

Magazine on Low External Input Sustainable Agriculture



LEIS INDIA



Valuing underutilised crops



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Kolar farmers are back to millet cultivation to beat the climate aberrations.

(Photo: S Jayaraj for AME Foundation)

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:

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The editors encourage readers to photocopy and circulate magazine articles.

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Dear Readers

It is heartening to know that there is increasing recognition worldwide for family farming and nutritional crops like pulses and millets (UN declarations such as International Year of Family Farming -2014; International Year of Pulses -2016). However, it is deeply disturbing with country facing unprecedented heat waves, droughts and farmer's miseries.

Diversity is the key for coping with climate change, for sustaining livelihoods and planet ecology. There is lot more to be understood about cultures, their options and resilience. This issue focusing on the theme of valuing underutilised crops brings out the role of local food crops, particularly in addressing the issues of food security and climate change. Thanks to enthusiastic practitioners for sharing their experiences. LEISA India has been always focusing on sharing alternatives. We remain indebted to all those who have been sharing positive experiences and creating a hope for a better future.

We are thankful to all those who have been contributing voluntarily for the printed copy. We look forward to many joining them as well as share their rich experiences for the benefit of all.

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.

ILEIA – the centre for learning on sustainable agriculture is a member of AgriCultures Network which shares knowledge and provides information on small-scale family farming and agroecology. (www.theagriculturesnetwork.org). The network, with members from all over the world - Brazil, China, India, the Netherlands, Peru and Senegal, produces six regional magazines and one global magazine. In addition, is involved in various processes to promote family farming and agroecology. The ILEIA office in The Netherlands functions as the secretariat of the network.

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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Revival of agro biodiversity that characterizes traditional agriculture is crucial for addressing food and nutrition security. Bringing back millets, pulses, coarse cereals etc. into the cropping systems can help fill the nutritional gap that is ever widening in the present rural communities.



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33 Past for the present

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Valuing underutilised crops

The rapid expansion of modern agriculture has resulted in an unprecedented loss of plant genetic diversity. Dependence on just a few crops has made food production dangerously vulnerable to crop failures. Further, climate change conditions with increasing frequency and severity of extreme weather events, has added to the vulnerability of crop production, resulting in food insecurity and malnutrition.

According to the United Nations Food and Agriculture Organization, 75% of the world's food crop diversity was lost in the twentieth century as farmers abandoned local varieties in favor of genetically uniform high-yielding crops. Although thousands of crops have been cultivated since the dawn of agriculture, twelve crops currently supply 80% of the world's plant-based dietary energy. Just four crops – rice, wheat, potato, and maize – supply nearly 60% of plant-derived calories and protein.

Beyond the cultivated crops there are a number of wild or semi domesticated species— like the tubers, minor millets, pulses, indigenous green leafy vegetables, tropical fruits etc., which were a primary part of the diet of the poor, a few decades ago. These species are not only hardy and resilient to changing climatic conditions but are also an important source of nutrients. On the other hand, forest foods that are collected and not cultivated have served as safety nets during times of food shortages, since long.

The current over-reliance on a handful of major staple crops has inherent agronomic, ecological, nutritional and economic risks and is unsustainable in the long run. Fortunately, this threat is being recognized and increasingly there are initiatives to revive traditional food systems. It is becoming clear that conserving traditional food systems is a powerful way to contribute towards saving local ecosystems. This issue brings out a few of those experiences.

Dietary diversity and nutrition

Food Security is often seen as the amount of energy available from staple food production and currently global supply of food energy is dependent on only a small number of cultivated species.

In some regions surrounded by extraordinary biodiversity, people just do not depend on the cultivated crops for food needs. Their diets include many neglected, uncultivated and forest foods which help them overcome periods of food insecurity and malnutrition. They are the ones who generally live on the edges of the forests, like the tribals and the adivasis. However, with little or no attention being paid for conserving these species, many of these varieties and species, along with a wealth of traditional knowledge about their cultivation and use, are being lost at an alarming rate. For example, the share of uncultivated food from the forest has gradually declined in the diets of Paharia tribes in Jharkhand. Initiatives like conservation, preservation, processing of uncultivated foods have helped them regain their position and enhance the dietary diversity of the communities (Das, p.11). 'Uncultivated' foods are not just about satisfying hunger, but about savouring the forests and people's relationship with them. (Sarangi, p.26).

There are certain types of crop plants that are not cropped but edible, containing high nutrients and having medicinal value. These crops, also called as hidden harvests, are capable of providing essential nutrients to household diets, besides contributing to household income. One of the best examples for the rich diversity of edible non-crop plants is the homegardens of Kerala. A study conducted in randomly selected 48 homegardens of Malappuram district recorded about 27 edible herbaceous and shrub species. (Chandrasekhara U M and Reshma P K, p. 28).

Fostering farm resilience

Several regions are experiencing unprecedented weather events caused by climate change, putting global food and nutrition, at risk. Recent climate change assessments have identified low levels of adaptive capacity as one of the main drivers of farm vulnerability. Increasing environmental degradation suggests an urgent need for exploring novel solutions. Tubers, pulses and millets are important for the livelihoods and nutrition of poor farmers, especially in fragile regions. Inclusion of such species in cropping systems will enhance the biodiversity and result in improving farm resilience to environmental stress. For instance, Ama Sangathan, a women federation consisting of 1200



Photo: AME Foundation

Farmers harvesting Cassava in Dharmapuri, Tamil Nadu

indigenous women, have revived tuber crops in two blocks in Odisha, by their vibrant campaigning. (Mohanty and Jhodia, p.14). Farmers have started cultivating Elephant Foot Yam, Cassava and Sweet potato in the rainfed hilly terrains of Rayagada and Kalahandi districts. While cassava is widely recognised for its ability to sustain drought by shedding leaves, tolerate high temperature and grow well in marginal soils, sweet potato tolerates saline conditions and can withstand flash floods and mid-season drought.

In the context of climate change, uncultivated forest foods are a very important community-based adaptation strategy. Besides their ecological functions such as releasing oxygen, precipitating rain, recharging groundwater, conserving fertile topsoil, buffering against droughts and floods, forests are also about securing food for local communities. A study by Living Farms revealed that the dependence of communities on forest foods ranged from 20% to 50%, depending on the characteristics of a village and the biodiversity composition of the forest. (Sarangi, p. 26).

Emerging initiatives

Though many of the local food crops are generally neglected, both by the research and the policy makers, civil societies have been playing a key role in reviving the forgotten food crops.

Pulse Panchayat, an integrated approach promoted by MSSRF resulted in establishing a sustainable production, value addition and marketing system for pulses. The initiative implemented by Illuppur Agriculture Producer Company Limited, a Farmer Producer Company in Tamil Nadu, is moving towards achieving self sufficiency in pulse production (Hopper R S S and Thachinamurthy K, p.7). The *Pulse Panchayat* movement has demonstrated that innovative approaches with Knowledge management enhancement, through multi-stakeholder platforms and policy making networks, are key to achieving self sufficiency in pulse production.

LIBIRD's initiative to promote growing yam on terrace walls has caught up with the Chepang communities in Nepal. Yam has various nutritional benefits, yet, the crop remains neglected. In the absence of national research and extension programmes on yam, a simple technique of "cultivating yam in sacks" on the base of terrace walls, has been well received by the local communities. (Ghimire et.al., p.23).

Farmers preferences need to be the basis for understanding the utility of diversity. Participatory research on cassava and elephant foot yam undertaken in Kolli Hills and Wayanad has resulted in farmers identifying better varieties that suit their requirements, including higher yields, higher starch content, enhanced drought tolerance and the ability to adapt to local conditions. Through intercropping, they have also been able to cultivate a diversity of short duration food crops alongside their main crop, boosting the nutritional content and diversity of household diets, earning extra income and strengthening the resilience of their farming systems against shocks, such as drought. (EDI Oliver King et al., p. 20). Similarly, communities in the Kumaon Himalayan region established a seed bank and preserved 158 crop varieties of paddy, millets, vegetables. (Mukerjee et al., p. 33).

Support needed

The traditional local crops have multiple benefits. As population is increasing and several nations face issues of food insecurity and malnutrition, these local crops seem to be a possible solution. Especially in times of rapid climate change conditions, these crops bring in farm resilience. Also, local crops reinforce cultural identity and reiterate the key role played by women in sustainable agriculture.

Concerted efforts are needed to revive these crops. Awareness on agronomic, ecological and nutritional benefits and the commercial opportunities these crops offer, need to be raised. Support in the form of research and policy will go a long way in wide spread cultivation of these crops. The International Year of Pulses -2016, declared by the United Nations is one step towards that end. Its time to look back to move towards a sustainable future!

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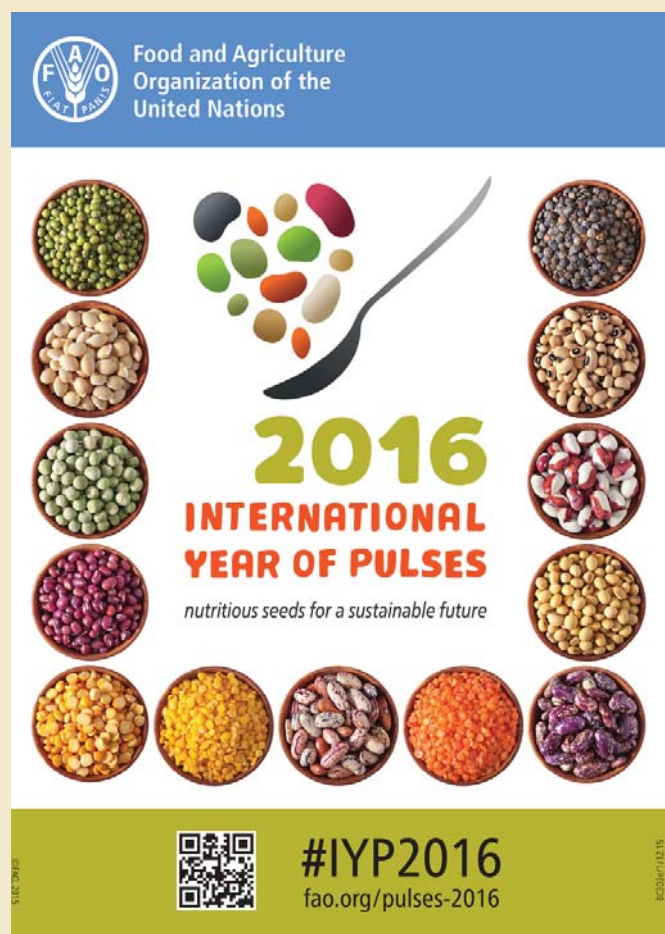




Photo: MSSRF

Farmers taking oath to cultivate pulses

Pulse Panchayat

Achieving self sufficiency in pulse production

R S Shanthakumar Hopper and K Thachinamurthy

Pulse panchayat is an integrated approach in establishing a sustainable production, value addition and marketing system. The initiative implemented by a Farmer Producer Company in Tamil Nadu, is moving towards achieving self sufficiency in pulse production.

Pulses with their inherent capacity to fix biological nitrogen and the ability to withstand weather variability, are the solutions in reclaiming fallow lands and improving soil fertility of degraded lands. Packed with nutrition and their ability to grow under harsh conditions, pulses are ideal for poor farmers with marginal lands.

