach 2012 at Nuremberg Germany during February 2012, total value of organic produce during 2011-12 is expected to be around Rs. 8575 crores, out of which marketable surplus was worth Rs 4550 crores (50% of production). Details of various retail formats with number of outlet units (as per OTA) are as follows:

1. Modern High End Retail 350 units
2. General Trade Outlets 1500 units
3. Institutional Consumers 300 units
4. Claimed Organic Outlets 2000units
5. Rural/Farmer/NGO operated 2000 units

Table 4 Product wise category and quantity exported during the year 2010-11

(As per the details provided by APEDA)

S.No.	Product category	Exported quantity in MT
1	Oil Crops (Except sesame)	17965.94
2	Cotton & textiles	17362.79
3	Processed Food	8752.37
4	Misc	5916.68
5	Basmati Rice	5242.93
6	Tea	2928.08
7	Sesame	2409.11
8	Honey	2408.79
9	Non Basmati Rice	1633.73
10	Dry Fruits	1472.17
11	Cereals (Except Rice)	1347.89
12	Spices - Condiments	1174.35
13	Medicinal & Herbal Plants	627.09
14	Coffee	320.34
15	Vegetables	166.99
16	Aromatic Oil	38.57
17	Pulses	38
18	Fruits	27.51
19	Flowers	3.45
	Total	69836.78

Organic Agriculture Research Institutions
Research needs of organic agriculture is being looked after an ICAR sponsored "Network Project on Organic Farming (NPOF-ICAR) with Project Directorate of Farming System Research, Modipuram, UP as its coordinating centre. NPOF-ICAR project, besides its head quarter at Modipuram is being operated from 13 centres located at Raipur-Chhattisgarh Bajura- Himachal Pradesh, Comibatore-Tamil Nadu, Dharwad-Karnataka, Calicut-Kerala, Pantnagar-Uttarakhand, Bhopal-Madhya Pradesh, Ranchi-Jharkhand, Umiam-Meghalaya, Jabalpur-Madhya Pradesh, Karjat-Karnataka, Ludhiana-Punjab and Parbhani-Maharashtra.

Besides these, two State Agricultural Universities namely University of Agricultural Sciences, Dharwad, Karnataka and CSK Himachal Pradesh Krishi Vishvavidyalay, Palampur have also started separate Departments of Organic Agriculture Research.

Organic Input production
Steady increase in organic input production infrastructure has also contributed to significant growth of organic agriculture area in the country. Biofertilizers, bio-pesticides and organic fertilizers are essential inputs for organic farming and their availability is continuously on rise.

Biofertilizers and bio-pesticides – India has excellent production network in the country. As on today there are more than 225 production units in the country with an installed annual production capacity of more than 125,735 MT for biofertilizers and bio-pesticides. During 2010-11 more than 37997 MT of biofertilizers and 69137 MT of bio-pesticides were produced in the country.

Organic fertilizers – With the continuous intervention of Central and State Governments, production of different organic manures are increasing. During the year 2010-11 the country has produced and utilized more than 3671 lakh MT of different types of organic fertilizers/ manures, contributing approximately 7.34 million tons of nutrients in terms of NP&K.

A case of Organic Potato in Bihar: World record production using Ecofriendly Agri Bio Inputs

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Introduction:

Potato (*Solanum tuberosum* L.) popularly known as 'The king of vegetables', has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato (Dahiya, 2001, Ezekiel et al 2003). Being a short duration crop, it produces more quantity of dry matter, edible energy and edible protein in lesser duration of time than cereals like rice and wheat. Hence, potato may prove to be a useful tool to achieve the nutritional security of the nation. Potato is one of the main commercial crop grown in the country. It is cultivated in 23 states in India. Uttar Pradesh, West Bengal, Bihar, Punjab and Gujarat account for a lion's share in total production. Varieties like Kufri, Chipsona-1, Kufri Chipsona-2, Kufri Jyoti, Kufri Luvkar, Kufri Chandramukhi, and Pukhraj are most popular varieties being grown.

Organic Initiative of Bihar:

Bihar Government planned a major programme in 2011-12 for taking up large scale organic farming. The chief Minister of Bihar declared a major initiative by organizing International Conference on "Organic Bihar" in June 2011. Several national and international experts and practicing farmers were invited. A key note address by Dr. M.H. Mehta former Vice Chancellor GAU and now Chairman of "The Science Ashram/Gujarat Life Sciences" presented a model showing how packages of Ecofriendly Agri Bio Inputs can substantially reduce the agri-input cost and at the same time improve farm productivity. Such a model of Agri Bio Inputs CERTIFIED BY France based company; ECOCERT was thought to be the most appropriate for most of the places but particularly for resource poor and backward areas.

Bihar-Nalanda District:

Many parts of Bihar are relatively poor but have rich and diversified agricultural base. Again more than 70% of labor force and poor are in rural areas. It was appropriately thought that a right ecofriendly or organic model can convert this into an opportunity.

Materials and Methods:

The organic farming of Potato, variety Pukhraj was carried out at Darveshpura, Nalanda district in Bihar. Nitish Kumar (a farmer) adopted the 'Dhaincha' (Sesbania) green manuring as the first process to increase the fertility of soil. Inputs used were 100 kg vermi-compost, 100kg chicken manure, N.P.K - Bio inputs of Gujarat Life Sciences (GLS) like Wonderlife -G (Granule based Biofertilizer), GLS-Enrich (humic acid based soil conditioner), Vamstar (Vesicular-Arbuscular Mycorrhiza root promoter), Tricholife (Trichoderma as seed treatment), Superlife (liquid Biofertilizer), Hot Favorite & Amino mix (plant derived liquid growth promoter), Kelp Extract (Growth Enzyme), Neem A life (botanical biopesticide) & Beaulife (*Bauveria bassiana* microbial pesticide). Beside this, time to time proper training was organized and field visit by GLS experts and State Government officers helped farmers for application of inputs in right proportion and at the right time. All these inputs conform to the International standards of Ecocert and have been found to be safe and highly effective Agri Bio Inputs. Such a package (Ahlawat et al 2009, Mehta 2009) was developed keeping in mind the need of a model which is ecofriendly and reduces the cost of agro inputs and still give higher production. To help the farmers improve productivity with ecofriendly inputs, the scientists of Gujarat Life Sciences were asked to make a comprehensive package of Agri Bio Inputs. The details of the package are given in stage wise manner in Table 1.

