GLOBAL ORGANIC
AGRICULTURAL INNOVATIONS

Editors:
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GLOBAL ORGANIC AGRICULTURAL INNOVATIONS comprises of 74 contributions related to major innovations in organic agriculture from 18 countries and areas all over the world.

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IFOAM-Organics Asia has established sector groups such as the Asian Local Governments for Organic Agriculture (ALGOA), Asian Organic Youth Forum, Asia Organic Innovations & Technology Platform, and the Women in Organic Agriculture in Asia (WOAA) to further its work and have more impactful influence in the region. It is the Secretariat of the Young Organics-Global Network, Education-Research for Organic Agriculture Development and Asia Secretariat of the Global Alliance of Organic Districts (GAOD).

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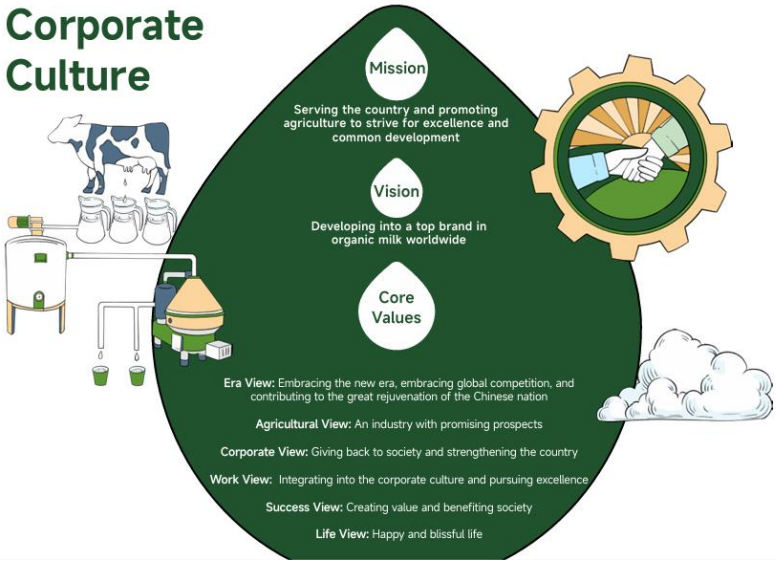
About China Shengmu Organic Milk Limited

China Shengmu Organic Milk Limited, as China's largest organic dairy company, produces desert organic raw milk in a circular way integrating planting, breeding, and processing. The business covers the entire value chain of the dairy industry, including pasture growing, dairy cow cultivation, and raw milk processing.

In July 2014, the Company successfully listed on the main board of the HKEX (stock code:1432), becoming the world's first stock in the organic raw milk industry and the first domestic raw milk brand to obtain organic standards of China and the EU. With the safe milk source base as the core, the Company adopts an organic approach to pasture growing and dairy farming, produces high-quality organic raw milk, and consolidates partnerships with downstream liquid milk product enterprises.

Since its inception, China Shengmu Organic Milk Limited, with the vision of developing into a top brand in the global organic milk industry, has always adhered to the core Corporate Culture values of "Integrity, Excellence, Pragmatism, and Passion." It has innovatively combined desert governance with circular agriculture, taking advantage of the favorable geographical conditions and natural environment of the Ulan Buh Desert in Inner Mongolia, China, to improve the ecological environment and develop the sand industry on a large scale - forming an organic industry chain.

China Shengmu Organic Milk Limited has become a pioneer in China's organic circular industry in the desert and the world's largest producer of organic raw milk. As the dairy industry speeds up its modernization, capital, talent, and other essential resources are rapidly concentrating towards leading enterprises. In the process of industry transformation, it has put forward a new development philosophy adhering to the concept of "Youth, Openness, Reform" and jointly promoting "Sustainability and Common Development" of the industry to become a top brand in the global organic milk industry.



PREFACE

GLOBAL ORGANIC AGRICULTURAL INNOVATIONS covers major innovations and research in organic agriculture from 18 countries and areas around the world. This edition showcases the diversity and robustness of the growth of organic agriculture around the world.

More than seventy innovators and researchers contribute to this edition which covers themes from climate change impacts on organic agriculture, pest control, methods of organic aquaculture, multi-cropping, innovative marketing strategies, public food procurement, social inclusiveness, use of digital technology, etc.

The editors hope that this book of best practices can become the basis to expand networking among the contributors and for continuing research on organic agriculture.

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INFLUENCE OF NEEM OIL AS ORGANIC PESTICIDE ON GROWTH AND YIELD OF BRINJAL (*SOLANUM MELONGENA*)

MAISHA MALIHA, AND AFM JAMAL UDDIN (BANGLADESH)

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Introduction

Brinjal (Solanum melongena), known as eggplant belongs to the Solanaceae family and is one of the most common and popular vegetables in the world (Harish et al. 2011). In Bangladesh, brinjal is considered as the second most important vegetables crop in respect of production. Brinjal production is increasing day by day. But its yield potential is very low compared to other countries due to incidence of insect pests (Das et al. 2000). For this reason, farmers show a tendency of adopting chemical fertilizer and Bt brinjal in many countries to increase yield as well as to control insect pests despite the controversy and health hazard over Bt brinjal. To control the major pest of brinjal like brinjal shoot and fruit borer as well as improve the crop growth and development, application of pesticides and chemicals against insects is not cost effective and environment friendly.

Beside these synthetic pesticides that work on contact often build up in the surrounding environment, leaving toxic residue behind that can harm and even kill pets and other animals in the area. In this point we badly need potential alternatives regarding these harmful chemical pesticides.

Neem oil is a naturally occurring pesticide found in seeds from the neem tree which is organic, biodegradable non-toxic and the active ingredient in the oil is azadirachtin, which repels and kills a wide variety of insects, including aphids, mealybugs, whiteflies, leafhoppers, thrips, and other garden pests like spider mites, nematodes and also effective against various fungal diseases.

Brinjal shoot and fruit borer (*Leucinodes arbonalis*) is the serious insect for brinjal production which damage brinjal fruit more than 30-86% in Bangladesh (Alam, 2003). Farmers spray insecticides which are expensive and also harmful for farmers' and consumers' health as well as the whole environment. Neem oil is responsible for the toxic, repellent, antifeedant, growth-inhibiting, oviposition-inhibiting and sterilizing effects in insects (Mordue and Nisbet, 2000). Therefore, the present investigation was designed to evaluate the neem oil for quality brinjal production.

Methodology

The experiment was conducted at the horticultural farm, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh to evaluate the function of neem oil on Charki brinjal variety. Neem oil was collected from the local market. The experiment was conducted under Randomized Complete Block Design (RCBD). The experiment comprised four treatments viz. Foliar application of Neem oil @5ml L^{-1} at T_0(Control), T_1(Single Application), T_2(Twice Application), T_3(Thrice Application) at 15 days interval. Liquid soap was mixed with the solution. The size of each unit plot was 3.0 m × 1.0 m; line to line and plot to plot distances were 0.5 m and 1.0 m respectively while plant to plant distance was 60 cm. Manure and fertilizers were applied according to the recommendations of Bangladesh Agricultural Research Institute (BARI) (Mondal et al. 2011).Data on plant height, number of branch, infested branch no., branch infestation (%), no. of leaves/plant, chlorophyll percentage (using SPAD-5 Chlorophyll meter, no. of fruit/plant, no. of infested fruit, fruit infestation (%),single fruit weight(g), yield/plant (kg), yield/ha (ton) and yield increase (%) were recorded and arranged accordingly.

Result and Discussion

From the findings of the study, Neem oil shows the best result in all parameters including the tallest brinjal plant (85.3 cm), maximum number of leaves (41.0). maximum number of branch (14.7), Minimum infected branch (0.2), minimum shoot infestation (11.9%), Maximum number of fruits per plant (13.3), the minimum number of infested fruit (0.2), the maximum weight of total fruit was (2.25 kg) was found from different Neem oil treatment. On the other hand, the shortest plant (68.7 cm), maximum infected branch (3.0), Maximum shoot infestation (37.0%), the minimum weight of total fruits (1.81kg), minimum number of fruits per plant (11.0), maximum number of infested fruits (4.3) was found in control treatment. Finally, the minimum yield of brinjal was (50.5 t ha^{-1}) and maximum yield (57.3 t ha^{-1}) was found under neem oil treatment with thrice application which was (13.47%) higher yield over control treatment.

Neem oil which most active component is Azadirachtin that inhibit the microbial growth and its repellent role interferes with insect hormone systems that make harder for insects to grow and lay eggs that lower the infestation (%) which leads to healthier branch and fruit ultimately increases yield and quality of fruit under Neem oil treatment.

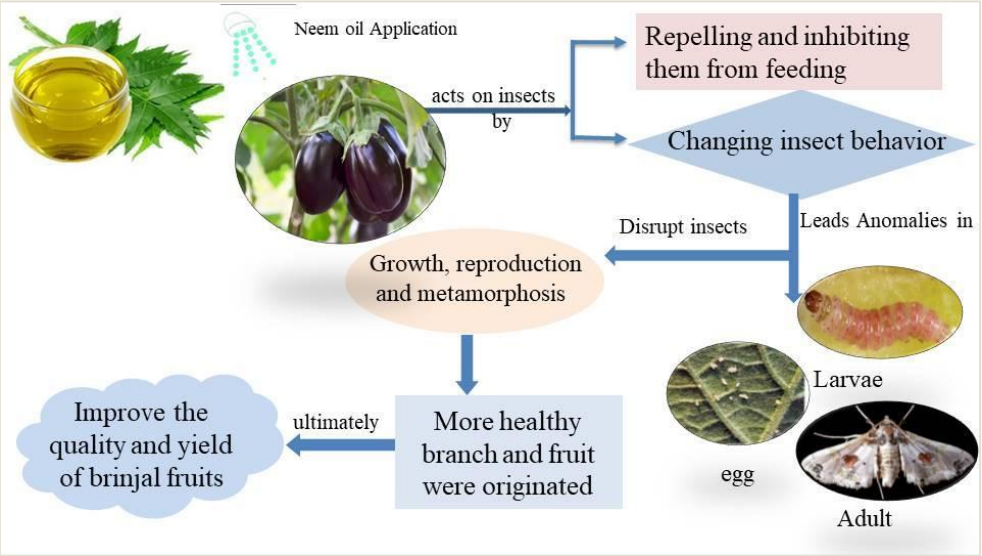

Figure: Influence of neem oil on organic brinjal production

Potentiality of Organic Pesticide

By using pesticides on crops, humans come in direct contact with them, and they can cause two types of poisoning: “Acute poisoning” and “Chronic poisoning”. On the other hand, genetically modified brinjal adversely affects our food chain, threats for biodiversity, and have different health and environmental hazard. For Examples stinging eyes, rashes, affect the skin, eyes, mouth, and respiratory tract, blindness, nausea, dizziness, headache, vomiting, cancers, birth defects, reproductive harm, immunotoxicity, neurological and developmental toxicity and so on. That's why we need to ensure the production of organic safe food by increasing the use of organic pesticides instead of depending on chemical pesticides. Then we can stay healthy and protect the environment from these harmful pesticides. Due to climate change impacts, the agriculture sector is under thread. That is why the Government and concerned authorities put emphasis on organic agriculture by following the Principles of Health, Ecology, Fairness, and Care which are the basis for th4 growth

and development of organic agriculture. They express the contribution that organic agriculture can make to the world, and a vision to improve all agriculture in a global context.

Conclusion

Neem oil showed effective performance to combat shoot and fruit borer, increase growth attributes, decrease infestation, and increase the yield of brinjal among all the treatments. So, it can be said that foliar spray of neem oil would be the prominent way to reduce the infestation as well as increase yield. Organic farming can reduce the dependency on harmful chemical pesticide. Overall, by ensuring the use of neem oil instead of synthetic pesticide we can provide the farmer with a safe working environment and so they can supply safe food. Finally, we can also protect the environment from hazardous chemicals.

References

Alam, M. M. (2003). Studies on the soil borne nature of Phomopsis blight and fruit rot of eggplant. An M.S. thesis submitted to the Dept. of Plant Path., Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 01-89.

Das, A. N. and Singh, B. R. (2000). Field reaction of brinjal varieties against shoot and fruit borer, (Leucinodes orbonali). Environ. Eco. 8(2), 761-762.

Harish, D. K., Agasimani, A. K., Imamsaheb, S. J. and Patil Satish, S. (2011). Growth and yield parameters in brinjal as influenced by organic nutrient management and plant protection conditions. Res. J. Agric. Sci. 2(2), 221-225.

Mondal, M. R. I., Islam, M. S., Jalil, M. A. B., Rahman, M. M., Alam, M. S. and Rahman, M. H. H. (2011). Krishi Projukti Hatboi (Handbook of Agro-technology), 1st part, 5th edition. Bang. Agri. Res. Inst. Gazipur-1701, Bangladesh. p. 390.

Mordue, A. J. and Nisbet, A. J. (2000). Azadirachtin from the neem tree Azadirachta indica: its actions against insects. Anais da Sociedade Entomológica do Brasil 29, pp. 615-632.

RECTANGULAR HAND NET FOR RICE SEEDBED INSECT PEST CONTROL WITHOUT INSECTICIDE

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Introduction

Rice is the staple food for more than half of the world population but serious yield losses due to insects and diseases. Bangladesh agriculture was totally organic before 1950, when pesticides were introduced in farmer's field. In 1950, Bangladesh population were 43.6 million which has been exceeded 165 million by 2022. After the 1960s Green Revolution, pesticides use rapidly increased to meet up food demand and growing populations cereal food security, as a result emergence of new pests and increased incidence of some pest started to appear.

Due to climate change and intensive cultivation, insect pests like yellow stem borer (YSB), thrips, brown planthopper (BPH), green leafhopper (GLH), rice hispa (RH), leaf folder (LF), grasshoppers (GH) etc. attack increasing day by day in rice seedbeds. Farmers rely solely on insecticides to control insect pests in seedbeds as well as main rice field. Insect pests first attack rice in seedbed generally 7-9 days after sprouted seed sowing. At this early sensitive stage, traditional sweep net (round hand net) is not suitable to collect insects because it injured tender rice seedlings and leaves and its insect catching efficiency is also lower.

Generally, farmers face insect attacks in rice seedbeds when they try to produce healthy seedlings. In T. Aman 2023 season Cumilla region of Bangladesh faced serious insect pest attacked (Fig. 01) in rice seedbeds and they used 1-2 times insecticides to control yellow stem borer consequently beneficial insect were reduced. To protect rice seedbeds from beneficial insects (predators and parasitoids) as well as keep air, soil, and water free from pollution, it's essential to use environment-friendly technology.

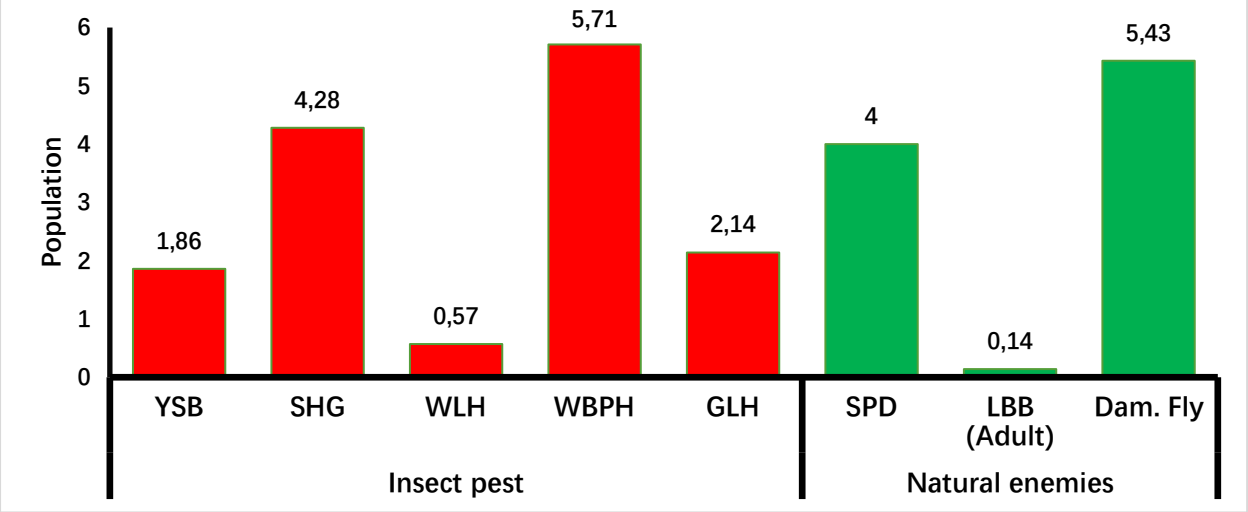

Figure 1: Rice seedbed harmful insect pest and natural enemies' scenario in 2023, T. Aman season in Cumilla, Bangladesh

Unique Approach

Developed a novel rectangular hand net (RHN) and evaluated the efficacy for managing insect pests in rice seedbeds. Innovated rectangular hand nets are not injured tender rice seedlings and leaves and found it can

catch higher no. of insect pest. The newly developed hand net consists of a rectangular frame that includes 4 mm GI wire, and the frame length and width 50 cm and 20 cm, respectively. It also consists of a plastic pipe that length 100 cm, radius 0.75 inch, and market available white colour mosquito net, which length from the frame is 80 cm. (Note photo 03). Methods of application is rapidly walking with RHN around the seedbed. After sweeping a full seedbed harmful insect has been destroyed and beneficial insect released back in the same field (Kabir et all., 2023). It's found significance better performance than round hand net in rice seedbeds. It's developed in Bangladesh Rice Research Institute (BRRI) regional station Barishal in Boro rice season, 2021-22 for solve the surroundings rice farmers problem.