The area and production of pulses has been witnessing a steady decline. Grown under rainfed conditions on marginal lands, pulse production faces a number of constraints. Some of them include area stagnation, low productivity, lack of timely availability of inputs, susceptibility to pests and diseases, inefficient storage and market linkages, price

volatility, lack of crop insurance etc. The per capita availability of pulses in India is low at 33g/capita/day (2009-10), while the WHO recommends about 80g/capita/day. To meet the domestic demand the government is forced to resort to imports.

To enhance production and make pulses affordable to the common man, the government has been promoting improved technologies and farm management practices through its initiatives like NFSM – Pulses in 171 districts belonging to 14 states. Recently, in order to provide incentive to farmers, Government of India has announced a bonus of Rs 200 per quintal of Pulses.

M.S. Swaminathan Research Foundation (MSSRF) through the India Morocco Food legume Initiative (IMFLI), has promoted *Pulse Panchayats* in Tamil Nadu and Odisha states of India in fostering self sufficiency in pulse production. OCP Foundation, Morocco has initiated a programme through South – South Collaboration - an India Morocco Food legume Initiative (IMFLI) involving partners in India



Photo: MSSRF

Women's group meeting in progress

and Morocco. This paper explains the initiative taken up by MSSRF in Tamil Nadu.

Pulse Panchayat

Edaiyapatti panchayat is located in Annavasal block of Pudukkottai district, which is one of the driest regions in Tamil Nadu. 95% of the farmers are small holders. The panchayat has 79 open wells to provide partially assured irrigation. The major crops grown are paddy, millets, black gram and groundnut. Only few farmers cultivated pulses on an area of about 30 acres. Majority of the rainfed lands were left fallow and now brought under cultivation through bio-industrial watershed activities.

Illuppur Agriculture Producer Company Limited (IAPCL) was initiated in 2012 and registered in January 2015 to address the market issues for the farmers in a collective manner. IAPCL was established with 1000 shareholders belonging to 5 panchayats inclusive of Edaiyapatti panchayat farmers. One hundred and eighty two farmers from Edaiyapatti are now with IAPCL as institutionalised farmers. IAPCL focus is on four different value chain based enterprises (pulses, organic vegetable, integrated dairy and poultry) to enhance the income of farmers by promoting sustainable production, value addition and marketing.

In 2013, the entire panchayat passed the resolution to take up pulse cultivation in a massive way, agreeing to put the maximum available land i.e. 474 acres (Gross Cropped Area) into pulse production for one season. The members had successfully demonstrated certified pulse seed production in Rabi season.

The entire panchayat consisting of 10 villages has been digitized using remote sensing tools and strategic plans developed for pulse production. The Panchayat and the IAPCL are involved in the planning and monitoring of the pulse production. The Panchayat has provided infrastructure

facilities for the village knowledge center and the custom hire of farm equipments. The technical backstopping support is provided by the National Pulse Research Station, Vamban, Government Agriculture department, and MSSRF.

The IAPCL is promoted based on value chain analysis of various crops and as a business model. All the activities are funnelled through the IAPCL. The role of IAPCL is as follows:

- Input supply of quality seeds, bio-fertilisers, custom hire of farm equipments etc.
- Procurement of produce, storage and marketing
- Access to credit through linkages with banks
- Access to knowledge empowerment through Village Knowledge center
- Facilitate processing of produce for value addition
- Linkages with various stakeholders and MSSRF

Several initiatives like Intensive awareness programmes, knowledge building on pulse cultivation through Participatory Varietal Selection (PVS) processes, Farmer Field Schools (FFS), Farmer Field days, discussion platforms through Agriculture Producer Groups, assured market option through establishing their own producer company, possibility of getting premium price by Producer company etc., motivated farmers in taking up the pulse cultivation. Some of them are described in detail here.

Farmer-Participatory Varietal Selection Trials (FPVST)

Totally 41 participatory varietal selection trials were conducted in this area to identify the best performing pulse varieties in the locality. The varieties were sourced from various institutions – agriculture universities, research

Table 1: Varietal selection trials 2015 -2016

Pulse Crop	Pulse Varieties Tested	Best Performing Variety
Black gram	Kharif - VBN 4, ADT-5, MDU -1 Rabi - VBN 4, VBN-6	Kharif & Rabi – VBN 4
Green gram	Kharif – Co 8, VBN 3, VRM-1 Rabi VBN3 ,Co 8,VRM1, BGS9,ML618	Kharif – Co8 & VBN 3 Rabi – VBN 3
Red gram	Kharif – 37 acres intercrop with Gnut Rabi –VBN2, ICPL1124,161, 20335, 88039	Rabi – ICPL 88039
Groundnut	Kharif – Co 7, Pollachi 1, VRI 2 Rabi – VRI 2, K6, Co4, TMV7, GG2	Kharif – Co7 & VRI 2 Rabi – VRI 2



Photo: Author

Farmers participating in Varietal Selection Trials

institutes and farmers. Every PVST process involved 20 progressive farmers in five decisive stages of the crop. Vamban 4 & 6 and MDU 1 performed well in black gram, Vamban 3 and Co 8 performed well in green gram and CO 6 and LRG 41 performed well in red gram. Farmer field days were held after each trial to provide an opportunity to select the best variety based on 10 critical parameters during five decisive crop growth stages.

Promoting *Climate Smart* agriculture practices

Promotion of pulses in rice fallow cropping system has brought an additional area (40%) under pulses production. Demonstrations were done by including short duration varieties of pulses as main/catch crop. This has enhanced productivity by more than 30% compared to the traditional variety, with additional incomes. The varietal replacement rate of new improved cultivars has increased by 70%. The inputs and credit support is through the IAPCL. Farmers were capacitated in Integrated Crop Management practices with adoption of new improved varieties and packages of practices based on climate variability. By leveraging CSR funds from Hindustan Petroleum Corporation (HPCL),

The “Pulse Biopark” based on the value chain analysis managed by the IAPCL has significantly enhanced the pulse cultivating farmers share in the consumer rupee.

Mumbai, Asia Initiatives, USA, more than 30 open wells were rejuvenated to ensure equitable sharing of water resources for pulse cultivation, especially in Rabi season, for quality seed production. This has reclaimed more than 50 acres of fallow lands.

The farmers field school has trained them to cultivate pulses with new climate smart agriculture technologies like accessing quality seeds, cultivating pest and disease resistance varieties, nutrient management through soil health cards based recommendations, seed treatment, Foliar spray of DAP (Di Ammonium Phosphate), use of pulse wonder (a booster with nutrients and growth regulators), line planting, intercropping, water management, processing etc.

The farmer’s field days has enabled farmers, scientists, project staff and government department staff to share and spread the experiences of pulse production. The yield levels from various pulses were 50% more than the State and the National average yields.

Promotion of seed system and governance

A fully functional and sustainable Pulse seed supply system for quality seed supply is very important. To meet the demand of Certified/Truthful seed at farmers’ level, a Pulse Seed Value Chain System was established through IAPCL. The Seed Replacement Rate (SRR) has increased to more than 40%. About 10 tons of quality seeds were procured by the IAPCL and stored. This will be further certified by the

government agencies. Thus, low cost innovative seed systems and select farmers' preferred varieties through farmers' participatory varietal selection (FPVS) which replaced old varieties, has yielded encouraging results.

Storing seeds in innovative triple layered Purdue Improved Crop Storage (PICS) bags (originally designed by Purdue University), was demonstrated. The loss of seed quality owing to storage pest incidence was considerably less. Besides preserving seed quality, this method of seed storage enhanced seed viability.

The Pulse Biopark

The Pulse Biopark, based on the value chain analysis, is a pilot project, implemented by the IAPCL with the technical support of MSSRF and other stakeholders. A dhal mill has been installed and the initial processing results are encouraging and benefiting small and marginal farmers to process their produce. The processed pulse is cleaned, packed, branded and sold in the open market. Documenting existing and innovative value chains for different pulses, will enable Scaling up, Sales and Sustaining (3 S) the Pulse production.

Knowledge Management

Knowledge management through Farmer Field Schools and Farmers Field Days using ICT tools were integrated through Village Knowledge Centres, managed by the IAPCL. Support services of custom hire of farm equipments at the right time with affordable rental charges, has enabled small farm holders to benefit economically. The village knowledge centre provided timely and location specific information on climate smart agriculture technologies, crop insurance, soil health care, market prices, plant and animal health care clinics, monsoon behaviour and government schemes. Phone-in programmes, voice and text messages were also used with more than 2000 farmers, to enhance pulse productivity.

Conclusion

The *Pulse Panchayat* movement has demonstrated that innovative approaches with Knowledge management enhancement, through multi-stakeholder platforms and policy making networks, are key to achieving self sufficiency in pulse production. The *Pulse Biopark* based on the value chain analysis managed by the IAPCL has significantly enhanced the pulse cultivating farmers share in the consumer rupee. This has also reduced the post harvest losses significantly. These approaches will bridge the supply - demand gap and have significant importance in Grain Legume research and development especially in countries with low and middle income with high rates of

Table 2: Economics of Black gram 2015-16

Variety	Improved variety with New Techniques - VBN 4 (Rs.)	Local Variety with Traditional Practices - T9 (Rs.)
Summer Ploughing	550	Nil
FYM application (2 tractor load)	3600	Nil
Ploughing before sowing (2times)	900	1100
Seed quantity (kg / acre)	900 (6kg)	1200 (8kg)
Seed treatment	50	Nil
Seed sowing	500 (Machine sowing)	200
Cost of weed management	600	2000
Foliar and Pesticide spray	1000	500
Harvesting and threshing	2000	2000
Total Yield (Kgs /acre)	350	140
Gross income (Rs.) / acre	31500	12600
Total cost (Rs.) / acre	10100	7000
Net Income (Rs.) / Acre	21400	5600
Net profit- Rs. 21400 / acre		

undernourishment. Breaking the yield barrier, tolerance to biotic and abiotic stress factors and enlarging the genetic base of pulses are challenges for discussion in the International Year of Pulses - 2016.

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Uncultivated foods

The hidden treasure

Anshuman Das

The share of uncultivated foods from the forest has gradually declined in the diets of Paharia tribes in Jharkhand. Initiatives like conservation, preservation, processing of uncultivated foods has helped them regain their position and enhance the dietary diversity of the communities, also addressing the issues of hunger and malnutrition.

It was a January morning. The misty hills were emerging out in the horizon with the changing mood of the sun. I crossed a Santhal village in the foothills and started moving up to reach a Paharia village, *Kutlo Pahar*, on the top of a hill in Litipra block of Pakur district in Jharkhand. The dominant tribal community here is the *Paharias*. The *paharias*, as the name indicates, are a hill tribe settled in the hilly ranges of the Rajmahal hills. *Paharias* survive on shifting cultivation and a traditional forest based economy.

After walking one hour I reached the village. The villagers informed me about the practices prevalent there. *Paharias* cultivate cowpea by cleaning up and often burning bushes on the hill. They also do mixed cropping with pigeon pea and maize. *Paharias* depend on Mahajans, the local money lenders, for seeds and also market. The Mahajans also sell or barter essential goods such as rice, potato, onion, chilly etc.,. However, Mahajans are not considered as a threat, as perhaps they are the only link to the outside world.