Table 1: GLS Organic Package for Potato
Nutrient Management

Stage	Product Recommended and Dosage
Stage 1: Main field preparation	
While main field preparation	GLS – Enrich@8 kg/acre + Bioshot@ 5 grams per liter of water in the soil
Stage 2 : Sowing	
At the time of sowing	Wonderlife-G@ 5 kg. / acre + Vamstar @ 2.5 kg. / acre respectively with FYM
Stage 3: Germination & Vegetative Development	
15 days after germination	Superlife @1 liter/ acre + Tricholife@1 kg/acre in the root zone
30 days after germination	Wonderlife –G @ 5 kg. / acre + Vamstar@ 2.5 kg. / acre with FYM
50 – 60 days after germination	Hotfavourite@ 1 liter/ acre in the root zone through drenching
Stage 4: Tuber initiation and development	
75 days after germination	Vamstar @ 2.5 kg/acre with FYM
80-90 days after germination	GLS Amino mix @2-3 ml/ liter of water in the root zone
Disease and Pest Management	
Pests/ Disease	**Control**
All stages disease management	Tricholife @ 1 kg/acre
Leaf spot, root and stem rot, damping off disease	Bioshot @5 grams/liter of water as foliar or root zone application
Thrips	Spray: Neem-A-Life at 4-5 ml / lit. of water. If thrips attack is very heavy, spray Thrip-Thrash (1-2 ml/liter of water) with Neem-A-Life. Repeat the spray if required
White fly	Spray Neem-A-Life with Beaulife (1-2 ml/liter of water)
For other pests like Aphids, Jassids, Bollworms	Use Beaulife at 4-5 gms. / lit. of water + Neem-A-Life 4-5 gms /liter of water and spray on infected area
Mite	Mite no mite: 1-2 ml/liter of water to combat Red spider mites, Yellow mites and spider mites.
Sucking & Chewing pests, DBM	Monoshot: 3-4 ml/liter of water for preventive pest control as well as for infested area
Nematode	Use Nematkiller 1 kg/acre through drenching. If problem persists, repeat the application.

Table2: Eco organic package for Potato – A Typical Case.

Sr no	Inputs name	Kg/lit per hectare
1	cow dung	1500kg
2	Vermicompost	100kg
3	Poultry manure	100kg
4	Wonderlife-G (Granules)	10kg
5	GLS ENRICH (soil conditioner)	20kg
6	Vamstar (root promoter)	6.25kg
7	Tricholife (seed treatment and Disease Management)	2.5kg
8	Superlife (liquid Biofertilizer)	2.5 lit
9	GLS Hot Favourate + GLS Amino mix (liquid growth promoter)	2.5 lit each
10	GLS Kelp Extract (Growth Enzyme)	2.5 lit
11	Bioshot (bio-fungicide)	2.5kg
12	Neem A life(Botanical biopesticide)	2.5 lit
13	Beaulife (powder biopesticide)	2.5 kg

(The farmer also had used 12kg/hectare of NPK mixture but other than that no chemical fertilizer or pesticides were used.)

Few selected progressive farmers of village Darveshpura planted potato crop during winter of 2011-12 and based on above package reported his inputs usage as per Table - 2. Although the package used by the farmer was not 100% organic meeting certification requirement, but was very close to organic as only a very small quantity of NPK fertilizer was used

Results and Discussion:

In the village Darveshpura of Nalanda District, Bihar nearly 65 hac of land was taken up for organic cultivation of potato with the above mentioned Package (Table 2). A small but progressive farmer Mr. Nitish Kumar (6) was taken up as typical case. Shri Nitish Kumar had been growing potato (and other crops) in his farm since last many years and had earlier reported a highest yield of potato of nearly 30tones/ha using chemical inputs.

With his hard work, dedication and observational precision farming with above organic package, Nitish Kumar has proved that with help of organic input package, a substantial increase in production is possible. To witness the actual yield the harvesting of potato, was undertaken under the supervision of agriculture scientist and District Agriculture and Horticultural, officers and a production of 72.9 tones /ha. was reported (Hindustan Times March 15, 2012).

Dahiya and Sharma (1994) had reported that previous world record of potato production (in Netherlands) was about 45.0 tons/hectare. The yield of Shri Nitish Kumar was far ahead of last world record and that too was obtained with balanced and effective use of organic inputs. The previous average yield from the same area with chemical cultivation was approximately 30 tons per hectare. This world record production of potato with organic inputs has proved that the new generation Agri Bio Inputs not only ensures higher productivity in a sustainable and eco-friendly manner but also promise higher profitability with chemical residue free healthy food.

Acknowledgments:

The authors are grateful to the Government of Bihar, officers of the Department of Agriculture and Horticulture, Bihar and farmers of Nalanda District for their initiative, support and faith in developing such an Ecofriendly farming model. For the intelligent understanding and application of this model, farmers like Mr. Nitish Kumar of Darveshpura, Nalanda District deserve special appreciation and congratulations.

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HARITIMA - The Organic Kitchen of Uttarakhand

On 5th of June,2012 the country's first certified organic restaurant **HARITIMA- The Organic Kitchen of Uttarakhand** opened for the public at Tera Gaon, Sahastardhara Road, Dehradun. This is to remind readers that the state of Uttarakhand has declared Organic agriculture as a thrust area. The Uttarakhand Organic Commodity Board has the mandate to market the organic food commodities from the state where a number of traditional crops like millets, pulses, spices and condiments are being produced and are part of traditional recipes. There was an ardent need to showcase the usage of these organic and traditional crops in contemporary gourmet to popularise them. Every morsel used at Haritima is free from toxics and synthetic inputs.

Needless to say, in the present world of fast food, precooked food and adulterated food, Haritima strives to be a place where organic, fresh as well as delicious food can be a safe alternative for the people as well as the visitors in Dehradun. Mr Shard Sundriyal the CEO of Tera Gaon the partner organization of this initiative says that we are looking forward to service pure and organic traditional meals to tourist and local residents of Dehradun. The restaurant has a diverse menu of traditional and fusion foods. Some of the important cuisines which are worth talking about are Finger Millet (Koda/Mandu) Kathi Roles, Local Beans Salads, Traditional Kumaoni/Garhwali Meals complete with Sukse, Hemp Milk veggies, Hemp/Bhanjera Chutuny, Stuffed Parathas and Deserts. The beverages consist of organic tea, coffee, apple juice, kafal (Miraca) juice and rhododendron juice. While speaking to the guests in the inauguration every one lauded the novel initiative and appreciated the quality of food. According to Pradeep Dadlani, Marketing consultant for the event about 20 invitees were interviewed and feed back on pricing, quality and diversity was taken and all of the invitees gave an excellent remark.

Haritima is ensconced in the principal that essentially food is nutrition for the body. Organic foods embody nature's gift to the mankind where food is produced without the use of any chemical or synthetic inputs. It is a matter of great pride that an organic restaurant, the first of its kind in India, has finally opened where you and your family can ensure 100 % certified organic food within the realms of your budget says Mrs Binita Shah, CEO, Organic Board.

