

Healthy Horticulture



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Cultivating fruits and vegetables can contribute to a better quality of life for family farmers and their communities.

(Photo: BAIF)

The AgriCultures Network

LEISA India is a member of the global AgriCultures Network. Seven organisations that provide information on small-scale, sustainable agriculture worldwide, and that publish:

Farming Matters (in English)

LEISA revista de agroecología (Latin America)

LEISA India (in English, Kannada, Tamil, Hindi, Telugu, Oriya, Marathi and Punjabi)

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The editors have taken every care to ensure that the contents of this magazine are as accurate as possible. The authors have ultimate responsibility, however, for the content of individual articles.

The editors encourage readers to photocopy and circulate magazine articles.

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Dear Readers

Fruits and vegetables are dietary necessities. They have multiple health benefits, including the strengthening of the immune system. But to provide all the health benefits, it is also important that fruits and vegetables are produced in a healthy manner, following agro ecological approaches. Promoting healthy diets to strengthen our immune systems is especially important during the current pandemic situation. Besides health benefits, cultivating fruits and vegetables can contribute to a better quality of life for family farmers and their communities. This needs wider awareness and we hope it is created as we celebrate the International Year of Fruits and Vegetables (IYFV) during 2021.

While focusing on production, it is important that we stop wastage too, as fruits and vegetables are highly perishable. A great extent of fruits and vegetables produced are lost in the supply chain between harvest and consumption. COVID-19 has demonstrated the feasibility of short and inclusive value chains as a way to provide better market opportunities for family farmers, through a number of initiatives.

In this issue, we have included experiences of farmers and institutions that are practising and promoting agroecological approaches in producing fruits and vegetables that are safe for consumption. Also included are experiences of farmer collectives in value addition and marketing initiatives. We look forward to your feedback, as always. We remain deeply indebted to you all for your commitment to promotion of LEISA.

The Editors

LEISA is about Low-External-Input and Sustainable Agriculture. It is about the technical and social options open to farmers who seek to improve productivity and income in an ecologically sound way. LEISA is about the optimal use of local resources and natural processes and, if necessary, the safe and efficient use of external inputs. It is about the empowerment of male and female farmers and the communities who seek to build their future on the bases of their own knowledge, skills, values, culture and institutions. LEISA is also about participatory methodologies to strengthen the capacity of farmers and other actors, to improve agriculture and adapt it to changing needs and conditions. LEISA seeks to combine indigenous and scientific knowledge and to influence policy formulation to create a conducive environment for its further development. LEISA is a concept, an approach and a political message.

AMEF is a member of AgriCultures Network, which is involved in co-creation and sharing of knowledge on family farming and agro ecology. The network is locally rooted and globally connected. Besides magazines, the network is involved in multi stake holders' engagement and policy advocacy for promotion of small holder family farming and agroecology. The network consists of members from Brazil, Ethiopia, India, Netherlands, Peru and Senegal. The secretariat of the network is located in IED Afrique, Dakar, Senegal.

MISEREOR founded in 1958 is the German Catholic Bishops' Organisation for Development Cooperation. For over 50 years MISEREOR has been committed to fighting poverty in Africa, Asia and Latin America. MISEREOR's support is available to any human being in need – regardless of their religion, ethnicity or gender. MISEREOR believes in supporting initiatives driven and owned by the poor and the disadvantaged. It prefers to work in partnership with its local partners. Together with the beneficiaries, the partners involved help shape local development processes and implement the projects. This is how MISEREOR, together with its partners, responds to constantly changing challenges. (www.misereor.de; www.misereor.org)

AME Foundation promotes sustainable livelihoods through combining indigenous knowledge and innovative technologies for Low-External-Input natural resource management. Towards this objective, AME Foundation works with small and marginal farmers in the Deccan Plateau region by generating farming alternatives, enriching the knowledge base, training, linking development agencies and sharing experience.

AMEF is working closely with interested groups of farmers in clusters of villages, to enable them to generate and adopt alternative farming practices. These locations with enhanced visibility are utilised as learning situations for practitioners and promoters of eco-farming systems, which includes NGOs and NGO networks. www.amefound.org

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The tremendous contribution of small-scale agriculture and agroecological-based production systems to food security has been realized in the midst of scenarios of climate change, economic and energy crises in the last decade. Reports based on broad consultations with scientists and extensive researches evidenced that small-scale farmers can double food production within 10 years in critical regions like Asia and Africa by using agroecological methods already available.

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Women in the Andean highlands of Cocapata, Bolivia, play a leading role in re-establishing peasant ways of farming, while building innovative connections with urban people. In doing so, they are creating agricultural systems that not only nourish the community and its natural resources but that also support vulnerable populations in the city and secure access to safe and healthy food during the current pandemic.

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BAIF's innovative model of "Agri-horti-forestry (Wadi)" integrates horticulture into the farming system for sustainable livelihoods through climate smart practices, productive engagement with under-utilized land and optimal use of local resources. The model with horticulture as the core component ensures multiple income streams round the year especially during lean periods from a combination of medium gestation-high resilience and short gestation-high returns cropping patterns.



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Enhancing livelihoods, nutrition and environment
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Healthy Horticulture

The importance of health and well being of the humankind is in limelight more than ever before - namely the 'nutritional well being'. It has been realised that besides access, the quality of food too, is highly critical. What is gaining attention is the need to access diverse food choices available from the local ecosystems themselves; improved production and consumption of fruits and vegetables.

Today's agriculture produces enough food for the global population, but it has not given everyone everywhere access to sufficient, safe, and nutritious food. Moreover, the role of agroecological approaches in contributing to sustainable and resilient agricultural and food systems of today and future is being recognised – be it food security, environmental preservation, resilience to climate change, women's empowerment, and increased peasants' control over agrifood systems. (Kandiah Pakeerathan, p.6)

Recognising the enormous importance of nutritious food systems based on fruits and vegetables, The UN General Assembly designated 2021 as the International Year of Fruits and Vegetables (IYFV). This momentous decision should serve as a unique opportunity to raise awareness on the important role of fruits and vegetables in human nutrition, food security and health and as well in achieving UN Sustainable Development Goals. As hunger continues to rise for the fifth consecutive year and obesity rates increase, encouraging the consumption of healthy foods, such as fruits and vegetables, and ensuring their accessibility is fundamental. The key messages highlighting focus on fruits and vegetables include: need for their daily consumption; boosting sustainable production and inclusive value chains; recognition of multiple health benefits they offer; minimising their losses and wastage. They are critical for contributing to a better quality of life for family farmers and their communities – through additional incomes, improved livelihoods, food security and nutrition, enhanced resilience and increased agrobiodiversity.(p.25).

We should recognise the current situation for small and marginal farmers. Malnutrition and migration are twin realities. Malnutrition is a serious issue in rural areas. Farmer, the primary producer is constantly confronted by climate, markets and livelihood challenges. Invariably, his own nutritional security is not ensured as their focus has been on incomes from the farm. For instance, in hill regions, there is a large-scale migration of men towards plains, due to which the rural areas contain significantly higher female population leading to demographic imbalances too. Thus, women play the most important role in maintaining nutritional supplies of the family.

Whether it is in rain fed areas in South India, for instance, Dharmapuri, or in hilly areas of Uttarakhand, or as distant an area like Bolivia, when men migrate, women play a critical role in nurturing local biodiversity. They are aware of their traditional benefits – of food, health and nutritional benefits of local biodiversity. For instance, Nutri-gardens of Uttarakhand contribute to diversified family diet resulting in better household nutrition as well as small incomes. Myriad coloured vegetables into the daily diet are expected to raise immunities and hence the concept of "Eating a rainbow" in the plate must be popularized among the rural fraternity. (Preethi Mamgai, p.11).

Women in the Andean highlands of Cocapata, Bolivia too are creating agricultural systems that not only nourish the community and its natural resources but that also support vulnerable populations in the city and secure access to safe and healthy food during the current pandemic. These peasant women are playing a leading role in breeding and managing diverse potato varieties - introducing varieties or species that are better adapted to the current climate. (Lidia paz Hidalgo, p.28).

The production area need not always be backyard alone. If one is desirous of holistic and natural farming, Bhaskar Save's farm stands out as a great inspirational example

of local diversity. The diverse plants in Bhaskar Save's farm co-exist as a mixed, harmonious community of dense vegetation. Rarely can one spot even a small patch of bare soil exposed to the direct impact of the sun, wind or rain. To ensure this, four fundamental principles of natural farming are adhered to – recognising the 'right to live' of all living creatures, recognition and appreciation that each creature is serving a purpose in web of life, farming should not be solely money oriented with short sighted greed and lastly, nurturing perennial fertility regeneration. While consuming 5% to 15% of the plants' biomass yield, the balance 85% to 95% of the biomass, the crop residue, must go back to the soil to renew its fertility, either directly as mulch, or as the manure of farm animals. If this is religiously followed, nothing is needed from outside; the fertility of the land will not decline. The farm yield– in all aspects of total quantity, nutritional quality, taste, biological diversity, ecological sustainability, water conservation, energy efficiency and economic profitability– is superior to any farm using chemicals, while costs (mainly labour for harvesting) are minimal, and external inputs almost zero. (Bharat Mansata, p.16).

The production model could have horticulture as the core component which ensures multiple income streams round the year, especially, during lean periods from a combination of medium gestation-high resilience and short gestation-high returns cropping patterns. Production from fruit trees starts flowing in from the fourth year onwards. The model results in improved consumption of pulses, vegetables and fruits at household level. (Sawanth et.al., p.33). Choice of fruits and vegetables need not be always for food security alone. Smart choices can be made. It could be even be drive niche market driven pursuits. This requires building skills, tapping new markets for impressive incomes. (Gopi Karelia, p.20).

The benefits can be beyond household levels too. In fact, farmers organized into farmer producer organizations (farmers cooperatives) took up value chain initiatives including input supplies, aggregation of farm produce, collective processing and marketing resulted in reduced cost of production while ensuring better price for their produce. (Sawanth et.al., p.33). In fact, markets



may galvanise communities towards self reliance. For instance, formulating a plan, the panchayat committee of Kanjikuzhi in Kerala invited the 8,600 families in the area to grow vegetables at home, in backyards and on terraces. The idea was to use every available space for farming. The initial funding came from the panchayat. Panchayat in combination with women self help organisation, kudumbashree ensured that Kanjikuzhi village no longer needs to get vegetables from elsewhere. (Tanya Abraham, p.14). This is a perfect example of several players coming together.

IYFV action message is that it should be a multi sectoral, multi institutional initiative. In fact, IYFV recommends that Governments, NGOs, Private companies, farmers and cooperatives, consumers have to play specific roles to strengthen the movement – to increase production, improve markets, reduce losses, strengthen public policies. If driven by a public policy, fostering convergence of several diverse institutions, fostering technologies and digital solutions, creating efficient market linkages and models, the twin goals like health and wealth creation can be simultaneously pursued.



Healthy horticulture for wealthy life

A Sri Lankan scenario

Kandiah Pakeerathan

Current Sri Lanka's agricultural policy banned all forms of synthetic agrochemicals and fertilizers, therefore, inorganic farmers are moving towards organic for healthy horticulture production with the mandate of "toxin-free nation: healthy food for wealthy life".