People also shared as to how they lost the forest and forest based food and traditions— mostly because of the increasing pressure on the forest due to population.

The gap in the diet

A nutrition survey was conducted as a part of the baseline study of 'Fight Hunger First Initiative' of Welthungerhilfe in 2012, in 10 villages of *Paharia* tribes. The study highlighted that 33% of the children are severely and another 40% are moderately underweight. 56% of children are



Photo: Author

Fruits collected from the forest

stunted. The average calorie consumption drops to 1,500 kcal during periods of food shortage. On the contrary, a study with the Dongaria Kondh community in Niyamgiri hills showed that forests provide rich food sources throughout the year and contributed approximately 37%, 30% and 45% to the total food basket of tribal in summer, rainy and winter season, respectively. This points to the fact that the share of forest foods in the diet of the tribals has been on the decline, for several reasons. For instance, in recent years, the government has introduced subsidized rice for the tribal and Below Poverty Line (BPL) families to cope with hunger. This has brought about a significant change in their food habits - reducing their diet diversity to very simplified rice based meals. With very little awareness on nutrition, the tribals now sell off the nutrient rich wild foods like fruits, roots and tubers, insects, birds, rodents, edible leaves, mushrooms, tamarind, and bamboo shoots to the middlemen in exchange for salt, oil and other domestic products at a throw away price.



Photo: Author

Paharia women's traditional dance

The treasure

“The children are not hardy as we used to be in our days” – Rawte Paharia, one of the elderly members of the community, murmured. Taking this forward, looking into the seasonality of wild foods became our initial point of reference. We engaged children in identifying and documenting these foods. It was evident that with the modern development trends, their indigenous knowledge base had eroded. The younger generation unaware of their heritage and rich biodiversity, are depending more on external sources of food and medicines. Consequently, they are more vulnerable to malnutrition, hunger and disease.

Communities could recall uncultivated food, mostly the wild edible plants including leaves, flower, fruits, animals, birds, mushroom, fish, crabs, shrimps, honey etc. They shared, how these uncultivated food are natural insurance for them against climatic shocks, especially in the stress period, generally during summer and rainy season. A farmer, in his 40s, came forward – *“In my childhood we hardly bought anything from open market except kerosene and salt, now we have to buy most of the things from outside market or mahajans who more frequently trade with us. The cash*

The community identified 10 types of mushroom, 8 types of aquatic weed, 5 types of honey, 24 green leafy vegetables, 15 types of fruits, 6 types of legumes, 2 types of millets, 4 types of tubers and 3 types of seeds which are available in the wild.

income has become a big deal for survival. Forced migration and logging of our trees are a direct fall out of this changed scenario.”

Gradually with time, the community identified 10 types of mushrooms, 8 types of aquatic weeds, 5 types of honey, 20 types of birds, 24 green leafy vegetables, 15 types of fruits, 6 types of vegetables, 6 types of legumes, 2 types of millets, 3 types of flowers, 4 tubers and 3 types of seeds which are available in the wild. All these have been documented carefully with their local names, scientific names, description, propagation habits, choices and tolerance, use, nutritional value, seasonality etc., by the volunteers from the community. Scientific identification of mushroom and fishes could not be done, inspite of expert's involvement.

Taking action

The documentation process enriched us in understanding the nature, environment, food and related culture of the Paharia tribe, but for the community it resulted in improved diet diversity. In the beginning, it was more at a knowledge level. During rainy season, couple of tubers and leafy vegetables and during summer, some fruits were included in the diet. This has turned to twelve to fourteen servings per week in their lunch and dinner. Women could recall some of the recipes and practices that were almost forgotten. Preservation activities like dehydration of green leaves, pulse cake made of local dried leaves and wet grinded pulses etc., have also been tried, appreciated and included back in the diet.

On the basis of these experiences, a capacity building module was developed focusing on nutrition education. This included basic nutritional health and sanitation related issues, preparation of local recipes, simple techniques of food processing etc. Also, a women's group with 25 mothers selected from 10 villages, was trained to take this agenda further.

The process also went beyond food and diet. Community leaders started to conserve uncultivated food and surrounding natural resources. Several challenges were faced during the conservation process. The survival of new plant samplings was a serious challenge. It was observed in the forest that the local species had a very good symbiosis which ensured their survival and growth, whereas, the plantation in the degraded forest often failed. Using this lesson, communities focused on developing in-situ conservation methods by supplementing gaps in dense forest locations. Four ex-situ conservation sites were developed, one each at Buchotola and Simlong village, whereas 2 sites were developed on Kutlo pahar village. At each location,



Diverse forest food on display

35 to 40 local species have been initially conserved. This spontaneous work was further synthesized into another capacity building module for community leaders on conservation related issues of uncultivated food and commons.

To bridge the nutrient gap in the diets, some allied activities were taken up. Most of the legumes after harvest were stored by local communities in plastic bags which often resulted in pest attacks, forcing farmers to sell legumes within one or two months of harvest. To address this issue, GI sheet drums were introduced across 70 households to store the legumes. Members were trained in preservation processes using local materials like dried neem, pongamia and vitex leaves. This has checked distress sale of legumes.

Along with ex-situ preservation, many other initiatives were taken up. For example, plantation of local varieties of jujubay, custard apple, mango, guava, jackfruit etc were taken up in the homestead, cultivation of bajra was revived in 6 villages, catchment treatment and channel creation for water was done extending the water availability for additional two months period.

Looking beyond

Uncultivated foods, has re-gained its old position in the diets and minds of the people. But it was also realized that unless

forest base is regained and the ecosystem is re-established, the demand for uncultivated foods can never be met. The initiative which started with uncultivated foods raised the demand for development of water, improving diets and diversity on the farm.

Some of the farmers visited Ranchi and Delhi to share their knowledge – some were first timers - stepping on a motored vehicle! The treasure to them was these foods, but treasure to us remained the joy and confidence in the eyes of some farmers like Rawte Paharia, Shankari Paharia and many more. They are now involved in creating *Food Forest* for in-situ conservation of these wild food sources inside the forest by planting a judicious combination of various trees, shrubs, creepers/ climbers, grasses, tubers - that acts as a food reserve and provide fuel and fodder as well. A long way to go, indeed!

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A woman harvesting diverse millets

Climate smart crops

Abhijit Mohanty and Sumani Jhodia

Tubers, pulses and millets are important for the livelihoods and nutrition of poor farmers, especially in fragile regions. These crops are not only underutilised, but are also under-researched. Ama Sangathan, a women federation consisting of 1200 indigenous women, have revived these crops in two blocks in Odisha, by their vibrant campaigning.

In Odisha State of India, tubers, pulses and millets had traditional place in the diet of the tribal communities. They ensured food and nutritional security during periods of food scarcity. However, with commercialisation of agriculture leading to monocropping systems of cultivation of paddy, these traditional food crops lost their place in the cropping systems. Also, extensive application of chemical inputs has resulted in decreasing natural fertility of the soil

with diminishing yield. To make the situation worse, in recent years, Odisha's vulnerability to natural disaster has been alarming. Recurrent cyclones, floods, and droughts severely affect the livelihood of the majority resource poor farmers of the State.

It is in this grim situation, Ama Sangathan (AMS), a women federation representing 1200 indigenous women has undertaken a vibrant campaigning on reviving cultivation of tubers, pulses, millets. This is being done in two blocks - Kashipur of Rayagada and Thuamulrampur of Kalahandi districts, with the support of Raghuraj Foundation.

The bargaining and negotiation skills of women farmers improved and their contribution to supplementing household income is being recognised.

Table 1: Nutritional value of tuber crops

Nutrients	EFY	Cassava	Sweet Potato
Protein (percent)	2.0	2.5	2.2
Fat (percent)	0.1	0.2	00
Starch (percent)	16.6	32.4	21
Energy (Kcal)	75.0	135	00
Vitamin B-1 (mg)	0.6	0.04	00
Vitamin B-2 (mg)	0.7	0.05	00
Vitamin C* (mg)	0.0	34	00
â carotene (µg)	26.2	00	00
Calcium (mg)	12.7	26	30
Phosphorous (mg)	67.0	32	49
Magnesium (mg)	47.0	00	24
Sodium (mg)	4.1	2	13
Potassium (mg)	622	39.4	373
Sulphur (mg)	11.8	39.4	29
Iron (mg)	0.51	0.9	0.8
Copper (mg)	0.18	00	00
Zinc (mg)	1.05	00	00
Manganese (mg)	0.31	00	00
Boron (mg)	0.7	00	00

Source: *Tropical Tuber Crops* edited by Balagopalan et. al (1999)

* Values are expressed in mg/100 g fresh weight

Tuber crops adapt to a wide range of agro-climatic conditions and give good performance even under marginal growing conditions. These crops cease tuber development as well as vegetative growth and become dormant during unfavourable conditions such as drought, flood, and heat-stress condition. They resume growth during favourable conditions, hence chances of crop failure is very less. On the other hand, pulses and millets which are an important component of food and nutritional security of the poor, need less water and produce assured and high yield.

Promoting tuber cultivation

The rainfed hilly terrains of Rayagada and Kalahandi districts are ideal to grow Elephant Foot Yam-EFY (*Amorphophallus paeoniifolius*). EFY offers several advantages – it tolerates shade conditions, it is easy to cultivate, has high productivity, less susceptible to pests and diseases, is in steady demand and fetches reasonably good price. AMS organised a series of interactive meetings with the farmers and shared the importance of EFY. Field demonstrations were conducted where farmers were trained on agroecological method of tuber crops cultivation. After realising various advantages of EPY cultivation, gradually the farmers started to show their interest.

Initially, 50 farmers of Rayagada cultivated EFY. Farmers followed agro ecological ways of cultivation. Before

planting, the tubers are treated with cow dung slurry mixed with *Trichoderma*. After planting and compacting the planted tubers, pits are covered with organic mulches like green

Shobini Muduli is delighted to harvest Sweet potato



Photo: Abhijit Mohanty

Table 2 : Nutritional value of various millets

Millets	Protein (g)	Fibre (g)	Minerals (g)	Iron (mg)	Calcium (mg)
Pearl	10.6	1.3	2.3	16.9	38
Finger	7.3	3.6	2.7	3.9	344
Foxtail	12.3	8	3.3	2.8	31
Proso	12.5	2.2	1.9	0.8	14
Kodo	8.3	9	2.6	0.5	27
Little	7.7	7.6	1.5	9.3	17
Barnyard millet	11.2	10.1	4.4	15.2	11

Source: MINI, Deccan Development Society, India.

leaves and dried paddy straw. It was observed that mulching immediately after planting not only conserves soil moisture and regulates soil temperature, but also suppresses weed growth.

Along with EFY, farmers also started cultivating Cassava (*Manihot esculenta*) and Sweet potato (*Ipomoea batatas*). Cassava is widely recognised for its ability to sustain under fluctuating climate especially during drought by shedding leaves, tolerates high temperature and grows well in marginal soils. Sweet potato tolerates saline conditions and can withstand flash floods and mid-season drought.

Promoting inter-cropping and mixed-cropping

AMS encouraged inter-cropping and mixed-cropping of pulses and millets with tuber crops as it offers insurance against crop failure, promotes crop diversification and helps in restoring soil fertility.