India Organic News

Sustainable Agricultural Development and Organic Farming in India - Under the changing agricultural scenario, the agricultural technologies needs a shift from production oriented to profit oriented sustainable farming. In this direction, the pace of adoption of resource conserving technologies (RCTs) by the Indian farmers is satisfactory to a larger extent but, under the present scenario, we are in the half way of conservation agriculture. The CA systems will leads to sustainable farming and will be the major thrust of the future farming. The conditions for development of sustainable agriculture are becoming more and more favorable. New opportunities are opening the eyes of farmers, development workers, researchers and policy makers. They now see the potential and importance of these practices not only for their direct economic interest but also as the basis of further intensification and ecological sustainability. This does not mean that agrochemicals can be abandoned. Also, research has an important role to play. Bankers and funders should think of how best to provide incentives and credits, accessible to poor farmers and women, to make investment in dry land farming possible. As conditions for farming will continue to change, the key to sustainable agriculture is the capacity of farmers and all other actors in agricultural development, as well as the wider society, to learn, experiment, adapt and cooperate in an effective way. To conclude, a small farm management to improve productivity, profitability and sustainability of the farming system will go a long way to ensure the all-round sustainability (Source – Narayan 2012 Golden Research Thoughts Vol.1,Issue.XI/May 2012pp.1-4)

Provisioning ecosystem services income extend comparison between organic and conventional agricultural fields in Puducherry, India - Agriculture supplies provisioning services- food, fodder, fuel, timber, medicine and ornamental in ecosystem service parlance. Management of ecosystem services is vital to maintain and improve the productivity of agricultural systems in order to meet the food demands of the growing human population. However, conventional management practices can severely reduce the ecological and financial contribution of agriculture, which in the longer term can offset the ability of farming to produce large amounts of commodities for more economic return. In the current work, a novel bottomup experimental approach is used to quantify the economic value of provisioning ecosystem services between conventional and organic agriculture fields in Kuruvinatham and Soriankuppam villages of Bahour commune, Puducherry during September 2008 to October 2010; authors investigated 30 farms - 15 Organic and 15 Conventional agricultural fields with varying species composition and degree of commercialization. Data were gathered through interviews among selected farmers and identified 51 species utilized as food, fodder, fuel, timber and medicine. Species retention is governed by species relative importance. Conventional fields were found to be less diverse with reduced density resulting in low annual gross income. Thus it has less ecological and socioeconomic advantages, as compared to organic fields. Practice of traditional organic agriculture systems plays significant roles in both ecological and economic terms by livelihood improvement, biodiversity conservation, soil fertility enhancement and poverty reduction. Therefore it is important to conserve and promote organic agriculture to achieve sustainable production and economic returns. (Source - Padmavathy and Poyyamoli, Journal of Agricultural Extension and Rural Development Vol. 4(6), pp. 120-128, 5 April, 2012)

Emerging health risks associated with modern agriculture practices: A comprehensive study in India - In order to enhance food production, India has adopted modern agriculture practices and achieved noteworthy success. This achievement was essentially the result of a paradigm shift in agriculture that included high inputs of agrochemicals, water, and widespread practice of monoculture, as well as bureaucratic changes that promoted these changes. There are very few comprehensive analyses of potential adverse health outcomes that may be related to these changes. The objective of this study is to identify health risks associated with modern agricultural practices in the southern Indian state of Karnataka. This study aims to compare high-input and low-input agricultural practices and the consequences for health of people in these communities. The fieldwork was conducted from May to August, 2009 and included a survey carried out in six villages. Data were collected by in-depth personal interviews among 240 households and key informants, field observations, laboratory analyses, and data from secondary sources. The study identified four major visible impacts: occupational hazards, vector borne diseases, changing nutritional status, and inequity in development. In the high-input area, mechanization has resulted in more occurrences of serious accidents and injuries. Ecological changes due to rice cultivation in this area have further augmented mosquito breeding, and there has been a surge in the incidence of Japanese encephalitis and malaria. The traditional coarse cereals (complex carbohydrates, high protein) have been replaced by mill-polished rice (simple carbohydrate, low protein). The prevalence of overweight (BMI>25) has emerged as a new public health challenge, and this is most evident in large-landholding households, especially in the high-input agriculture areas. In all agro-ecological areas, it was observed that women faced a greater risk of both extremes of under-nutrition and being overweight. Output-driven and market-oriented modern agricultural practices have changed the ecology and disease pattern in this area in India, and our survey indicated significant health effects associated with these changes. There is a need for more extensive epidemiological studies in order to know the full impact on diseases and to understand the complex causal relationships. (Source – Sarkar et al Environmental Research Volume 115, May 2012, Pages 37–50)

Quality analysis of indigenous organic Asian Indian rice variety- *Salem samba* - Rice is the world's most important food crop and is a primary food source for over one third of the world's population. The current scenario in the food and agriculture sector marks the sudden increase in concern towards organic farming and conservation of genetic biodiversity in rice production. The objective was to analyze the various quality aspects in terms of proximate and nutrient composition, physical characteristics, milling characteristics and physicochemical characteristics and cooking quality of organically grown traditional indigenous Asian Indian rice variety - *Salem samba*. The nutrient content of *Salem samba* was found to be relatively higher when compared to conventional rice varieties. And based on its proximate composition it was identified to give soft and non waxy cooked rice with medium amylose content which is ideal for cooking. Based on milling characteristics it was identified that parboiled milling is highly suitable. In terms of physiochemical characteristics, the indigenous rice variety *Salem samba* was identified to have a high intermediate gelatinization temperature and also formed a hard gel in terms of its gel consistency. The cooking quality was found to be satisfactory and was identified to have close interrelationship with physicochemical characteristics. (Source – Ravi et al 2012, Indian Journal of Traditional Knowledge Vol 11)

Productivity and Soil Health of Potato (Solanum tuberosum L.) Field as Influenced by Organic Manures, Inorganic Fertilizers and Biofertilizers under High Altitudes of Eastern Himalayas - Field experiments were conducted in three consecutive summer seasons of 2005 to 2007 to study the effect of integrated nutrient management on soil health and productivity of potato (*Solanum tuberosum* L.) under rainfed condition. The experiment was laid out in a split plot design with eight nutrient management practices (combinations of organic manures viz, farm yard manure (FYM), poultry manure (PM), vermicompost (VC) and inorganic fertilizers in main plots and seed tuber treatment with three biofertilizers (*Azotobacter*, phosphorus solubilizing bacteria (PSB) and *Azotobacter* + PSB) in sub plots. The results showed that 50% of the recommended dose of NPK through inorganic + 50% recommended dose of nitrogen (RDN) through organic manures (FYM, PM or VC) or 100% recommended dose of NPK through inorganic fertilizers alone favorably influenced the tuber yield, nutrient uptake, soil fertility and paid higher returns compared to other treatments. Seed treatment with *Azotobacter* + PSB proved better in tuber yield, nutrient uptake and recorded higher returns as compared to sole treatment of either *Azotobacter* or PSB. Three years pooled result revealed that integrated application of 50% of recommended NPK through inorganic and 50 % RDN through PM recorded significantly highest tuber yield (22.73 t/ha) closely followed by 100% recommended NPK through inorganic (22.20 t/ha) which were 228% and 223% respectively, higher than control. Integrated application of inorganic and organic fertilizers and seed treatment with *Azotobacter* + PSB biofertilizers improved tuber yield, nutrient uptake, and gave higher return as compared to other treatment combinations. Total organic carbon (TOC), soil microbial biomass carbon (SMBC), available N, P, and K status of the soil after 3 years were maximum when 50 % recommended dose of NPK were applied through inorganic and remaining 50 % RDN through PM. (Source - *Manoj Kumar et al 2012, Journal of Agricultural Sciences* Vol 4, No 5)