*Organic Movement of North and East (OMNE) promoting natural farming for production of healthy food
wealthy life in Sri Lanka*





Model farm following nature farming to train organic farmers

In Sri Lanka over 60 percent of the total population are involved in farming and 38 percent of the total workforce are farm labours, steadily declining the agriculture contribution to GDP. Horticulture plays an important role in providing livelihood to a larger portion of poor people, increases the level of national income and export revenue, generates new employment opportunities, increases farm income, and indirectly enhances the nutrition and health of the nation. There is a need to increase the healthy fruits and vegetable production by several folds with the gradual increase in population, increase in per capita income, and expansion of exports and tourism industry of the country. Today's agriculture produces enough food for the global population, but it has not given everyone everywhere access to sufficient, safe, and nutritious food. Scaling-up of agroecological approaches can contribute to ensuring sustainable and resilient agricultural and food systems today and in future: assuring food security, environmental preservation, resilience to climate change, women's empowerment, and increased peasants' control over agrifood systems.

The tremendous contribution of small-scale agriculture and agroecological-based production systems to food security has been realized in the midst of scenarios of climate change, economic and energy crises in the last

decade. Reports based on broad consultations with scientists and extensive researches evidenced that small-scale farmers can double food production within 10 years in critical regions like Asia and Africa by using agroecological methods already available.

In the world of organic production, Sri Lanka's contribution is 2.5%. But in the last ten years, the growth of Sri Lankan organic agriculture extension increased by 216.4 %. Currently, 0.6 % of fruits and 0.2% of vegetables are produced organically.

Agroecological approaches for safe production of fruits and vegetables: motivation and assistance

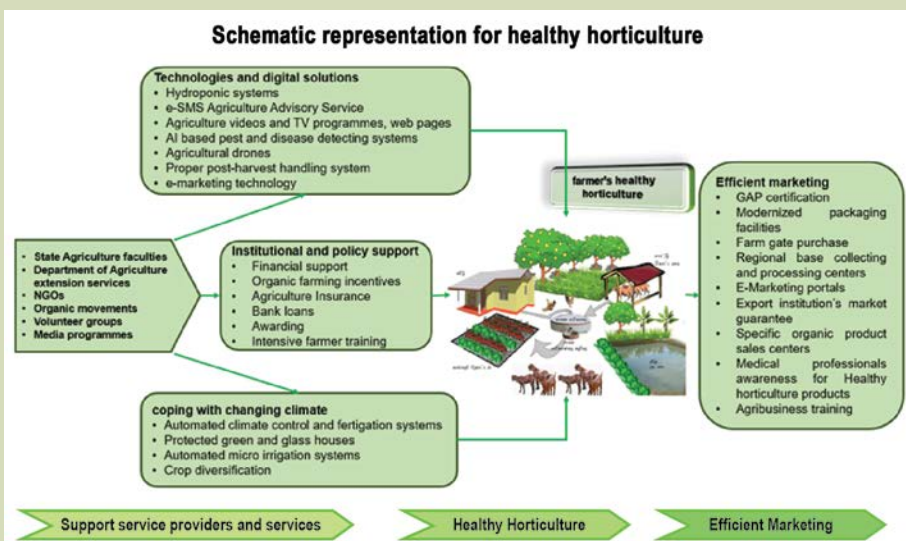
Sri Lanka exports nearly 9000 tons of both fresh and processed fruit and vegetables, and 65% of the fresh products are targeted to the Middle East and the Maldivian market. Almost 100% of the processed products are exported to the European market. United Arab Emirates, Saudi Arabia, Qatar, Maldives, India, United Kingdom, Kuwait, Germany, and Pakistan are the top fruits & vegetable importing countries from Sri Lanka. To maintain the international market standards and guarantee, Sri Lankan farmers should follow the Good Agricultural Practices (GAP) while cultivating fruits and vegetables, if not, they will not be able to get ISO 22000 certificate, which stickily bind health & safety regulations stipulated

by the European Community to export.

In the past decade, Sri Lanka lost its international market owing to the detection of trace chemicals in the exported fruits and vegetables. Moreover, in the recent past, the cancer and CKDU patient population has increased in Sri Lanka, with suspected root cause being overuse of synthetic agrochemicals. Therefore, since 2009, substantial awareness is being created among the farmers on the need to shift to organic agriculture/ Nature farming/ follow Nammalvar's concept of organic farming etc. These were done through intensive workshops, exhibitions, and training organized by the Department of Agriculture, International Federation of Organic Agriculture Movement (IFOAM), Organic Movement of North and East (OMNE) of Sri Lanka, Faculties of Agriculture under national universities of Sri Lanka, Lanka Organic Agriculture Movement (LOAM), the campaign of nature lovers, various media and public fora. In 2018, young organic entrepreneurs established model organic farms to train the farmers from time to time on how to incorporate ecological approaches while setting up organic farms.

Organic Movement of North and East (OMNE) promoting natural farming for production of healthy food wealthy life in Sri Lanka

In 2019 and 2020, the Organic Movement of North and East (OMNE) hosted ever climate change hackathon (Climathon) in Sri Lanka in association with local environmental activist's groups, to enlighten the courses of climate change, and tactics need to be adopted to safeguard the water resources for sustainable food production. Moreover, the Department of Agriculture, Northern Sri Lanka organized island-wide tours and foreign tours especially to India, China, and Indonesia with the selected farmers who were willing to use cutting-edge technologies to uplift their organic farms to a commercial level. Information gathered in all these knowledge-sharing venues and techniques learned by the farmers have changed their mindset. They are turning away from chemical-intensive single-crop



farming in favour of production methods based on agroecological approaches. There is growing evidence of agroecological farming systems in Sri Lanka which will keep carbon in the ground, support biodiversity, rebuild soils, and sustain yields, providing a basis for secure livelihoods. All these eco-friendly approaches will assist to restore our ecosystem as per the mandate of the UN decade (2020-2030) of Ecosystem Restoration. The food sovereignty and security will be met by the production of healthy horticulture using environmentally friendly and socially equitable technologies and methods, in a world with a shrinking arable land base, increasingly limited supplies of water and nitrogen, and within a scenario of a rapidly changing climate, social unrest, and economic uncertainty. UN mission on International Year of Plant Health 2020 and the International Year of Fruits and Vegetables in 2021 provides an opportunity to promote healthy diets for adequate nutrition while eliminating hunger, reducing poverty, protecting the environment, and boosting economic development in the COVID-19 pandemic scenario.

Demand pull vs supply push scenario for organic fruits and vegetables

In Sri Lanka, there is a huge demand for healthy vegetables and fruits. The demand is steadily increasing owing to the bitter experience of human health hazards and awareness. But the problem is vegetables and fruits produced through organic practices are costly, therefore, this is affordable to the higher income group of 20% of the total population of Sri Lanka for daily consumption. Therefore, government and non-governmental



Angadi: A unique market to sell pure organic fruits and vegetables

organizations are promoting organic home gardening with financial incentives and technical assistance to meet the household demand and excess production is being marketed through the specially established organic markets and sales centers around the department of agricultural extension centers, supermarkets, and the special fresh organic products sales centers called “*Ankadi*”. Medical professionals, extension staff of the Department of Agriculture, and members of OMNE play a major role in directing organic lovers who are health conscious towards these markets.

In contrast, commercial organic growers who are the following GAP are targeting export markets to get 20% more premium to the organic products compared to the similar non-organic horticulture products. Some of the nationally renowned supermarket owners and exporters eg: Keels supper, Cargills, CIC, Lankem PLC, and many other private exporters (Eg: Tropical Health Foods (Pvt) Ltd, Sunfrost (Pvt) Ltd, Saraketha Holdings (Pvt) Ltd, etc.) established collection centers in two or three places in every district and are collecting the fresh vegetables and fruits using their standard quality control criteria. Moreover, Dambulla Dedicated Economic Centre plays a major role to individual producers who can sell their products in wholesale market to exporters. For meeting the requirement of the organic export sector in Sri Lanka, certification is carried out by foreign certification agencies like SKAL, Netherlands; IMO, Switzerland; EcoCert, Germany etc. At present, there is

no government regulatory authority to handle inspection and certification in the country. LOAM (Lanka Organic Agricultural Movement), Export Development Board, and the Department of Export Agriculture have been engaging in promoting exports. For many years, and with great success, the private sector alone has developed the concepts and markets for healthy organic horticulture products.

How to get premium profit?: Good Agricultural Practices (GAP) and certification

To facilitate the production of quality and healthy fruits and vegetables and to fulfill the standard marketing compliance, Ceylon Chamber of Commerce (CCC) has developed the Standards and Trade Development Facility (STDF) in collaboration with the International Trade Centre (ITC). To address the problems and accelerate trade of Sri Lankan fruits and vegetables, the Ceylon Chamber of Commerce (CCC) in collaboration with the Department of Agriculture (DOA), Sri Lanka organized more than 40 Islandwide training and awareness programs for more than 900 farmers and exporters with a special focus on good agricultural practices (GAP) and other relevant Sanitary and Phytosanitary Standards (SPS), pest and disease prevention, business, and finance from 14 districts in the country. Now, the farmers who follow the GAP are being evaluated carefully and certified for export.

To promote farm productivity by implementing innovative new technologies and training events, many NGOs for example, USAID and Chemonics are partnering on the Supporting Opportunities in Livelihoods Development (SOLID) project, which trains farm households in the northern and eastern regions of the country on improved agricultural practices and new technologies. The project focuses on providing training for value chains in the dairy and horticulture sectors. 2,100 dairy and horticulture farmers from northern and eastern Sri Lanka have been benefited from this support.

Since 2016, \$58.63 million worthy Agriculture Sector Modernization Project (ASMP), the fund received from the International Development Agency (IDA) of the World Bank, has been implemented by the Ministry of Agriculture (MOA), Government of Sri Lanka in five provinces and seven districts: Northern province (*Jaffna* and *Mullaitivu*), Northcentral province (*Anuradhapura* and *Polonnaruwa*), Eastern Province (*Batticaloa*), Central Province (*Matale*) and Uva province (*Monaragala*). Through this five-year project, smallholder farmers have been trained to produce competitive high-value agricultural products, improve their ability to respond to market needs and access domestic and international markets, and become sustainable market participants.

National policy on digital horticulture: Agricultural modernization vs exclusion of agrochemicals

Besides the recently imposed import ban policy on synthetic agrochemicals (fertilizers and pesticides), the president of Sri Lanka has also initiated to increase the production of organic inputs by opening new small to large scale organic inputs production and marketing units by providing financial assistance. This has further strengthened the scope of production of healthy fruits and vegetables. To motivate and attract farmers towards organic agriculture, the government of Sri Lanka provides Rs 12,500 as financial incentives to farmers who are cultivating fruits and vegetables organically. The President of Sri Lanka further announced that organic fertilizer will be provided in lieu of the concessionary fertilizer package for farmers.

Like developed countries, private companies play a major role in introducing new cutting-edge technologies to modernize the agriculture sector in Sri Lanka. “Govi Mithuru” (in Sinhala) or “Ulavar Tholan” (in Tamil) is one of the pioneering ground-breaking services

introduced in Sri Lanka in 2015 by the Ministry of Agriculture and the Ministry of Health, Nutrition and Indigenous Medicine of Sri Lanka and the Centre for Agriculture and Biosciences International with the collaboration of United Kingdom’s Department for International Development and Australia’s Department of Foreign Affairs and Trade-funded GSMA AgriTech Programme to provide customized and timely advice to farmers regarding land preparation, cultivation, crop protection, harvest, and nutrition security. Moreover, largest Multi-National Companies (MNCs) like CIC PLC and Hayleys Agriculture Holdings introduce agriculture drones, automated farm implements, giving training, loan services, and financial assistance to purchase these innovative technologies to maintain “smart agriculture practices,” to get high profit with the collaboration of DOA.