Special focus was given to revive indigenous varieties of millets which is one of the staple foods for the communities in the region. AMS motivated farmers who had preserved

millet seeds to multiply those varieties. Within a span of 5 years, kodo and little millets are revived. Farmers are now cultivating mixed-cropping of several millets like finger, pearl, foxtail, little, proso, kodo and barnyard.

In the case of cassava inter-cropped with millets, farmers produced 170 kg/0.4 hectare of millets resulting in a 10% increase in the farm income. Intercropping cassava with black beans produced 140 kg/0.4 hectare of beans, resulting in a 20% increase in income. When both pulses and millets were grown with cassava, 110 kg/0.4 hectare of millets and 85 kg/0.4 hectare of pulses were produced, resulting in a yield increase of 20% compared with cassava alone. All these inter-crops are harvested prior to cassava, hence it does not have adverse effect on the yield of cassava.

Similarly, sweet potato inter-cropped with maize has substantially increased the tuber yield. Because, maize in this system not only provides additional yield but also acts as a live stake. The organic C content of the soil is enriched by the addition of dried maize haulms. Likewise, inter-cropping of red grams with sweet potato also produced better results, owing to the fact that red gram crop fixes atmospheric nitrogen in the soil. A range of pulses like green gram, black gram, cowpea are grown as inter-crops in EFY, during the initial stages of EFY cropping period.

The beneficial effect of pulse crops in improving soil health and sustaining productivity is remarkable. On the account of biological nitrogen fixation, addition of considerable amount of organic matter through root biomass and leaf fall, deep root systems, mobilisation of nutrients, protection of soil against erosion as cover-crop and improving microbial biomass, they keep soil productive and alive by bringing qualitative changes in physical, chemical and biological properties. Millets require very less water and can withstand a certain degree of soil acidity and alkalinity, moisture stress, high temperature and variations in soils ranging from heavy to sandy in nature. Millets produce multiple securities - food, nutrition, fodder, fibre, health, and ecology.

Sukri Majhi showing Cassava tuber



Photo: Abhijit Mohanty



Photo: Abhijit Mohanty

Sliced Cassava being sun dried

Increasing market potential of tubers by value addition

To help farmers gain additional income from tuber cropping, AMS imparted training to the farmers on various methods of processing and value addition of cassava, EFY and sweet potato. As a result, farmers are now making a range of value added produces from tuber crops and getting fair price by directly selling the same at the local markets – For example, cassava chips, cassava “papad” prepared from cassava flour and wafers made from cassava starch. Some farmers of Rayagada are extending self-life of EFY tubers by converting them into cakes. Similarly, sweet potato is being processed into composite flour and chips.

Visible impacts

Earlier, farmers were confined to only mono-cropping, and faced crop loss due to late arrival of monsoon or low rainfall. Further, they had to face acute food shortage during June, July, August and September when the new crop was standing in fields. During this period, farmers unable to get enough food, either starved or consumed non-edible stuffs like mango kernel, tamarind seeds, and many other items which made them susceptible to food poisoning. But, now they

“Last year, the monsoon was delayed. So the yield of paddy was very low. But, our tuber crops and pulses survived in this difficult situation too. I harvested 1.5 quintals of EFY, 0.70 quintal of cassava and 1 quintal of sweet potato along with a range of pulses and millets that has been grown with these tubers as inter-crops and mixed-crops. We had ample food as buffer stock for our household consumption and also earned INR 24844/- by selling the surplus produces at the local market. Besides, we are getting better price for our processed and value added tuber crops produces in the local market. Thanks to AMS for providing us the much needed technical support”, says overwhelmed Sobhini Muduli.

are cultivating tubers, pulses and millets through mixed-cropping and inter-cropping round the year. The impact of this is phenomenal, especially on women and children, in terms of food availability and enhancing nutritional value of food basket.

The processing and value addition of tuber crops has undoubtedly reinforced the livelihoods of many marginal rainfed farmers of the region. Firstly, farmers are now getting better market price for their processed and value added products. With proper processing and value addition, farmers are now able to store the surplus items for a longer period of time. They use these reserve food stocks during the food scarcity periods. The bargaining and negotiation skills of women farmers have been improved and their contribution to supplementing household income is being recognised.

The application of organic inputs, inter-cropping of leguminous crops and millets along with adaptation of integrated pest management techniques has not only helped restore soil fertility, but has also rejuvenated the denuded landscape.

Tubers, pulses and millets are undoubtedly ‘climate smart crops’, important for the livelihoods and nutrition of poor farmers, especially in tropical and sub-tropical countries. These crops are not only underutilised, but are also under-researched. With adequate support and hand holding, these underutilised crops can substitute the major crops, while ensuring farm resilience. For this to happen, scientists, researchers and civil societies need to play an enabling role.

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Traditional crops ... the basis of our food and farming systems

Interview: Diana Quiroz and Madeleine Florin

Mariam Mayet is the director of the African Centre for Biodiversity (ACB). In a recent report, ACB turns their attention towards genetic modification of non-commercial 'orphan crops' and the way this technology is replacing farmer managed food systems. In this interview Mariam explains what is wrong with genetic modification of these crops and where the real solutions lie.

What is meant by non-commercial 'orphan crops'?

Traditional crops such as cowpea, sorghum, millet, pigeon pea, cassava and sweet potato are referred to as non-commercial 'orphan crops', as part of a particular narrative that values crops that are produced commercially and traded on international markets, while everything else, like traditional or indigenous crops, are considered 'orphan'. But on the ground, these crops form the basis of our food and farming systems. The value of these crops is not recognised. They've been neglected in regional, national and international policy, and in research and development spaces.

But we do not agree with the use of the term 'orphan crops'. In the same way that we changed the discourse around 'informal seed systems' to 'farmer managed seed systems' we have to question whether crops are really orphan or underutilised. Terms like 'orphan crops' are derogatory and I regret that we used it in our recent report, but it's out there now and it's a learning curve for us. The more we work with farmers on the ground the more we are humbled and we go back to the drawing board to rethink our strategy and way forward.

What is your concern with genetic modification of these crops?

First, we are very critical of genetically modified (GM) crops in Africa and have been opposing GM in Africa for almost



20 years. We are fundamentally opposed to reductionist solutions imposed upon Africa by powerful external forces that are based on replacing existing farmer managed food and farming systems with a model that is ecologically unsustainable and inherently socially unjust.

Claims that GM addresses vitamin and nutrient deficiencies through biofortification is turning the attention and resources of politicians and researchers towards new technologies such as gene editing and gene silencing. There has been a spate of articles and discussion around this, yet very little attention goes to the biosafety risks nor the past failures associated with GM crops. It is surprising that biofortification receives so much attention when GM crops simply cannot address multiple nutritional challenges arising from, amongst others, environmental degradation and lack of access to public health and sanitation. Our main objection is that this diverts

resources and the policy making trajectory away from real solutions which can be found in the diversity of food and farming.

In some parts of Southern Africa, and in the USA, Canada and Latin America, farmers can't even imagine agriculture without GM. At the same time, smallholder farmers in Africa produce 80% of our food largely based on their own seed systems. So in our recent report (see box), we look at what the GM industry is doing with farmers' traditional seeds and crops, and where public research funding is going. Now at least groups have, in one document, an outline of who are the companies donating technology, which traits in crops are being researched, which crops are being targeted, and how much money is going into these projects. The report reveals that there are whole host of agendas at play. For instance much of the research is on new GM traits and is in the stage of either greenhouse containment or confined field trials. The prospects of commercialisation are unclear as approval of new traits takes a long time and depends on the evolution of biosafety regulations and new or existing moratoriums. It is not clear when, or whether or not, any of these GM crops will reach the commercialisation stage.

But in general, we are very concerned about the GM industry and multinational companies further prying open Africa's food and farming system through its expansion into non-commercial crops, while there is clearly an opportunity for governments and a host of actors to embrace an alternative transformation agenda based on agroecology.

Can you elaborate some of these real solutions?

It is important to support the right of farmers to choose their means of production and survival. And this means starting with where farmers are and emboldening and strengthening their systems. Moreover, the protection of farmer managed seed systems is needed. In these systems you find diversity and resilience. We need to shift away from the idea that seeds within farmer managed seed systems are sub-standard or of poor quality. Within these seeds, you may have drought resistant or nutritional properties and characteristics with cultural importance.

What steps can be taken towards these solutions?

We are pushing for big policy change towards recognition and protection of these systems and supporting local campaigns. For us, information is key and ACB tries to put current information and knowledge in the public domain, complemented by other activities and events. Earlier this year, we organised a course where we brought together activists from across Africa and spoke at length about GM of non-commercial, indigenous crops.

I think the revaluation of traditional crops will increasingly become part of the resistance campaigns against GM. There is a conference coming up in Nigeria where church groups will discuss the rise of GM cowpea. Nigeria is the world's largest producer of cowpea and field trials with Bt cowpea are in quite an advanced stage so we expect a lot of resistance there. Our previous report on cowpea was translated into French and is being used by our friends in Burkina Faso, where there is a growing resistance to GM from the grassroots, for example through an event to coincide with the international march against Monsanto in May 2016. When our colleagues in Africa integrate information from our reports into their local campaigns that way, it's a big victory for us.



New report: For your own good The chicanery behind non-commercial 'orphan crops' and rice for Africa

The African Centre for Biodiversity released this report in April 2016 outlining the GMO industry's expansion across Africa. The report focuses on non-commercial crops – cassava, sorghum, sweet potato, pigeon pea and millet, as well as rice – revealing that a great deal of research and development is currently underway into the genetic modification of these crops. Most of the ongoing trials are focused on drought and salt tolerance, nitrogen use efficiency, resistance to tropical pests and diseases and nutritional enhancement (biofortification). The key countries that have been targeted include Burkina Faso, Egypt, Ghana, Nigeria, Kenya, Uganda and Malawi.

The current wave of GM research is not enabling smallholders in Africa to choose their means of production and survival and is shifting control over the future of farming in Africa from farmers to those who will benefit from profits to be made from GM. Moreover GM crops threaten genetic diversity that exists amongst traditional plant varieties. The report concludes that "the GM industry appears to be expanding its grasp over traditional subsistence crops. [...] By focusing research on traits that are meant to 'benefit' farmers and malnourished populations, the industry is bent on winning the hearts and minds of Africans regarding genetically modified crops."

This work complements work already produced on GM banana (Schnurr, 2014) and GM cowpea (ACB, 2015).

Enhancing crop diversity leads to farm resilience

EDI Oliver King, S Abubaker Siddick, Girigan Gopi and Nat Kav

Monocropping of cash crops for generating incomes has displaced mixed farming systems and associated local crop diversity, negatively impacting on food security and climate resilience. Initiatives to produce improved varieties through participatory varietal selection, intercropping trials with pulses and millets and promoting local millet seed production through community seed banks have made farming more resilient and remunerative.

India is home to incredible diversity in plant and animal species and is ranked among the richest areas of biodiversity in the world. Unfortunately, much of this diversity is being eroded at an alarming rate, largely due to habitat destruction and invasion by alien species.