Impact

Using a Rectangular Hand Net (RHN) for insect pest management in rice seedbeds without insecticides can have several direct impacts on various aspects, including household economics, society, environment, gender, and abroad.

Household Economics

By reducing the need for chemical insecticides, farmers can save money on purchasing pesticides. Healthier seedlings can result in higher crop yields, leading to increased income for households. Higher crop yields can enhance food security for the household by ensuring a more substantial harvest.

Society

Reduced exposure to chemical insecticides can lead to improved health among farmers and their families. The adoption of sustainable pest management practices like RHN can lead to knowledge sharing within farming communities, strengthening social ties.

Environment

The decreased use of chemical insecticides reduces chemical pollution in the environment, benefiting local ecosystems and water quality. The RHN promotes biological pest control by preserving natural predators and parasitoids, which contributes to ecological balance. Reduced chemical usage can improve soil health and long-term sustainability.

Gender

Women often play a significant role in rice farming. Implementing RHN can reduce the health risks associated with pesticide use, making it safer for women to participate in farming activities. By adopting sustainable and cost-effective pest management methods, women can become more economically empowered within their households.

Facilitating Export

Many countries have stringent regulations on pesticide residues in food products. Using RHN to reduce pesticide use can help meet these international standards, facilitating exports.

Food Safety

Reduced insecticide use leads to safer rice products for consumers, both domestically and abroad.

Long-term Environmental Sustainability

Implementing RHN supports sustainable farming practices, contributing to long-term environmental sustainability and resilience in the face of climate change.

The RHN has great prospect of rice growing countries for raising healthy seedlings without using insecticides. Due to the climate changes insect pest attack rising but RHN an environmentally friendly technology for rice growers.

Notes of the Photos

01. Harmful insect yellow stem borer egg in rice seedling.

02. Seedbed became orange colour due to insect infestation in 2023 T. Aman season in farmers field of Cumilla, Bangladesh.

03. Farmers field adoption trial in Cumilla regions rice seedbed in T. Aman 2023 season.

04. Insect pest caught after sweeping.

References

M.M.M. Kabir, M. A. Hossain, M. P. Ali, M. N. Bari, S. S. Haque, S. T. Hossain and J. Datta. 2023. Management of insect pests in rice seedbed using a novel rectangular hand net (RHN) for insecticide free seedlings. Int. J. Bus. Soc. Sci. Res. Vol 11 No. 1, pp 19–20.

AGROECOLOGICAL FARMING IN BANGLADESH: BUILDING RESILIENCE ADAPT TO CLIMATE CHANGE

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Agroecology ensures agricultural productivity and conserve natural resources; closely related to sustainable agriculture. Due to mechanization, structural and industrial development, the amount of CO2 in air is increasing day by day; as a result, the air temperature is increasing rapidly, for that reason the global climate is changing. As a result, the big cities are turning into heat Islands.

Climate change causes frequent storm, excessive rain or flood or sometimes affects drought, increased salinity in Bangladesh as well as increased insect and disease infestations. A review of various research reports shows that by the year 2100, the sea level may rise by a maximum of 1 meter, resulting in the submergence of about 18.3 percent of the total area of Bangladesh। Bangladesh will lose agricultural land area which will put the country's food security at serious risk.

Climate change in Bangladesh is changing rainfall patterns. Bangladesh has to face frequent floods and droughts due to disruption of normal rainfall, as a result, the various agricultural production be hampered. In order to build a sustainable agricultural system; challenges are to develop Tolerant/ resistant cultivars and affordable improved technology. Doing SWOT analysis of area-based farmers capacity and resources should adopt sustainable technology for the respective area.

Agro ecological technologies vary from region to region. For example, the salinity of the coastal areas is high, so crops can be grown under the sack system to avoid the influence of salinity. Coastal belt farmers can grow crops hydroponically even in high saline conditions, in addition to increasing production intensity by growing spirulina in buckets. The “Sorjan method”; an intensive method of growing crops on alternately raised beds and deep sinks in coastal areas is very useful for farmers.

Sack method

Spirulina production

Sorjan method

To increase the farmers’ income, the farmers’ land should be maximum used, not even an inch of land can be left vacant. For this purpose, farmers can grow vegetables in bed in the yard of the house, perennial fruits and vegetables in ponds aisles, grow floating vegetables in the rainy season and grow creeping vegetables in lofts,

following the GAP practices. Farmers can use drip irrigation techniques for efficient irrigation in their crop field to minimize the water loss.

The major problem of organic crop production in Bangladesh is crop nutrient management. Many farmers are not interested in organic crop production due to farmer's misconceptions and not knowing the appropriate fertilizers management techniques. For a long time, the research on the management of crop nutrient in the organic way in Sher-e-Bangla Agricultural University, Dhaka Bangladesh.

Recently various research is being conducted on various sources of organic matter compositions to increase crop productivity using liquid manure in addition to conventional organic matter. Our research has shown that liquid vermicompost is more productive than the direct use of vermicompost in organic production. For this reason, Horticulture Innovation Lab., Bd.; Sher-e-Bangla Agricultural University, Bangladesh have developed various liquid manures based on available organic matters; such as Vermi Tea: (Vermi compost: water 10:**100**), SAU-MLM (Vermi compost: Oil cake: bone meal: water=10:1:1:**100**); SAU-NLM (Fresh Cow dung: Fresh Urine: Jaggery: Water=10:10:1:**100**); and SAU-PLM (Fresh Cow dung: Urine: Jaggery: Chick pea/ Gram Besan: Soil: Water=10:10:1: 1:1:**100**), One-part liquid manure with 5 parts water was used when it was used in the crop field. These liquid fertilizers are very useful for soil health as well as crop production.

Agro ecological farming

Solar light trap

In order to produce safe vegetable crops, it is essential to use organic pesticides and mechanical systems instead of synthetic pesticides for insect and disease control. Mixing neem oil or tobacco leaf juice with water, adding a little liquid soap to it and spraying it on leaves and soil every 3-4 days in the afternoon will reduce the insect infestation to a great extent.

Apart from that, light traps, pheromone traps and yellow sticky traps are very effective to control insects. Pest exclusion nets can also be used in crops to completely control pests in vegetable fields. Various crop diseases can be easily controlled by spraying Trichoderma and Clybio, which improves the soil health. This resilience reduces the risk of insects and diseases. Agroecological farming system improves soil health by adding adequate organic matter, which helps to mitigate climate change by seizing the carbon in soil.

CAN TROPICAL FRUIT TREES BE PLANTED IN FRESHWATER PONDS?

ZHU RUIJUN[1], WANG RONG[2] (CHINA)

1. Organic Food Development and Certification Center of China (OFDC); 2. Shanghai Kaitai Fish Culture Development Co., Ltd.

Introduction

In Jinshan District of Shanghai, there exists an organic farm where tropical fruits such as bananas, passion fruit, longan, papaya, lychee, pineapple, and mango are cultivated both on the bank and within the water of freshwater pond. This innovative approach enables the simultaneous production of aquatic products and fruits. By establishing a greenhouse, while using the characteristics of high specific heat capacity of water, to achieve double insulation effect and promote the growth of tropical fruits.

The incorporation of ponds plays a significant role in this agricultural system. Ponds account for 83.6% of the total greenhouse area, while fruit trees comprise the remaining 15.1%. Within these ponds, bream and red swamp crayfish are organically cultivated, whereas passion fruit, grapes, and other vine fruit trees are grown alongside. Additionally, corrugated pipes are strategically placed within the ponds to facilitate optimal growth conditions for tropical fruit tree transplantation. The three-dimensional planting and breeding model effectively optimizes land resource utilization, in comparison to traditional practices such as rice field fish farming and rice field shrimp farming. Furthermore, integrating tourist activities like fruit picking, fishing, and sightseeing enhances the overall benefits of this approach.

Unique Approach

Currently, shrimp and fish farming in paddy fields is prevalent in China; however, there are limited instances of integrating fruit tree cultivation with aquaculture. Moreover, the organic cultivation of tropical fruits in freshwater ponds within subtropical regions remains unexplored.

The farm constructed a 4.78-hectare multi-storey greenhouse, within which ponds of 4-hectares were excavated for the cultivation of bream and crayfish, accounting for 83.6% of the total greenhouse area. Alongside the ponds, vine fruit trees such as grapes and passion fruit were planted, covering a planting area of 0.53 hectares which accounts for 11.1% of the greenhouse space. Tropical fruit trees, including lychee, banana, longan, papaya, pineapple and mango were potted in three different sizes of corrugated pipes with diameters of 0.8 m and heights of 1 m, 1.2 m and 1.5 m respectively. A total of 3760 pots were placed within the ponds area for cultivation purposes. The potted fruit trees were fertilized using coconut bran, peat and organic fertilizer mixture on a planting area covering approximately 0.19 hectares which accounted for 4% of the greenhouse space.

This model capitalizes on the thermal insulation effect of the greenhouse itself by incorporating a large pond area, utilizing the high specific heat capacity of water to achieve dual thermal insulation. The internal temperature of the greenhouse in winter is not less than 10℃, and the average monthly temperature is above 20℃ throughout the year. Tropical fruit trees are strategically introduced along and within the ponds to ensure optimal temperature and humidity regulation, thereby facilitating the growth of tropical fruit trees. Simultaneously, bream and red swamp crayfish are introduced into the ponds, fed by water plants, spiral snails, and organic corn. The excrement produced by the fish and shrimp is absorbed by potted fruit trees to facilitate material and energy circulation within the greenhouse.

Impact

The implementation of the three-dimensional culture model of fish and fruit symbiosis can significantly enhance the efficiency of agricultural land utilization and reduce enterprises' expenditure on land rent. Considering the annual rent expense of RMB 18,000 per hectare for farmland in suburban Shanghai, cultivating 0.72 hectares of fruit trees within the greenhouse could result in a yearly saving of RMB 13,000 on land rent.

Through the establishment of greenhouse and pond, the integration of tropical fruit tree cultivation and aquaculture is achieved, thereby effectively ensuring year-round fruit production, and generating dual income from both aquatic products and fruits.

In terms of fruit production, the greenhouse yields 5 tons of grapes, 4 tons of bananas, 1.5 tons of papaya, 1.2 tons of pineapple, 1 ton of mangoes, 0.5 tons each of passion fruit and longan. The passion fruit is harvested biannually, during the periods of June to August and November to December. The harvesting season of grape spans from May to October. Mangoes, bananas, and papayas can be harvested throughout the year. In terms of aquatic products, crayfish production amounts to 7.5 tons annually, while bream yields 1 ton.

The fruit is valued at 40 RMB/Kg, resulting in a total income of RMB 548,000. Aquatic products are priced at 50 RMB/Kg, generating a total revenue of RMB 425,000. Overall, the output value per hectare of land in the greenhouse is about RMB 206,000.

The three-dimensional culture model of fish and fruit symbiosis significantly enhances production efficiency, benefits, and product quality in comparison to conventional methods that solely focus on cultivating fruit trees or breeding aquatic species.

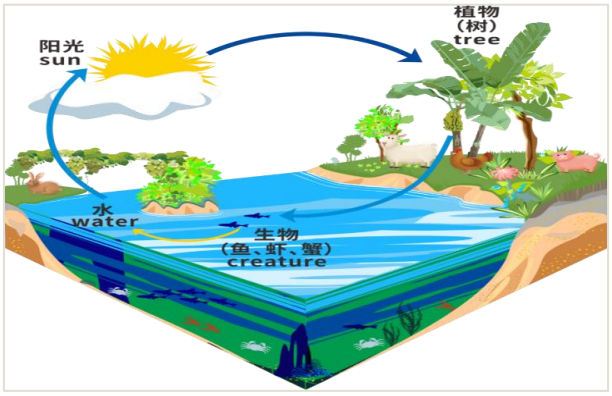


Figure 1: Diagram of three-dimensional culture model of fish and fruit symbiosis

Figure 2: three-dimensional culture model of fish and fruit symbiosis

Figures 3 & 4: Lychee trees planted in the ponds

Figure 5: Banana trees planted in the ponds

Sources: link of the sources or email of the source's persons

ORGANIC FISH: AS A WAY TO PROTECT WATER QUALITY

ZHU RUIJUN[1], PAN JIAYONG[2] (CHINA)

1. Organic Food Development and Certification Center of China (OFDC); 2. Hangzhou Qiandao Lake Development Group Co., Ltd.

Farm: Lake Qiandaohu Organic Fishery, Hangzhou Qiandao; Lake Development Group Co., Ltd

Introduction

Since 2000, Organic Food Development and Certification Center of China (abbreviated as OFDC) has been conducting organic freshwater fish certification in Lake Qiandaohu, Chun'an County, Hangzhou City, Zhejiang Province, China. This initiative witnessed the emergence of China's first organic fish and the robust growth of organic aquaculture in the country. Over the past 23 years, within the certified waters spanning 40,000 hectares of Lake Qiandaohu, Hangzhou Qiandao Lake Development Group Co., Ltd. has consistently introduced silver carp and bighead carp juveniles while establishing a large-scale model for organic aquatic environmental protection-oriented fishery. By utilizing fish breeding to control blue-green algae proliferation and achieve water purification goals, this model has successfully achieved a comprehensive harvest of economic, ecological and social benefits within organic aquaculture.

Unique approach

Lake Qiandaohu, formerly known as Xinanjiang Reservoir, is a valley-type reservoir characterized by its vast fishery production area of 40,000 hectares and an average water depth of 34 meters. The lake boasts numerous islands, rivers, and waterways with a meandering shoreline. It possesses abundant plankton feed resources and exhibits exceptional ecosystem and water quality conditions that are beneficial for the development of organic aquaculture.

In 2000, Hangzhou Qiandao Lake Development Group Co., Ltd., in collaboration with OFDC, initiated the organic certification for silver carp and bighead fish in Lake Qiandaohu—marking the inception of China's first-ever certification program for organic aquatic products. Silver carp and bighead carp thrive solely on plankton present within the lake without any reliance on external feed sources. Their natural growth facilitates nitrogen and phosphorus conversion within the water body while effectively purifying it and preventing algal blooms—a demonstration to this model's ecological sustainability and promotion of healthy aquatic farming.

The organic fish in Lake Qiandaohu can be provided throughout the year, with the key lying in juvenile breeding and the application of integrated fishing technology. Annually, from mid-November to the end of December, six-month-old silver carp and bighead carp species are introduced into cages located in the northwest region of Lake Qiandaohu. The breeding density ranges from 14/m2 to 28/m2 for bighead carp and from 16/m2 to 30/m2 for silver carp. The cage mesh size is between 2.8cm and 3.2cm, while the depth ranges from 4m to 8m. Following a breeding period of approximately nine to ten months, bighead carp are released from the cages between late August and early September of the subsequent year, with an average weight of (10±2) fishes/kg and (6±0.5) fishes/kg for silver carp achieved at this stage. During their time in cages as 2-year-old individuals, both species rely solely on natural plankton within the water body without any feed or fertilization provided externally for growth purposes. Once released from cages, these fishes are allowed to grow freely within Lake Qiandaohu where they undergo over four years of culture before reaching an average weight exceeding 4kg for bighead carp and more than 3kg for silver carp.

The company pioneered the combined multi-gear fishing of " block, drive, gill and stow" in China by utilizing a combination of fish-finder technology and staff expertise to monitor fish populations in fishing grounds, verify their presence, establish a blockade to confine them, and deploy nets for capture. When the estimated fish production exceeds 50,000 kg in a given area, multiple nets are deployed along with single-layer gill nets or three-layer frame gill nets to corral the fish into different sections of the water body.