Department of Agriculture under the Ministry of Agriculture plays a major role in implementing Digital Agriculture. With the ABD funding, DOA has already initiated several e-agriculture programs called interactive ICT and mobile platforms and software applications to disseminate information to achieve agricultural goals by harnessing information and communications technology (ICT).

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Nutri-gardens

A rich source of nutrition for farm women

Preeti Mamgai, Pankaj Nautiyal and Renu Jethi

Vegetable and fruit based nutri-garden is the richest source of nutrition and can play an active role in eradicating undernutrition. Nutri-garden is advanced form of kitchen garden in which fruits and vegetables are grown as a source of food and income. For small and marginal farmers, nutri-gardens can contribute towards diversified family diet and provide several other benefits, particularly for women.

Malnutrition is a serious issue in rural areas, particularly in hill regions. The crop productivity in the hilly region is low due to small and scattered land holdings, poor soil fertility and mostly rainfed agriculture. Farmers are still practicing traditional subsistence farming comprising of mainly cereal crops which cannot sustain farm families for more than three to four months in a year. There is a large-scale migration of men towards plains, due to which the rural areas contain significantly higher female population and has led to demographic imbalance in the region. Therefore, women require high quality nutrients in their daily diet as their work load and energy expenditure is more. One of the solutions to this prevailing problem in hills can be “Local needs met locally”. Climatic conditions of hill region are suitable for seasonal and off seasonal vegetable and fruit production which are rich in micronutrients. As landholding size in the region is small and fragmented, establishment of nutri-garden is easy and remunerative way to address prevailing malnutrition among hill community.

Training farm women on Nutri-garden





Cultural operation in Nutri-garden

Nutri-gardens

Vegetable based nutri-garden is the richest source of nutrition and can play an active role in eradicating under-nutrition. Nutri-garden is advanced form of kitchen garden in which vegetables are grown as a source of food and income in a more scientific way. For small and marginal farmers, nutri-garden can contribute to the family diet and provide several other benefits, particularly for women. Present researches focus on field-based commercial crops but income from the sale of these crops often is not used to buy quality food by the family. This is slowly arising as questions about agriculture's contribution to nutrition and health. This has led to introduction of nutri-gardens as they show a more clear-cut way from food production to nutritional outcomes. According to Indian Council of Medical Research (ICMR, 2010) recommendation for vegetable consumption can be fulfilled i.e. 300 gm of vegetable per person per day in which 50 g leafy vegetable; 50 g root vegetables and 200 g other vegetables.

Concept of “*eating a rainbow*” in the plate must be popularized, as colors are the indicators of wide range of vitamins and pigments.

The geographical and climatic attributes in the hill region are suitable for production of temperate and subtropical fruit crops like apple, pear, peach, plum, citrus, apricot and walnut. Micronutrient malnutrition can be overcome by including a variety of fruits and vegetables in daily food basket. Nutrition related agricultural interventions implemented under the ICAR-VPKAS, Almora in 2018, proved to be effective in enhancing food production and diversify dietary intake. More than 65 nutri-gardens were successfully demonstrated in higher hilly regions of the Uttarakhand with active participation of women farmers.

Setting up a nutri-garden

Usually a nutri-garden can be established in the backyard of house where there is enough water availability. In hills, nutri-gardens should be maintained near house so that it can be protected from animal damage which plays havoc in the region. A rectangular garden is preferred to a square plot. Nearly 200 m² land is sufficient to provide vegetables throughout year for a family consisting of five members. Layout and crop allotment in nutri-garden can be modified depending on climatic and seasonal changes.

- Perennial vegetables should be allotted to one side of the garden so that they may neither create shade for the remaining plot nor they interfere with intercultural operations. Shade loving vegetables may be planted in perennial plots. Compost pits can be provided on the corner of nutri-garden for effective utilization of kitchen waste.
- After allotting areas for perennial crops, remaining portions can be divided into 6-8 equal plots for growing annual vegetable crops.
- By following scientific practices and crop rotation, two to three annual crops can be raised in the same plot. For effective utilization of plot accession cropping, inter cropping and mixed cropping can be followed.
- Walking path should be provided at the center as well as along four sides. Since fresh vegetables from garden are directly utilized for consumption, organic manure should be used which is abundant in villages. However, in order to harvest good crop free from pest and diseases, chemicals can be utilized in limited amount.

- It is important that preference should be given to long duration and steady yielding crop varieties than high yielding ones.
- A bee-hive may be provided for a plot of 200 m² for ensuring adequate pollination in crops besides obtaining honey.

In these nutri-gardens, horticultural crops can be grown which covers a wider range of crops such as fruits, vegetables, root and tuber crops, aromatic and medicinal plants, spices and plantation crops, which enhances diversity in nutrition.

Women empowerment through nutri-garden in high hill region of Uttarakhand

Like other farm families in the hill region of Uttarakhand, Mrs. Pooja Karki was earlier practicing traditional subsistence farming and produced food enough to sustain the family for only three to four months in a year and was dependent on the market for food for rest of the period of the year. She came in contact with scientists of ICAR-VPKAS, Almora in 2018 and was trained in vegetable cultivation practices, mushroom cultivation, vermicomposting, honey bee rearing and vegetable seedling production under protected condition. Although she was educated only up to 8th standard, she was very keen to learn about nutrition and other improved agricultural improved practices to enhance nutritional status. More than 16 types of vegetables along with fruit plants rich in various micro-nutrients were grown in nutri-gardens. She took a keen interest in the training and Frontline demonstrations of nutri-gardens in her back yard with a land area of 200 m² which is enough for meeting the daily nutrient requirement of her family. She has worked almost single-handedly on her land to achieve the nutrition farming and other allied activities.

In the very first season she was able to obtain a good yield of vegetables more than sufficient for home consumption. She also sold vegetables in nearby local markets. She also started nursery preparation of vegetable crops in poly-tunnels installed in nutri-garden and is instrumental in providing seedlings of improved varieties of vegetables to fellow farm women. Other farmers from nearby villages visited her farm for farmer to farmer exchange and learn from her efforts towards food and nutritional security.



Pooja Karki with produce from her nutri-garden

Conclusion

Nutri-gardens are cornerstone in traditional farming systems, since time immemorial but with time, it has lost its importance. Myriad coloured vegetables into the daily diet will enhance the individual's ability to fight diseases and improve immunity. Also innumerable phytochemicals in a range of fresh fruits and vegetables act as anti-oxidant, anti-allergic, anti-carcinogenic, anti-inflammatory, anti-viral and anti-proliferative. Nutri-gardens are also very much essential in places and villages which are isolated and far from the local market. Awareness campaign regarding the proper nutrition, nutri-gardening, dietary habits, should be demonstrated in the rural and remote areas. Nutri-gardening is one of the advantageous ways to improve nutrition level in women with minimum investment.

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Kanjikuzhi

Kerala's first chemical-free, vegetable-sufficient panchayat

Tanya Abraham

The village started its experiments in organic farming way back in 1994, when most of India hadn't heard of the concept.

The sea breeze blows gently, laden with the smell of sand and salt, as I make my way to Kanjikuzhi, a coastal village in Kerala's Alappuzha district. Once I enter the village, the air is suddenly crisp with a new aroma of vegetables, gathered fresh from gardens.

Kanjikuzhi presents a picture very different from the rest of India. At a time when vegetables are getting scarce even in villages, Kanjikuzhi is brimming with surplus veggies, that too grown organically. The only vegetable-sufficient panchayat in Kerala, Kanjikuzhi is a model worth emulating. More so because it started its experiments in organic farming way back in 1994, when most of India hadn't heard of the concept.

How did it all start? Since Kanjikuzhi's soil was deemed unfit for agriculture, it had to depend chiefly on vegetables procured from other parts of Kerala. This jacked up the prices of veggies. On top of this, the villagers' income from local industries (chiefly coir) was measly. So, the then panchayat heads called for a revolution: they decided that the future lay in organic farming, undertaken by farming families of the village. "It was important that vegetables were not bought, but grown right here," says the panchayat president, M.G. Raju.

"When we hit upon the idea, challenges loomed ahead. It is not just that the soil was not good enough for



Photo: H. Vibhu

Sanu, who has been farming in Kanjikuzhi for the past 16 years

cultivation but there was also the need to educate people on organic farming. More importantly, there was the need to devise a practical and efficient method to ensure the continuity of the project," he adds.

Formulating a plan, the panchayat committee invited the 8,600 families to grow vegetables — from bitter melon, red spinach, cauliflower, to beans and more — at home, in backyards and on terraces. The idea was to use every available space for farming. The initial funding came from the panchayat. "To ensure sustained practice, a smaller committee called Karshika Karmasena was trained to monitor and encourage the growers. It was an arduous process, but eventually the pH balance and nutrient levels of the soil were restored, and pest-



Photo: H. Vibhu

One of the farmers' outlets in the village

prevention methods were implemented while techniques that support organic farming were developed locally," explains Raju.

Farmer knows best

Once the system had been put in place, the responsibility to keep it running was vested with the villagers. So, to this day, each family monitors the amount of manure required and the pest-control procedure. "The farmers know what works best for them. They arrive at it through a trial-and-error method," says Raju. If there is one absolute rule, it is that no chemicals are to be used in cultivation.

The panchayat offers free seeds and saplings, which are grown in greenhouses by Kudumbashree, a women's self-help organisation. "Last year we gave away more than 50 lakh saplings. We also provide facilities for low-cost, eco-friendly composting," says Raju.

Kanjikuzhi no longer needs to get vegetables from elsewhere. "Earlier vegetables had to be brought to the village from neighbouring cities. Now we have our fresh, organically-grown vegetables sold in the local market," says Raju. When they began to produce surplus, shanties appeared on the highway, selling the vegetables to travellers. "Our vegetables began reaching the cities from which we had once bought them. When we offer organic produce at a reasonable price, we believe we are addressing two aspects of a buyer's need — finance and health."

Life in the village has changed. The bounty has brought in prosperity. Some of the villagers earn as much as ₹50,000 a month, and they farm all through the year. They also give classes on organic farming; some have even developed hybrid vegetable varieties. Forty-eight-year-old Subhakeshan supports his family by selling the seeds of a local hybrid bean referred to as the Kanjikuzhi bean. "I started cultivating 2% land — this has expanded to 25% now; farming has changed my life," he says. Another farmer, 71-year-old Anandhan, says that he cultivates all year round. The trick, he explains, is to stop cultivating at 80% yield: "That is when diseases tend to strike. This way I am able to cultivate all-year through, three rounds of it."

Lessons on farming are compulsory in local schools to prepare the next generation. "The soil is rich with nutrients now and our children grow up having healthy, chemical-free food," says Raju, speaking for the village. The panchayat had an annual turnover of ₹14 crore in the last financial year and Kanjikuzhi's produce is relished all over Kerala, no mean feat for a village that started out as a sandy beachside place.

◆
The article was originally published at <https://www.thehindu.com/sci-tech/agriculture/how-kanjikuzhi-village-in-alappuzha-became-the-first-chemical-free-vegetable-sufficient-panchayat-in-kerala/article28949494.ece>

Bhaskar Save

The Gandhi of Natural Farming

Bharat Mansata

Late Bhaskar Save – the acclaimed ‘Gandhi of Natural Farming’ – has inspired and mentored 3 generations of organic farmers. His way of farming and teachings were rooted in his deep understanding of the symbiotic relationships in nature, which he was ever happy to share freely (and still very enthusiastically!) with anyone interested. In 2010, the International Federation of Organic Agriculture Movements (IFOAM) – the world-wide umbrella body of organic farmers and movements – honoured Save with the ‘One World Award for Lifetime Achievement’.