In the hilly regions of southern India, the native agrobiodiversity is being replaced by the cultivation of cash crops for generating farm income. In Kolli Hills (Tamil Nadu), over the last three decades, cassava has increasingly replaced native millets. A parallel shift has happened in Jeypore (Odisha), where eucalyptus is now occupying traditional agricultural landscapes, while banana is replacing paddy rice in Wayanad (Kerala). While enabling farmers to generate some income, increasing monoculture of market-driven cash crops resulting in loss of crop diversity is accelerating rates of soil erosion, promoting crop disease, while making farmers more vulnerable to climate risks. It is also reducing local food production, thereby increasing people's dependence on food procured from outside the region, and on wheat and rice provided by public food distribution systems.

Roots and tubers, often neglected by agricultural extension systems, are traditional sources of food and income for small farmers in rural India. In Kolli Hills, however, cassava that constitutes 70% of crop production in the region, is grown solely for commercial purposes. Over 7,000 hectares of farmland is devoted to a single, non-edible variety (H165),



Photo: Girigan Gopi/MSSRF

Participatory varietal selection resulted in greater diversity

as this is preferred by industry for its superior starch quality. Monocropping of a single cassava variety over such a large area has resulted in increased disease incidence and soil erosion, causing productivity loss. It has also displaced mixed farming systems and associated local crop diversity, negatively impacting on food security and climate resilience. In response, the MS Swaminathan Research Foundation (MSSRF) in collaboration with the University of Alberta - working through the *Alleviating Poverty and Malnutrition in Agrobiodiversity Hotspots* (APM) project - initiated participatory varietal selection (PVS) for cassava varieties, undertook intercropping trials with pulses and millets and organized high quality millet seed production through community seed banks.

Participatory research on cassava and elephant foot yam undertaken in Kolli Hills and Wayanad has resulted in farmers identifying better varieties that suit their requirements, including higher yields, higher starch content, enhanced drought tolerance and the ability to adapt to local conditions. Through intercropping, they have also been able to cultivate a diversity of short duration food crops alongside their main crop, boosting the nutritional content of household diets, earning extra income and strengthening the resilience of their farming systems against shocks, such as drought.

Emerging outcomes

Greater diversity in cassava through participatory varietal selection

Selection trials were organized with the participation of men and women farmers to identify cassava varieties for starch, productivity and edibility, using 11 cassava varieties brought from the Central Tuber Crops Research Institute, Kerala. Farmers identified three cassava varieties (CMR 1, CMR 73 and Sirekha) which were comparable in yield to H165. All three varieties had higher starch content (27-29%) compared with H165 (24%), and one of the varieties, Sirekha, which was selected by female farmers, is edible. All three varieties are now being made available to farming families, and will add to cassava diversity in the region.

Intercropping for increased income

In another participatory process, farmers in Kolli Hills have intercropped cassava with finger millet, black bean and onion, increasing the diversity of their crop production. In the case of cassava intercropped with millets, farmers produced 170 kg/acre of millets resulting in a 12% increase in farm income. Intercropping cassava with black beans produced 140 kg/acre of beans, resulting in a 23% increase in income. When both pulses and millets were grown with cassava, 110 kg/acre of millets and 80 kg/acre of pulses were produced, resulting in a yield increase of 21.5% compared with cassava alone.

A farmer-driven intercropping approach using onions led to the production of 300 kg/acre of onions, resulting in a 60% increase in family income. Intercropping did not have adverse effects on cassava yield, as the millets, pulses and

Through intercropping, farmers have been able to boost the nutritional content of household diets, earning extra income and strengthening the resilience of their farming systems against shocks, such as drought.



Farmers have identified the best varieties of elephant foot yam and adopted best practices

Photo: Girigan Gopi/MSSRF

onions were harvested prior to cassava tuber development. Furthermore, the use of legumes contributed positively to soil health. Women and children benefited from intercropping through increased availability and consumption of diverse food crops like millets and pulses.

We were mono-cropping cassava for several years to earn income. The new way of intercropping helped us to harvest finger millet and later on black bean with the same or increased quantity of cassava. It gave us additional food for our family, rather than depending on the income from cassava to buy food, says Kalaiselvi, a 28 year old woman farmer from Tamarakulam.

Resilience through community seed banks

Small and marginal farming communities in India often have limited access to quality seeds, due to weakened traditional seed systems and increased dependency on seed supplied through the state or commercial markets. The APM project supported the establishment of seed banks to provide quality rice and millet seeds of local and improved varieties offering high yields and desirable culinary properties. The seed banks are managed by farmers' clubs or women's self help groups; those borrowing seed are required to pay back double the quantity after the harvest, helping to make the seed banks sustainable. Community members also mastered skills for identifying superior varieties and producing quality seeds. Establishment of seed banks has led to the timely availability of quality seeds, increasing farmers' options in seed choice, minimizing risk of crop failure and boosting crop productivity. The provision of new and improved varieties has also contributed positively to the diversity of cropping systems in these regions. By increasing agro-biodiversity and human capacity, these seed banks are contributing to long-term resilience and food security in these communities.

Positive steps for Elephant Foot Yam

In Wayanad district, Kerala, male farmers traditionally cultivate elephant foot yam on rice fields during the fallow season. They rely exclusively on one variety of yam and experience relatively high production costs. Through

participatory research, farmers have identified best varieties and adopted low cost farming practices, such as a reduced seed rate, mulching of crops to induce early sprouting and application of farmyard manure. Two varieties, *Gajendra* and *Wayanad local*, were selected by farmers using criteria which included yield, resistance to disease, drought tolerance and germination rate. Improved farming practices also resulted in reduced production costs and yield increases of around 30% (*Wayanad local*) and 24% (*Gajendra*) compared to conventional practice.

In Kerala, land-owning families allow landless women and marginal farmers to use their land for six months during the rice fallow (December-June) to grow yam or any short duration crop free of cost. This provides the land owners with residual benefits from applied fertilizer and crop residues, as well as from soil tillage, all of which boost their next paddy rice crop. The project facilitated landless women farm workers to gain access to such lands for the cultivation of elephant foot yam, using high quality seed, enabling them to earn income in the range of INR 3,000-13,000 (Indian rupees) in six months. They have also used the rice fallows to cultivate diverse vegetables, including cowpea, amaranthus, okra, maize, pumpkin and cucumber, for their own consumption.

Conclusion

Through participatory research, farmers identified cassava and elephant foot yam varieties that offer more yield and income. They also learnt techniques of intercropping which have further increased crop diversity and increased the



Photo: S Abubacker Siddick/MSSRF

Intercropping cassava with onions resulted in a 60% increase in family income

nutritional value of their food basket. Seed banks managed by farmers' clubs and women's self help groups have been instrumental in enhancing on-farm agro-biodiversity and reducing risk from drought for small and marginal farming families. Women farmers and landless collectives have benefited from improved farming practices and access to quality seeds, which have in turn opened up new and diverse livelihood options.

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Photo: Girigan Gopi/MSSRF



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Yam on terrace walls

Bhawana Ghimire, Rajeev Dhakal, Roshan Pudasaini, Rachana Devkota and Pashupati Chaudhary

Yam has several nutritional benefits, yet the crop remains neglected and underutilized. In the absence of national research and extension programmes on yam, LIBIRD's initiative to promote yam cultivation on terrace walls has caught up with the *Chepong* communities in Nepal.

The *Chepong* are an indigenous community belonging to Tibeto-Burmese family, mainly inhabiting the mountain ranges of central and western Nepal. *Chepong* people live a semi-nomadic life style and face high levels of food insecurity. They mainly grow maize and millets on marginal sloping lands using slash-and-burn techniques. Many of them have started practicing permanent agriculture in terrace lands in the recent years, but have still keep slash-and-burn practice alive.

Historically, *Chepong* people have been dependent on collection of wild yam and other plants like chyuri (*Aesandra butyracea*), kafal (bay-berry), githa (*Dioscorea bulbifera*), etc., from the forest. As food produced is only sufficient for 6 months, they resort to fishing and hunting, besides forest food collection during the lean season.

Yam is very important in *Chepong* people's life – as a means of food security, tradition and culture. Since ancient times, yam and *Chepong* communities are believed to have strong connections. A study conducted in Dhading district of Nepal reported that, out of the 10 of the 13 species of yam found in this district, 9 are used as food and one as a detergent. Such an exclusive use of yam by *Chepong* people makes them rich in knowledge on identification, processing and consumption of yam.

In spite of yam having various nutritional benefits, the crop still remains as neglected and underutilized species. Nationally there is no research and extension programmes on yam. One of the main reasons for this crop being neglected is drudgery or labor associated with planting and



Harvest ready for the market

harvesting, lack of multiple harvest, short shelf life and lack of market for surplus production. Above all, the unavailability of quality planting materials in adequate quantity is making yam cultivation less attractive than in the past.

The initiative

It's been just few generations since *Chepong* people began practising settled agriculture. Even today, they farm on terraces and leave terrace walls unattended. Such terrace

A report of Nepal *Chepong* Association (NCA) suggests that 71% of the children are malnourished. Non-toxic wild yam of Nepal is recognized as 'Health/ Functional food' with high nutritional values. Rich in starch, yam is principal source of food and carbohydrate during food insufficiency periods for such communities. Some of the species of yam reported to have 5 times more protein than potatoes and sweet potatoes. Yam also supplements many dietary minerals. Yam can be mixed with different kinds of food like noodles and breads, which further enhances the nutritional value and palatability ultimately aiding to overcome malnutrition in children.



Demonstration of yam cultivation in sacks at Laitak village

lands accounts for 40% of the land and are covered with naturally grown forages. Local Initiatives for Biodiversity, Research and Development (LI-BIRD) in partnership with scholars from University of Guelph, and Canadian Mennonite University and funded by International Development Research Centre (IDRC) and Global Affairs Canada (GAC), Canada is trying to promote the use of barren and steep walls of the terraces and other areas which are least used for food production.

A simple technique introduced by the project is “yam cultivation in sacks” on the base of terrace walls. This method eases harvest of yam by planting them in sacks filled with soil. In addition the sacks with yam help reduce soil erosion or wall collapse. The sacs are placed on the terrace walls. Harvest is done by simply cutting/tearing the sacks and taking out tubers. This way farmers can grow yam on a commercial scale.

The *Chepang* farmers follow their own method of cultivating yam by digging pits of one meter depth and width on the terrace edges or walls, apply considerable amount of Farmyard Manure and plant the head of the tuber in the pit. Farmers find it easier to plant and harvest yam in edges as compared to the corners of terrace walls. They usually harvest the tubers just prior to *Maghe Sakranti*. The lands that were used as *khoirya* (slash-and-burn land) are also being used for yam cultivation.

With increased awareness among farmers about the market possibilities and opportunities, yam cultivation has been increased, while farmers have been seeking different methods of cultivating yam both in marginalised and terrace lands with minimum efforts.