This process gradually narrows down the fishing range until silver carp and bighead carp can be effectively captured within the nets. Different fishing nets have different specifications, among which the purse seine net mesh specification is 2a=15cm, stow mesh specification requires 2a≥19cm, and gill net mesh specification is 2a=17cm. Once caught, organic silver carp and bighead fish are transported via live fish transport ships to a dedicated storage where they undergo temporary net culture for approximately 15-20 days before being sold.

Impact

Since the initiation of organic fish farming, Lake Qiandaohu has experienced no recurrence of cyanobacteria outbreaks, achieving both ecological and social benefits through the control of algal blooms and water purification via fish-based methods. The ingestion of cyanobacteria by silver carp and bighead carp is proportional to their body weight, with a consumption rate of up to 40kg for every 1kg increase in weight. The silver carp was found to have the capacity to absorb 29.8g of nitrogen, 1.7g of phosphorus, and 121.5g of carbon from the water per 1kg increase in body weight, while the bighead carp exhibited a similar ability by absorbing 29g of nitrogen, 1g of phosphorus, and 115.7g of carbon per 1kg increase in body weight.

Considering the annual production capacities for bighead carp and silver carp in Lake Qiandaohu are reported as being at approximately 4800 tons and 1200 tons respectively, it is estimated that through organic output facilitated by these two species, an effective removal amounting to approximately70.56 tons of nitrogen, 3.24 tons of phosphorus, and 284.64 tons of carbon could be achieved. Using the filter feeding characteristics of silver carp and bighead carp, the nutrient salt level of Lake Qiandao was effectively reduced, and the likelihood of a cyanobacteria bloom was significantly inhibited.

The ecological and social benefits of organic fish production in Lake Qiandaohu are complemented by its substantial economic benefits. For instance, the retail price of bighead carp in conventional ponds in China is RMB16-20/Kg, whereas the retail price of organic bighead carp from Lake Qiandaohu reaches RMB33.58/Kg. The premium for bighead carp certified by OFDC ranges from 67.9% to 109.8%, with the output value of organic bighead carp in 2022 reaching RMB122 million.

Concurrently, the company is extending the organic value chain, building upon its organic fisheries to further process, catering, and marketing of organic fish products. This includes tourism and scientific research, establishing a nationwide marketing and distribution network. The resultant Lake Qiandaohu organic fishery management model has emerged as a benchmark and template for inland freshwater fisheries in China and is being followed and implemented in various lakes and reservoirs across the country.

Figure 1: Overview of Qiandao Lake organic aquaculture water

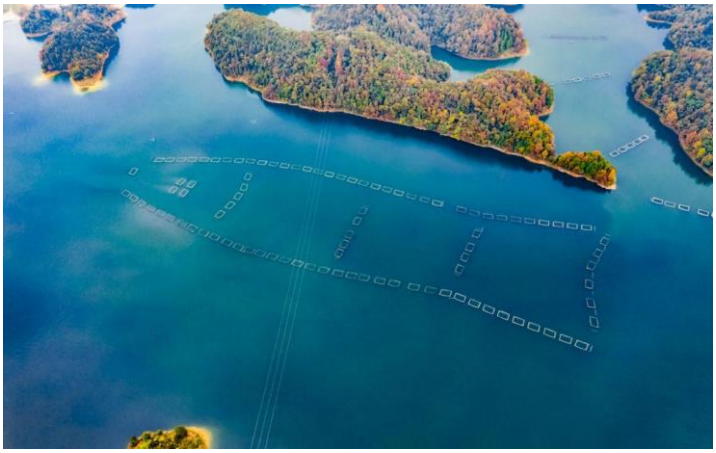


Figure 2: Cages for juvenile breeding in the lake

Figure 3: Juvenile releasing into lake

Figure 4: Combined multi-gear fishing of "block, drive, gill and stow"

Figure 5: Organic fish temporary storage

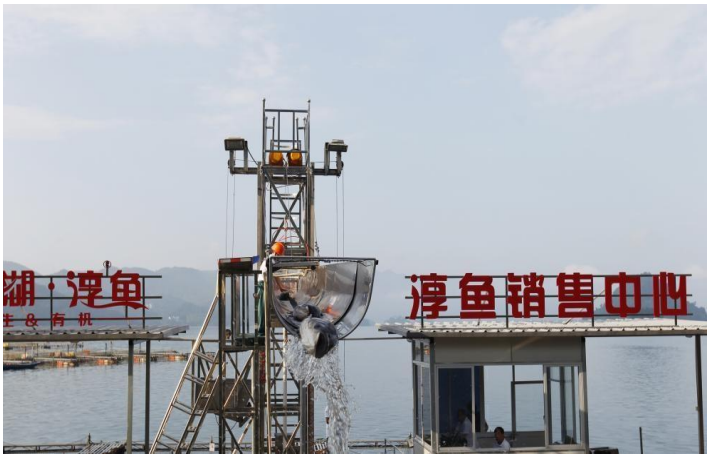


Figure 6: Organic fish sales center

Figure 7: Organic fish restaurant

Figure 8: Organic fish soup

Figure 9: Organic fishery cultural tourism in Lake Qianda

Sources: link of the sources or email of the source's persons

GROWING SOYBEAN FOR MELON

WANG YADONG (CHINA)

General Manager, Taizhou Gugeng Xinyuan Ecological Farming Technology Co Ltd

Introduction

From the ancient agronomy work "Important Arts for the People's Welfare", it is found that the ancient ancestors sowed melon and soybean together in production of melon, so that the melon benefit a lot. Taizhou Gugeng Xinyuan Ecological Farming Technology Co., Ltd. carried out the melon and soybean symbiosis attempt. The results found that the melon and soybean symbiosis not only help melon yield, improve the soil, but also significantly improve the next crop yield and income.

Unique Approach

In the Chapter Melon Growing of "Important Arts for the People's Welfare" published in Northern and Southern dynasties (420-489), recorded the "Sowing beans for getting melon" superb agronomy summarized by the ancestors : "Sowing four melon seeds and three soybean seeds in a sunny side of a pit. When melons grow several leaves, pinch off the soybeans. Melon is weak, the seedlings cannot grow alone, so it is necessary to grow soybean for the start of the soil. When the melon comes out of the ground and grows leaves, you need to pinch off the bean seedlings, otherwise the seedlings will cover the melon and the melon will not grow well. However, if you pinch off the bean seedlings, the sap that comes out of them is more effective in moistening the melon seedlings well; you cannot uproot the bean seedlings, otherwise you make the soil void and easy to dry out. Hoeing more often will bring you more melons. If you do not hoe, you will not have melons. This is also true for grains, vegetables, and fruit plants."

Taizhou Gugong Xinyuan Ecological Farming Technology has formed a technical model of sowing melon and soybean together after trials:

1. Melon seeds and soybean seeds sown together. Melon seeds are weak, and soybean seeds germinate quickly, with strong strength to break through the topsoil, strong root system and certain water storage capacity. Melon's sprouting force is poor, and is hard to break through the topsoil alone, so soybeans help to protect the melon seedling rate, at the same time support a good root ecological environment for the melon with its root system.

2. After several leaves grow on the melon seedling, you can pinch off the growing point of the soybean seedling, leaving one-third, so that the melon and soybean symbiosis. Rhizobial symbiosis is a unique feature of legumes, which form a symbiotic relationship with the rhizobium in their roots, converting atmospheric nitrogen into a plant-available form through nitrogen fixation. Legumes use rhizobacteria to absorb external nutrients running roots after so that the melon root nutrition is also helped.

3. In melon and soybean symbiosis, the powerful root system of legume crops is rich in nutrients, which nourishes a diversity of other beneficial rhizobacteria, and the beneficial rhizobacteria protect melon roots from pathogens.

4. Strong legume root system has good drought resistance. In the system of melon and bean symbiosis, Melon seedlings have soybean roots as a protective umbrella in times of drought, and water absorption and transpiration of soybeans to prevent water logging in times of flooding.

Impact

The soil after planting soybeans is deep, soft and fertile, keeping the soil pH at around 6.5-7, and has a good weed-purifying effect. The root residue of soybeans is also rich in soybean rhizobacteria and other active rhizobacteria, and soy protein that can help the growth of next crops. Soy protein is an isoflavone estrogen, with antioxidant, improve the immunity of next crops, help growth and so on. Therefore, melon and soybean symbiosis not only help melon yield, improve the soil, but also significantly improve the next crop yield and income, is a crop production model worth promoting.

Figure 1. Sowing soybean with melon

Figure 2. Watermelon

Figure 3. Weighing of watermelon

Sources: link of the sources or email of the source's persons

CASE ANALYSIS OF URBAN FARM OF JINHUI ORGANIC FARM, BEIJING

YUHUI QIAO (CHINA)

China Agricultural University, China

Introduction

Jinhui Organic Farm is located in Huairou District, Beijing and the lower reaches of Huairou Reservoir, with excellent natural endowment. Jinhui Organic Farm started organic production in 2012 and has developed into a typical organic urban farm in the suburbs of Beijing with the integration of the three industries. The farm covers an area of 17.4 ha and has built high-standard solar greenhouses, spring and autumn greenhouses and intensive nursery greenhouses. It mainly focuses on vegetable cultivation, supplemented by fruit trees and animal husbandry. The diverse plant and animal composition of the farm forms a complete and stable farm ecosystem.

Unique Approach

Jinhui Farm has a complete set of standardized production management system and technical operating procedures, and established a perfect pre-production, mid-production and post-production standardized management system to ensure efficient operation of the farm (Fig. 1). Farm comprehensive use of physical, biological and artificial measures for comprehensive control of diseases, pests and weeds. The farm is equipped with composting facilities and fermenters to convert organic waste into organic fertilizer for the farm nutrient cycle. The complete water supply, drainage and irrigation system on farm realizes the efficient use of water resources. Environmentally friendly production methods have resulted in continuous improvement of the farm's ecosystem.

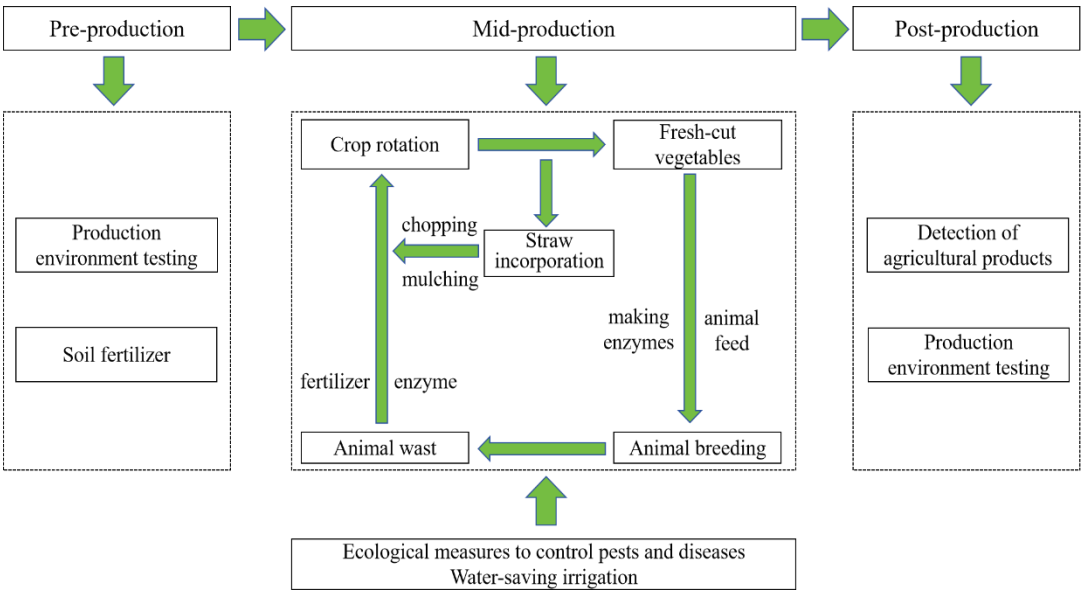


Figure 1 Jinhui organic farm production and management model

With the continuous improvement of organic planting technology and the quality of the ecological environment, the output of organic vegetables on farms has increased at a rate of 5%-10% every year, and the second and tertiary industries have gradually developed. The farm's prepared vegetables, bread and other products are gradually abundant. Agricultural and cultural tourism services such as farming activities, catering, homestay, picking, tourism more diverse.

Jinhui farm has developed a diversified marketing model and established the brand "Jinhui". By providing membership-based vegetable delivery services, the farm has established a public welfare platform to attract merchants to settle in and sell high-quality agricultural products, providing consumers with high-quality, convenient and diversified services. In 2021, Jinhui had cooperated with HiMaMa, the head organization of Beijing parent-child industry, to accelerate the development of cultural tourism industry, greatly enhance the brand awareness of Jinhui, and further increase the sales scale of agricultural products.

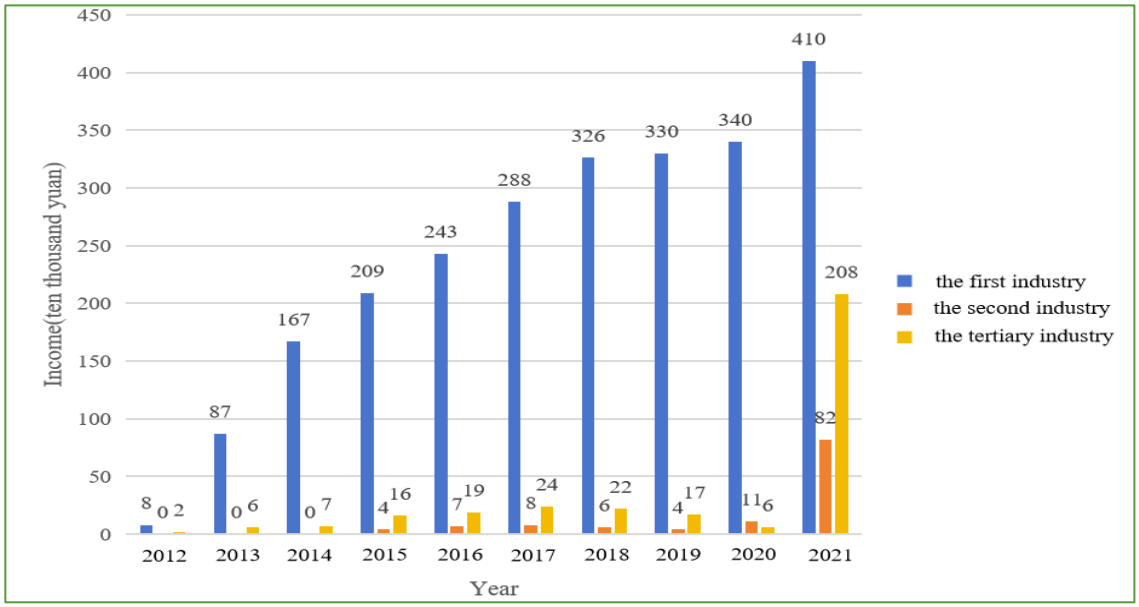


Figure 2 Changes in farm benefits from 2012-2021

Impact

Through the accumulation of organic production technology, the improvement of management level and diversified marketing strategies, Jinhui has created a model of urban organic farm with the integration of the three industries and sustainable development. So far, the annual output of Jinhui vegetables has reached more than 200 tons, and the comprehensive annual revenue has reached more than 7 million RMB (Fig. 2).

(1) while assisting more than 40 merchants to sell high-quality agricultural products, bringing an average revenue of 200,000 to 500,000 yuan to them.

(2) Jinhui Farm adheres to the concept of organic public welfare promotion, not only guiding people to choose a healthy organic lifestyle through the public welfare platform,

(3) but also cooperating with the local government to help the local government build more ecological farms.

CASE ANALYSIS OF ORGANIC FOODS OF YUEFENG ISLAND ORGANIC FARM

YUHUI QIAO (CHINA)

China Agricultural University, China

Introduction

Yuefeng Island Organic Farm is located in Kunshan City, Jiangsu Province, China, by the Yangcheng Lake (fig. 3), is a comprehensive organic farm, with businesses including organic planting, food development and processing, and tourism services The total area of the farm's own fruit and vegetable production base is 15.33 ha. Organic rice production agreements were signed with local rural cooperatives, and the organic rice planting area reached 15.33 ha. Yuefeng Island organic farm grows about 258 kinds of garden plants and more than 70 kinds of vegetables and fruits in the four seasons, building a complete agro-ecosystem with rich biodiversity, and forming a composite landscape of farmland, vegetable fields, wetlands, woodlands and characteristic building land.