Soil microbial biomass, functional microbial diversity, and nematode community structure as affected by cover crops and compost in an organic vegetable production system - Soil microorganisms play a crucial role in mineralization and breakdown of complex organic compounds in soil. Microbial populations and functional diversity are greatly influenced by quantity and quality of crop residue and other incorporate organic amendments. This study investigated the effect of cover crops (rye or a mixture of rye-vetch) and compost on soil microflora and microfauna under an organic tomato production system. Each cover crop treatment was used in conjunction with or without compost in a split-plot experimental design. Data on soil respiration, microbial biomass, metabolic quotient, and nematode populations were measured at the end of the growing season. Metabolic characteristics of the soil microbial community were determined using 31 C substrates on Biolog-Eco Plate™. Community level physiological profile (CLPP) was assessed by calculating average well color development (AWCD), richness (S), Shannon–Wiener diversity index (H), and evenness (E). Effect of compost was more pronounced on soil respiration than cover crop treatment. Highest microbial biomass was found in the soils amended with rye and compost (195–210 μg g dry soil^{-1}). Regression analysis between microbial biomass and soil organic matter (SOM) showed strong correlation (R^2 value of 0.68–0.56) in two out of the three growing seasons. Calcium, magnesium, and potassium concentrations in soil also positively correlated with microbial biomass. There were significant differences among soils in numbers of plant parasitic, bacterial, and fungal feeding nematodes during the initial years of the study but the differences were not evident later. Shannon–Wiener diversity index was significantly affected by cover crop treatment with rye treatments generally exhibiting higher degree of soil microbial functional diversity. Biolog-Eco Plate™ assay was sensitive to changes in the short-term. Principal component analysis of the Biolog data allowed differentiation of treatments but distribution patterns varied from year to year. Authors conclude that both rye and rye-vetch mixture can affect the functional diversity of soil microbial community but differences between them are marginal when compared to compost and no-compost treatments. Microbial communities were more responsive to compost applications than cover crop effects. (Source – Nair and Ngouajio 2012, Applied Soil Ecology Volume 58, July 2012, Pages 45–55

Opportunities and Constraints in Organic Farming: An Indian Perspective - Organic farming (OF) follows the principle of circular causation and has emerged in response to questions on health, environment and sustainability issues. In this review, authors assess the status, opportunities and C- sequestration potentials of OF in India. Authors identify constraints that impede adoption of OF especially for small farm holders who constitute over 70% of farming community in India. With large land area and climate diversity, India has a considerable potential to contribute to C-sequestration. The soil organic carbon (SOC) in cultivated soils is less than 5 mg g^{-1} compared to 15-20 mg g^{-1} in uncultivated soils. This available potential of 10-15 mg g^{-1} soil–C sink could balance net emission from fossil fuel combustion. Although India occupies second position in terms of number of certified organic farms (44,926), it is 13th in terms of area under OF representing only 0.3 % of total agricultural lands. This scenario appears poor compared to many other countries. Farmers apprehension towards OF in India is rooted in non-availability of sufficient organic supplements, bio fertilizers and local market for organic produce and poor access to guidelines, certification and input costs. Capital-driven regulation by contracting firms further discourages small farm holders. An integrated effort is needed from government and nongovernment agencies to encourage farmers. (Source – Pandey and Singh Journal of Scientific Research, Banaras Hindu University, Varanasi Vol. 56, 2012 : 47-72)

Organic Herbal Farming and its relation with the Environment - Nepal has a vast variety of landscapes: mountains, hills, plain, valleys etc. This is the main reason why it is very likely to find herbals anywhere in the country. Indeed the soil of Nepal is very rich (mostly clay soil) and there are a lot of virgin lands. As community development practitioners, authors feel responsibility to alert people of what and how they can grow and use local resources. If natural resources are protected and mobilized, it will support Nepal to keep a sustainable healthy environment. This paper reviews UNEP-EPLC and some other organizations' experiences with organic herbal farming and its connection, directly or indirectly, to the environment. Also, this paper studies the importance of protecting the soil with good fertilizer as well as the importance of organic herbal farming to enhance the farmers' socioeconomic status. Finally, the paper identifies major challenges and draws key learning in developing sustainable herbal farming system and practices that could be applicable in the context of participatory herbal farming for healthy environment. (Source – Subedi 2012, Design for Innovative Value Towards a Sustainable Society, 2012, 1075-1080)

Recent Developments of No-Till and Organic Farming in India: Is a Combination of These Approaches Viable? - The increase in crop production brought by the green revolution in India is now shadowed by new challenges related to soil degradation (e.g., erosion, decline of soil organic matter content, salinization) and scarcity of water resources. The present work particularly discusses the contribution of no-till and organic farming, which are increasingly being adopted in India, to meet the increasing food demand in a sustainable way. Under no-till, erosion is reduced to rates close to those found in natural ecosystems, provided enough mulch is retained at the surface which is usually not the case in India, because of competing uses, for example, fodder, fuel, construction material, and also crop residue burning for land preparation. No-till should therefore not be considered separately from complementary measures, aiming at retaining mulch on the soil surface. Efficient recycling of organic material needs to be implemented concomitantly with diversifying fodder and fuel sources which requires enhancing the multi-functionality of farming systems. These prerequisites make it difficult for farmers to adopt no-till, particularly the poorer ones for whom experimentation with new techniques often involve unbearable financial risks. Organic farming apprehends the farm as an organism, and is thus a good option to improve sustainability as introduced above, by e.g., closing nutrient cycling. However, organic farming typically implies tillage for weed control (no chemical herbicides). "Natural farming," as promoted by Fukuoka (1978) combines no-till with organic farming. An overview of available literature on Indian experiences with "natural farming," most of it originating from unconventional sources (i.e., reports available on Internet, but no peer reviewed literature) indicates that crop yields can compare well with the highest yields in a particular region. Increased productivity and environmental benefits are also often mentioned. The limited accuracy of these sources makes it necessary to pursue further investigations, and authors conclude with propositions for future work in this context. This should start with a rigorous assessment of existing *"natural farming"* systems regarding their productivity and environmental benefits, in order to demonstrate its potential before starting projects that promote the system for broader adoption. (Source – Duboc et al Journal of Sustainable Agriculture Volume 35, Issue 6, 2011, 576-612)

Fair Trade and organic initiatives confronted with Bt cotton in Andhra Pradesh, India: A paradox - This paper explores a confluence of Fair Trade and organic initiatives under the prevalence of Bt cotton in India, using as an interpretative framework Guthman's conventionalization thesis for organic farming in the Northern context. In a case study conducted in Andhra Pradesh, the confluence of the two initiatives, contrary to their ethical standards, contributed to the spread of genetically modified (GM) seed. The Fair Trade initiative, lacking a scheme for compensating for the decrease in income that producers have to endure during the conversion period, tends to take a more relaxed attitude toward GM crops in order to assist small farmers. Fair Trade's dilemma between helping poor farmers and promoting organic farming may have indirectly allowed Fair Trade producers to tend towards conventional farming with Bt seeds. As a result, the confluence of the two initiatives has not intensified the organic concept as "an alternative accumulation strategy for agrarian capitalism," but neither has it released disadvantaged Southern farmers from agrarian capitalism. Rather, it has led farmers into another form of agrarian capitalism. (Source - Rie Makita, 2012, Geoforum, online edition April 2012)