Bhaskar Save’s 14 acre orchard-farm, Kalpavruksha, is located on the Coastal Highway near village Dehri, District Valsad, in southernmost coastal Gujarat. About 10 acres are under a mixed natural orchard of mainly coconut and chikoo (sapota) with fewer numbers of other species. About 2 acres are under seasonal field crops cultivated organically in traditional rotation. Another plot is for a nursery for raising coconut saplings that are in great demand. The farm yield– in all aspects of total quantity, nutritional quality, taste, biological diversity, ecological sustainability, water conservation, energy efficiency and economic profitability– is superior to any farm using chemicals, while costs (mainly labour for harvesting) are minimal, and external inputs almost zero.

Natural abundance at Kalpavruksha

About twenty steps inside the gate of Bhaskar Save’s farm is a sign that says: “Co-operation is the fundamental Law of Nature.” – A simple and concise introduction to the philosophy and practice of natural farming! Further inside the farm are numerous other



Save removing coconut saplings

signs that attract attention with brief, thought-provoking *sutras* or aphorisms. These pithy sayings contain all the distilled wisdom on nature, farming, health, culture and spirituality, Bhaskarbai has gathered over the years, apart from his extraordinary harvest of food!

Kalpavruksha compels attention for its high yield easily out-performs any modern farm using chemicals. This is readily visible at all times. The number of coconuts per tree is perhaps the highest in the country. A few of the palms yield over 400 coconuts each year, while the average is closer to 350. The crop of *chikoo* (sapota) – largely planted more than forty-five years ago – is similarly abundant, providing about 300 kg of delicious fruit per tree each year.

Also growing in the orchard are numerous bananas, papayas, areca-nuts, and a few trees of date-palm, drumstick, mango, jackfruit, toddy palm, custard apple, *jambul*, guava, pomegranate, lime, pomelo, *mahua*, tamarind, neem, *audumber*; apart from some bamboo and various under-storey shrubs like *kadipatta* (curry leaves), crotons, tulsi; and vines like pepper, betel leaf, passion-fruit, etc.

Nawabi Kolam, a tall, delicious and high-yielding native variety of rice, several kinds of pulses, winter wheat and some vegetables and tubers too are grown in seasonal rotation on about two acres of land. These provide enough for this self-sustained farmer's immediate family and occasional guests. In most years, there is some surplus of rice, which is gifted to relatives or friends, who appreciate its superior flavour and quality.

The diverse plants in Bhaskar Save's farm co-exist as a mixed, harmonious community of dense vegetation. Rarely can one spot even a small patch of bare soil exposed to the direct impact of the sun, wind or rain. The deeply shaded areas under the *chikoo* trees have a spongy carpet of leaf litter covering the soil, while various weeds spring up wherever some sunlight penetrates.

The thick ground cover is an excellent moderator of the soil's micro-climate, which – Bhaskar Save emphasizes – is of utmost importance in agriculture. “On a hot summer day, the shade from the plants or the mulch (leaf litter) keeps the surface of the soil cool and slightly damp. During cold winter nights, the ground cover is like a blanket conserving the warmth gained during

the day. Humidity too is higher under the canopy of dense vegetation, and evaporation is greatly reduced. Consequently, irrigation needs are very low. The many little insect friends and micro-organisms of the soil thrive under these conditions.”

Ten acres of orchard have consistently yielded an average food yield of over 15,000 kg per acre per annum! (This has declined in the past 15-20 years following pollution from progressive industrialization of the area.) In nutritional value, this is many times superior to an equivalent weight of food grown with the intensive use of toxic chemicals, as in Punjab, Haryana and many other parts of India.

Nature's tillers and fertility builders

It is not without reason that Charles Darwin declared a century ago: it may be doubted whether there are many other creatures that have played so important a part in world history as have the earthworms. Bhaskar Save confirms, “A farmer who aids the natural regeneration of the earthworms and soil-dwelling organisms on his farm, is firmly back on the road to prosperity.” Various other soil-dwelling creatures – ants, termites, many species of micro-organisms – similarly aid in the physical conditioning of the soil and in the recycling of plant nutrients; and there are innumerable such helpful creatures in every square foot of a natural farm like Kalpavruksha.

In stark contrast, modern agricultural practices have proved disastrous to the organic life of the soil. By ruining the natural fertility of the soil, we actually create artificial ‘needs’ for more and more external inputs and unnecessary labour for ourselves, while the results are inferior and more expensive in every way. “The living soil,” stresses Bhaskar Save, “is an organic unity, and it is this entire web of life that must be protected and nurtured. Natural Farming is the Way.”

Weeds as friends

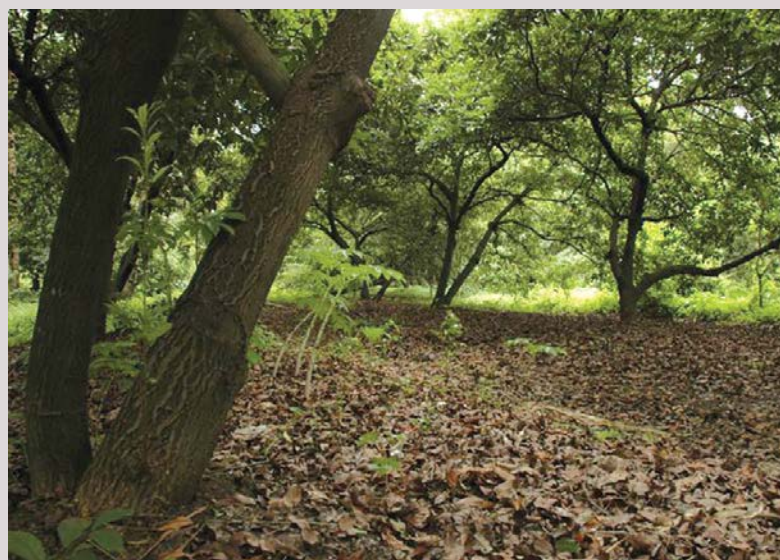
“In nature, every humble creature and plant plays its role in the functioning of the eco-system. Each is an inseparable part of the food chain.

The only sensible and lasting ‘root-cure’ to situations of weed rampancy among field crops is to adopt mixed planting and crop rotation, while discontinuing chemicals and deep tillage. Since the problematic weeds

will only phase out gradually as the soil regains its health, they may still tend to over-shade the food crops in the interim period of recovery. The way to manage this is to periodically cut the weeds (before they flower), and mulch them at least 3-4 inches thick on the soil under the crops. Without any sunlight falling on the weed seeds buried in the soil, their fresh germination is effectively checked.

When farmers shift back to organic farming, their soil steadily improves in health each year. Correspondingly, crop growth gets better, while weed growth declines. In just 2-3 years, there should be no need for any weeding at all. Until then, the farmer is better advised to cut and mulch the weeds.

The cutting of weed growth above the land surface – without disturbing the roots – and laying it on the earth as ‘mulch,’ benefits the soil in numerous ways. With mulching, there is less erosion of soil by wind or rain, less compaction, less evaporation, and less need for irrigation. Soil aeration is higher. So is moisture absorption, and insulation from heat and cold. The mulch also supplies food for the earthworms and micro-organisms to provide nutrient-rich compost for the crops. Moreover, since the roots of the weeds are left in the earth, these continue to



Leaf litter acts as natural mulch

bind the soil, and aid its organic life in a similar manner as the mulch on the surface. For when the dead roots get weathered, they too serve as food for the soil-dwelling creatures.

It is also important that the cutting and mulching operation should be done before the weeds have flowered and become pollinated. If the farmer is too late, and the mulch contains pollinated weed seeds, a new generation of the same weeds will re-emerge strongly in the mulched areas.

Do nothing?

While the physical work on a natural farm is much less than in a modern farm, regular mindful attention is a must. Hence the saying: “The footsteps of a farmer are the best fertilizer to his plants!” In the case of trees, this is especially important in the first few years. Gradually, as they become self-reliant, the work of the farmer is reduced – till ultimately, nothing needs to be done, except harvesting. In the case of coconuts, Bhaskarbhai has even dispensed with harvesting. He waits for the coconuts to ripen and fall on their own, and merely collects those fallen on the ground!

For growing field crops like rice, wheat, pulses, vegetables, etc., some seasonal attention, year after year, is unavoidable. This is why Bhaskarbhai terms his method of growing field crops – organic farming, while a fairly pure form of ‘do-nothing natural farming’ is only attained in a mature, tree crop system. However, even

The principles of farming in harmony with Nature

“The four fundamental principles of natural farming are quite simple!” declares Bhaskar Save. “The first is, ‘all living creatures have an equal right to live’. To respect such right, farming must be non-violent.

The second principle recognizes that ‘everything in Nature is useful and serves a purpose in the web of life’.

The third principle is: farming is a dharma, a sacred path of serving Nature and fellow creatures; it must not degenerate into a pure dhandha or money-oriented business. Short-sighted greed to earn more – ignoring Nature’s laws – is the root of the ever-mounting problems we face.

Fourth is the principle of perennial fertility regeneration. It observes that we humans have a right to only the fruits and seeds of the crops we grow. These constitute 5% to 15% of the plants’ biomass yield. The balance 85% to 95% of the biomass, the crop residue, must go back to the soil to renew its fertility, either directly as mulch, or as the manure of farm animals. If this is religiously followed, nothing is needed from outside; the fertility of the land will not decline.”

with field crops, any intervention by the farmer should be kept to the bare minimum, respecting the superior wisdom of nature, and minimizing violence.

The five concerns of farming

Bhaskar Save summarizes the key practical aspects of his approach to natural farming with reference to the five major areas of activity that are commonly a preoccupation of farmers all over the world. These are tillage, fertility inputs, weeding, irrigation, and crop protection.

Tillage

Tillage in the case of tree-crops is only permissible as a one-time intervention to loosen the soil before planting the saplings or seeds. Post planting, the work of maintaining the porosity and aeration of the soil should be left entirely to the organisms, soil-dwelling creatures and plant roots in the earth.

Fertility Inputs

The recycling of all crop residues and biomass on the farm is an imperative for ensuring its continued fertility. Where farm-derived biomass is scarce, initial external provision of organic inputs is helpful. However, no chemical fertilizer whatsoever should be used.

Weeding

Weeding too should be avoided. It is only if the weeds tend to overgrow the crops, blocking off sunlight, that they may be controlled by cutting and mulching, rather than by uprooting for 'clean cultivation'. Herbicides, of course, should never be used.

Irrigation

Irrigation should be conservative, no more than what is required for maintaining the dampness of the soil. Complete vegetative cover – preferably multi-storied – and mulching greatly reduces water needs.

Crop Protection

Crop protection may be left entirely to the natural processes of biological control by naturally occurring predators. Poly-cultures of healthy, organically grown crops in healthy soil have a high resistance to pest attack. Any damage is usually minimal, and self-limiting.

At most, some non-chemical measures like the use of neem, diluted *desi* cow urine, etc may be resorted to. But this too is ultimately unnecessary.

By thus returning to Nature many of the tasks that were originally hers, a weighty burden slips off the back of the half-broken, modern day farmer. And the land begins to regenerate once more.