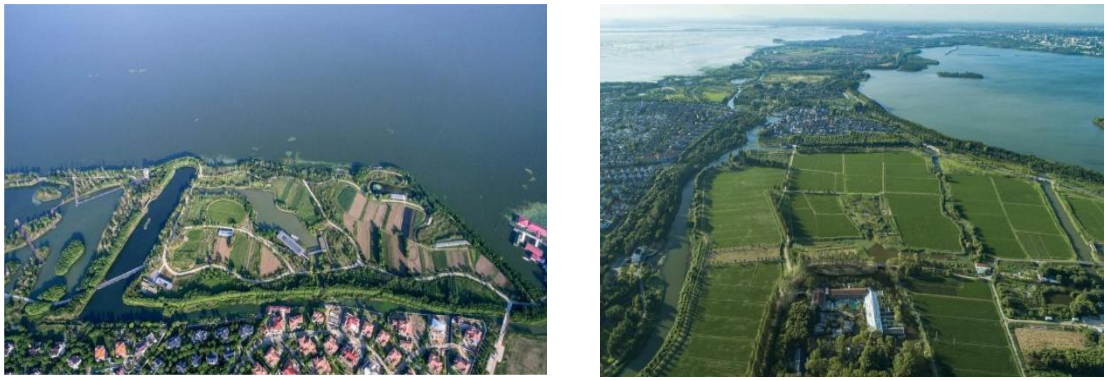


Figure 3 Yuefeng Island Organic Farm vegetable production base and rice production base

Unique Approach

Yuefeng began organic production in 2012. The farm adopts physical, biological way to control diseases, pests and grasses, and the main equipment includes insect-proof net, armyworm board, insect-killing lamp, etc. The farm attaches great importance to soil health management (Fig. 4). From 2015 to 2021, the farm continued to carry out organic fertilizer replacement and pesticide reduction work in the rice base, including soil testing and formula fertilization, planting green manure, and the development of crop rotation fallow plans. During the seven years, the total amount of chemical fertilizer in the rice base was reduced by 90.3 tons, the amount of pesticides was reduced by about 500kg, and the content of soil organic matter was increased to 20.6 g/kg. Since 2019, organic rice production has gradually increased to 6.6 t/ha, which is almost the same as conventional rice production.

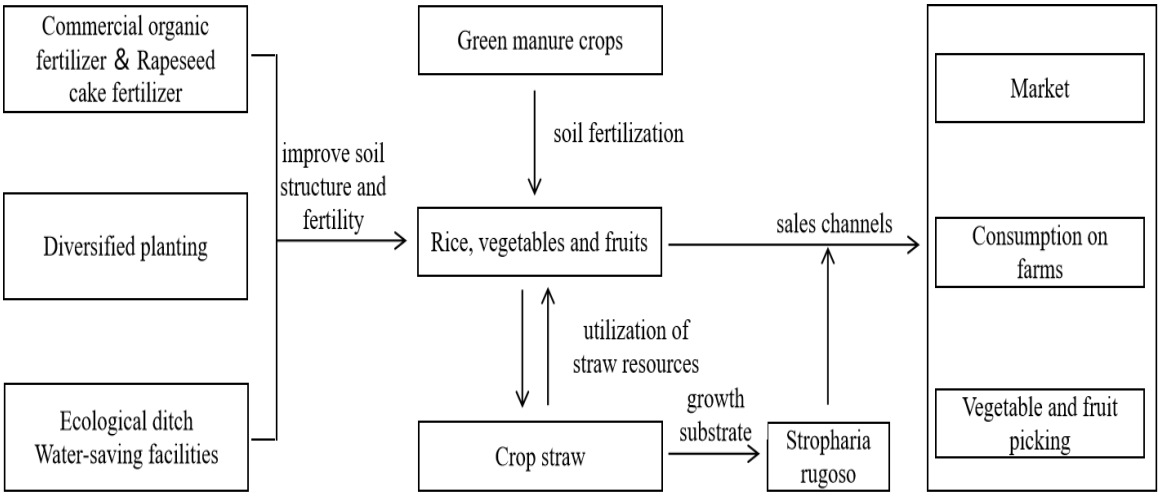


Figure 4 Typical ecological pattern

The integration of the three industries is the key to sustainable management of organic farms. Since 2015, Yuefeng island has made efforts in the secondary and tertiary industries and actively created regional brands. With its excellent organic rice quality, the brand "Qingcheng rice" has gained great popularity in the industry, and has carried out strategic cooperation with a number of large enterprises. The farm combines Chinese Jiangnan culture with local customs, develops wine, zongzi, Gorgon seed osmanthus cake and other special foods, and actively expands online and offline sales channels. At the same time, the farm is also actively developing farm picking, farming education, family activities and other businesses (Fig. 5).

Figure 5 Colorful farming education activities

Impact

In 2021, the income of Yuefeng island reached 7.126,100 yuan, double the total income in 2018 and an increase of 55.2% over 2020. Yuefeng island with its exploration experience and successful examples in ecological agriculture, actively contributes to the development of rural revitalization.

(1) Since the launch of the "Qingcheng Program" in 2013, it has provided professional and comprehensive training for about 200 young people with agricultural dreams.

(2) In 2020, Yuefeng island was rated as the science Popularization Education Base of Jiangsu Province, holding an average of more than 60 activities and receiving about 12,000 people every year.

(3) Farm and local farmers cooperate to grow organic rice, so that villagers share the market dividends brought by ecological agriculture, but also let them feel the significance of protecting the ecological environment, better establish a sense of "ownership", enhance their dignity and sense of belonging.

CASE ANALYSIS OF ORGANIC RICE OF LINHU ECOLOGICAL FARM

YUHUI QIAO (CHINA)

China Agricultural University, China

Introduction

Suzhou Linhu Ecological Farm is located in Linhu Town, Wuzhong District, Suzhou City, Jiangsu Province, China, established in 2018, covers an area of 33.33 ha. It is planned and designed by the Organic Cycle Research Institute of China Agricultural University (Suzhou) and belongs to Suzhou Tai Laker Modern Agriculture Development Co., LTD. While developing the planting industry, Linhu promotes the integration of the first, second and tertiary industries and the promotion of agricultural technology. At present, it has registered a number of rice brands, and attracted projects such as national ecological farm, rice field painting, and natural agriculture planting base to enter the farm.

Unique Approach

At the beginning of the construction of Linhu ecological farm, great importance was attached to the overall planning of the farm. The Organic Cycle Research Institute of China Agricultural University (Suzhou) has developed a typical ecology and management model for Linhu from multiple perspectives (Fig. 6), fully considering multiple factors such as the overall integrity of the farm, internal material circulation, utilization and protection of biodiversity, and integration of multifunctional industries.

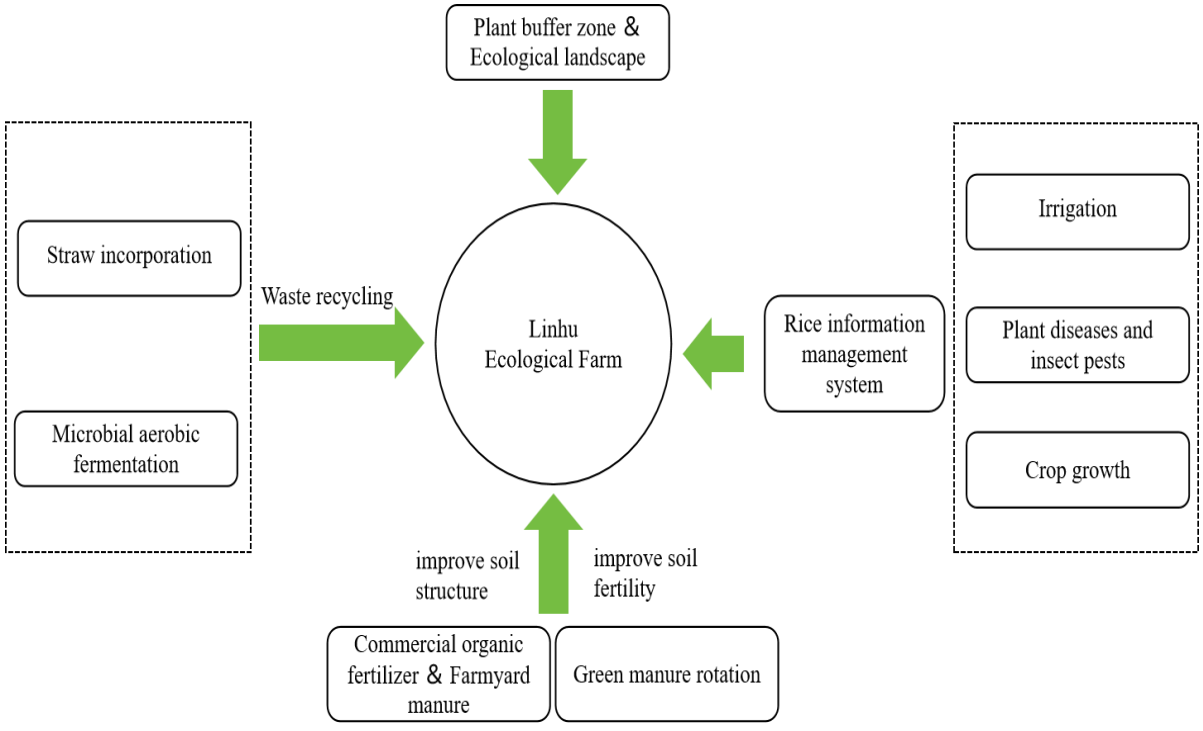


Figure 6 Typical ecology and business model of Linhu Ecological Farm

Linhu collaborates with the China's first urban and rural organic waste treatment and utilization demonstration center (Linhu) to obtain organic fertilizer. The center recyles a variety of organic waste (kitchen waste, garden waste, water grass of Tai Lake, reeds, blue algae, river silt, rice straw), through a special fermentation process, 7

days to complete the production of fertilizer, an annual output of solid organic fertilizer 5000 tons, can achieve 6000 acres of land green production.

Farm construction has a large area of beautiful ecological landscape, play an important ecological function. The ecological landscape of the farm is scientifically planned, for example, functional plants such as sesame and vetiver planted in the plant buffer zone play a key role in natural enemy protection and pest control, and planting a variety of functional plants in and around the river channel can not only purify water quality, enhance biodiversity, but also enhance aesthetic effects.

The combination of the three industries is also the focus of Linhu development. Linhu registered "Jiangnanwei rice", "Wuxiao rice" and other brands, with excellent rice quality, won many awards, brand awareness rapidly improved. At the same time, the farm also launched rapeseed flower festival, rice planting festival, rice field painting festival, harvest festival and other activities, and provide private customized services for agricultural tourism. In terms of sales, online and offline simultaneous sales. The continuous the integration of the three industries has put forward higher requirements for the operation level and product quality of ecological farms, which play a positive role in promoting.

Impact

Linhu Ecological Farm is a very high-quality and eco-friendly farm model. With scientific overall planning, reasonable landscape design and green production methods, the problem of agricultural non-point source pollution has been effectively alleviated. In the core area of Linhu, the total nitrogen and total phosphorus emissions were reduced by 0.84 tons/year and 0.28 tons/year, which was greatly improved compared with the farm environment in the early planning stage. This farm construction model is worth learning and promoting in more rice producing areas.

In addition, the collaboration between ecological farms and urban and rural organic waste treatment and utilization demonstration center (near the lake) has combined agricultural production with urban food waste resources, drawing the distance between urban and rural integration, which is worth imitating in more modern cities and surrounding agricultural areas.

"VRIKSHAYURVEDA"— THE FOUNDATION OF ORGANIC AGRICULTURE IN INDIA

THOMAS JACOB AND REESAMOL G VAZ (INDIA)

Peermade Development Society

Vrikshayurveda is the art of maintaining the health, healing and productivity of plants. The Sanskrit word *Vrikshayurveda* means 'science of plant life.' Vrikshayurveda is specifically meant for the conservation/ propagation/ cultivation/ plant care and development of plant-based processes and products including organic manures, organic liquid manures, bio pesticides, growth regulators and promoters that are effectively utilised for healthy germination, nourishment, rejuvenation, and treatment of plants.

The origin of Vrikshayurveda could be traced as before 3000BCE through oral tradition to the written text by Surapala around 1000CE. They also emphasised the importance of biotechnological interventions and research with a view to explore the commercial aspects of the plant world. Identification and classification of soil and soil conservation measures, various sowing techniques, methods of propagations, planting techniques, rules for watering, nutritional care and managements are the major topics under Vrikshayurveda. Plant protection based on the ayurvedic principles of Panchabhoudika (Five elements – Air, water, fire, Earth & Space) and Tri-dosa (Vata, Pitta & Kapha) are described in the text.

Seed Treatment

Pre and post treatment of seeds are essentially required to check infections, pest attacks, diseases, diseases occur due to climate changes, atmospheric pollution and nutritional deficiencies. There are more than 25 several useful prescriptions mentioned in Vrikshayurveda to induce quick germination. These prescriptions will further help to provide adequate nutritional supplements for healthy growth of plants/trees.

Properly dried seeds are soaked in milk and dried again. This process is repeated for five days, and fumigated with powder of the herb *Embelia ribes* along with ghee (clarified butter).

Medicinal herb *Acorus calamus* is used as a fungicide to prevent fungal attack during the germination. Some of the base materials used in the prescription for nurturing Seedlings are cow-urine, cow-dung, self-generated alcoholic preparations, milk, ghee (clarified butter), curd, butter milk, sugar, honey, sesamum oil/ oil cake, fish, blood of animals and humans, fat and flesh of animals etc.

Plant of *Embelia ribes*

Scientific Explanation of the Vrikshayurveda Practices

Milk and ghee have been used for centuries. Glutamate, Leucine and Proline form about 40% of the total amino acids in the milk. The amino acid Proline has been found to systemically induce resistance in plants. High amounts of endogenous Proline increase contents of Cytokinin and Auxins which promotes vegetative and reproductive growth in crops. Lactobacillus bacteria in milk could enhance decomposition of organic matter and increase the absorption of nutrients by plants. This bacterium also has the potency to inhibit the attack of diseases like wilt diseases of tomato.

Nutritional Care (Growth Promoters, Bio-manure/Liquid Bio-manure) Prescribed in Vrikshayurveda

Kunapajala of Vrikshayurveda – The World's First Prescribed Liquid Manure

The ingredients of kunapajala have been fermented which means (protein, fat) etc. already broken down to simple low molecular weight products, and therefore nutrients from which would become available to plants faster than from the traditionally applied organic matter (Neff et al. 2009).

In the book of *Vrikshayurveda*, Surapala mentioned a very effective manure, a liquid ferment called "*Kunapajala*," which means filthy water (Nene, Y. L. 2018). It is produced from animal and plant sources through fermentation. As per Surapala, the excreta, marrow of the bones, flesh, brain, and blood of a boar mixed with water and stored underground is called 'kunapa' (Nene, Y. L. 2006). *Kunapajala* has some plant growth regulatory actions which enhance the overall growth of plants. Being a liquid, it is a more suitable form of manure. It can be beneficial in the growth of plants with minimal toxic effects on the human body compared to chemical fertilizers (Chandra et al., 2019). Usually, the raw organic matter decomposes into humus which will be further digested by soil microbes producing high levels of organic acids like humic, carbonic, and fulvic acids and increasing high cation (+) exchange capacity. This capacity mobilizes calcium, potassium, and other plant nutrients (Shubhashree et al.,2018). To obtain a good result, aerobic composting is said to be beneficial (Shubhashree et al.,2018). The attraction of *Kunapajala* is that it can be applied to any plant at any stage of development (Naresh et al., 2018)

The application of *Kunapajala* is different from that of organic manures. Because liquid *Kunapajala* can quickly penetrate the rhizosphere (Nene, Y. L. 2018). Neff et al. (2003) claim that the fermentation of *Kunapajala* breaks down the ingredients into simple low molecular weight products, which is the reason for its effectiveness. Therefore, the plants can absorb nutrients from *Kunapajala* more quickly than from other organic manure that is applied conventionally. Furthermore, Patil (2007) noted that there is always a risk of transmitting the dormant pathogen to fields with plant-based compost. However, since the ingredients in *Kunapajala* are cooked and fermented, this is avoided.

In general, *Kunapajala* serves a vital role in the fast decomposition of organic wastes and the improvement of soil humus content, which is necessary to maintain the activity of microbes and other living forms in the soil. (Chandra et al., 2019) *Kunapajala* is made from ingredients that are readily accessible and may mitigate a variety of concerns while also increasing productivity and preventing a variety of nutritional problems in soils and crops. It can be produced cost-effectively on the farm with a little infrastructure and hands-on training. It is part of the Ayurvedic system, in which indigenous cow products (dung, urine, milk, ghee, and curd) are key constituents, along with a few selected medicinal plants. *Kunapajala* supplements major and minor nutrients, growth stimulants, and other plant hormones (Pathak et al ., 2018).

Scientific Studies on the Impact of *Kunapajala* on Black Pepper Undertaken by *Reesamol G Vaz, Duddukuri Govinda Rao & Dr. Thomas J* (2023).