Performance of botanical and fungal formulation for pest management in organic okra production system - The botanicals and mycopathogenic formulation were tested for their efficacy against okra leafhopper, aphids and whitefly at Organic Farming Research Centre, Navile, Shivamogga during 2009. The performance of botanicals and mycopathogenic formulation against leafhopper revealed that the Neemazol @ 3.5% recorded 2.43 and 2.60 leafhoppers/3 leaves, Neem oil @ 2% recorded 2.63 and 3.50 leafhoppers/3 leaves and NSKE @ 5% recorded 3.53 and 4.00 leafhoppers / 3 leaves. These three treatments were found superior among botanicals and Beauveria bassiana @ 2.5 g / l recorded 2.5 and 3.6 leafhoppers/3 leaves and was on par with other mycopathogens at 10 DAS of first and second spray, respectively. Results on aphids and whitefly were recorded as follows: Neemazol @ 3.5% recorded 1.67 and 3.17 aphids/3 leaves and 2.00 and 2.63 whitefly/3 leaves, Neem oil @ 2% recorded 1.93 and 4.33 aphids/3 leaves and 2.17and 3.40 whitefly/3 leaves and NSKE @ 5% recorded 2.00 and 6.00 aphids/3 leaves and 3.00 and 4.00 whitefly/3 leaves at 10 DAS on the first and the second spray respectively and these were found superior among botanicals. Verticillium lecani @ 2.5 g/l showed 2.53 and 6.67 aphids/3 leaves and 2.80 and 3.53 whitefly/3 leaves at 10 DAS on the first and the second spray respectively and was on par with other mycopathogens. (Source – Naik et al 2012, J. Biopest, 5 (Supplementary): 12-16 (2012)

Global Organic

Comparing the yields of organic and conventional agriculture - Numerous reports have emphasized the need for major changes in the global food system: agriculture must meet the twin challenge of feeding a growing population, with rising demand for meat and high-calorie diets, while simultaneously minimizing its global environmental impacts. Organic farming—a system aimed at producing food with minimal harm to ecosystems, animals or humans—is often proposed as a solution, however, critics argue that organic agriculture may have lower yields and would therefore need more land to produce the same amount of food as conventional farms, resulting in more widespread deforestation and biodiversity loss, and thus undermining the environmental benefits of organic practices. Here authors used a comprehensive meta-analysis to examine the relative yield performance of organic and conventional farming systems globally. Our analysis of available data shows that, overall, organic yields are typically lower than conventional yields. But these yield differences are highly contextual, depending on system and site characteristics, and range from 5% lower organic yields (rain-fed legumes and perennials on weak-acidic to weak-alkaline soils), 13% lower yields (when best organic practices are used), to 34% lower yields (when the conventional and organic systems are most comparable). Under certain conditions—that is, with good management practices, particular crop types and growing conditions—organic systems can thus nearly match conventional yields, whereas under others it at present cannot. To establish organic agriculture as an important tool in sustainable food production, the factors limiting organic yields need to be more fully understood, alongside assessments of the many social, environmental and economic benefits of organic farming systems. (Source - Seufert et al 2012, Nature)

Comparison of nutritional quality between conventional and organic dairy products: a meta-analysis - As a contribution to the debate on the comparison of nutritional quality between conventional *versus* organic products, the present study would like to provide new results on this issue specifically on dairy products by integrating the last 3 years' studies using a meta-analysis approach with Hedges' *d* effect size method. The current meta-analysis shows that organic dairy products contain significantly higher protein, ALA, total omega-3 fatty acid, *cis*-9,*trans*-11 conjugated linoleic acid, *trans*-11 vaccenic acid, eicosapentanoic acid, and docosapentanoic acid than those of conventional types, with cumulative effect size (± 95% confidence interval) of 0.56 ± 0.24, 1.74 ± 0.16, 0.84 ± 0.14, 0.68 ± 0.13, 0.51 ± 0.16, 0.42 ± 0.23, and 0.71 ± 0.3, respectively. It is also observed that organic dairy products have significantly ($P < 0.001$) higher omega-3 to -6 ratio (0.42 vs. 0.23) and Δ9-desaturase index (0.28 vs. 0.27) than the conventional types. The current regulation on organic farming indeed drives organic farms to production of organic dairy products with different nutritional qualities from conventional ones. The differences in feeding regime between conventional and organic dairy production is suspected as the reason behind this evidence. Further identical meta-analysis may be best applicable for summarizing a comparison between conventional and organic foodstuffs for other aspects and food categories. (Source – Palupi et al 2012, Journal of the Science of Food and Agriculture, Online edition March 2012)

Conventional, organic and biodynamic farming: differences in polyphenol content and antioxidant activity of Batavia lettuce –*Lactuca sativa* L. ssp. *acephala* L., cv. Batavia red Mohican plants were cultivated under intensive conventional, organic and biodynamic farming and were analyzed for their polyphenol content and antiradical activity in order to demonstrate the influence of farming on yield, polyphenol content and antiradical activity. The yield of plants from conventional farming was the highest (2.89 kg m^{-2}), while polyphenol content, measured by spectrophotometry, of these plants was lower at $P < 0.05$ (1.36 mg g^{-1}) than the content of plants from organic and biodynamic farming (1.74 and 1.85 mg g^{-1}, respectively). The antiradical activity, measured by DPPH · assay, was positively correlated to flavonoid and hydroxycinnamic acid contents. Flavonoid, hydroxycinnamic acid and anthocyan patterns were not affected by the type of cultivation, while quantitative differences were demonstrated and some differences were found between conventional farming and organic or biodynamic farming. The yield of conventionally grown salads was the highest. (Source – Heimler et al 2012, Journal of the Science of Food and Agriculture Volume 92, Issue 3, pages 551–556)

Health effects of an organic diet—consumer experiences in the Netherlands - Health is one of the main reasons for consumers to buy organic; however, scientific evidence for a health effect is still limited. The aim of this study was to investigate the perceived health effects experienced by consumers of organic food using a free access online questionnaire. A total of 566 respondents participated, of whom 30% reported no health effects. The other respondents reported better general health, including feeling more energetic and having better resistance to illness (70%), a positive effect on mental well-being (30%), improved stomach and bowel function (24%), improved condition of skin, hair and/or nails (19%), fewer allergic complaints (14%) and improved satiety (14%). Furthermore, it was found that the switch to organic food was often accompanied by the use of more freshly prepared foods and other lifestyle changes. This research provided insight into the experienced health effects of consumers of organic food. Although the study design does not permit direct conclusions on health effects of organic food, the results can serve as a basis for the generation of new hypotheses. (Source – de Vijver and Vliet 2012, Journal of the Science of Food and Agriculture, Online edition Feb 2012)

Strawberries from integrated pest management and organic farming: Phenolic composition and antioxidant properties - Consumer awareness, pesticide and fertilizer contaminations and environmental concerns have resulted in significant demand for organically grown farm produce. Consumption of berries has become popular among health-conscious consumers due to the high levels of valuable antioxidants, such as anthocyanins and other phenolic compounds. The present study evaluated the influence that organic farming (OF) and integrated pest management (IPM) practice exert on the total phenolic content in 22 strawberry samples from four varieties. Postharvest performance of OF and IPM strawberries grown in the same area in the centre of Portugal and harvested at the same maturity stage were compared. Chemical profiles (phenolic compounds) were determined with the aid of HPLC-DAD/MS. Total phenolic content was higher for OF strawberry extracts. This study showed that the main differences in bioactive phytochemicals between organically and IPM grown strawberries concerned their anthocyanin levels. Organically grown strawberries were significantly higher in antioxidant activity than were the IPM strawberries, as measured by DPPH and FRAP assays. (Fernandes et al 2012, Food Chemistry, Online edition in Press)