Bhaskar Save adds: “Non-violence, the essential mark of cultural and spiritual evolution, is only possible through natural farming.”

In conclusion, says Save – “Natural farming is blessed by Annapurna, the mother goddess of abundant food for all that lives.”

This writeup is adapted from 'The Vision of Natural Farming' by Bharat Mansata, 277 pages, Earthcare Books, www.earthcarebooks.com



Bharat Mansata

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Organic Dragon fruit production

Gopi Karelia

Harbant Singh from Punjab switched to organic farming to cultivate dragon fruit and sandalwood as they require less water than conventional crops.

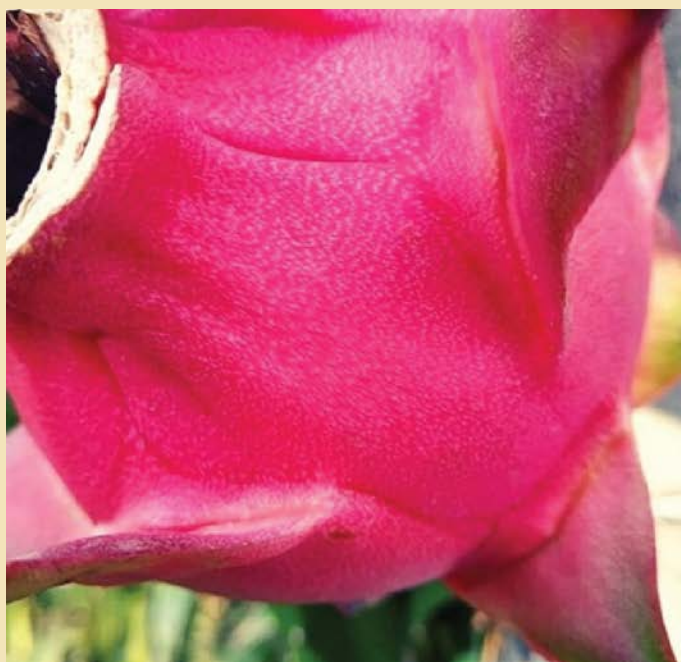
When Harbant Singh from Punjab's Thulewal village joined his family occupation of farming in the 70s, the groundwater was available at 15 feet. Decades later, when his son, Satnam started farming, groundwater tables had drastically fallen to 150 feet. This had a direct effect on the Singh family. They were reeling under debt due to the high input costs for motors to pull up the water, the tubewell and the heavy usage of chemical fertilisers. In the land of

five rivers (Beas, Jhelum, Chenab, Ravi, and Sutlej), the father-son duo stared at a looming water crisis – just like tens thousands of farmers across the state.

Figures back up this unfortunate plight. As per a 2019 report by the Central Ground Water Board (CGWB), Punjab, where today paddy fields thrive, will turn into a desert within 25 years if rampant groundwater extraction continues. Way before this report was released, Harbant realised the environmental damage



Harbant Singh on his farm



Dragon fruit farming requires minimal inputs

his farming techniques were making and even predicted deteriorating conditions of farmers. But he lacked avenues and resources to implement pro-environmental changes on his farm until 2016.

In that year, Harbant and Satnam participated in a workshop organised by Kheti Virsat Mission (KVM), a charitable trust helping farmers switch to organic farming. They interacted with farmers, learnt methods and identified eco-friendly alternatives to chemical fertilisers.

Umendra Dutt, founder member and executive director of KVM says, *“monoculture of single cropping reduces the soil fertility forcing farmers to use chemical fertilisers to enhance the yield. This, in turn, disrupts the natural plantation cycle. It is advisable to grow as many seasonal crops or vegetables as possible which also reduces insect attacks.”*

Umendra further underlines that killing every pest is not necessary as some beneficial ones promote soil activity that is crucial for roots. And finally, the farmer must replicate the natural cycle of plants. In other words, the farm should mimic nature and minimize the use of external inputs, such as fertilizers and pesticides.

“Keep animals like cows and hens on your farm as they help in soil preparation. Their residue acts as nutrient-rich manure. Instead of discarding agro-waste such as

leaves use them to mulch the soil. Invite birds to thrive on the farm as they feed on insects that can leave your crop damaged. The answer to every farming problem lies in nature, one has to only look for it,” adds Umendra.

“Using harmful pesticides and exploiting water tables is like an addiction in our region and many farmers want to come out of this vicious cycle but no one wants to take risks. All of us are aware of the damage it is causing to the lands. So, when I got an opportunity and assurance from a farmer’s community that switching to organic is possible, I grabbed it,” says Harbant.

Box 1: Method of cultivation

- Dig a 2-feet deep trench in the soil to accommodate a 7×12 feet cement pole vertically.
- Enclose the pole with a hollow cement ring.
- Maintain a distance of one foot between each pole so that it can receive sunlight
- Four dragon fruit trees, which is a climbing plant, can thrive on one pole
- Fill the inside of the pole with soil and jeevamrut (a mix of cow dung and urine) to provide nutrition to the plants.
- Use drip irrigation technique to water the roots directly. Harbant adds liquid organic fertiliser in the water pipe to keep insects at bay.

Putting into practice

After attending the workshop, the 60-year-old decided to keep aside his years of experience and knowledge for the sake of a larger good and started growing dragon fruit, lemon and sandalwood.

Explaining the reason behind choosing these unusual plantations, Satnam says “Of the eight acres, we have dedicated 1.55 acres for chemical-free farming. Both dragon fruits and sandalwood use 90 per cent less water as compared to traditional crops like wheat or rice. They also need less maintenance and input cost but they give high returns.”

Haresh Thacker, a dragon fruit farming expert from Kutch, agrees with Satnam and says, “*The dragon fruit is a tropical plant that is low on calorie content and contains antioxidants. It does not require much water to grow and can thrive in arid areas.*”

Even though the water requirements and agricultural inputs are minimal, dragon fruit farming can have phenomenal results in terms of yield if maintained properly. For instance, one acre of dragon fruit trees gives the Singh family 40 quintals (4000 kilos) every year and a kilo fetches upto Rs 200. “*We have 2500 trees of dragon fruits that annually give us approximately Rs 8,00,000 per acre. As for sandalwood, the trees will bear results after 15 years and every tree can fetch up to Rs 3,00,000. We have close to 200 sandalwood trees,*” he adds.

Vietnam method to grow Dragon Fruit

In the last decade, Gujarat’s water-scarce Kutch district has witnessed an organic dragon fruit revolution where hundreds of farmers are growing the *Hylocereus undatus*, which is pink on the outside and has a white pulp, peppered with black seeds, on the inside.

Satnam happened to visit Vishal Doda, a friend from Kutch who is doing dragon fruit farming in 15 acres. Impressed by the Vietnam technique to grow the fruit, Satnam learnt it and purchased 500 seedlings from his nursery.

He taught his father and invested Rs 4 Lakh (per acre) in cement poles, irrigation facilities, labour costs and seeds to set up the process. Harbant has planted 500 poles on



Dragon fruit needs less water and can grow in arid areas

1.25 acre, “*In the first year, per pole will give around 4-5 kilos fruit which will then increase to 20 kilos in the fifth year*”. He recovered the cost within two years.

Sandalwood and Lemon plantations

Being a parasitic plant, roots of sandalwood called ‘haustoria’ derive their nutrition from other host plants and in return supply nutrients to their hosts according to a study published in Current Science journal.

So, Harbant purchased the *Santalum album* variety from Bengaluru and planted 200 trees on half an acre. Between each tree, there is a distance of 12 feet where he is cultivating lemons.

“*Apart from its high commercial value, sandalwood cultivation has many benefits. It requires moderate water in the first five years after which it grows on its own and it takes 15 years for sandalwood to be ready for harvesting. Sandalwood plant gives seeds after four years and every kilo can fetch up to Rs 1000. While there is no legal ban on planting sandalwood trees in Punjab, a farmer has to seek permission from the government during its cutting,*” explains Satnam.



This is an edited version of the original published at <https://www.thebetterindia.com/237963/punjab-farmer-earns-lakhs-how-to-organic-farming-dragon-fruit-sandalwood-india-gop94/>

Government is offering 50% subsidy to farmers for dragon fruit cultivation

Dragon fruit, also called Pitaya, Strawberry pear & Kamalam (in Gujarat) is a beautiful tropical fruit that is crunchy and sweet in taste. Dragon fruit is native to Southeast Asia and Latin America and is now grown and eaten all over the world. Its pinkish-red skin, dark red rind, and light green scales make its appearance bold.

In India, dragon fruit is mostly grown in Gujarat, Uttar Pradesh, Madhya Pradesh, Maharashtra, Kerala, Tamil Nadu, Karnataka, and West Bengal.

Under the Mission for Integrated Development of Horticulture, a target has been set to cultivate dragon fruit in 2 hectares in the Bulandshahar district of Uttar Pradesh. For this, a subsidy of 50% of the total cost, *i.e.*, 2.5 lakh rupees will be provided to the farmers. For this, farmers will have to register online, for the details you can visit the official website.

The mission for Integrated Development of Horticulture (MIDH) is a Centrally Sponsored Scheme for the

holistic growth of the horticulture sector covering fruits, vegetables, root and tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa, and bamboo. Under this, the Government of India contributes 60% of the total outlay for developmental programmes in all the states except for the states in North East & Himalaya, and 40% share is contributed by State Governments.

In case of the North Eastern States and the Himalayan States, the Union Government contributes 90%. Apart from this, MIDH also provides technical advice and administrative support to State Governments/ State Horticulture Missions for the Saffron Mission and other horticulture related activities.

Source: <https://krishijagran.com/agriculture-world/government-is-offering-50-subsidy-to-farmers-for-dragon-fruit-cultivation/>

1,017 varieties of agricultural crops, 206 of horticultural crops developed since 2018

Union Minister for Agriculture and Farmers Welfare **Narendra Singh Tomar** in a written reply in Lok Sabha informed that the **National Agricultural Research System (NRAS)** has developed as many as 1,017 varieties of 69 field crops and 206 varieties of 58 horticultural crops. These varieties have been developed by **NARS** over the past 3 years, *i.e.* from 2018 to 2020 and the current year.

NARS, under the aegis of the Indian Council of Agricultural Research (ICAR), comprising of various ICAR institutes and central/state agricultural universities, is engaged in the development of new crop varieties high yield and biotic/abiotic stress tolerance of field crops and horticultural crops.

ICAR has a strong network of All India Research Projects (AICRP) / All India Network Projects (AINP),

coordinated by various ICAR institutes. They are operational in the various Central and state Agricultural Universities and ICAR institutes, for development of new crop varieties of field and horticultural crops.

Currently, 44 AICRPs/AINPs of field and horticultural crops are operational through 50 SAUs/CAUs/DUs and 55 ICAR institutes across the country at 1,017 locations.

ICAR has also approved Rs. 3340.32 crores for these research universities or Institutes during 2018-19 to 2021-22. Moreover out of the total amount, Rs. 2420.32 crores has been utilized till 2020-21.

Source: <https://krishijagran.com/agriculture-world/1-017-varieties-of-agricultural-crops-206-of-horticultural-crops-developed-since-2018/>

At 329.86 MT in 2020-21, India is set to witness highest ever horticulture crop production

The increase can be seen mainly in all horticulture crops such as fruits, vegetables, aromatic and medicinal plants, spices and plantation crops, except flowers.