Kunapajala solutions were prepared with quantifiable ingredients as per the previously standardized protocol. (Nene 2012) Seven different types of *Kunapajala* were prepared using different protein substrates and herbal ingredients follows. Pork based *Kunapajala* T1 (PKJ), Beef based *Kunapajala* T2 (BKJ), Chicken based *Kunapajala* T3 (CKJ), Fish based *Kunapajala* T4 (FKJ), Mutton based *Kunapajala* T5 (MKJ), Duck based *Kunapajala* T6 (DKJ), Herbal *Kunapajala* T7 (HKJ) (Nene 2006, Naik et al 2022)

Physicochemical, Microbiological & Ecotoxicological Properties of Different *Kunapajala* Solutions

The study evaluated the physicochemical, microbiological, and ecotoxicological properties of all the seven *Kunapajala* solutions one day after preparation (D1) and two months after preparation (M 2). The pH, electrical conductivity (EC), primary, secondary, and micronutrient content were assessed. Microbial analysis was conducted using selective media. Ecotoxicity tests followed OECD (1984) guidelines, employing a filter paper contact test with *Eisenia fetida* at M2. LC50 values were determined using LDP line software.

Results indicated that natural fermentation converted *Kunapajala* into a nutrient-rich solution, regardless of the protein substrate. The solution post-fermentation contained ample nutrients essential for robust plant growth (Table 1). Additionally, the *Kunapajala* formulation exhibited the capacity to foster the growth and multiplication of beneficial soil microorganisms (see Fig 1). Ecotoxicological findings demonstrated that the formulation was non-harmful to earthworms at recommended dosage (Fig 3). LC50 values spanning 64.54% to 83.44% were noted across diverse *Kunapajala* solutions (Table 2). In conclusion, *Kunapajala* emerged as a proficient bioenhancer of plant growth. The herbal variant displays a higher safety profile by not harming earthworms even at full concentration.

Impact of *Kunapajala* on *Piper nigrum* Growth Attributes

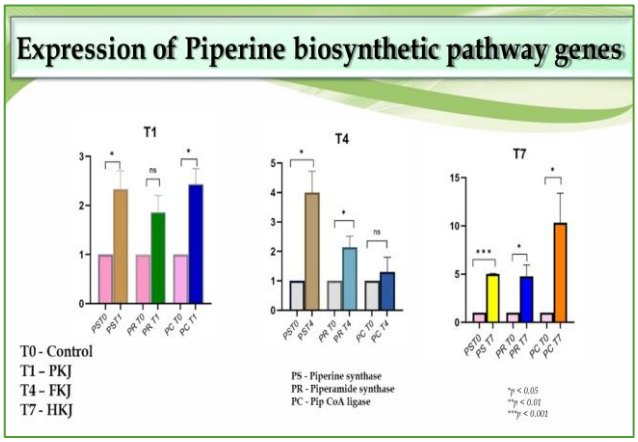
The performed field trials with different *Kunapajala* solutions on black pepper cultivation and evaluated various plant growth attributes, physicochemical properties of soil, nutrient status of the leaf, and soil microbiome. During the experiments, seven treatments (T1 to T7) and one untreated control (T0) were used to study and compare the effect of different *Kunapajala* solutions on Piper nigrum. The results suggest that the *Kunpajala* application significantly enhanced plant growth in terms of plant length in T1 PKJ, T2 BKJ, T3 CKJ, T4 FKJ, and T7 HKJ and leaf area in T1 PKJ, T2 BKJ, and T7 HKJ. The chlorophyll content was also raised significantly in T1 PKJ, T3 CKJ, T4 FKJ, T6 DKJ, and T7 HKJ.

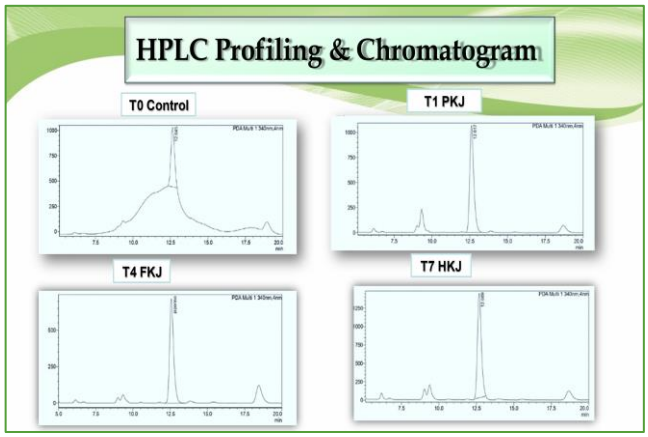
Impact of *Kunapajala* on Rhizosphere Microbiome of *Piper nigrum*

The 16s rRNA-based metagenome profiling of the rhizosphere microbiome of black pepper soils revealed a signature enrichment of beneficial microbes as a result of *Kunapajala* treatment. The taxonomic composition was dominated by Proteobacteria. Similarly, Rhodoplanes, Planctomyces Pirellulaceae, Alphaproteobacteria, and Cytophagaceae were the predominant genera observed in treated groups. In support of these findings, we provide evidence that *Kunapajala* application influences plant growth, soil, and plant nutrient status, and favorably shapes the soil microbiome of black pepper. The positive impact of *Kunapajala* on spice crops was found to deal with the problems of organic black pepper cultivators without causing any harm to the environment.

The Effect of Organic Liquid Nutrient *Kunapajala* on Piperine Content and Related Gene Expression in *Piper nigrum L.*

The study investigated the influence of three types of *Kunapajala* solutions – Herbal (HKJ), Pork-Based (PKJ), and Fish-Based (FKJ) – on the expression of genes related to piperine biosynthesis and the resulting piperine content in *Piper nigrum L*. *Kunapajala, a* liquid organic nutrient described in *Vrikshayurveda*, was employed for this purpose. The genes evaluated were Piperine synthase (PS), Piperamide synthase (PAS), and Piperoyl-CoA ligase (PC), with black pepper elF 2B used as the internal reference gene for real-time qPCR (Schnabel et al., 2021). Quantification of piperine was conducted through HPLC analysis. Upon the application of *Kunapajala,* notable upregulation of PS, PAS, and PC genes was observed in HKJ-treated plants.





Additionally, PKJ and FKJ treatments led to significantly higher levels of PS and PC compared to control plants. HPLC analysis revealed that piperine content in PKJ-treated (8863.9405 ± 9.03 mg/l), FKJ-treated (6160.0195 ± 16.50 mg/l), and HKJ-treated (11541.3045 ± 22.48 mg/l) peppercorns were markedly ($p < 0.05$) greater than untreated controls (4450.7175 ± 3.46 mg/l).

These findings highlight *Kunapajala's* potential to enhance the pivotal alkaloid piperine in Piper nigrum L. In summary, the application of *Kunapajala* to *Piper nigrum* holds promise for augmenting the production of piperine, a crucial bioactive constituent. Among the solutions tested, HKJ demonstrated the highest effectiveness in promoting piperine synthesis, followed by PKJ and FKJ.

Vrikshayuveda Preparations for Profuse Flowering and Fruiting

Paddy straw is prepared in the form of rope and tied over the branches of Jack fruit tree (*Artocarpus heterophyllus*) followed by pouring of the decoction prepared from Vacha (*Acorus calamus*) over the rope. Heavy flowering and fruiting is seen below the trunk where the treatment was given. This experiment was conducted by Mr. Krishnakumar, Assistant Director of Agriculture in the Government Farm.

Fumigation in Vrikshayurveda

Fumigate with triphala powder-*Terminalia chebula*, *Terminalia bellirica*, *Phyllanthus emblica* below the branches and fruits of Pomegranate (*Punica granatum)* to increase the fruit size.

Virkshayurveda for Management of Plant Diseases

Paste is prepared from cow urine, *Embelia ribes*), *Brasica juncea*, *Sesamum indicum* along with Ghee is smeared over the affected part and then fumigated with suitable drugs followed by irrigation with the mixture of milk and water. Apart from insecticidal/Germicidal, it acts as growth promoter and enhances profuse flowering and fruiting.

A mixture prepared from the bark of *Pongamia pinnata, Cassia fistula*, *Azadirachta indica*, *Alstonia scholaris* is further mixed with and add *Cyperus rotundus* and *Embelia ribes* and cow urine and applied externally over the affected part as insecticide/ Germicide.

Biotechnological Intervention in Vrikshayurveda

Introduce Scent in Unscented Flowers

Aromatic soil is prepared by mixing aromatic flowers and applied on the basin of the tree. This is followed by pouring the aromatic decoction prepared from *Anogeissus latifolia* and *Accacia chundra*.

Then the stem smeared with paste of sandalwood. Fumigate clarified butter along with aromatic plants/ substances

Conclusion

Vrikshayurveda is age old agriculture science that was developed for producing nutritious food for the wholistic development of human beings. It covers the entire aspects of organic food production that align with the environment, the ecosystem, nutrition, and wellbeing of all-inclusive life on earth. One of humanity's most significant challenges is producing enough nutritious and healthy food for a growing population while securing environmental, social, and economic sustainability Consumers are becoming more aware of the adverse consequences of various agrochemicals used for pest control, disease management, crop nutrition, growth regulation, and promotion It is crucial to understand *Vrikshayurveda* in modern scientific agriculture.

SUCCESSFUL INNOVATIVE BUSINESS MODEL FROM NORTHERN INDIA

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The Beginning

A transformative figure emerged, reshaping the landscape of agriculture in North Indian state-Uttar Pradesh. Mr Nihal Singh, the luminary founder of Pavitramenthe Fair Organic Pvt Ltd (https://pavitramenthe.com/) is not just a farmer; he's a steward of sustainable farming and an advocate for organic revolution. Born into the fertile soils of farming family, Nihal's life journey reflects a profound commitment to environmental sustainability and ethical farming practices. Educated in a rustic village, Nihal's early years were marked by an innate connection to the land. His academic pursuit led him to an under-graduate degree -BSc in Agriculture, a foundation for the profound transformation that awaited him.

The turning point came in 2004, when Nihal, armed with his agricultural education, chose to dedicate his life to farming. Initially, he couldn't overlook the conventional chemical farming practices prevailing in his family farm. But, witnessing the adverse effects on the land, human health, and the environment, he felt compelled to initiate change. In a bold stride toward sustainable agriculture, Nihal embraced ancient, organic and regenerative farming practices in the early 2000s. The journey was arduous, with limited organic resources and a lack of consumer awareness posing significant challenges. Undeterred, Nihal initiated his organic farming journey with mint crop production, pioneering efforts to promote organic and regenerative farming.

His expertise found further expression in consulting roles for Serendi Mentha and Phalada Agro Research from 2006 to 2015. When Serendi ceased operations in 2014, Nihal took the helm as an agripreneur, founding Creation Biotech. His mission was clear- to motivate fellow farmers towards regenerative organic farming. The watershed moment arrived in 2018 with the establishment of Pavitramenthe Fair Organic, operating under the brand name "Immortelle." The company's ethos cantered around regenerative organic practices, aligning seamlessly with the natural ecosystem and eschewing external chemical inputs.

Nihal's philosophy extends beyond farming; it's a belief that agriculture should fulfil needs, not greed. Pavitramenthe Fair Organic's commitment to good organic practices, fair wages, fair pricing, and transparent, sustainable operations seeks to bring about positive change socially, economically and environmentally.

The Business Model

The impact of their work reverberates through the cultivation, export, and supply of high-quality organic products to the global markets. With over 4000 registered organic farmers associated with Pavitramenthe Fair Organic Pvt Ltd, their journey is studded with accolades, including the prestigious Jaivik India Award in 2022.

The project is located in North Indian state-Uttar Pradesh, wherein, they are engaged with small holder farmers in cultivating, exporting, and supplying a range of high-quality food grains, Indian spices, herbs, pulses, jaggery, Brown Sugar, flours, edible oils, essential oils (Mentha, basil, chamomile, rose, davana, etc.), etc. which are organic & Fair for Life (FFL) certified. With its diverse and effective agricultural and fair trade programs, Pavitramenthe could easily achieve Regenerative Organic Certification™ (ROC™) silver status in 2019, thus becoming the first supplier of a potentially wide range of ROC-certified field crops.

Pavitramenthe Fair Organic Pvt Ltd supports farming communities by helping them in conversion to organic & regenerative agricultural practices. The farmers' capacities are build-up on sustainable practices by organizing hands-on training, supplying bio-inputs, helping in following good agricultural practices & organic farm certification

& marketing. The farmers are also supported in many other aspects beyond agricultural production like health care, clean water, children education etc using CSR funds.

The Indian small scale farmers having land less than 1 hectare even though at times organic by default, often find it difficult to switch over to certified organic. But the technical & bio-inputs support extended by Pavitramenthe Fair Organic Pvt Ltd they could successfully transition from conventional to organic production practices leading to their farm products reaching to domestic and global markets. They are expanding their regenerative program such that by 2025 some 90 percent of project farmers apply sufficient compost, practice conservation tillage, and grow cover crops.

As planned, each farmer grows a mint crop every year, and in the rest of the land they grow a diversity of crops—food crops for local consumption, as well as value-added organic and fair certified products for the high-end Indian and international markets. It's their expectation & dream that with reduced cost of production, premium prices, improved soil fertility, and increased yields, farmers' margins can be increased offering the next generation of villagers an attractive alternative to moving to the city, or at least a supplementary income. They continuously work to make their dream realistic.

Dr. Bronner (https://info.drbronner.com/all-one-blog/2021/02/book-sneak-peak-honor-thy-label/)-one of the major clients of Pavitramenthe Fair Organic Pvt Ltd produced a documentary about its working culture, sustainable agriculture practices, and reviews of happy farmers [1]

Dr. Bronner's & Pavitramenthe work on the Fairtrade model since the beginning. Together they shared incredible ideas in terms of the progress of the organization and also guided for doing even better for society, environment, and community development. Beyond the fields, Pavitramenthe's Fair-For-Life certified program leads community projects spanning healthcare, women's empowerment, hygiene awareness, and farmer logistical support. Their business ethos go far beyond earning money for self, but more on helping farming communities in a multiple ways-technical & social empowerment including of farm women and rural children. Nihal and his associates strongly believe that farming must result in happiness in pursuit of sustainable agriculture through organic & regenerative practices.

Nihal Singh's life story is an odyssey of transformation, from a son of the soil to a torchbearer of regenerative organic farming. His narrative serves as an invitation, urging others to join the movement towards a more sustainable and harmonious world. Nihal's legacy guides us towards healing the earth, socially, economically, and environmentally- a testament to the enduring impact of a visionary farmer who is now a well-established organic agri-entrepreneur inspiring many other farmers in the region who regularly visit organic farms supported & promoted by him through Pavitramenthe Fair Organic Pvt Ltd.

Recognition

In recognition of his outstanding contributions to sustainable agriculture and regenerative organic practices, Nihal Singh has been honoured with several prestigious awards throughout his transformative journey. Beyond national borders, Nihal Singh's influence reaches a global scale. Serving as a Senior Panelist on the American Botanical Council's Sustainable Herbs Program, he has contributed to shaping international perspectives on sustainable and

[1] https://youtu.be/pkkk5FjNyQw?si=mC48Is1Q25EuT36k

ethical herb cultivation. [2] This role showcases his dedication to a holistic approach in agriculture, extending his impact far beyond the fields of Bareilly in India. These accolades stand as a testament to his dedication and impact on the farming community and the environment through organic agriculture.

[2] https://sustainableherbsprogram.org/webinar/toolkit-webinar/

DETECTION OF ORGANIC RICE QUALITY VIA MOBILE APP

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Introduction

In recent years, the demand for organic rice in Indonesia has increased along with the increasing consumer awareness. However, information or knowledge systems regarding consumer expectations of the quality of organic rice have not been well developed. In the other hand, the asymmetric information about quality and price become the fairness challenges for both consumer, producer as well as processor. For this reason, this apps aims to fulfil the gaps in information or knowledge systems throughout the supply chain which is the strategy for developing the quality of organic rice. The aim of this apps is to increase the consumer awareness on quality as well as increase willingness to pay, in the other hand encourage farmers to connect with direct consumer and deliver their products efficiently.

Unique Approach

This apps project has been continuing for the second version (two years) 2021-2023. The main goal was to encourage the consumer to be familiar with organic brown rice. Focus group discussions (FGD) were conducted with farmers, processors, and consumers, from which key information or knowledge was coded and weighted to describe which was the dominant factor for quality development. The study found that the definition of organic rice quality differs among farmers, processors, and consumers.

The engagement to the consumer through online and direct intervention in the household has started. We establish an interactive application in the mobile phone android basis to encourage the consumer to be aware of organic brown rice. All of the stakeholders in the organic brown rice value chain have been included such as farmers, traders and consumers. User will get information about originalities (both certification and location), degree of organic rice; prices, delivery, recorded Good Agriculture Practices as well as information about where the consumer can purchase the product. This interactive application will continue to add other organic items and in the future tracing the food system from farm to fork can be easily assessed.