Marketing

When Muglin was the nearest market, only 25% people of these communities were able to sell their produces. People were not sure if all the production from their vegetable farm would be sold in the market. Only fruits like banana were

Many people cultivate yam mainly to eat during *Haribodhani Ekadasi* (1st day of fortnight in ascending or descending moon cycle) and *Maghe Sakranti* (1st day of month of Magh according to the Nepalese calendar) as a religious ritual. In *Haribodhani Ekadasi*, the people believe that they should not eat the food reaped from the tilled land. Likewise, there is a tradition of eating yam cooked in the last day of Poush in the first day of magh according to the Nepalese calendar. These traditions are common among other ethnic groups of Nepal. These communities also eat yam as the constituent of pickles, use them in value addition of vegetables like ‘*masayura*’ (Taro product), consumed as boiled, steamed or fried foods.

sent to Kalimati, Kathmandu, the capital city of the country, until a vegetable collection centre was established in a nearby town, Fishling. Fishling (13 Km away from Muglin), a junction point of various villages in the Mugling - Kathmandu highway, now serves as a sink of vegetables produced by adjacent Village Development Committees (VDCs) of different districts. Vegetables are collected at the collection centre in Fishling and marketed to different major cities, mainly to Kalimati Vegetable Buying and Selling Centre (about 100 Km away), Narayngarh (about 50 Km), Bhairahawa (about 170 Km) and Pokhara (about 103 Km).

Along with vegetables, yam is also one of the major commodities that is marketed through these channels. Farmers of adjacent VDCs, including farmers from Chepang community, are availing this opportunity to sell yam - cultivated and collected. The number of farmers selling yam at Fishling has been increasing.

A female farmer, resident of Bhulmichowk VDC, in Gorkha, harvests about 3 kg of tuber per plant on an average. It's just been couple of years since the family has started mass production and marketing of yam. While they invested 1400 NPR from cultivating yam, they harvested a quintal of yam and are hoping to earn 50,000 to 70,000 Nepalese rupees

Preparation of sacks for transplanting yam



(NPR). The women farmer delightfully shares that all the members of her house including the educated sons and daughter in-law support in cultivating yam.

Spreading far and wide

This technique of farming yam on sacks was originally tested in *Laitak* and *Ahal* of Jogimara VDC of Dhading and *Patle* of Majhthana VDC of Kaski. As most of the *chepangs* of Jogimara, Bhulmichowk and Kaule have family relation in one or other way, this technology has got easily transferred from Jogimara to other places even among non-*Chepang* communities. The new way of yam farming has attracted many to cultivate yam.

Also, this unique method of planting has helped to minimize landslides on steep gradient farmlands in Jogimara, Gorkha, Chitwan and nearby areas. This has resulted in minimizing climate change risks to farming and enhanced sustainability of the farming system. Eventually, *Chepang* communities are ensured of food security and sustainable livelihoods.

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- An archive of LEISA India magazines – English edition and regional editions (Kannada, Tamil, Hindi, Telugu, Oriya, Punjabi and Marathi)
- Photos and videos on LEISA practices.
- Interesting cases of people following LEISA practices.

The screenshot displays the LEISA India website. At the top, it says 'Low External Input Sustainable Agriculture' and 'Thursday, June 02, 2016'. The main header includes the LEISA INDIA logo and a navigation menu with links: Home, About Us, Services, Impact, Subscription, Archives, Videos/Photos, Contact Us, and Contribution. Below the menu is a search bar and a 'Readers Survey' section with a 'Survey Results' link. The main content area is divided into three columns. The left column features 'Magazines' with English and Regional Language options, each with a thumbnail image. The middle column is titled 'Agriculture News' and includes a form for sharing experiences (200-400 words) with fields for Name, Email, and Message, along with a CAPTCHA and a 'Send' button. The right column contains a 'Fact Sheet' about LEISA India magazine, 'Forthcoming Themes' (Measuring the impact of agroecology, Valuing underutilised crops), 'Services' (Training organizations, Knowledge management, Documentation and Communication, Guiding Documentation and Product development, Facilitating knowledge exchange platforms), and a 'Feedback' section with prompts for reader comments and usage.

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Valuing un-cultivated foods

Debjcet Sarangi

Commodification of forests in an era of climate crisis has reduced them to mere 'carbon stocks'. Forests are also food reservoirs and many rural poor communities depend on forests for meeting their food needs. Given the right support, uncultivated foods can be a solution for addressing the issue of food insecurity, especially in the light of climate crisis.

Forests are a rich source of uncultivated foods, like edible flowers, fruits, leaves, seeds, mushrooms, bamboo shoots, roots and tubers, birds, honey and edible insects, etc. Though most Adivasi farmers in Rayagada district grow around 30 varieties of crops in a single year, they trust the forest for diversity. Adi, one such farmer says *"We can never match the forest. If we grow 40 varieties, there are 200 different foods available in the forest"*. In the forests, summer breeds a wide range of foods including fruits, monsoon rains spur bamboo shoots and mushrooms while winter fosters varied tubers. Parbati Pusika, elderly Adivasi woman from Tadingpai village, says *"Forest is our mother. The roots and bamboo shoots, edible greens and honey sustained people in my village for three months during a very bad drought year."*

Besides supporting a household's dietary needs, these uncultivated food items also supplement family income. *"When there's no money at home, we get turmeric growing in the forest and sell it to buy salt or oil from the market,"* Aadi says. The forest foods give them a sense of independence, dignity and pride, and more importantly, protect them from falling into the clutches of money lenders.

Therefore, should we accept the idea that the object of agricultural science is the production of a few selected crops in narrowly defined spaces? Should we exclude the spaces around and between ploughed fields, the grazing areas, forested areas, water bodies and the homesteads? Is "food production" synonymous with "cultivation"? Food is also about collecting and conservation says Living Farms.



Forest foods form a significant part of the tribal household diet

Role of forest foods in family diet

To understand the role of forest foods in household diets, Living Farms conducted a study in 2013, across the villages of Rayagada district in Odisha. The study recorded 121 different kinds of forest foods being harvested between the last week of July 2013 and December 2013. On an average, 4.56 kg of such foods were harvested per household, which ranged from 21 to 69 different kinds of food. On an average, 0.725 kg of forest foods became part of the household daily diet, accounting for 12% to as much as 24.4% of total cooked foods across six villages. The dependence of communities on forest foods ranged from 20% to 50%, depending on the characteristics of a village and the biodiversity composition of the forest. This is both in terms of diversity and quantity.

Largest quantities harvested from forests were that of various tubers. *Keta* is one of the tubers quite important to local communities as a drought food. *Pita konda*, another tuber can be stored for 4-5 months. In the years of drought, when cultivated crops fail, these tubers and other forest foods become vital for meeting essential food needs. Additionally, the villagers also collect more than 22 types of edible greens and 12-15 varieties of fruits from forest.

The villagers usually go food foraging into the forests in groups. They share amongst themselves the food they collect. Even those who are not able to go into the forests for collection are given a share; no one is left out. Each village

has its traditionally accepted boundary and mutually agreed extent of access to the forest. Every member of the village has equal right to the forest, to the local stream, to the trees, and other shared resources of that ecosystem. If people from one village go to the neighbouring one to collect bamboo shoots, the others may come over to the first one for collecting honey. This culture of interdependence is vital for the survival of people and the eco-system.

Shrinking forest resources

Field experiences and community dialogues show that forests are becoming denuded and are being replaced by monocultures of teak, eucalyptus, and pongamia. As a result, the forest composition is also changing rapidly. The negative consequences of the shrinking forest biodiversity is particularly experienced by women who gather all non-timber forest produce (NTFP), including wild foods. *“The forests have changed; and so have the people. In the process, many of our edible forest tubers are lost. We would prefer to plant our own food trees”*, says Phulo Sikoka who is over 80 years.

The mainstream model of food and farming does not recognize the multiple values of diverse, traditionally consumed forest-based foods of Adivasis, and other forest-dwelling communities of the country. The official idea of ‘food security’ is embedded in the supply of entitled quantities of subsidized (ration) ‘card’ rice/wheat from ‘central pool’ warehouses or provision of state-defined meals. Region-specific cultivation of locally preferred and nutritious crops, such as millets, other grains, pulses, oil seeds and greens in Adivasi food and farming systems, are neglected. There isn’t adequate law and policy support. The traditional forest dwelling communities do not have legal ownership of much of the land, on which they traditionally have been living, has major implications for their life and livelihoods. Even after 10 years of the passage of the Forest Rights Act, only 6% of the forest villages in Odisha have got their customary and legal rights over their forests recognized.

Way forward

In the context of climate change, uncultivated forest foods are a very important community-based adaptation strategy.

With food security and nutrition high on the agenda in many political and scientific spheres, it is crucial to understand the contribution of forests and trees to a food secure and nutrition-sensitive future.

There are many other human made threats to forests in a globalising and ever-changing world. Commodification of forests in an era of climate crisis has reduced them to mere ‘carbon stocks’, while they are also food reservoirs. Their ecological functions such as releasing oxygen, precipitating rain, recharging groundwater, conserving fertile topsoil, buffering against droughts and floods are also about securing food for local communities. The multiple functions of forests need to be acknowledged.

India’s forest policies have to be re-aligned with food security objectives. Sustainable forest management ought not to be only from the point of view of timber alone, but from the point of view of the multi functionality of forests. People’s access to commons and the maintenance of diversity in the commons has to be given due attention. Improved tenure and access rights to forest resources, particularly for women, could support more sustainable resource management for food security. Forests need to be viewed as nurturing both people and their cultures.

Uncultivated foods need to be encouraged as a long-term adaptation strategy in the light of climate crisis. Local initiatives for agroforestry and sustainable agriculture, which do not poison the soils and water with chemical fertilisers, or put agroecology at risk ought to be promoted— this approach to agricultural technologies deployed in farming has implications for forest diversity conservation too (for example, bee population decline due to use of synthetic chemicals in farming).

With food security and nutrition high on the agenda in many political and scientific spheres, it is crucial to understand the contribution of forests and trees to a food secure and nutrition-sensitive future. Food sovereignty if not nurtured as an organising principle of local forest-dependent communities, can also come to affect the sovereignty of the state as a whole. Food and nutrition are too important an area to be left to markets to deliver on. This is where forests can deliver and that too in a decentralised way. ‘Uncultivated’ foods are not just about satisfying hunger, but about savouring the forests and people’s relationship with them.

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Centella-asiatica

Hidden harvests

Chandrashekara U M and Reshma P K

There are certain crop plants that are not cropped but edible, containing high nutrients and medicinal value. These crops also called as hidden harvests are capable of providing essential nutrients to our diets besides contributing to household income.

Out of the 12,000 edible plants in the world, a mere fifteen crops provide 90% of the world's food, with three crops – rice, maize and wheat – making up two-thirds of this total. Most societies today rely on agriculture for their food provision. But that does not mean that agriculture alone provides all food. In all agricultural lands, one can find certain non-crop plants and among them, some are edible. Such edible non-crop plants remain

important in all agricultural systems as they are capable of providing essential vitamins and minerals to our diets besides contributing to the family income. That is why these edible non-crop plants are called as the “hidden harvest” of agriculture.

One of the best examples for the rich diversity of edible non-crop plants is the homegardens of Kerala and homegardeners invariably use them. For instance, a study conducted in randomly selected 48 homegardens of Malappuram district recorded about 27 edible herbaceous and shrub species. Of these 27 species, 22 yield edible leaves while the remaining 5 yield edible whole plant. The study also revealed that *Centella asiatica*, *Oxalis corniculata*, *Phyllanthus urinaria*, *Portulaca oleracea*, *Senna occidentalis* and *Senna tora* are very common as they are known for their natural regeneration and quick establishment in the homegardens. Their wide distribution is also owed to the fact that they are known for their food and medicinal values.