New Delhi: India's horticulture production is expected to increase by 2.93 per cent to a record level of 329.86 million tonnes (MT) in 2020-21, according to the second advance estimate of horticulture production released by the Ministry of Agriculture Thursday.

In the previous year, the country's horticulture crop production was 320.47 MT. The increase can be seen mainly in all horticulture crops such as fruits, vegetables, aromatic and medicinal plants, spices and plantation crops, except flowers.

Among the three most widely consumed vegetable crops – potato, onion and tomato – the maximum increase in production has been seen in potato, with a surge of over 10.55 per cent. While potato production is estimated to increase to 53.69 MT in 2020-21 against 48.56 MT in 2019-20, the production of onion and tomato are estimated to be just marginally higher – for onion it is

26.92 MT in 2020-21 up from 26.09 MT last year and for tomato, it is 21 MT in 2020-21 compared to 20.55 MT in 2019-20

The overall production of vegetables is estimated to be 196.27 MT compared to 188.28 MT in the previous year. The fruit production is estimated to increase to 102.76 MT against 102.08 MT last year. This slight increase in fruit production of 0.68 MT is mainly contributed by an increase in output of prominent fruits such as banana, mango and jackfruit.

Estimated increase in coconut production in states like Karnataka, West Bengal and Tamil Nadu – from 14.01 MT last year to 14.63 MT in 2020-21 – has pushed up overall plantation crop production to 16.60 MT this year from 16.12 MT. The production of spices, meanwhile, has also seen an estimated increase of almost 4 per cent from 10.14 MT in 2019-20 to 10.54 MT in 2020-21.

Source: <https://theprint.in/india/at-329-86-mt-in-2020-21-india-is-set-to-witness-highest-ever-horticulture-crop-production/696984/>

3 Centers of Excellence established in Karnataka under Indo-Israel Agriculture Project

New Delhi: For taking forward the Israeli technologies in the field of Horticulture, Sh. B. S. Yediyurappa, Chief Minister, Government of Karnataka and Sh. Narendra Singh Tomar, Minister for Agriculture & Farmers Welfare, Government of India jointly inaugurated the 3 Centers of Excellence (COEs) established in Karnataka under Indo-Israel Agricultural Project (IIAP).

MIDH Division of Ministry of Agriculture & Farmer's Welfare, Government of India and MASHAV – Israel's Agency for International Development Cooperation – are leading Israel's largest G2G cooperation, with 29 operational Centres of Excellence (COEs) across India in 12 States, implementing advanced Israeli Agro-Technology tailored to local conditions.

Out of these 29 fully functional COEs, 3 are from Karnataka, viz., COE Kolar for Mango, COE Bagalkote for Pomegranate and COE Dharwad for Vegetables. These Centres of Excellence generate knowledge, demonstrate best practices and train officers and farmers.

Shri Narendra Singh Tomar, Union Minister of Agriculture & Farmers Welfare said, "these Centers will help farming community of Karnataka to get access to the latest innovative Israeli technologies and adopting them to increase production and productivity which will help in increasing the farmers income.

The inauguration ceremony was also attended by Shri Sanjay Agarwal, Secretary, Department of Agriculture, Cooperation & Farmers Welfare, Government of India, Senior officers of Israeli Ministry of Foreign Affairs, Ministry of Agriculture & Farmer's Welfare, Government of India and Government of Karnataka. The senior officers of all the State Horticulture Missions also joined to witness the virtual launch of the ceremony.

Source: <https://indiaeducationdiary.in/3-centers-of-excellence-established-in-karnataka-under-indo-israel-agriculture-project/>

International Year of Fruits and Vegetables 2021



INTERNATIONAL YEAR OF
FRUITS AND VEGETABLES

2021

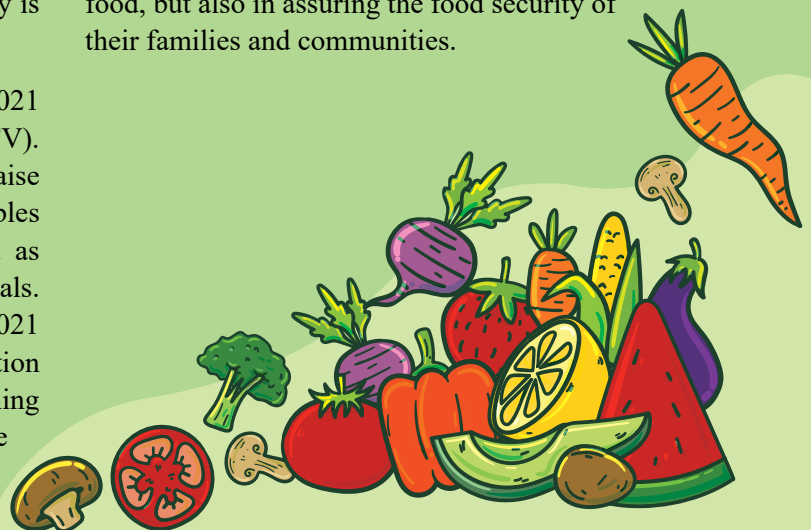
Regions around the world have different gastronomic and culinary traditions. Similarly, different cultures have access to a variety of different fruits and vegetables and have different nutritional recommendations and guidelines for a proper diet. Yet, one thing that all cultures have in common is that fruits and vegetables are dietary necessities. They assure and maintain overall good health and contribute to the proper functioning of the body.

Did you know that a minimum of 400 grams or five portions is the recommended daily serving of fruits and vegetables? However, for many, fresh produce items are inaccessible and out of reach. There are many reasons for this, one of which is that fruits and vegetables perish more easily and are thus more highly prone to loss and waste along the agri-food system. Another is that fresh produce is often more expensive than unhealthy snacks and junk foods. As hunger continues to rise for the fifth consecutive year and obesity rates increase, encouraging the consumption of healthy foods, such as fruits and vegetables, and ensuring their accessibility is fundamental.

The UN General Assembly designated 2021 the International Year of Fruits and Vegetables (IYFV). The IYFV 2021 is a unique opportunity to raise awareness on the important role of fruits and vegetables in human nutrition, food security and health and as well in achieving UN Sustainable Development Goals. The International Year of Fruits and Vegetables 2021 falls within the UN Decade of Action on Nutrition (2016-2025) and the UN Decade of Family Farming (UNDF 2019-2028). These observances reinforce

each other while providing greater visibility to small-scale producers and raise awareness on food security and nutrition. The IYFV 2021 can act as a springboard towards achieving the Sustainable Development Goals (SDG) by 2030. FAO is the lead agency for celebrating the year in collaboration with other relevant organizations and bodies of the United Nations system.

The IYFV will raise awareness of the health benefits of fruit and vegetable consumption; advocate for healthy diets through increased consumption of fruits and vegetables; promote international efforts to boost fruit and vegetable production and value chains in a sustainable and safe way; bring in a focus on the need to reduce losses and waste in fruit and vegetable supply chains from production to consumption; and invite relevant stakeholders to strengthen the capacities of developing countries to adopt innovative approaches and technologies in combating loss and waste of fruits and vegetables. In addition, special attention will be paid to the role of women, not only in the production of food, but also in assuring the food security of their families and communities.



Key Facts

- A minimum amount of 400g per day or five portions of fruits and vegetables is beneficial for health.
- Introduce fruits and vegetables at as early as 6 months of age and keep them as regular parts of a healthy diet throughout life.
- Production of high-value fruits and vegetables can be profitable, compared to other crops, from small amounts of land, water and nutrients.
- COVID-19 has demonstrated the importance of short and inclusive value chains - including for fruits and vegetables – as a way to provide better market opportunities for family farmers in urban and peri-urban areas.
- Digital innovations make it possible to track and trace fresh produce from production to consumption. This broadens market opportunities, reduces losses and waste and makes the value chain more transparent.
- Fruits and vegetables are good sources of dietary fiber, vitamins and minerals, (e.g. folate, vitamin A and C, potassium) and beneficial phytochemicals.
- As part of a healthy diet, fruits and vegetables can help lower risk factors for non-communicable diseases, such as overweight/obesity, chronic inflammation, high blood pressure, and high cholesterol.
- Up to 50 percent of fruits and vegetables produced in developing countries are lost in the supply chain between harvest and consumption.
- It can take up to 50 litres of water to produce an orange. Losses in fruits and vegetables represent a waste of increasingly scarce resources such as soil and water.
- Significant quantities of fruits and vegetables that are perfectly fit for consumption are wasted along the food system because of aesthetic or physical irregularities.

Official Launch Event of the IYFV-2021

The Director-General of the Food and Agriculture Organization of the United Nations (FAO), QU Dongyu, launched the **International Year of Fruits and Vegetables 2021 (IYFV)** on 15th December 2020, with an appeal to improve healthy and sustainable food production through innovation and technology and to reduce food

loss and waste. FAO, the lead agency for celebrating the year in collaboration with other organizations, launched the year with an international virtual event.

Speaking at the event the FAO Director-General described the initiative as “a unique opportunity to raise global awareness”. He noted that the COVID-19 pandemic had challenged people to find new ways of fighting hunger and malnutrition and said IYFV would highlight the role of digital technologies in improving nutrition and market opportunities.

“In the current health crisis we are facing around the world, promoting healthy diets to strengthen our immune systems is especially appropriate,” Qu said. While noting the challenges in improving production and agri-food chains, the FAO Director-General encouraged countries to see the International Year as an opportunity to improve infrastructure, farming practices thereby supporting small scale farmers. He emphasized fruits and vegetables were a good way for farmers to create cash crops.

Hundreds of events are being organized worldwide to promote the International Year of Fruits and Vegetables, 2021.

Key Messages

Live by it, a diverse diet

Fruits and vegetables should be consumed in adequate amounts daily as part of a diversified and healthy diet.

Foster sustainability

Sustainable and inclusive value chains can help increase production, help to enhance the availability, safety, affordability and equitable access to fruits and vegetables to foster economic, social, and environmental sustainability.

Harness the goodness

Fruits and vegetables have multiple health benefits, including the strengthening of the immune system, that are essential for combating malnutrition in all its forms and overall prevention of non-communicable diseases.

Respect food from farm to table

The high perishability of fruits and vegetables needs special attention to maintain their quality and safety through appropriate treatment and handling across the

supply chain from production to consumption in order to minimize loss and waste.

Innovate, cultivate, reduce food loss and waste

Innovation, improved technologies and infrastructure are critical to increase the efficiency and productivity within fruits and vegetables supply chains to reduce loss and waste.

Growing prosperity

Cultivating fruits and vegetables can contribute to a better quality of life for family farmers and their communities. It generates income, creates livelihoods, improves food security and nutrition, and enhances resilience through sustainably managed local resources and increased agrobiodiversity.

Take Action

Everyone has a role to play - from governments and private sector companies to the general public and even youth. The private sector must promote and implement corporate social responsibility and other initiatives

that promote the consumption of fruits and vegetables. Civil society and non-governmental organizations (NGOs) should form networks and action groups to work in an articulated way to promote awareness, availability, accessibility and affordability of fruits and vegetables. Farmers and cooperatives should work together and promote coordination within supply chains to help increase market competitiveness and reduce loss and waste in fruits and vegetables. Governments should implement consistent public policies that ensure healthy food systems in order to promote the availability, accessibility and affordability of fruits and vegetables. Researchers and academic institutions need to be advocates for sustainable production practices. All consumers, including children, should be encouraged to increase the amount of fruits and vegetables in their diets

All need to work together to make a difference and ensure that fruits and vegetables become part of everyone's diet in an effort to promote healthy habits and eradicate hunger and malnutrition from the planet.