Data from the FGD was collected using an affinity diagram and was weighted according to the expert panel. The unique approach of the apps is started by using Design Thinking (DT) where, we learn what is the important aspect from individual persona (consumer, producer, processor). We learn and capture their empathy map and furthermore understand what was important for them to have specific apps. Data was coded and weighted to describe which key knowledge was the main gap/barrier. Parallel to this, organic rice data was collected by using Colorimeter using CIE LAB with standardize picture captured. The multi-regression was used to validate the pictures. This apps is not only for the consumer but also for the farmers and processors. The apps is apply the principles of the organic farming in fairness for the transparency information.

Impact

In the first version, we only create the first feature for the organic rice quality based on their variant, long-short grain, and degree of milling. The second version we include information about the traceability of organic rice, information about the farmers, information about the cultivation, information about rice milling unit.
Furthermore, we also include information of comparing organic rice prices, and location nearby store/market as well as mode of delivery.

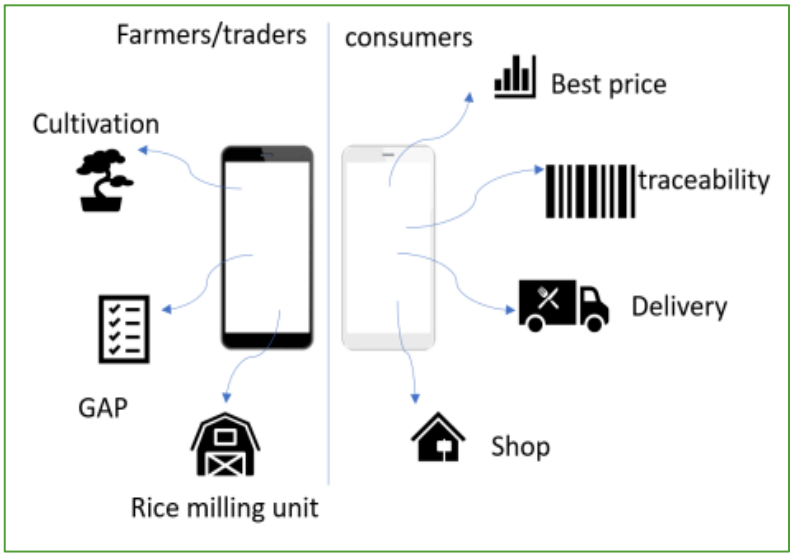


Figure 1. Farmer/traders and consumers desktop in

As the second version we have launched the application in in android platform that can detect and measure the quality of the organic rice as can be seen as follows:

Fig. 2 Apps in mobile phone

As the mobile application has been launched. The performance of the application has 95% level of confidence. The recent version only available in Bahasa Indonesia. Future development, with the similar approach, we could develop for tea, coffee, or cacao.

Sources

David W, Ardiansyah., Budijanto S, Kahl J, Strassner C. (2020) Bioactive Compounds and Sensory Properties of Organic Rice: The Impact of Degree of Milling. Current Research in Nutrition and Food Science.

David W, Ardiansyah, Budijanto S, Strassner C (2019). Sensory evaluation and nutritional information on organic brown rice. Organic Agriculture 10 243-252.ersons

REQUIREMENTS FOR BOOSTING ORGANIC 3.0: FURTHER ACCESS TO BIOLOGICAL CONTROL AGENTS (BCAS)

MOHAMMADREZA REZAPANAH (IRAN)

Associate professor at the Iranian Research Institute of Plant Protection (IRIPP), Agricultural Research Education and Extension Organization (AREEO), Tehran, Iran

Organic agriculture (OA) requires not only data recording and conversion period, but also access to biological control agents (BCAs) and the legislated facilities when needed. Of course, biological control (BC) methods (classical or importation, conservation, and augmentation) have been developed via diverse farming systems such as OA and even via diverse plant protection approaches. The ecological benefits of BC have been expressed in medium and high level of Integrated Pest Management (IPM).

The statistical trends and indexes of OA in West Asia express a variation of quantity. For example, the OA land in 2021 in hectares (ha) were in Afghanistan, 98, Armenia, 583, Azerbaijan, 38080, Iran, 7051, Iraq, 63, Kuwait, 32, Oman, 7, Pakistan, 69850, Turkey, 327583, UAE, 5419. There was not a record of OA land in The World of Organic Agriculture Statistics and Emerging Trends 2023 for Bahrain, Qatar and Turkmenistan, the countries around Iran.

The OA land for Russia was 655457 ha, for Kazakhstan, 113247, for Kyrgyzstan, 30259, for Tajikistan, 22292 and China, 2753700 ha. There is no record for OA land of Uzbekistan, but its wild collection recorded as 4925 ha. Most of the countries are recorded as not fully implemented. This implies that a synchronization on legislation should be followed by regional cooperation such as Shanghai agreements as soon as possible. In an investigation in Iran, the legislation, related laws, bylaws, regulations, and standards that may have impacts on OA, BC, BCAs, biological fertilizers (BFs), soil fertility and conservation agriculture (CA) in the past decades in Iran have been collected from national legislation data banks. Their impacts have been investigated and discussed by elected professionals.

The statistical trends of BC, OA and wild collection have been correlated to other indexes such as the BFs amount used in the country and area that BCAs are released. The data correlation with the related regulations to evaluate the impacts of the regulation on organic boosting expressed the gap of legislation for boosting OA and BC via BFs and BCAs market growth. Of course, factors out of the studies should be considered in further investigations in different countries. While history of classical BC in Iran was recorded since 1930s, the statistic trends of OA land in Iran have been recorded since 2000. While the 1st recorded microbial BCA in annual reports of Iran's National Plant Protection Organization (PPO) is *Bacillus thuringiensis* preparations against forest pests since the early 1970s.

The high technology BCAs such as preparations based on insect viruses, their technology and innovation need more investments as well as human resources and cooperation model nationally and regionally. Maybe as the International Organization for Biological Control (IOBC) was established to promote environmentally safe methods of pest and disease control in 1964; in another part of the world, TIPI and or regional stakeholders of BCAs' technology, research and innovation can play such role in similar model.

The statistical trends of BC in Iran show fluctuations. It seems that the BCAs and BFs were increasingly produced in Iran during recent decades. Their diversities were extended by knowledge-based companies, but their markets are still waiting for improving trends of BC, CA and OA.

There are questions, such as should further budget support be approved? Or should an institute improve the regulations and legislations in a nexus approach after a policy impact analysis? The nexus approach to be applied to problem analysis, to solution design and to policy, technology, and methodology impact analysis, where

combined complex indicators can emerge as better descriptors of real compound multi-dimensional progress rather than incorrect sector-wise misleading indicators.

That is exactly why institutionalization and its three pillars, namely, cognitive, normative, and regulatory phases in the aforementioned order. That is, the regulatory phase is the last step instead of the first. A proper understanding about the vital importance of the need for considerable BC and OA practices for achieving long-term food security and sustainability, supported by strong science and scientific evidence, should find its way to the cognition or understanding of policy makers, societal leaders and move forward into the normative phase, by creating a wide-spread societal value in the public domain for BC and OA practices in the food sector and agriculture.

All regional stakeholders should establish a regional federation via scientific and professional structures to pass cognitive and normative phases sustainably and to reach regulatory phase for proving required legislation to get benefits of international trade of OA, BFs, BCAs and Participatory Guarantee System (PGS) in the current organic 3.0 and ecological era.

GREEN MANURED FARMS PROTECT OUR PLANET EARTH

KAZUMA KATAHIRA (JAPAN)

Katahira Farm Owner

Introduction

The nitrogen-fixing capacity of legumes, known as green manure, far exceeds the quantity of chemical fertilizer used in conventional farming, as verified in my small-scale farm with multi-cropping of about 60 vegetables.

According to a theory, the amount of nitrogen fixation by the green manure is said to be 10-20 kg per 10 acres.

The soil becomes rich because the number of wide variety of microorganisms increases according to the growth of roots. This situation helps the microorganisms to find and to eat enough food.

Green manure with high nitrogen-fixing capability by rhizobium bacteria, such as hairy vetch and white clover, are particularly effective for this purpose.

Soil microorganisms are said to live from a few hours to a few days, and are constantly being killed and regenerated, increasing the amount of organic matter, and the dead carcasses become foods for the newly born ones.

Perennial green manure, which are growing in all seasons, and providing continuous supplies to soil microorganisms.

In forests and meadows, seeds fly in from nowhere and take root, insects are born, birds and animals gather, life and death repeat, feces and urine and carcasses fall to the ground and are absorbed by plants as inorganic matter by decomposers. Green manure and no-till cultivation promote vegetable cultivation by applying the cyclic system created by nature.

However, the synergistic effect of the large number of different microorganisms generated by no-tillage with multiple varieties of green manure is the unknown field.

We, organic farmers, should regenerate the land that we have completely contaminated by chemical fertilizers and pesticides. Then, we get back the original green earth.

The practical methodology to return it back to its original state is no farm cultivation for three years.

Organic farming using green manure in Katahira farm.

The use of green manure to provide nutrients to crops is the Organic farming free from residual pesticides, kill soil microorganisms, or contaminate the soil with nitrate-nitrogen or other pollutants caused by chemical inputs. It is cost-effective and environmentally friendly compared to chemical fertilizers, compost, and other inputs.

As a practical example of farming, Katahira Farm's produce is summarized below.

The following photos show a variety of vegetables grown with oats, clover, and hairy vetch green manure as a fertilizer that has been plowed into the farmland for over seven years without any chemical fertilizers or cattle manure inputs.

The nitrogen-fixing capability of the legumes/green manure exceeded the effect of chemical fertilizers of conventional farming.

Figure 1

Figure 2

Figure 1. Home-grown Kuroda 5" carrots grown with hairy vetch the previous year, mixed with black bok soil.

Figure 2. Chinese cabbage grown with hairy vetch and oats as a plow fertilizer in the previous year.

Soil is a mixture of Kuroboku/black bok

[1] In garlic farms, immediately after white clover was planted alternately with white clover between aligned rows and the neighboring white clover was removed, the leaves of the garlic were long green, but 12 days later the garlic leaves began to turn yellow, apparently as evidence that they were receiving nitrogen fertilizer content from the nearby clover.

[2] In the beet farms, white clover green manure was planted between the rows to contributed to growth the root big enough.

[3] In edamame farms without rotation for three consecutive years, white clover was sown in the previous year and direct sown in the spring, resulting in a harvest of more than 35 pods per plant after about 80 days, exceeding the results of cultivation using chemical fertilizers and compost.

The table below shows the types of crops grown with green manure and the number of plants*.

Table I Crop names volume

Vegetable Name	Volume	Vegetable Name	Volume	Vegetable Name	Volume
Garlic	4,000	beets	300	Arugula	100
Onion	3,000	fava beans	300	Mustard Leaf	100
Carrots	2,000	open-air tomatoes	100	Eggplant	50
Edamame	2,000	Green onion	500	cabbage	30
Mixed Leaf	2,000	fava bean	300	Taro	200
Daikon radish	300	peanuts	200	Squash	100
Chinese cabbage	300	spinach	200	Yacon	200

Conclusion

1. Which green manure are to be used, how to be planted single/double parallel line(s) planted or mixed planted require still further study. Because these matters are relevant to the growth of the crops.
2. Mineral elements taken out of the field in vegetable cultivation should be supplemented by considering the balance of elements in the earth's environment. The mineral elements balance should also be balanced by green manure.
3. If small-scale family farmers, who currently account for 75% of the world continue to promote organic farming using green manure like a patchwork farm, they can make a significant contribution to realize global environmental pollution and carbon neutrality.
4. PGS activities can promote enjoyable organic local regeneration, with less certification costs and by small family farmers. They will be able to protect high quality and productive vegetables.

Therefore, PGS + green manure will save both food and protect our planet earth.

The is a global imbalance. Resources are limited, and it is clear that even organic fertilizers will follow in the footsteps of conventional cultivation.

If we think of a region as a single field, the future of agriculture will be one in which resources and elements are recycled.

Small-scale agriculture is the best suited to curb this trend, and local production for local consumption (PGS) is a system that needs to be promoted around the world to protect the global environment in the future.

CO-CREATING A NEXT SUSTAINABLE SATOYAMA THROUGH MICHINOMUKOU MODEL

YOSHITERU KIRA (JAPAN)

CEO of Tambasasayama KIRA Farm, Co–founder of AZE Institute, Project leader of Michinomukou, Japan

Introduction

Tambasasayama City is located in the central-eastern part of Hyogo Prefecture, and its core industry is agriculture. In 2021, it was recognized as a Japanese Agricultural Heritage in the cultivation system of Tamba black soybeans, which has a 300-year history [1]. It also declared its commitment to an organic village in 2023 and to promote organic farming and other forms of agriculture that take the natural environment and living creatures into consideration [2]. However, despite this recognition of rural Japanese culture, it has several major issues to overcome, such as: the declining and aging population and reduction in the number of companies engaged in the agricultural sector, resulting in the increase in abandoned farmland.

When we consider how to ensure Satoyama's legacy for future generations, it is necessary to recognize and approach the issues separately from those of agriculture and rural areas [3]. The issue of agriculture is the difficulty of finances when trying to consider environmental effects, while the issue of rural areas is declining in the number of people living, cultivating, and maintaining the area, having no way to overcome this situation. The next section introduces the efforts of KIRA Farm to approach the former issue, and "*Michinomukou*" to solve the latter from the new perspective of organic agriculture [4].

Unique Approach

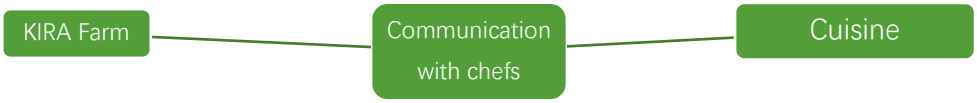
1. METHODS OF Tambasasayama KIRA Farm

Tambasasayama KIRA Farm is responsible for the agricultural production of Michinomukou [5]. Established in 1995, the farm has built relationships with local restaurant chefs through small-lot, diversified cultivation using non-industrial organic farming methods. Its features include:

- Cultivating multiple varieties of vegetables adapt to the field environment.
- Utilizing local resources such as recycled compost from school lunches, grass clippings, and grass ash, which is the knowledge of traditional agriculture in an environmentally friendly way that benefits the ecosystem.
- Actively communicate with local chefs and build partnerships to expand the range of food on offer, for example, suggesting the usage of carrots' flowers for pleasing the eye, not only the deliciousness of the cuisine (Figure 1).
- Bring attention to the wild plants by explaining and delivering them as merchandise.

In this way, we have demonstrated the potential of this agricultural process to be viable, meaning bringing the agriculture financially sustainable. However, we have not been able to solve the issue of rural areas. Therefore, it was necessary to create new ways to take part in the Satoyama area, which led to the concept of *Michinomukou*.

Figure 1. Organic vegetables and interaction with restaurants (Mikage Juenne) [6].



2. Michinomukou MODEL

Michinomukou started in 2022 with the concept of promoting Satoyama for the future. The project scheme is to include Satoyama projects and Interaction projects to promote Satoyama area management in an integrated manner (Figure 2). With many team members coming from diverse backgrounds, including organic farmer KIRA Farm, regional coordinators, I-turners, housewives and business practitioners.

The Satoyama area management aims to achieve a balance between the expansion and integration of local businesses that interact with consumers in urban areas. With the expansion of agriculture & forestry in the region, has as its goal, increasing sustainability through the expansion of production and these business activities lead to the preservation of Satoyama. To this end, it is important to focus on the Satoyama area where local watersheds, ecosystems, agricultural culture, local industry, and livelihoods are all integrally connected.

The project will initially proceed on a small basis to clarify the issues and stakeholders. For example, planting rice as a participant in a hands-on program, becoming a manager for cleaning communal waterways, or farming as a producer: each of these actions creates a Satoyama. The acquisition process of these newly learnt and integrated issues will eventually lead to a sense of community, and hence, the creation of a new Satoyama cultural economic zone.