Table 1. Mean nutrient composition (mg per gram) of edible non-crop plant species growing in homegardens of Kerala.

Species name (Malayalam name)	Common/local names	Protein	Fat	Fibre	Minerals	Calcium	Iron
<i>Alternanthera bettzickiana</i> (Cherucheera)	Lal Mehndi, Red Calico Plant, Joyweed	52.3	0.013	31.3	44.2	4.9	0.5
<i>Centella asiatica</i> (Muthilila)	Mandukaparni, Brahmi, Mandukig, Brahma-manduki, Khulakhudi, Mandookaparni Divya	48.6	0.007	44.3	47.9	9.3	0.45
<i>Cleome viscosa</i> (Naikkadugu)	Asian spider flower, Yellow spider flower, Bagra, Hulhul, Naivela, Nayibela, Pilitalvani, Kukkavaminta, Pivala tilavan	54.3	0.015	29.7	27.8	4.9	0.25
<i>Diplazium esculentum</i> (Churuli)	Dhekia, linguda	54.2	0.009	49.8	53.2	13.3	0.6
<i>Oxalis corniculata</i> (Puliyarila)	Creeping Wood Sorrel, Creeping Oxalis, Amrul, Yensil, Paliakiri, Amrulshak, Poliyarala	43.3	0.009	13.4	33.8	8.3	0.6
<i>Phyllanthus urinaria</i> (Keezharnelli)	Chamber Bitter, Common leaf-flower, Shatterstone, Stone-breaker Herb, bhumyamalaki	32.1	0.006	41.6	38.6	9.2	0.75
<i>Portulaca oleracea</i> (Kozhupacheera)	Purslane, Lunia, Leibak kundo, Paruppu keerai, Koluppa, Dudagorai, Nunia sag	47.3	0.012	38.9	41.3	7.9	0.7
<i>Remusatia vivipara</i> (Marachembu)	Hitchhiker Elephant Ear, kadu gadde, marakesu, maravara-tsjembu, rukh-alu, rukhalu, Laksmāna	53.6	0.016	46.8	55.8	11.3	0.75
<i>Senna occidentalis</i> (Poninthavara)	coffee senna, septic weed	20.2	0.007	35.0	57.9	8.9	0.65
<i>Senna tora</i> (Thavara)	Charota, Chakvad, Chakavat, Chakunda Kawaria, Gandutogache, Chakramandrakam, takara, Takala, Chakramarda, Dadmari, Tagarai, Chinnakasinda	49.2	0.013	32.0	58.3	11.3	0.75
<i>Talinum cunelfolium</i> (Sambarcheera)	Flameflower, Badhalacheera, Vassalacheera, Sambarcheera, Palaku, Akukoora, Seema bachali. Pasali.	43.2	0.012	47.9	51.3	12.6	0.8

It was also found that homegardeners adopt two ways to collect these edible non-crop plants. For instance, they make special collection trips to gather plants such as *Alternanthera bettzickiana*, *Alternanthera pungens*, *Amaranthus caudatus*, *Amaranthus spinosus*, *Diplazium esculentum*, *Senna occidentalis* and *Senna tora*. On the other hand, they collect edible parts of certain species such as *Centella asiatica*, *Oxalis corniculata* and *Phyllanthus urinaria* only during their casual visits.

It may be mentioned here that majority of the households know that all these 27 species are nutritionally rich. However, no scientific analyses to evaluate their nutritive

Diplazium esculentum



Edible non-crop plants are good sources of many nutrients such as protein, fibre, fat and minerals and their nutritive values are higher than that in many commercially cultivated vegetables.



Cleome viscosa



Talinum cuneifolium

values were conducted, until an attempt was made recently in the Kerala Forest Research Institute. The nutritive status of 11 common edible non-crop plants is given in Table 1.

Proteins are essential for growth and maintenance of our body tissues. According to the Indian National Institute of Nutrition, the daily requirement of dietary protein for an individual is 60g. The present study showed that every one gram of edible part of a species contain 19.3 mg to 54.33 mg of protein, with more protein in *Cleome viscosa*, *Diplazium esculentum*, *Remusatia vivipara* and *Alternanthera bettzickiana*. It was also noticed that the protein content in these species was relatively higher than that in common leafy vegetables like palak, lettuce or cabbage.

Human body needs fats to act as energy reserve and to facilitate proper functioning of nerves and the brain. In general, leafy vegetables are poor in fat content. Among the 27 species studied, *Remusatia vivipara* and *Cleome viscosa* has the highest fat content (0.015-0.016 mg in one gram).

The fat composition in all these edible non-crop species is comparable to those found in conventional leafy vegetables.

Fibres are nutrients which promote digestive health. It is reported in the Manual of Indian National Institute of Nutrition that a person needs 28-35 grams of fibre per day. All the species investigated in the present study are good source of crude fibre with the highest concentration of 49.8 mg in one gram in *Diplazium esculentum*. Thus, food prepared from 100 gram of leaves of these edible non-crop plants would meet about 9-12% of the fibre requirement of our body.

Human body needs about 1 gram of calcium daily as it is vital for muscle functioning and neural transmission. Among the species studied, *Diplazium esculentum* and *Talinum cuneifolium* are rich in calcium (12.6 to 13.3 mg in one gram). Similarly, about 18 mg of iron is required by an individual on a daily basis for facilitating blood production and oxygen transport. Out of the 27 species, *Talinum cuneifolium* has the highest iron content (0.8 mg in one gram).

It can be concluded that all the investigated species of edible non-crop plants are good sources of many nutrients such as protein, fibre, fat and minerals and their nutritive values are higher than that in many commercially cultivated vegetables. Majority of these species also possess medicinal value. Thus, their consumption could help in alleviating the problem of malnutrition at no cost. Popularisation, management and sustainable utilisation of these lesser known plants would also help to maintain the ecology through enhanced plant biodiversity, while contributing to food and nutrition security in the rural landscapes.

U M Chandrashekara

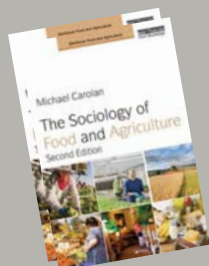
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The Sociology of Food and Agriculture 2nd Edition

Michael Carolan, © 2016, Routledge, 348 p., Paperback £29⁹⁹, ISBN: 9781138946255

In this second edition of *The Sociology of Food and Agriculture*, students are provided with a substantially revised and updated introductory text to this emergent field.

The book begins with the recent development of agriculture under capitalism and neo-liberal regimes, and the transformation of farming and peasant agriculture from a small-scale, family-run way of life to a globalized system. Topics such as the global hunger and obesity challenges, GM foods, and international trade and subsidies are assessed as part of the world food economy. The final section concentrates on themes of sustainability, food security, and food sovereignty. The book concludes on a positive note, examining alternative agri-food movements aimed at changing foodscapes at levels from the local to the global.

With increased coverage of the financialization of food, food and culture, gender, ethnicity and justice, food security, and food sovereignty, the book is perfect for students with little or no background in sociology and is also suitable for more advanced courses as a comprehensive primer. All chapters include learning objectives, suggested discussion questions, and recommendations for further reading to aid student learning.

Vision Infinity for Food Security Some Whys, Why Nots and Hows!

Sharma, Shashi B., Wightman, John, 2015, Ebook, 64 Euros, ISBN: 978-3-319-23249-2

A new perspective on the global food security situation and highlights the need for seeking a common vision and implementing global planning to define the manner in which the human species will manage its food security. The basic question of 'is there enough food' is examined in general and then in some detail.

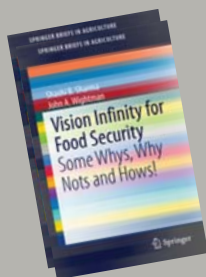
The history of food production is reviewed in the hope that lessons can be learned from the past. Intensive agriculture has stripped out the nutrients that support plant growth and marginalised extensive tracts of land. The global solution to feed the growing population has been and continues to be – produce more food. Even during the last 30 years, about 95 percent of global research investments have focused mainly on increasing productivity.

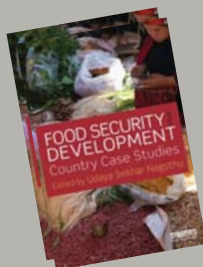
However, about a third of the food produced, sufficient to feed over two billion hungry people, is lost or wasted in the food value chain. Climate change is another confounding factor that impinges on our discussions. Pests of all kinds continue to destroy food before and after it is harvested, even though the technology to protect it is available. Solutions include extending the number of cultivated plant and animal species to include those that can prosper in what are currently considered to be extreme environments.

Seed Sovereignty, Food Security Women in the Vanguard of the Fight against GMOs and Corporate Agriculture

Vandana Shiva (Ed.), 2016, EBook, 424 p., ISBN: 9781623170295

In this unique anthology, women from around the world write about the movement to change the current, industrial paradigm of how we grow our food. As seed keepers and food producers, as scientists, activists, and scholars, they are dedicated to renewing a food system that is better aligned with ecological processes as well as human health and global social justice. *Seed Sovereignty, Food Security* is an argument for just that—a reclaiming of traditional methods of agricultural practice in order to secure a healthy, nourishing future for all of us. Whether tackling the thorny question of GMO safety or criticizing the impact of big agribusiness on traditional communities, these women are in the vanguard of defending the right of people everywhere to practice local, biodiverse, and organic farming as an alternative to industrial agriculture.





Fighting poverty, hunger and malnutrition with neglected and underutilized species

Stefano Padulosi, Judith Thompson and Per Rudebjer, 2013, *Biodiversity International*, 60 p., ISBN 978-92-9043-941-7

Despite getting little attention from researchers, crop breeders and policymakers, neglected and underutilised plant species (NUS) play a vital role in household nutrition for millions of families. This short, attractively presented guide outlines their value to food security, food system resilience, nutrition, livelihoods and cultural identity, drawing on success stories from around the world.

The book also sets out the key challenges facing NUS, including climate change, loss of knowledge and genetic diversity, lack of research, poor competitiveness and lack of infrastructure, and inappropriate policies and programmes. The book outlines eight separate actions that are required to achieve this, including: changing perceptions of NUS as unimportant 'poor man's food'; developing capacity in researching, teaching, policymaking, trading and farming; undertaking more research on NUS; setting up global on-farm NUS conservation programmes; and finding innovative ways to upgrade NUS market chains and develop and market value added products.

Food Security and Development Country Case Studies

Udaya Sekhar Nagothu, © 2015, *Routledge*, 274 p., £85.00, 9781138817012

The global food system is characterized by large numbers of people experiencing food insecurity and hunger on the one hand, and vast amounts of food waste and overconsumption on the other. This book brings together experiences from different countries addressing the challenges associated with food security. Seen through various disciplinary lenses the different cases included are countries at various stages of food security, with diverse stories of success as well as failures in their efforts - China, Brazil and India, as well as less developed countries in Africa and Asia, such as Malawi, Ethiopia, Tanzania, Myanmar, Bangladesh and the Philippines.

The authors pay special attention to the environmental and socio-economic challenges in the respective chapters and how they contribute to food insecurity. Each of the case studies identifies and analyzes which factors or drivers (environmental, economic, policy, technology, markets) have been the most powerful shapers of the food system and their future impact. Overall, the book provides insights in order to foster a greater understanding of the issues surrounding food security and support progress towards the goal of a sustainable food system for all.