Effects of organic farming and genotype on alimentary and nutraceutical parameters in tomato fruits - In recent years there has been growing interest in the influence of sustainable cultivation systems on the biochemical quality of vegetables. In this study, two genotypes of tomato, Giulianova and Perbruzzo, were grown in both organic (Or) and conventional (Conv) systems for three years and harvested at commercial ripening in each year. The Conv system was established according to traditional techniques and the Or system according to current EU regulations. Samples were evaluated for volatile substances, sugars, organic acids, dry matter, pH and lycopene. During the three years, volatile substances increased in Or samples of Giulianova, while this response was less evident in Perbruzzo. Other parameters of both genotypes were not influenced by Or cultivation. Lycopene content in both Conv-cultivated genotypes was constant during the whole experimental period. In Or samples, lycopene content was lower than in Conv samples during the first and second years. In the last year, lycopene content in Or samples of Giulianova was similar to that in Conv samples, while lycopene content in Or samples of Perbruzzo was higher than that in Conv samples. Changes in biochemical parameters of tomato fruits could be affected by both cultivation system and genotype, with a significant increase in both volatile substances and lycopene in the 2010 crop.(Source – Migliori et al 2012, Journal of the Science of Food and Agriculture Feb 2012 online edition)

Organic Farming Improves Pollination Success in Strawberries - Pollination of insect pollinated crops has been found to be correlated to pollinator abundance and diversity. Since organic farming has the potential to mitigate negative effects of agricultural intensification on biodiversity, it may also benefit crop pollination, but direct evidence of this is scant. Authors evaluated the effect of organic farming on pollination of strawberry plants focusing on (1) if pollination success was higher on organic farms compared to conventional farms, and (2) if there was a time lag from conversion to organic farming until an effect was manifested. Authors found that pollination success and the proportion of fully pollinated berries were higher on organic compared to conventional farms and this difference was already evident 2–4 years after conversion to organic farming. Results suggest that conversion to organic farming may rapidly increase pollination success and hence benefit the ecosystem service of crop pollination regarding both yield quantity and quality (Source – Anderson et al 2012, PLoS ONE 7(2)

Comparative fruit quality parameters of several Japanese plum varieties in two newly established orchards, organic and conventionally managed - The fruit quality parameters of several Japanese plum cultivars (*Prunus salicina* Lindl) were studied in two experimental orchards under organic and conventional management. The study was performed during 2008–2010 in the province of Seville (SW Spain). Colour, weight, size, firmness, soluble solid concentration and acidity were measured for fruit quality evaluation. Yield was also determined. In general, the organic fruit was of smaller size and weight. There was little difference in the colour of most of the varieties, but some varieties such as 'Friar' and 'Black Amber' were more colourful in the organic orchard. The soluble solid concentration and acidity were similar in the fruit from both orchards. The organic plums showed firmness equal to or slightly greater than conventional ones. Dry matter and nitrites were analysed in 2010, and no significant differences were observed in most of the varieties. The accumulated fruit yield was significantly superior in the conventionally managed orchard. (Source – Daza et al International Journal of Food Science & Technology Volume 47, Issue 2, pages 341–349, February 2012)

Crop yield, root growth, and nutrient dynamics in a conventional and three organic cropping systems with different levels of external inputs and N re-cycling through fertility building crops - One of the core ideas behind organic production is that cropping systems should be less dependent on import of resources, and minimize negative effects on the surrounding environment compared to conventional production. However, even when clearly complying with regulations for organic production, it is not always obvious that these goals are reached. As an example, strong dependence on import of manure is often seen in current organic production, especially in systems producing high value crops such as vegetable crops. The aim of the present study was to test novel approaches to organic rotations, designed to reduce the reliance on import of external resources significantly. Authors compared a conventional system (C) and an organic system relying on manure import for soil fertility (O1) to two novel systems (O2 and O3) all based on the same crop rotation. The O2 and O3 systems represented new versions of the organic rotation, both relying on green manures and catch crops grown during the autumn after the main crop as their main source of soil fertility, and the O3 system further leaving rows of the green manures to grow as intercrops between vegetable rows to improve the conditions for biodiversity and natural pest regulation in the crops. Reliance on resource import to the systems differed, with average annual import of nitrogen fertilizers of 149, 85, 25 and 25 kg N ha^{-1} in the C, O1, O2 and O3 systems, respectively. As expected, the crop yields were lower in the organic system. It differed strongly among crop species, but on average the organic crops yielded c. 82% of conventional yields in all three organic systems, when calculated based on the area actually grown with the main crops. In the O3 system some of the area of the vegetable fields was allocated to intercrops, so vegetable yields calculated based on total land area was only 63% of conventional yields.

Differences in quality parameters of the harvested crops, i.e. nutrient content, dry matter content or damages by pests or diseases were few and not systematic, whereas clear effects on nutrient balances and nitrogen leaching indicators were found. Root growth of all crops was studied in the C and O2 system, but only few effects of cropping system on root growth was observed. However, the addition of green manures to the systems almost doubled the average soil exploration by active root systems during the rotation from only 21% in C to 38% in O2 when measured to 2.4 m depth. This relates well to the observed differences in subsoil inorganic N content (N_{inorg}, 1–2 m depth) across the whole rotation (74 and 61 kg N ha^{-1} in C and O1 vs. only 22 and 21 kg N ha^{-1} in O2 and O3), indicating a strongly reduced N leaching loss in the two systems based on fertility building crops (green manures and catch crops). In short, the main distinctions were not observed between organic and conventional systems (i.e. C vs. O1, O2 and O3), but between systems based mainly on nutrient import vs. systems based mainly on fertility building crops (C and O1 vs. O2 and O3). Highlights► Yield loss in organic vs. conventional systems was on average less than 20%. ► Pest and disease damage was not systematically different among the 4 systems. ► Fertility building crops improved nutrient management, reducing environmental nitrogen losses. ► Adding fertility building crops in the rotation almost doubled root exploitation of the soil. ► Main difference in N dynamics was between systems with or without fertility building crops. (Source - Thorup-Kristense et al 2012, European Journal of Agronomy Volume 37, Issue 1, February 2012, Pages 66–82)

Consumers' beliefs and behavioural intentions towards organic food. Evidence from the Czech Republic - Research has revealed that organic consumers share beliefs about positive health effects, environmentally friendly production and better taste of organic food. Yet, very little is known about the decisions of organic consumers in post-socialist countries with emerging organic food markets. In order to examine this area a representative data set (N = 1054) from the Czech Republic was used. Target group of the study has become the Czech consumers that purchase organic food on regular basis. The consumers' behaviour was conceptualised with the use of the theory of planned behaviour (ToPB). Firstly, the ToPB model was tested, and secondly, belief-based factors that influence the decisions and behaviour of consumers were explored. The theory proved able to predict and explain the behaviour of Czech organic consumers. The best predictors of the intention to purchase organic food are attitudes towards the behaviour and subjective norms. Decisive positions in consumers' beliefs have product- and process-based qualities. Highlights ► Findings are based on a large national Czech survey. ► Theory of planned behaviour model was tested. ► The best predictors of the intention are attitudes and social norms. ► The concerns about the product- and process-based qualities prevail. ► Less importance is given to concerns about production systems and producers. *(Source Zagata* - Appetite Volume 59, Issue 1, 2012)