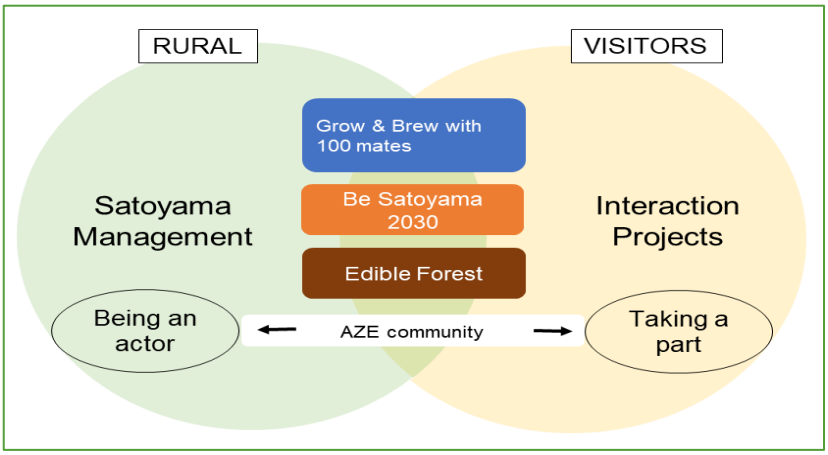


Figure 2: Satoyama Area Management Scheme of Michinomukou

Impact

PROJECT 1. 100 人ではぐくむ名前はまだ無い日本酒 (Grow & Brew with 100 mates)

The project involves participating in the sake making process from rice cultivation. This is enhanced by working closely with a local sake brewer, *Karibaichi* Sake Brewery [7]. The water from the mountains is used to make both the rice and sake, and not forgetting that the agriculture and local industry also share in the richness of the clear fresh mountain waters. Rice planting, mowing, observation of living creatures, and then the rice harvesting is followed by a visit to the sake brewery.

The name of the sake is selected by those participating in this project which further fosters a sense of togetherness and being in harmony with the environment that create the unique sake. In 2022, the total number of participants was 10 times that of the village residents, and the economic impact was 10 times greater than that of rice-only production and sales on the same field area. On this metric alone, it is a huge success. It has also been well received in 2023.

PROJECT 2. Be Satoyama 2030

This modelled on being a practical hands-on school to create template Satoyama by 2030, as one of its main objectives. The program is based on learning about the origins of Satoyama from: agriculture, forestry, daily life as a whole, field practice, and discussions among the participating students. It has led to the collaboration with forestry professionals, wood coordinators, and experts in animal damage control, including participation from companies as well as individuals.

Future Prospect

The Osaka-Kansai Expo is scheduled to be held in 2025 [8]. Hyogo Prefecture envisions a Field Pavilion under the theme "Our Field, Our SDGs," and *Michinomukou* is one of its authorized programs [9]. We are preparing to use this opportunity to build a network with various people and rural areas.

Figure 3. Projects photos including rice harvesting, sake, and practice in the forest

SOURCES

[1] Japanese Agricultural Heritage:

https://www.maff.go.jp/j/nousin/kantai/index.html

[2] Organic village in Japan:

https://www.maff.go.jp/j/seisan/kankyo/yuuki/organic_village.html

[3] Satoyama is a rural area, being maintained by local people in a way that both natural resources and livelihoods are sustainable. People use plants and timber to make their livings, and that results in conserving biodiversity and ecosystem services.

https://satoyama-initiative.org/ja/concept/satoyama-initiative/

[4] *Michinomukou*: https://michinomukou.org/

[5] *Tambasasayama KIRA Farm*: https://kira.farm/

[6] *Mikage Juenne*: https://www.mikage-juenne.com/

[7] *Karibaichi* Sake Brewery: https://syuugetu.jp/

[8] EXPO 2025 Osaka, Kansai, Japan: https://www.expo2025.or.jp/

[9] Hyogo Field Pavilion: https://expo2025-hyogo-fieldpavilion.jp/

BIOFERTILISER BASED ON STREPTOMYCES SP. FOR SOIL IMPROVEMENT AND SEED TREATMENT IN ORGANIC AGRICULTURE OF KYRGYZSTAN

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The Kyrgyz Republic has significant potential for the cultivation of cereals, vegetables, and fruit crops. Since 2004 in Kyrgyzstan, the agriproducts produced ecologically start increasing. For the successful implementation of organic production, the farmers should use the practices and techniques specific to organic farming. The principles of organic farming are based on the preservation of the ecological balance of the environment and human health, the abandonment of chemically synthesized fertilizers and pesticides, genetically modified seeds, and seedlings. Instead, organic fertilizers (compost, manure, siderites and biofertilizers) are proposed, the use of biopesticides and bio fungicides, which preserve biodiversity in soil and the environment, and create the conditions for performing their useful use.

Microbial inoculants and technologies can be used for chemical free agriculture, replacing harmful pesticides as well as fertilizers for crop protection and enhancing the yields. There are more than 22,000 biologically active compounds of microbial origin registered of which 7,600 are produced by actinomycetes of Streptomyces genus. In addition, 70% of all known antibiotics were found to be from Streptomyces strains. Many Streptomyces are able to colonize the root hairs of plants, can penetrate them, thereby the rhizosphere for them is the main habitat and these bacteria are regularly found in the roots of plants. Another useful property of actinomycetes, they play an important role in the self-cleaning of soils from pathogens, they able to remain in the soil for the longest time, to have a suppressive effect on other groups of microorganisms, in the creation of soil fertility, they able to solubilize phosphate in phosphate deficient soils.

The present study was focused on evaluating in vitro and in vivo potential of Streptomyces strains toward various bacterial and fungal phytopathogens of cereals, vegetables, and fruit crops, for improving soil fertility, for combating the problems related to pollution and global warming.

Streptomyces species isolated from soil and rhizosphere of wild and crop plants were screened in vitro and in vivo experiments for antibacterial, antifungal, growth-promoting activities and for producing the volatile and phosphor solubilizing metabolites.

In present studies, local Streptomyces bacteria isolated from the rhizosphere of wild and crops as active biocontrol agents and bioinoculants were tested in in vitro and in vivo experiments. In vitro, results confirmed the great potential of these strains for use in improving agriculture without chemicals. After identifying in vitro experiments the presence of such metabolites like phosphate-dissolving and volatile compounds, antibacterial, antifungal and growth-stimulating activities, the strains were selected with cumulative beneficial effects that could be applied in the field conditions. Widespread and causing significant economic damage in vegetable, grain, and fruit growing, the pathogens were used for biotesting Streptomyces bioinoculants. Seven Streptomyces local isolates were tested against bacterial pathogens like Erwinia carotovora and Ralstonia solanacearum, causing soft and brown rot in vegetables, mainly in potatoes and other tuber-forming crops. Also, biocontrol strains were tested against the bacterium Erwinia amylovora, which caused a fire blight, the most devastating disease affecting global pome fruit production. In 2008, fire blight was first reported in Kyrgyzstan and registered. A new disease invasion poses a critical threat to the conservation efforts to preserve endangered pome fruit species, the associated ecosystems, and local fruit production in Kyrgyzstan.

Among plant pathogenic bacteria, Pseudomonas syringae can cause diseases in more than 180 plant species, including annual and perennial plants, fruit trees, ornamentals, and vegetables. Bacterial canker caused by Pseudomonas syringae is the most harmful disease of the cultivated varieties of apricots, plums, cherries, peaches, and ornamental Prunus species in Kyrgyzstan. Streptomyces isolates were also screened for their antibacterial activity against this bacterial pathogen.

Except for the bacterial pathogens for bioassay experiments fungal pathogens like Alternaria tenuissima, Fusarium graminearum, Venturia inaequalis, and Monilia fructicola were used. Alternaria tenuissima is causing leaf blotch, cork rot, and core rot in apples. Venturia inaequalis is the causal agent affecting fruit trees' leaves and fruit tissue; this disease is named a scab. Apples are among the most economically important fruit crops in South and North Kyrgyzstan, affected by scab disease (Malus domestica). Monilia fructicola is the causal agent of brown rot of stone fruits, brown rot of apples, fruit extensive mould, and fruit mummification of apples affecting the fruiting stage, post-harvest, vegetative growing stage of trees in Kyrgyzstan.

Fusarium graminearum (teleomorph stage: Gibberella zeae) is the causal agent of Fusarium head blight in wheat and barley in the country; this disease leads to significant losses of crop yield, and especially quality through the contamination by diverse fungal mycotoxins, which constitute a significant threat to the health of humans and animals. Streptomyces alfalfae C1-4, isolated from the rhizosphere as a biofertilizer, was intended for seed and soil application to increase plant growth and protect from pathogens in this study. In vitro experiments, such vital properties as phosphate solubilization and producing volatile compounds, inhibiting the pathogens of this strain, were adequately evaluated, and a biofertilizer was developed based on this active strain.

In the first stage of our research, we used this active phosphate-dissolving strain in newly developed, low-fertile soils in order to find out whether it could be working in unfavourable field conditions. Used as a bioinoculant Streptomyces alfalfae C1-4 by soaking the seeds for 2 hours before planting in the soil, this application mechanism has shown encouraging results on wheat and soybeans.

The biofertilizers must have success criteria for wide application: they have to be effective in actual field conditions, in a range of soils and different host cultivars. Despite the low soil fertility and lack of irrigation water in the summer, treatment of seeds by Streptomyces alfalfae C1-4 product has shown a growth stimulatory effect on all phases of soybean than in wheat. It ultimately has increased biomass and grain yield overall. In all phases of vegetation, the ammonifying bacteria in the presence of an antagonist (a biological agent) developed rapidly and were constantly present in significant numbers in the rhizosphere.

This indicates a balance between the rhizosphere inhabitants and the Streptomyces alfalfae C1-4 biological agent. It can be assumed that Streptomyces alfalfae C1-4 produced growth-stimulating compounds such as auxin and cytokinins, which could enhance cell division and differentiation of the root system, increasing the number of lateral root hairs and consequently increase the nutritional and respiratory surfaces of the root system as a whole. The healthier root hairs emit the exudates more intensively, food for saprophytic bacteria. Cells and mycelium Streptomyces alfalfae C1-4 have taken root in the rhizosphere, showing no inhibitory effect on the development of saprophytic bacteria.

In general, there was no marked fungal infection in the root system of plants; there was not a single case of plant disease in the soybean crop area despite the low organic matter content in the soil. Root exudates of soybeans provide a nutritional base for the growth of antagonistic organisms, which plays a vital role in controlling the soil phytopathogens and contributes to the active functioning of a significant group—nitrogen-fixing bacteria in the rhizosphere.

The results have confirmed that the introduction of Streptomyces alfalfae C1-4 as a biological agent in soil together with the seeds has stimulated the growth and reproduction of valuable and essential for the soil environment

microorganisms. Therefore, the rhizosphere can be considered a microbiological buffer zone, in which the microflora protects the plants from the attack of pathogens and improves soil fertility. Streptomyces alfalfae C1-4, introduced into non-sterile soil, entered competition with the local soil microflora and could colonize the rhizosphere system of plants.

In our studies, the ability of Streptomyces diastatochromogenes Sk-6 to suppress the growth of phytopathogenic bacteria E. carotovora in vivo experiments makes it a potential biocontrol agent for reducing the soft rot infection of potato tubers in the storage period. Streptomyces diastatochromogenes Sk-6, as a biological disinfectant, could destroy surface and internal infection, protect the tubers from the growth of phytopathogenic bacteria in the early period of their reproduction, and improve the overwintering of winter crop.

Thus, using Streptomyces bioinoculants that promote plant growth, improve nutrient availability, control phytopathogens, and reduce abiotic stress in plants is essential for sustainable agriculture and an excellent alternative to environmentally hazardous chemical fertilizers and pesticides. Volatile compounds produced by this group of bacteria have yet to be used as metabolites; their usefulness for agriculture still needs to be studied, and strains with such compounds could undoubtedly be widely used as fumigants of seeds and fruits during storage instead of chemicals. In future studies, using advanced technologies and methods, it is necessary to study the chemical composition of all metabolites produced by these Streptomyces local strains to study the level of expression of genes responsible for the biocontrol properties in these strains. Also, to develop molecular markers to identify the clusters present in these strains.

PQNK: A SUSTAINABLE FARMING APPROACH FOR PROTECTING NATURE, INCREASING YIELD WITH LESS COST AND HIGHER NUTRITION DENSITY

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Introduction

PQNK (to be pronounced as picnic) is the abbreviation of some Urdu words; "*Paedar Qudratti Nizam Kashatqari*" which means sustainable natural farming system and it is also referred to as Paradoxical Agriculture. PQNK was pioneered in 2008 by a Pakistani agronomist, Asif Sharif, who encouraged growers to adopt natural means to increase agricultural production. Asif Sharif has conceptualized PQNK through first-hand experience on his own land in the Indo-Gangetic Plains of Pakistan. He later founded Pedaver, a company that works with thousands of farmers to disseminate the PQNK system and develop appropriate mechanization. Initially, after identifying that inundation, soil disturbance, and bare land are contrary to the natural processes of soil fertility and vegetation, Mr Asif developed PQNK planting system.

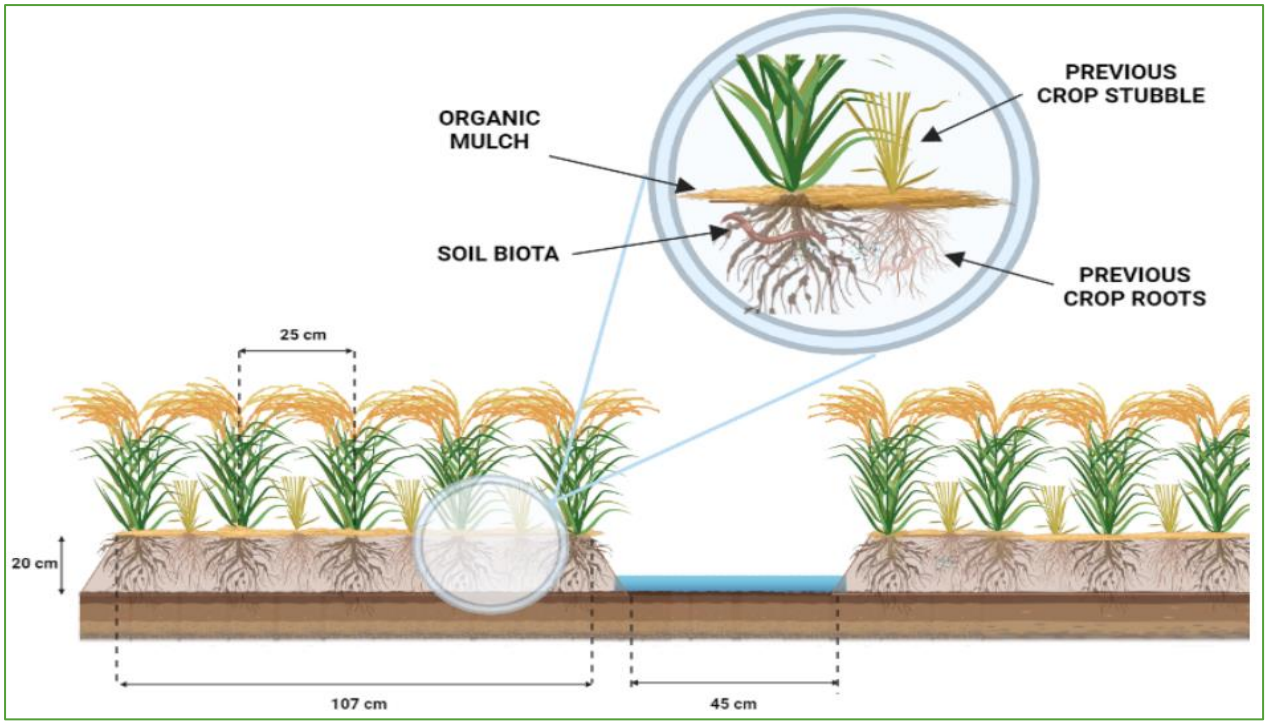
Unique Approach

Under PQNK, crops are cultivated on permanent no-till raised beds that are formed on leveled, non-compacted land. For this, the beds' size is adapted to the size of the tractor and machinery wheels, so that the wheels are driving through the furrows, hence not compacting the beds. Beds are covered with organic mulch that can be locally procured by leaving crop residues on the field after harvesting and by using cover crops in between cash crops. Irrigation is applied in the furrows between beds. Nutrient uptake from the soil is optimized by plant spacing and hard-pan breaking. The plant spacing also allows each plant to develop large canopies for catching sunlight and CO2 from the atmosphere and is to be adapted to the specific requirement of each crop.

Under PQNK, crop establishment can be done by both transplanting or direct seeding. Direct planting is preferable, but if choosing to transplant the seedlings, one should do this early and carefully to bring minimal disturbance to the root systems. Inter cropping, relay cropping, and under-sowing are techniques that can be used by farmers practicing PQNK to promote crop diversification within the farming system. Introducing agroforestry practices such as alley cropping, where trees are placed within the agricultural field, is also a way to increase the available in-field biomass for mulching and to promote biodiversity while increasing farm production.