Tropical Fruit Tree Diversity Good practices for in situ and on-farm conservation

Bhuwon Sthapit, Hugo A.H. Lamers, V. Ramanatha Rao, Arwen Bailey (Eds.), © 2016, *Routledge*, 456 p., Hardback, ISBN: 9781138781276

Farmers have developed a range of agricultural practices to sustainably use and maintain a wide diversity of crop species in many parts of the world. This book documents good practices innovated by farmers and collects key reviews on good practices from global experts, not only from the case study countries but also from Brazil, China and other parts of Asia and Latin America.

Drawing on experiences from a UNEP-GEF project on "Conservation and Sustainable Use of Wild and Cultivated Tropical Fruit Tree Diversity for Promoting Livelihoods, Food Security and Ecosystem Services", with case studies from India, Indonesia, Malaysia and Thailand, the authors show how methods for identifying good practices are still evolving and challenges in scaling-up remain. They identify key principles effective as a strategy for mainstreaming good practice into development efforts.

Past for the present

Prakriti Mukerjee, Ajay Rastogi and Reetu Sogani

Revival of agro biodiversity that characterizes traditional agriculture is crucial for addressing food and nutrition security. Bringing back millets, pulses, coarse cereals etc. into the cropping systems can help fill the nutritional gap that is ever widening in the present rural communities.

Chandan's grandmother is surprised to find her ten-year old grandson carefully taking down the recipe of 'jhungre ki kheer', a pudding made with barnyard millet. She herself has not tasted it in the last 30 years. She never learnt to read or write and she never felt the need to put down the recipes she was taught by her and her husband's family. Besides, she thinks, no one even grows food like that anymore; so, what would be the point of recalling these relics from the recesses of memory?

Chandan is one of the students of Odhla High School, Govindpur who is participating in a traditional recipe competition being conducted in their school by the Smallholder Innovation for Resilience (SIFOR) team. SIFOR has been working in five villages in the Kumaon Himalayas since 2012, to assess various aspects of traditional agriculture and climate preparedness of the same.

Changing farming conditions

As with many mountain communities around the world, agriculture in this region is practiced in the age-old way without any chemical inputs and growing mostly traditional crops for sustenance farming. These include crops like *Mandua* or Ragi/Finger Millet (*Eleusine coracana*), *Jhungra* or Barnyard Millet (*Echinochloa frumentacea*), *Cheer* or

Mixed cropping being practiced in the homestead





Women provide crucial support to agriculture in the region, especially with many men migrating to urban areas.

Proso Millet (*Panicum miliaceum*), Kauni or Foxtail Millet (*Setaria italica*), Jaun or Barley (*Hordeum vulgare*), Ugal or Buck Wheat (*Phagopyrum esculentum*), Phaphar or Bitter Buckwheat (*Phagopyrum tataricum*), Chulai or Amaranth (*Amaranthus caudatus*). Lentils grown in the region include Bhat or Himalayan Black Soybean (*Glycine max*), Maas or Blackgram (*Vigna mungo*), Masur or Lentil (*Lens culinaris*), Rains or Rice Bean (*Vigna umbellata*) and Gahat or Horse gram (*Macrotyloma uniflorum*) and oilseeds such as Alsi or Flax seed (*Linum usitatissimum*), Bhangjeera or Beefsteak Plant/Chinese basil (*Perilla frutescens*) and Til or Sesame (*Sesamum indicum*).

Agriculture in the Himalayas, especially the above mentioned crops, have suffered much in the last few decades due to various reasons at the global, national, regional as

"We have increased our production of mandua (finger millet) and jhungra (barnyard millet) in the last 2-3 years", says Bachuli Devi, a sixty-year-old woman-farmer from Kujoli.

well as local levels. Climate change is a major reason. According to some studies, the mean temperatures in the Himalayan region have increased more than the global and the Indian mean. Another major deterrent to agriculture is crop-depredation by animals like wild boar, monkeys as well as stray cattle.

With basic food grains like rice and wheat being easily available at subsidized rates through the Public Distribution Systems (PDS) and the continuous decline in crop productivity, many farmers have given up on agriculture. They prefer getting daily wages in exchange for their labour at various construction sites in and around their villages, through the National Rural Employment Guarantee Act, or simply moving to cities that seem to be dreamlike worlds of income security. There are many villages in the region which have become ghosts of their past with most or all of the residents leaving the green for greyer urban pastures.

Families that still practice agriculture, have started growing vegetables adjacent to their houses as they no longer can cultivate owing to factors like - their inability to protect their far off farms from depredation, erratic rainfall and shortage of hands to work in the fields. The youth in villages is also increasingly getting distanced from agriculture. Rich agricultural heritage and diversity has suffered because of this growing discontent which favors only a handful of crops and white-collar jobs.

Restoring crop biodiversity

SIFOR started working in five villages in Uttarakhand to restore the local traditional crops. There were very few farmers or none that were growing barnyard millet, proso millet, foxtail millet, flax seed etc. It was indeed a challenge, as some of the crops were completely lost. Seeds had to be brought from other villages where they were still being grown.

Some farmers have revived flaxseed, and also discovered an innovative cropping pattern to prevent damage by birds. Birds dislike flax seed and growing them on the field margins protects the main crop. Finger millet is a traditional crop that has always been grown. Presently, many families have scaled up its production as it is hardy and performs better in the face of climates vagaries. The SIFOR team introduced a traditional variety of wheat with long awns that deter birds and animals from attacking it. The variety had become extinct in the villages and hence the seed was obtained from the Champawat area near the Nepal border.

There were several problems during the revival process. Proso millet is preferred for its short duration nature. But, being an early crop with a sweet taste, the crop is prone to



Photo: Reetu Sogani

New radish variety developed by Dayanand Joshi

destruction by birds. In case of Barnyard millet, it was noticed that a particular kind of bird came to feed on it, which had not been spotted before. The effects of climate change have not only increased the instances of diseases and pest attacks but also brought about a change in the kind of pests and diseases that farmers have not encountered before.

Keeping in mind these challenges, efforts are being made to mobilize the community to take action to address food security of the villages in the long run. A community seed bank is being established with the aim of providing seed security and conserving agro biodiversity. In the seed bank there are a total of 158 crop varieties that have been collected from nearby villages as well as elsewhere in the Himalayas. They consist of many varieties of paddy, wheat, millets as well as vegetables. The seed bank is being managed by the SIFOR team at the moment and will eventually be handed over to the community.

A 'Crop Protection Committee' discusses various issues and has appointed a guard to watch out for crop raiders in the

areas where the village fields lie. The women of the region have been mobilized to constitute new Self-Help Groups (SHGs). These SHGs actively discuss and jointly take decisions on livelihood and agriculture matters as well as benefit from government related schemes and funding for such collectives. The SIFOR team facilitates many of these meetings to help keep the interest alive. Many of the activities are also routed through the SHGs.

Nurturing innovations

The knowledge of traditional farming, though passed on from one generation to the next, also fosters innovation, that helps its adaptation to changing times. Dayanand Joshi of Gallakot village is an exceptionally innovative farmer who has no scientific training in agriculture but has developed his own variety of radish by crossing a hybrid with traditional variety. He carried out the experiment for six years about twenty years ago. This new variety, called *Dayakesari*, can be used as both a vegetable and salad unlike the original varieties that can be used as either a vegetable or salad. Moreover, the green leaves of this variety can be

used as a vegetable during the summer season when not many greens are available.

Way forward

Local and indigenous communities have their own agricultural knowledge systems that have been developed over many generations. The systems and practices being integral to their natural surroundings, makes them sustainable.

Revival of agro biodiversity that characterizes traditional agriculture is crucial for addressing food and nutrition security. Bringing back millets, pulses, coarse cereals etc. into the cropping can help fill the nutritional gap that is widening in the present rural communities. Eventually, it can also be scaled up with market linkages, making agriculture lucrative for the youth. Institutions have an important role to play in reviving biodiversity and promoting ecologically sustainable practices at the community level. Then, kids like Chandan can not only learn about his agricultural heritage but can also become a successful farmer, taking pride in the rich crop biodiversity on his farm.

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Call for Articles

Measuring the impact of agroecology

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The September issue of LEISA India will explore how to better prove the effectiveness of agroecology. Agriculture and the rural world perform important roles in addressing the multiple crises of today: hunger and malnutrition, poverty, climate change, environmental degradation, loss of biodiversity, water, gender inequity and health. The Sustainable Development Goals, recently endorsed by the United Nations, explicitly mention the need to transform our current input heavy food systems in order to make them more sustainable and contribute to solving these global challenges.

There is ample evidence that agroecology driven by family farmers can contribute to addressing these challenges in an integrated way. But why is it continuing to be difficult to 'prove' the effectiveness of agroecological practices?

One challenge is that farmers' indicators or criteria to judge the effectiveness of agricultural practices differ from those of mainstream policy makers and scientists. The dominant agricultural paradigm sees the maximisation of yields of single crops as a key indicator of effective agriculture. But family farmers may use several additional criteria, in line with the multifunctionality of their farming system.

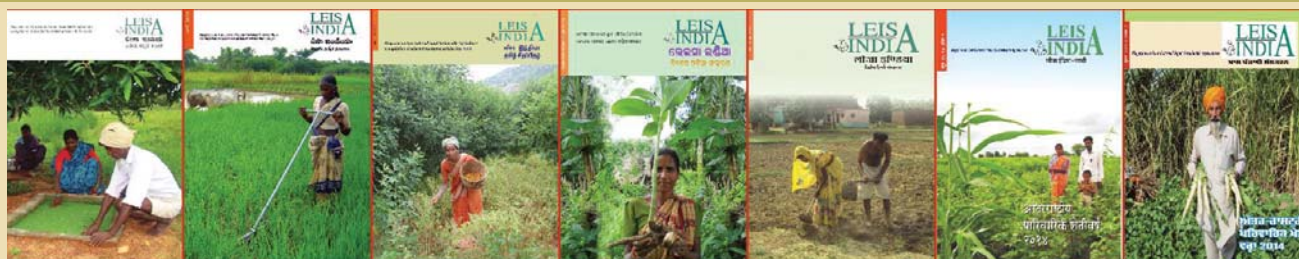
Innovative farmers continuously assess the effectiveness of their farming practices, because they want to know the added value of new practices compared to what they were doing earlier, or to what others are doing. They carefully observe their crops and their animals to assess the resilience of their system. They may 'read' their farm's resilience by observing changes in biodiversity, nutritional value, income and risk diversification, health, labour quality and general quality of life.

Because of this discrepancy in indicators it can be challenging to convince scientists, policymakers and other farmers about the effectiveness of agroecological practices. The September issue of LEISA India seeks to bridge these differences and contribute to a new perspective on indicators for agroecology's multifunctional contributions to society.

What (additional) indicators are family farmers using to assess the effectiveness of agroecology at the farm, landscape and community level? And which indicators are emerging at the aggregate level to assess the multifunctional benefits for agroecology to society at large? How can we show the contributions of agroecology to the Sustainable Development Goals? What are the challenges when demonstrating the impact of agroecology, and how are these challenges overcome? How can we demonstrate in a convincing way the crucial role agroecology can play in responding to the crises of our time? What can we learn from existing practices?

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