Healthy food from organic wheat: choice of genotypes for production and breeding - In the present study, 40 wheat genotypes were grown in the same soil in organic farming system trials in Alnarp, Sweden. The purpose was to evaluate opportunities for production and breeding of organic wheat of high nutritious value. The results showed a large variation in content of minerals, total tocochromanols and heavy metals in the grain of 40 organically produced wheat genotypes. Principal component and cluster analysis were used as tools for selection of the most suitable genotypes for production and breeding of organic wheat of high nutritious value. No single genotype group was found particularly superior from the studied material to produce this specific type of wheat. However, certain genotypes from different groups were found with promising nutritional characters. The most promising genotypes as related to nutritionally relevant compounds were 6356 spelt, *Triticum monococcum*, Ölands 17 borst spelt, Lv Dal 16 brun borst and Fylgia. By choosing these genotypes for organic production and future wheat breeding, nutritionally improved organic wheat products might be developed. However, for future breeding, nutritional components such as protein, fibre, glycaemic index and B-group vitamins should also be considered. (Source – Hussain et al 2012, Journal of the Science of Food and Agriculture, Online edition April 2012)

Phenolics, Flavonoids, Antioxidant Activity and Cyanogenic Glycosides of Organic and Mineral-base Fertilized Cassava Tubers - A field study was conducted to determine the effect of organic and mineral-based fertilizers on phytochemical contents in the tubers of two cassava varieties. Treatments were arranged in a split plot design with three replicates. The main plot was fertilizer source (vermicompost, empty fruit bunch compost and inorganic fertilizer) and sub-plot was cassava variety (Medan and Sri Pontian). The amount of fertilizer applied was based on 180 kg K_2O ha^{-1}. The tubers were harvested and analyzed for total flavonoids, total phenolics, antioxidant activity and cyanogenic glucoside content. Total phenolic and flavonoid compounds were determined using the Folin-Ciocalteu assay and aluminium chloride colorimetric method, respectively. Different sources of fertilizer, varieties and their interactions were found to have a significant effect on phytochemical content. The phenolic and flavonoid content were significantly higher ($p < 0.01$) in the vermicompost treatment compared to mineral fertilizer and EFB compost. The total flavonoids and phenolics content of vermicompost treated plants were 39% and 38% higher, respectively, than those chemically fertilized. The antioxidant activity determined using the DPPH and FRAP assays were high with application of organic fertilizer. Cyanogenic glycoside levels were decreased with the application of organic fertilizer. Among the two types of compost, vermicompost resulted in higher nutritional value of cassava tubers. Medan variety with application of vermicompost showed the most promising nutritional quality. Since the nutritional quality of cassava can be improved by organic fertilization, organic fertilizer should be used in place of chemical fertilizer for environmentally sustainable production of better quality cassava. (Source – Omar et al *Molecules* 2012, *17*(3), 2378-238)

Impact of soil oxygenation on seed quality of chickpea (*Cicer arietinum* Linn. cv. 'vijay') under organic farming condition - Pot culture experimentation was carried out on chickpea (*Cicer arietinum* Linn. cv. 'vijay') at P.G. Research

Center, Department of Botany, Tuljaram Chaturchand College, Baramati, using oxygenated peptone (2g/pot) as soil aerator. This treatment enhanced root system with increased length and biomass of root exhibiting increased absorptive area. This led to increase in total nitrogen, total phosphorous and total potash in root, stem and leaf. The treatment also increased accumulation of manganese, calcium and magnesium in root, stem and leaf, while zinc content was found to be decreased in root as well as in stem and it was stable in leaf. Interestingly, iron content was enhanced in leaf and root while it showed decrease in stem. The copper content was increased in root, stable in stem and decreased in leaf. The treatment resulted in early flowering and early maturity. There was increase in pods/plant as well as fresh wt and dry wt of 100 pods. The same is seen in seeds. The biochemical constituents of seed like total solids, ash, total acids, moisture content and crude fibre showed significant increase. The treatment also had an upper hand in soluble proteins, total carbohydrates and ascorbic acid under experimental condition. This indicated better nutritional quality of experimental seeds. The activity of enzymes like catalase, peroxidase and polyphenol oxidase was at higher level under the treatment condition. It is concluded that treatment of oxygenated peptone is useful for the qualitative and quantitative enhancement in chickpea under organic farming condition.(Source – Thakre et al 2012, Indian Journal of Natural Products and Resources Vol 3(1), March 2012)

Nutritional Value of Organic Meat and Potential Human Health Response - The nutritional quality of organically produced meat is affected by organic diet and breeding conditions. A number of studies confirm the lower total fat content of organic farm meat and this means a decreased calorific value. Carcasses from organically reared animals have usually higher content of intramuscular fat, positively affecting sensory properties. Moreover, the fatty acids' profile in organic meat is considered to be more beneficial to human health. Organic meat contains more favourable proportions of unsaturated fatty acids, including *n*-3 acids, and decreased level of saturated ones. The reason for this is a longer period of pasturage applied to organically reared animals. Therefore, consumption of organic meat can impose anti-cancer effects, stimulate the immune system and prevent coronary heart diseases. (Source – Steven et al 2012, Organic Meat Production and Processing. http://onlinelibrary.wiley.com)

Retail outlets: Nurturing organic food consumers - Consumer choice of retail outlet is often overlooked in explaining purchase behaviour in the organic food market. This paper uses theory from applied marketing research to identify the variables affecting consumer choice of retail outlet and finds that they play a determining role in whether or not consumers buy organic food. A grounded theory approach was used. The results confirmed the importance of variables previously identified in the literature in relation to the individual consumer, such as habit and budget, as well as those that relate to the retail outlet, such as convenience and product range. In addition, two new variables were identified that relate to whom the consumer was buying for and whether they are shopping alone or with others. This study focuses on the vast majority of organic food consumers. They are switchers because they purchase both organic and conventional products, rather than solely organic, or solely conventional. It concludes that choice of retail outlet adds to our understanding of their behaviour and that it facilitates identification of important implications for marketers. At a fundamental level, as some consumers actively seek out organic food on certain occasions it is important for retail outlets make them aware that they sell organic food and to stimulate sales with special offers. Further, smaller retailers, such as food co-ops or health food shops, should focus on providing a limited range of organic products and accept that they will not be able to match the convenience offered by supermarkets in terms of opening hours. (Source - Joanna Henryks and David

Pearson 2011, Organic Agriculture 1(4) 247-259)