IYVF will pay special attention to the role of women in production of food and assuring food security to their families



Photo: S Jayaraj for AME Foundation

Highland agriculture in the hands of women

Lidia Paz Hidalgo

Women in the Andean highlands of Cocabata, Bolivia, play a leading role in re-establishing peasant ways of farming, while building innovative connections with urban people. In doing so, they are creating agricultural systems that not only nourish the community and its natural resources but that also support vulnerable populations in the city and secure access to safe and healthy food during the current pandemic.

Rural communities in Bolivia are threatened by the introduction of chemical fertilizers, certified seeds, monocropping and climate change, which are leading to the degradation of their natural resources. To reverse this trend, communities in the municipality of Cocabata engage in the struggle for food sovereignty. They have embraced agroecology as a means of reaffirming their peasant way of life as well as actively resisting the capitalist system, which seeks to trap small-scale producers in vicious cycles of dependency whilst channeling profits to multinational corporations.

Peasant families in these communities once managed a high diversity of native potatoes, which have now disappeared because consumer markets favour one particular type. This trend has been facilitated and reinforced by the government which, since the 1980s, has imposed laws and regulations that require seeds to be certified and penalise the sale of unregistered, indigenous seeds.

Recovering potato diversity

The potato is commonly reproduced through its tuber (although the tuber is often mistakenly referred to as

‘potato seed’), which produces identical plants and thereby does not contribute to biodiversity. However, potatoes can also be produced by using the seeds from the small fruits that appear after the plant’s blooming period. Plants raised from seeds give rise to tubers that are genetically diverse. In this way, plant traits from long-lost varieties can be recovered. From 2017 to 2019, the Centre for Communication and Andean Development (CENDA) and communities in Cocabata engaged in a process of experimentation to recover these varieties in order to foster biodiversity and develop strains with enhanced climate change resistance. This was not easy. In the beginning the potatoes were very small, but through trial and error they were able to obtain potatoes large enough for consumption.

It is not only size that matters in potato cultivation. Now, with a base of over 100 different varieties, they can select and cross varieties in accordance with their own needs and values such as taste, health and resistance against diseases and frost. It also means that they can produce and save their own seeds for production, removing the need to buy tubers and in turn giving them greater autonomy. As put by one of the peasants: “We had gone

into loss when buying certified tubers, we have even become indebted to the companies that sell them. That is why now I am producing mak'unku seed myself. With that we are moving forwards”.

In the hands of women

Peasant women in Cocapata play a leading role in scaling up and out the practice of breeding and managing diverse potato varieties, both within and outside the region. A major instrument through which they do so are potato fairs, where the women display and exchange over 160 varieties. While the exchange of seeds is an ancient practice in Bolivia, it has become less common over the years. Due to economic globalisation, local markets have become a site for the purchase and sale of commodities.

Through the seed fairs, practices of exchange based on solidarity are re-valourised. Here peasants and other community members become exposed to and exchange potato varieties with diverse colours, tastes, textures and medicinal qualities. Peasants that hold the most exchanges and those that have the largest diversity of potatoes receive prizes. Many are won by women.

Despite successes in breeding diverse potato varieties and spreading them through fairs, some challenges remain. One major challenge lies in the nature of demand from commercial markets. Most potatoes are sold to regional markets in the nearby city of Quillacollo or through intermediaries who reach the communities via trucks. In these markets there is a strong preference for the waycha variety. The potatoes have to be of a certain size and end up in the cities where they are mostly processed into fast food. This narrow demand for one variety hinders communities from engaging in more diverse cultivation, which in turn exposes them to the inherent risks associated with cultivating only one variety: vulnerability to changes in climate, diseases, pests and shocks in market prices.

The adversities of markets and the pandemic

Aside from potato selection, women also play a leading role experimenting with new vegetables. Many women have concerns over the vegetables available in the market, which are produced by large farms in the valley using a lot of pesticides, and are expensive in some periods of the year. By producing vegetables that are less common in the region, women have been able to reduce their dependence on the market and can nourish their families

Peasant women play a leading role in breeding and managing diverse potato varieties.

with fresh, healthy and diverse foods. By using parts of the farm with different altitudes and micro-climates, as well as establishing small greenhouses, they are able to cultivate a diverse range of varieties with different requirements in terms of water, soil, temperature and shade.

Reciprocity between countryside and city

While potatoes and vegetables are important to nourish rural households and communities, they also play a role in securing food for vulnerable populations in the city. Over the past decades many people from rural communities migrated to cities, seeking improved employment, education and livelihood opportunities for themselves and their children.

Once in the cities, rural people and especially women, find themselves in a vulnerable position. They have few people to fall back on, occupy risky jobs and face food insecurity. Most migrant families settle on the outskirts of middle-sized cities such as Vinto and Quillacollo and make a living as informal vendors of sodas, vegetables or ice cream. Some continue to maintain a garden in their rural home communities. Santiago Bautista is one of them: “I’m happy to produce my own cabbages, carrots, and onions to share with my family. I’m happy to have my own little greenhouse.” Besides vegetables, potatoes also go to the cities to be processed into chuña or tunta, a method traditionally used by the Quechua and Aymara to dehydrate the potatoes so that they can be kept for years.

The countryside also supports vulnerable people in the city through a network of reciprocal relations. Many women who cultivate vegetables in the countryside share their produce with their extended family in the cities. Families who live in the countryside but do not grow vegetables obtain them from other community members as a gift, through exchange with other products, or by buying them for very low prices and then passing them on to relatives in the city.

The countryside supports vulnerable people in the city through reciprocal relations.

The varieties women experimented with include lettuce, carrot, onion, cabbage, radish, parsley, celery, chard, beet, turnip, broad bean and peas. They learned how to grow these 'new' crops by exchanging their experiences with other women in the community, but also internationally. Victoria Quispe, one of the peasant leaders in the community, brought knowledge home from a visit to Guatemala: "Before I didn't even know how to produce my own vegetables. I've learned from my travels. It didn't work the first time because I sowed too early. Now it works and I don't need to buy from the supermarket in Quillacollo". Women also experiment with agroecological practices, such as soil improvement through the use of sheep, lama and alpaca manure, and pest and disease management using plant extracts, ash, minerals and insect traps.

The vegetable gardens do not only play a role in nourishing peasants in their day to day life, they are also crucial in times of crisis. During the current COVID 19 pandemic, transportation between cities and the countryside has become severely restricted. Now that families have their own produce, they don't need to travel to stores in the city. In addition, during the pandemic many families that had migrated to the cities temporarily moved back to the countryside, where they knew they would have access to food produced by the community. The pandemic also motivated many families that did not previously have a garden to establish one.

Restoring ancestral knowledge

With the establishment of more diverse ways of farming, communities in Copacata also came to revalue ancestral knowledge and management practices. Until about 5 or 10 years ago, peasants managed their fields using a strict rotation cycle. After one or two cycles of potato cultivation, the land was left to rest for a period of 10 to 15 years. However, due to pressure to fulfill market demand, farmers no longer abide by these principles. Potatoes are now cultivated for up to 3 consecutive years. This has created problems with disease, which remain dormant in the soil for many years. More intense potato cultivation is also depleting soil fertility and leading producers to use chemical fertilizers that further degrade and contaminate the soil.

To reduce the pressure on the land, farmers are introducing varieties or species that are better adapted

The pandemic motivated many families to establish a vegetable garden.

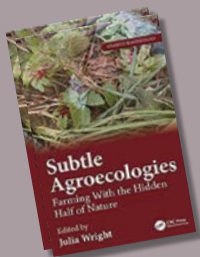
to the current climate. These are intercropped, planted in different periods of the season or cultivated at different altitudes. Legumes such as tarwi, which fix nutrients in the soil, are also incorporated in the rotation cycles. These new practices are supported by ancestral knowledge. By observing certain indicators, such as the flowering of cactus, the howling of foxes, the coloration of particular algae, the patterning of clouds and the humidity under stones, climatic predictions are made to decide the timing and location of specific crop plantings. Farmers constantly observe and adapt these indicators in response to the impacts of climate change. Thus, by recovering ancestral knowledge and combining it with new agroecological practices, rural communities are able to deal with the challenges of globalisation and climate change, while nourishing themselves and urban populations.



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Note: This article was originally published in Farming Matters, December 2020.

NEW BOOKS



Subtle Agroecologies: Farming with the hidden Half of Nature

Julia Wright (Ed), 2021, CRC Press, 384 p., Hardback £150.00, ISBN 9781138339811

This book is about the invisible or subtle nature of food and farming, and also about the nature of existence. Everything that we know (and do not know) about the physical world has a subtle counterpart which has been scarcely considered in modernist farming practice and research.

This book makes a foundational contribution to the discipline of Subtle Agroecologies, a nexus of indigenous epistemologies, multidisciplinary advances in wave-based and ethereal studies, and the science of sustainable agriculture. Not a farming system in itself, Subtle Agroecologies superimposes a non-material dimension upon existing, materially-based agroecological farming systems. Bringing together 43 authors from 12 countries and five continents, from the natural and social sciences as well as the arts and humanities, this multi-contributed book introduces the discipline, explaining its relevance and potential contribution to the field of Agroecology.

State of the RIGHT TO FOOD AND NUTRITION

Report- 2021

Isa Alvarez Vispo (URGENCI), Laura Michele, Annie Ruth Sabangan (FIAN International)

Global Network for the Right to Food and Nutrition, coordinated by FIAN International, July 2021, 42 p



The *State of the Right to Food and Nutrition Report* places the spotlight on the right to food and nutrition in the context of the COVID-19 pandemic. It looks at the measures that governments have taken to contain the spread of the virus, and the impacts these have had on different population groups. It equally provides insights to the ways in which communities and civil society groups across the globe have self-organized to confront the crisis and support those in need. Published by the Global Network for the Right to Food and Nutrition, with the support of its secretariat FIAN International, the report seeks to complement and create a dialogue with FAO's *State of Food Security and Nutrition in the World (SOFI)* report. It sheds light on the structural causes of hunger and malnutrition that are often rendered invisible when the focus is merely on numbers.

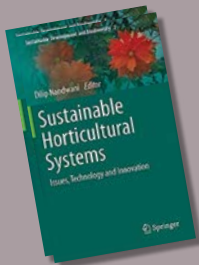
United Nations Decade of Family Farming 2019-2028: Regional Action Plan to implement the UNDFP for achieving the SDGs in South Asia.

Shrestha, R.B., Ferrand, P., Penunia, M.E., Dave, M., and Ali, Y. (eds.). 2021. SAARC Agriculture Center, Dhaka, Bangladesh; Food and Agriculture Organization of the United Nations (FAO), Rome; Asian Farmers' Association (AFA), the Philippines; International Cooperative Alliance Asia and Pacific (ICA-AP), India. DOI: <https://doi.org/10.4060/cb5030en>, ISBN [978-984-35-0127-1 [SAC]; ISBN 978-92-5-134526-9 [FAO]; © SAC and FAO.



This book is an output of a regional experts' consultation meeting on "UN Decade of Family Farming: Formulating Strategies and Action Plan to Strengthen Smallholder Family Farmers in South Asia", 5-6 November 2020. This book focuses on- family farming's constraints, challenges, opportunities, and government policies to contribute on attaining the targets of Sustainable Development Goals (SDGs) at country and South Asia regional levels.

The regional action plans are framed with expected outcomes, priority policies, priority actions, indicators, timeframe, and responsible institutions under **Seven Pillars of the UNDFP** customizing in South Asian context. This volume is useful for the family farmers and their organizations, researchers, academicians, development professionals, policymakers, governments, international organizations, development partners, and civil societies to synergize efforts and strengthen family farmers to achieving the SDGs in South Asia.



Sustainable Horticultural Systems: Issues, Technology and Innovation (Sustainable Development and Biodiversity Book)

Dilip Nandwani (Ed), 2014, Springer, 2014th edition, 415 p., ISBN-13 978-3319069036

Sustainable horticulture is gaining increasing attention in the field of agriculture as demand for the food production rises to the world community. Sustainable horticultural systems are based on ecological principles to farm, optimizes pest and disease management approaches through environmentally friendly and renewable strategies in production agriculture. It is a discipline that addresses current issues such as food security, water pollution, soil health, pest control, and biodiversity depletion. Novel, environmentally-friendly solutions are proposed based on integrated knowledge from sciences as diverse as agronomy, soil science, entomology, ecology, chemistry and food sciences. Sustainable horticulture interprets methods and processes in the farming system to the global level. For that, horticulturists use the system approach that involves studying components and interactions of a whole system to address scientific, economic and social issues. In that respect, sustainable horticulture is not a classical, narrow science. Instead of solving problems using the classical painkiller approach that treats only negative impacts, sustainable horticulture treats problem sources.

Sustainable Horticulture, 2 Volume Set

Debashis Mandal, Mohammed Wasim Siddiqui, Amrithesh C. Shukla (Eds.), 2018, Apple Academic Press, 750 p, Hardback £231.00, ISBN 9781771886499

This timely two-volume compendium, *Sustainable Horticulture*, addresses the most important topics facing horticulture around the world today. The volumes cover a wide range of topical issues and trends in sustainable horticulture today: *Volume 1: Diversity, Production, and Crop Improvements*, and *Volume 2: Food, Health, and Nutrition*.

Global food demand is expected to be double by 2050, while at the same time the production environment and natural resources are continually shrinking and deteriorating due to many complex factors. Horticulture, a major sector of agriculture, is vital to enhancing crop production and productivity in parity with agricultural crops to meet the emerging food demand. Implementing sustainable models of crop production is really an enormous endeavor. Promising technologies and management options are needed to increase productivity to meet the growing food demand despite deteriorating production environments.



Postharvest Handling and Diseases of Horticultural Produce

Dinesh Singh, Ram Roshan Sharma, V. Devappa, Deeba Kamil (Eds.), 2021, CRC Press, 454 p., £175.00, ISBN 9780367492892

Postharvest Handling and Diseases of Horticultural Produce describes all the postharvest techniques, handling, pre-cooling, postharvest treatment, edible coating and storage of the horticultural produce available to handle perishable horticultural food commodities, covering the areas of horticulture, agricultural process engineering, postharvest technology, plant pathology and microbiology. Postharvest diseases of major fruits and vegetables, with their causal agents, are described. The integrative strategies for management of postharvest diseases include effectively inhibiting the growth of pathogens, enhancing the resistance of hosts and improving environmental conditions, with results that are favourable to the host and unfavourable to the pathogen growth, including biotechnological approaches. The chapters are written by experts in the fields of plant pathology, horticulture, food science, etc. Core insights into identifying and utilizing appropriate postharvest options for minimizing postharvest losses and enhancing benefits to end-users are also provided.



Wadi

Enhancing livelihoods, nutrition and environment

Yogesh G. Sawant, Rakesh K. Warriar and Rajesh B. Kotkar

BAIF's innovative model of "Agri-horti-forestry (Wadi)" integrates horticulture into the farming system for sustainable livelihoods through climate smart practices, productive engagement with under-utilized land and optimal use of local resources. The model with horticulture as the core component ensures multiple income streams round the year especially during lean periods from a combination of medium gestation-high resilience and short gestation-high returns cropping patterns.

Agriculture, with its allied sectors, is the largest source of livelihoods in India. Seventy percent of its rural households still depend primarily on agriculture for their livelihood, with 82 percent of farmers being small and marginal. While achieving food sufficiency in production, India still accounts for a quarter of the world's hungry people and home to over 190 million undernourished people (FAO Report). Tribal communities in India are among the poorest and disadvantaged sections of the society. In 2018, India's National Data indicated that Scheduled Tribes in India were the poorest populace.

Majority of the farmers are small and marginal landholders and practice rain-fed subsistence agriculture. Low returns from agriculture leads to other challenges including fast depleting traditional resources, poor health and lack of access to services resulting in distress migration for survival. Distress migration is linked with

Sitarambhai produces vegetables all round the year



poor living conditions impacting health of the family and education of children. There is an urgent need to create alternative cropping systems that can ensure sustainable livelihoods as well as sustainability of the natural resources. Horticulture crops including fruits, vegetables, flowers etc. have great potential of achieving this. Against this background, BAIF Development Research Foundation (BAIF) has introduced and up-scaled the *Wadi* programme which involves promotion of fruit trees as well as other horticulture and forestry in the farming systems. This article aims at sharing the case of a tribal family that has moved from poverty to prosperity after adoption of the *Wadi* model. The case is representative of the *Wadi* programme which has resulted in significant improvement in livelihoods, nutrition and quality of lives of 2 lacs participating families in various parts of the country.

Shri. Sitarambhai Sonji Ghatka dwells in a remote village in the tribal region of South Gujarat. Sitarambhai lives in Kaprada block of Valsad district with six members in his family. They own 4 acres of land, a part of which is along plains. Almost half of the land is along the slope and is quite degraded. The family depends on agriculture as their primary source of livelihood.

Agriculture was mainly at subsistence level, with major crops cultivated being rice, finger millets and black gram. Cultivation was restricted to the monsoon season only. After the harvest of the *Kharif* crop, Sitarambhai had no other alternative source of livelihoods within the village and hence had to migrate for wage labour. He used to take 3 – 4 trips annually to Vapi, Silvassa or Nasik in search of work during the post-monsoon season. Each trip comprised of nearly 15 to 20 days. The fields were left barren thereby leading to further erosion of soil and loss of soil fertility. At times, the entire family had to resort to seasonal migration. This affected the nutrition and health of the family as well as interfered with the education of their children. Despite the challenges, migration catered to subsistence only. Majority of the families in the area were compelled to follow the same pattern which was quite alarming.

It is against this background that BAIF introduced the *Wadi* program in the area. The initial piloting was supported by NABARD and Supraja Foundation which helped in evolving suitable farming system models comprising of agriculture, horticulture and forestry interventions. BAIF with the support from Supraja

Value chain development has been a key outcome of FPOs



Highlights & impact

- Holistic customised approach for optimal local resource utilization and productive engagement.
- Outreach of 2 lacs families in 12 states by BAIF. Scale-up by NABARD with 5 lacs families.
- Additional household income of 80,000 - 90,000. Income stream across year.
- No distress migration, improved nutrition, health, education.
- Upward social mobility, empowerment.
- Value chain development: 48 FPOs with 41,000 member farmers. Processing of mango, cashew, amla (Indian gooseberry)
- Carbon sequestration potential: 24 tons per ha.
- Alignment with SDGs 1, 2, 3, 10, 12, 13.

Foundation introduced “Holistic Village Development Programme” under which *Wadi* and various horticulture crops were introduced with required value chain initiatives. This resulted in significant improvement in the livelihoods of the families. Sitarambhai came across some of his friends and relatives who had benefited from the *Wadi* model and hence decided to give it a try.

Initially he was not very confident since the land he could spare for tree plantation was along slopes and was highly degraded. On his request, BAIF team visited and assessed resources and jointly a farming system improvement plan was prepared. He also confirmed for undertaking all the required labour work and trainings. Support was provided in the form of planting material, basal fertilizers, trainings and regular handholding. Various pre-plantation activities including pit digging, pit filling, organic manure application were taken-up in the field. Sitarambhai planted 20 mango, 40 cashew plants with 250 forestry saplings along the border. Legume crops/pulses were introduced as intercrops in between the fruit trees. After harvest of the *Kharif* crop, sunhemp was introduced as intercrop on residual moisture. These intercrops helped in receiving additional income while also improving the soils due to nitrogen fixation potential. During the summer season appropriate soil conservation activities were taken up on the plot. He also initiated various organic practices including recycling of farm residues, green manuring, application of dashparni ark, etc. These practices along with soil conservation helped in improving the soils.

Later on he also received training in cultivation of vegetable crops including trellis based crops. Sitarambhai

had never taken up vegetable cultivation on commercial basis. He initiated trellis based vegetable cultivation on a small plot initially. He also cultivated some leafy greens under the trellis while bottle gourd was cultivated on the trellis system. This helped him cultivate 2 to 3 crops at the same time on the land. He received appreciable returns during the first season of vegetable crops. He used his savings to further increase the area under vegetable crops. Over the years as the trees grew there was remarkable improvement in the soil too.

During the initial years Sitarambhai received some additional income from pulses which were taken up as intercrop. He received significant increase in income from his vegetable plots during subsequent years. Production from fruit trees started flowing in from the fourth year onwards. The fruit production has increased steadily over the years. Now Sitarambhai receives year round production from various crops including cereals, pulses, vegetables, fruits, etc. A summary of the production and value of produce from his farmland before and after the initiative is presented in the table below.

The enhanced farm production has resulted in improved consumption of pulses, vegetables and fruits at household level. This has helped in improved nutrition at family level. The surplus fruits and vegetables have resulted in significant increase in family income. They are no longer dependent on distress migration for livelihoods. The family now leads a more dignified life and children are able to attend school on regular basis. The horticulture crops and trees with other initiatives have resulted in improvement in the soil quality. The family has observed increased biodiversity in terms of crops as well as birds and insects on their farmland.

Table: 1 Production and value of various crops

Crops cultivated	Before Wadi		After Wadi	
	Yield (kg)	Value (Rs.)	Yield (kg)	Value (Rs.)
Cereals (rice, finger millets)	1,400	35,000	1,100	27,500
Pulses (black gram, pigeon pea)	70	4,900	150	10,500
Bottle gourd	-	-	15,540	2,17,560
Cucumber	-	-	1,000	16,000
Mango	-	-	805	21,735
Cashew	-	-	180	18,900
Gross value of produce		39,900		3,12,195



Various fruits and vegetables are grown in a Wadi

Collective initiatives

There are several other farmers in the region who have adopted the *Wadi* i.e. agri-horti-forestry based farming system. This has resulted in overall change in the farming system and increase in farm returns while improving the natural resources of the area. These farmers are organized into farmer producer organizations (farmers cooperatives) that take up value chain initiatives including organizing input supply for farmers, aggregation of farm produce, processing of mango and cashew as well as marketing of the processed produce. The activities undertaken by the farmers' cooperatives have resulted in reduced cost of production while ensuring better price for their produce. The activities like agriculture input supply, aggregation, processing and marketing has created new enterprise and employment opportunities for youth in the area.

Several families have diversified into secondary agriculture enterprises like production of fruit plants/grafts, vegetable saplings, vermicompost, mushroom cultivation etc. The agri-horticulture initiatives have not only created positive impacts at individual family

level but have also created employment opportunities at community level. There is a significant improvement not only in the socio-economic status of the families but also resulting in improvement in the environment. The *Wadis* are also playing a vital role in climate change mitigation by sequestering carbon.

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