The influence of organic and conventional cultivation systems on the nutritional value and content of bioactive compounds in selected tomato types - Tomato fruits contain a high level of antioxidants such as vitamin C, polyphenols (including flavonoids), and carotenoids (such as lycopene and β-carotene). Some studies have shown the higher level of bioactive compounds in organically produced tomato fruits compared to conventional ones, but not all studies were consistent in this respect. The levels of carotenoids and phenolics are very variable and may be affected by ripeness, genotype and cultivation. The aim of the study was to compare the effects of organic and conventional production systems on chemical properties and phenolic compounds of two tomato types (standard and cherry). The experiment was carried out in two growing seasons of 2008 and 2009, and in three organic and three conventional farms. The results obtained have shown that, in 2008, organic tomatoes presented a higher ratio of reducing sugars/organic acids, and contained significantly more total sugars, vitamin C and total flavonoids, 3-quercetin rutinoside, and myricetin in comparison with the conventional fruits. In 2009, organic tomatoes contained significantly more vitamin C, quercetin-3-*O*-glucoside and chlorogenic acid, myricetin and kaempferol in comparison with the conventional fruits. The organic growing system affects tomato quality parameters such as nutritional value and phenolic compound content. The second significant factor of nutritional value of tomato is the type of fruits. It would be necessary to continue this study as a long-term experiment in order to eliminate the influence of seasonality. (Source – Hallmann 2012 Journal of the Science of Food and Agriculture)

Book Reviews

Organic Meat Production and Processing, By Steven C. Ricke, John Wiley & Sons, 24-Apr-2012 - 448 pages - Consumers purchase organic meats for what they perceive as superior taste, better nutritional value, long-term health benefits, or enhanced product freshness. Many consumers also believe organic meat is safer than conventional, perhaps containing lesser amounts of pesticides or food borne human pathogens. Organic livestock farming, which is reputed to be environmentally friendly and sustains animals in good health resulting in high quality products, has a defined standard with a greater attention to animal welfare and requiring at least 80 percent of feed grown without pesticides or artificial fertilizers. The higher guarantee of the absence of residue is certain, but the effect of organic farming on qualitative characteristics of the products is unknown. Substantial growth in organic food sales of all categories has occurred in recent years and certified organic food production has evolved into a highly regulated industry in the European Union, the United States, Canada, Japan and many other countries. "Organic Meat Production and Processing" examines in detail the challenges of production, processing and food safety of organic meat. The editors and an international collection of authors explore the trends in organic meats and how the meat industry is impacted. Commencing with chapters on the economics, market and regulatory aspects of organic meats, coverage then extends to management issues for organically raised and processed meat animals. Processing, sensory and human health aspects are covered in detail, as are incidences of food borne pathogens in organic beef, swine, poultry, and other organic meat species. The book concludes by describing pre-harvest control measures for assuring the safety of organic meats. This book serves as a unique resource for fully understanding the current and potential issues associated with organic meats.

Microorganisms in Sustainable Agriculture and Biotechnology, 2012 T. Satyanarayana, Bhavdish Narain Johri, Anil Prakash, Springer, 829 pages - This review of recent developments in our understanding of the role of microbes in sustainable agriculture and biotechnology covers a research area with enormous untapped potential. Chemical fertilizers, pesticides, herbicides and other agricultural inputs derived from fossil fuels have increased agricultural production, yet growing awareness and concern over their adverse effects on soil productivity and environmental quality cannot be ignored. The high cost of these products, the difficulties of meeting demand for them, and their harmful environmental legacy have encouraged scientists to develop alternative strategies to raise productivity, with microbes playing a central role in these efforts. One application is the use of soil microbes as bioinoculants for supplying nutrients and/or stimulating plant growth. Some rhizospheric microbes are known to synthesize plant growth-promoters, siderophores and antibiotics, as well as aiding phosphorous uptake. The last 40 years have seen rapid strides made in our appreciation of the diversity of environmental microbes and their possible benefits to sustainable agriculture and production. The advent of powerful new methodologies in microbial genetics, molecular biology and biotechnology has only quickened the pace of developments. The vital part played by microbes in sustaining our planet's ecosystems only adds urgency to this enquiry. Culture-dependent microbes already contribute much to human life, yet the latent potential of vast numbers of uncultured—and thus untouched—microbes, is enormous. Culture-independent metagenomic approaches employed in a variety of natural habitats have alerted us to the sheer diversity of these microbes, and resulted in the characterization of novel genes and gene products. Several new antibiotics and biocatalysts have been discovered among environmental genomes and some products have already been commercialized. Meanwhile, dozens of industrial products currently formulated in large quantities from petrochemicals, such as ethanol, butanol, organic acids, and amino acids, are equally obtainable through microbial fermentation. Edited by a trio of recognized authorities on the subject, this survey of a fast-moving field—with so many benefits within reach—will be required reading for all those investigating ways to harness the power of microorganisms in making both agriculture and biotechnology more sustainable.

A Biodynamic Manual: Practical Instructions for Farmers and Gardeners, 2011 By Masson and Blais Publ. Floris Books, pp 200 - For anyone already practicing, or turning to, biodynamic gardening and farming methods, numerous detailed questions arise, such as: * How do you choose your seeds? * What fertilizers should you use? * Which natural products are most effective? This manual, fully illustrated with explanatory diagrams and photographs, provides the answers. The book covers * all aspects of making and using biodynamic preparations and composts * managing the health of plants * weed control * parasite control * issues around mixed cultivation * animal care * specialized crops and planting such as fruit trees and vines. Although the technical aspects of biodynamic growing are exhaustively covered, the author also considers the human qualities necessary for this kind of agriculture to succeed. This is an invaluable guide for all biodynamic growers to have to hand daily.

New Vistas of Organic Farming, 2012, By Mukund Joshi, Scientific 392 p, ISBN : 9788172336752, Rs. 1,665.00 - The book attempts to convey a) the potential dangers of continuing the present form of agriculture vis-à-vis the sustainability of soil as well as health of people (in terms of pollution at all levels) b) traditional and untapped potentials of practicing organic farming c) scientific/documentary evidences for these two aspects. In the process, the book also presents the history of organic farming and the present scenario of practicing organic farming in India and world. The book is of great interest to anybody seriously concerned about future of agriculture, environmentalists, and scientists in general and agricultural scientists particularly besides all the postgraduate students in agriculture. It is written in the style of reference book maintaining high academic standards aimed at being authentic document in scientific and research circles. **Contents:** Foreword, Preface. 1. Introduction. 2. Effects of chemicals used in modern agriculture. 3. Fundamentals of Organic Farming. 4. History and Evolution of organic farming. 5. Potentials of Organic Farming. 6. Scenario of Organic Farming in India and World and Index.

Organic Agriculture for Sustainable Livelihoods By Niels Halberg, Adrian Muller, Publ Routleg Taylor and Francis Price $ 49.00 - This book provides a timely analysis and assessment of the potential of organic agriculture (OA) for rural development and the improvement of livelihoods. It focuses on smallholders in developing countries and in countries of economic transition, but there is also coverage of and comparisons with developed countries. It covers market-oriented approaches and challenges for OA as part of high value chains and as an agro-ecologically based development for improving food security. It demonstrates the often unrecognized roles that organic farming can play in climate change, food security and sovereignty, carbon sequestration, cost internalizations, ecosystems services, human health and the restoration of degraded landscapes. The chapters specifically provide readers with: (a) an overview of the state of research (b) an analysis of the current and potential role of OA in improving livelihoods of farmers, in sustainable value chain development, and in implementation of agro-ecological methods (c) proposed strategies for exploiting and improving the potential of OA and overcoming the constraints for further development and (d) strength and weakness of OA.