In a PQNK system crops are grown on raised beds which minimizes soil disturbance to protect soil biota, improves soil structure, and promotes carbon sequestration. Also, with machines developed to the size of the raised beds, PQNK facilitates the large-scale implementation of no-till. In PQNK, soil compaction is completely avoided by letting the tires of the heavy machinery drive in the furrows between the beds.

This guarantee driving through the land without compromising the soil structure where crops are planted. Similarly in this system a thick organic layer is maintained to cover the soil surface and prevent sunlight from reaching the soil which inhibits weed germination, resulting in a non-chemical strategy for weed management. Maintaining permanent biomass cover on the soil surface also protects the land from overheating in direct sunlight, which adversely affects the soil biota. Organic Mulch also buffers the force of winds and storms that erode the topsoil.



Overview of PQNK Farming Structure

Further, organic mulch applied as soil cover adds carbon and minerals to the soil system and supports the proliferation of soil microorganisms and mesofauna. The evaporative losses of moisture are also reduced by biomass cover, ultimately improving the water-use efficiency. In addition to this, the retention of non-harvested crop biomass, rootstocks, and stubble in the field after harvesting conserves the stock of carbon in the soil. These materials, when they decompose, support the soil biota and improve soil structure. PQNK makes crop residues a valuable source of biomass as well as a tool for integrated weed and nutrient management, giving farmers incentive not to burn them and thus also improving air quality and ecosystem.

In PQNK technology spacing between plants has increased, i.e., reducing plant density per m^2. This is because it is natural for tillering crops to grow more profusely in the more fertile soil environment that is created by PQNK practices: more soil organic matter, more soil moisture, more biotic activity, and better soil structure. By allowing each plant to fully develop its root systems and its canopy, more nutrients are absorbed from the soil (and more carbon is stored in the soil), while the photosynthetic process is boosted. The result is an increase in plant productivity which comes together with a reduced expense for seeds in case farmers need to buy them. Within a PQNK system, it is important to consider multiple strategies for achieving greater crop biodiversity. Introducing cover crops between seasons or using crop associations such as inter cropping, alley cropping, relay cropping, and under-sowing are valuable options. As raised beds need to be permanently covered with organic mulch, diversification strategies can provide the needed amount of biomass to keep the soil covered all throughout the year. Crop diversification also reduces farmers' economic vulnerability and the risks connected to crop failures.

PQNK Practices in Field

Impacts

PQNK system has been adopted by tens of thousands of Pakistani farmers because of no use of chemical fertilizers, insecticides & pesticides which brings economic benefits. Crops' performances improve under PQNK because of the better soil environment created by the system. Root systems and canopies get bigger thanks to the optimized plant spacing and breaking the hard-pan also gives space for the roots to expand. It all adds up to an increased availability of water and nutrients in the soil.

Plants with improved phenotypic traits are not only more productive but also more resistant and resilient against the effect of extreme weather events. PQNK practices result in a natural plant protection and nutrition system that protects the plants against the attacks of pests and diseases and optimises the food uptake of the plants. This lowers the risks for farmers while also reducing the costs related to the use of agrochemicals that negatively affect life in the soil.

Also, the reduced amount of labour connected to the adoption of permanent no-till mulched raised beds further cut production costs. Lower costs and better yield in quantity and quality result in greater profit for farmers, as reported in the table below, which is what makes PQNK so attractive among Pakistani farmers. The positive environmental externalities have great importance in terms of resource conservation and ecosystem restoration. By being completely organic and by avoiding tillage, PQNK systems minimize water and soil contamination while enhancing carbon sequestration and soil biological activities. Moreover, by breaking the hard-pan, allowing the rain and pumped-up irrigation water to seep back into the soil, the aquifers are replenished. Also, by avoiding flooded conditions in rice cultivation, PQNK systems highly reduce methane emissions

Cost-effectiveness of PQNK vs Conventional Agriculture - major crops

	Wheat		Sugarcane		Corn		Potatoes		Rice		Cotton	
Cost heads (**Rs**/acre)	Conv.	PQNK	Conv.	PQNK	Conv.	PQNK	Conv.	PQNK	Conv.	PQNK	Conv.	PQNK
Land preparation	8500	2000	8500	2000	8500	2000	16000	2000	16000	2000	8500	2000
Seed	7500	1875	10000	750	20000	20000	60000	80000	1500	525	2000	2000
Sowing/planting	4000	4000	8000	4000	4000	8000	8000	6000	12000	4000	4000	4000
Fertiliser	16300	/	25800	/	25800	5000	25800	2000	16300	2000	16300	/
Pesticides	/	/	2000	/	2000	1000	5000	/	2000	/	8000	/
Weedicides/hoeing	2000	/	2000	/	2000	/	2000	/	2000	2000	2000	/
Fungicides	/	/	/	/	/	/	4000	/	2000	/	/	/
Harvesting exp.	8000	8000	32000	40000	8000	8000	10000	10000	8000	8000	8000	8000
Water exp.	8000	2000	12000	2000	10000	2500	5000	2000	12000	2000	8000	2000
Labour/supervision	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Land rent	75000	75000	150000	150000	50000	50000	50000	50000	50000	75000	75000	75000
Total cost of production	139300	102875	260300	208750	140300	106500	195800	162000	131800	105525	141800	103000
Yield (bags/acre)	35	40	800	1000	80	80	80	80	40	40	25	30
Production cost per bag	3980	2571.9	325.4	208.7	1753.7	1331.2	2447.5	2025	3295	2638.1	5672	3433.3
Sale price per bag	4400	4400	350	350	2600	2600	3000	3000	5800	5800	7200	7200
Profit per bag	420	1828	24.6	141.2	846.2	1268.7	552.5	975	2505	3161.9	1528	3766.7
Profit per acre	14700	73125	19700	141250	67700	101500	44200	78000	100200	126474.8	38200	113000.1
Profit variation (%)	NA	397.4	NA	617	NA	49.9	NA	76.5	NA	26.2	NA	195.8

UMERKOT: At a time when Pakistan is reeling from major agricultural losses due to worst-ever floods the summer, 2022 that washed away thousands of acres of crops, a man in the southern Sindh of Pakistan says that “PQNK saved me from incurring any losses. In fact, I earned substantial profit and was even preparing to cultivate my next crop when a majority of farmers were trying to drain water from their fields”.

Agricultural land which is still submerged by flood water in Umerkot, Pakistan, on November 17, 2022.

Farmer Bhom Singh Sodho showing his produce in Umerkot, Pakistan, on November 17, 2022.

Sources:

1. https://www.pedaver.com/pqnk-paedar-qudratti-nizam-e-kashatqari/

2. https://uploads-ssl.webflow.com/62473771a75ad943caeb4dbf/64ca8b4356f60fed1c27bceb_PQNK%20Briefing%20%20.docx.pdf

DATE PALM WASTE COMPOST IMPROVES THE PRODUCTION OF ORGANIC BARLEY IN AN OASIS ENVIRONMENT

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Introduction

In Tunisia, date palm culture generates huge amounts of waste that can be valorized by composting. Composting is a simple, ecological, and low-cost way to recover and transform this waste into an organic amendment in biological oases. Renewable biomass waste allows re-incorporating the organic matter into the soil and improves soil fertility, promoting plant growth and increasing crop productivity. In the present study, we investigate the performance of compost on the growth and yield of organic barley in a Tunisian oasis.

Unique Approach

Date Palm Leaves Compost Preparation

The date palm leaves compost was prepared at a composting station of ASOC (Association for Saving Oasis of Chenini, Gabes, Tunisia) from cow manure and date palm leaves collected from local farmers in Chenini, Gabes, Tunisia. The date palm leaves were air-dried, mechanically chopped, and then mixed with the cow manure in a windrow of 5 t.

Photo 1: Composting process:

1. Collecting date palm leaves from local farmers; 2. Air-drying of leaves; 3. Chopping of leaves wood; 4. Mixing of cow manure and date palm material; 5. Windrowing of compost; 6-8 Packaging.

2. Experimental Site and Design

In an open-field trial, the experimental treatments were unamended soil and soil amended with 30 t/ha of compost and mixed in the upper 15–20 cm soil one day before seeding. The local barley (Hordeum vulgare L.) cultivar Sahli was used in this study as it represents the most grown cultivar in Tunisia's organic farming.

3. Grain yield and yield components estimation

At the harvest time, barley plants were collected, and yield component characters were determined, such as plant height (PH), spike length (SL), spike number per plant (SP), grain number per spike (GNS), thousand seed weight (TSW), grain yield (GY), biological yield (BY) and straw yield (SY). Then, mineral analysis was performed in order to determine grain nutrient constituents (N, P, K, Ca, Mg, Na, Fe, Mn, Zn and Cu).

Photo 2: Harvest stage of biological barley

4. Proteomic Analysis of Barley

The proteomic profile of barley leaves and roots in response to date palm waste compost application were analysed by LC-MS/MS and then validated based on qRT-PCR.

5. Metagenomic Analysis of Soil

High-throughput sequencing and quantitative real-time PCR (qPCR) were used to determine the effects of compost application on soil bacterial and fungal communities at the tillering, booting and ripening stages of barley plant growth.

Impact

1. General

Date palm waste compost allows farmers to transform oasis waste, which can provide a refuge for pests and predators of crops.

It permits also the re-incorporation of organic matter (OM) and nutrient into the soil characterized as poor in OM.

Thus, soil compost application can be an effective solution to improve soil properties, to boost plant development and increase crop yield.

2. Agronomic Benefits

The application of compost improves the main yield component traits including straw yield as well as biological yield.

Compost application enhanced the nutrient content of most elements (N, P, K, Ca, Mg, Na, Fe, Zn, Mn and Cu) in barley grain compared to untreated, whereas the concentrations of Cd, Cr, Ni and Pb were at low levels far below the limit.

Proteomic analysis of barley leaves and roots proved that barley responds to compost application by complex metabolism pathways.

In leaves, compost application altered abundance of several proteins related to abiotic stress, plant defense, redox homeostasis, transport, carbohydrate, amino acid, energy and protein metabolism, metabolic processes of phytohormone, DNA methylation and secondary metabolites.

In root, compost application activated the enzymes that are involved in redox homeostasis and the regulation of stress response proteins. These results suggest a protective effect of compost, consequently improving barley growth and stress acclimation.

Metagenomic analysis of soil proved that compost application increases soil microbial community diversity. Compost enriched the beneficial microorganisms and reduced the harmful microorganisms.

3. Economic Benefits

The production of compost is cost effective: The local farmers can make their compost since the inputs come from their own farms. Compost improves grain and straw yield, which could improve the income of local farmers.

Reference

Ghouili, Emna et al. 2022. “Date Palm Waste Compost Promotes Plant Growth and Nutrient Transporter Genes Expression in Barley (Hordeum Vulgare L.).” South African Journal of Botany 149. https://doi.org/10.1016/j.sajb.2022.06.018

Ghouili, Emna et al. 2022. “Proteomic Analysis of Barley (Hordeum Vulgare L.) Leaves in Response to Date Palm Waste Compost Application.” Plants (November). https://doi.org/10.3390/plants11233287

Ghouili, Emna, Ghassen Abid, et al. 2023. “Date Palm Waste Compost Application Increases Soil Microbial Community Diversity in a Cropping Barley (Hordeum Vulgare L.) Field.” Biology 12(4). https://doi.org/10.3390/biology12040546

Ghouili, Emna, Khaled Sassi, et al. 2023. “Effects of Date Palm Waste Compost Application on Root Proteome Changes of Barley (Hordeum Vulgare L.).” Plants: 1–25. https://doi.org/10.3390/plants12030526

GREENING FOOD PRODUCTION & CONSUMPTION: SAVING THE WORLD FROM FOOD POVERTY AND CLIMATE CRISIS

BY TEODORO MENDOZA (PHILIPPINES)

Abstract

The greatest challenge to humankind is how to achieve 50% reduction in global emissions by 2030 and net zero emissions by 2050 to avoid a 1.5-degree centigrade rise in global temperature and its effects on global food shortage and hunger. In this paper, two coupled options are tackled to achieve the stated greatest challenge. These are greening food production and consumption.

The current author did his own calculations based on available technical coefficients. The results revealed that greening production had 13.654 billion tons CO2eq.of avoided emission while greening consumption or no-meat diet 22.68 billion tons CO2eq or a total of avoided or reduced emissions of about 36.335 billion tons of CO_2equivalent.

Carbon emissions in 2018 were 31.5 billion tons CO2eq. It meant that it is possible to achieve not only net zero emissions but also net-sequestering human living through organic farming and adopting plant-based diets and at most vegan-vegetarianism.

Greening production or shifting to low-carbon-emitting food production leads to lower energy use and energy footprint due to non-use of agrochemicals (fertilizers and pesticides) and due to higher carbon sequestered through the soil organic carbon (SOC). Greening of food consumption or a shift to plant based -planetary health diet or consuming less and less meat, and minimizing food wastes could lead to reduced carbon emission.

Reducing meat intake even by 50% can free about 2.0 billion hectares of land of the 5 billion ha agricultural land. Seventy (70) percent of all agricultural lands are devoted to pastures and forage production for ruminant animals. These lands can be devoted to afforestation, reforestation, and agroforestry sequestering back carbon emitted via plant photosynthesis. The energy, nutrients, and water intensive grains to produce for animals are no longer necessary. Animals are fed 56% of all grains and 90% of all soybeans. The anticipated yield reduction due to massive adoption of organic agriculture during the transition stage can be offset with the reduced demand for grains.

Being resource-use intensive and high in greenhouse gas (GHG) food-consumption, a meat-based food is not a diet for all, as poor people are priced out when a global food shortage occurs. Green consumption through planetary health diet is an inclusive diet or diet for all that will not price out the

poor. An accelerated shift to planetary health diet will not harm us and Mother Earth. A meat-free diet is vital to save the world from hunger, food poverty, and the worst impacts of the climate crisis.

Climate change is diet change. Less and less meat is the way to progressive shift to organic agriculture. The human-triggered 6th cataclysmic forecast and global catastrophic food crisis can be avoided.

Keywords: carbon sequestration, climate crisis, diet change, greening production and consumption, organic agriculture, planetary health diet, plant-based diet.

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Dr Ted is an accomplished and well-recognized academic, with membership in various honorific and professional societies. He is also a leading academic in the discipline of crop physiology and ecology, a cross-cutting multi disciplines of farming systems, agroecology, and organic agriculture.

He has authored and co-authored 85 technical papers (28 in ISI and 57 in Non-ISI refereed journals), 4 chapters in a book, and 6 books. He has designed and introduced courses which are currently offered at UPLB (Introduction to Farming Systems, Design and Assessment in Farming Systems, Introduction to Ecological Agriculture, Advanced Ecological Agriculture, and recently, the Energetics of Crop Agriculture.

Work Positions

- Acting Director, of the Farming Systems and Soil Resource Institute, U.P. at Los Baños (1989),
- Deputy Director, Farming Systems and Soil Resources Institute, U. P. at Los Baños (1987 – 1989),
- Head of Crop Production and management division (1996-98),
- Head of Crop Ecology.

Educational Background

- Ph.D in Agronomy (1985) from UPLB and University of Florida (USA),
- M.S. in Agronomy (Crop physiology, Statistics) (1980),
- B.S. in Agronomy (Plant breeding) from UPLB (1977).

CONFLICT RESOLUTION AND PEACE RESTORATION THROUGH ORGANIC FARMING: EVIDENCE FROM MADHUPUR SAL FOREST IN BANGLADESH

BY MD. ASADUZZAMAN SARKER (BANGLADESH)

Maduphur Sal Forest (MSF) is the largest natural inland forest in Bangladesh. The ethnic Gharo and *Bangali* people are the major inhabitants in this forest area. The forest resources have been meeting up their livelihoods sustainably from time immemorial. Formerly the Sal Forest was riches in biodiversity and is now under intimidation of severe deforestation due to settlement of the local people and encroachment for farming (Hossain et al., 2013).

The settlement reached about 50 villages with about 40,000 populations living inside the forest. It is reported that a total amount of 80,000 acres of forest land of the Madhupur garh had been reduced to only 8,400 acres during 1928 to 2000 (Soma Dey, ibid). Both Garo and Bangali communities have been accusing each other of this rapid deforestation. The reason behind this blame was due to historical events.

Ethnic minorities, particularly the Garo and Koch people, were living in harmony with the MSF since time immemorial (Islam et al., 2013). Ethnic people have used forestland and practiced shifting cultivation in the Sal forests since before the British colonial time, and they also paid taxes to the landlord (locally called Zamindar) nominated by the British Governor. For this, the ethnic people enjoyed their formal land rights over Sal forests and were living in peace and harmony. Immediately after the British colonial period, the government abolished the landlord systems and acquired all-natural forestland as the property of the state in 1950.

However, in 1956 the Government ban shifting cultivation practiced by the ethnic minority and resulted in loss of their land rights. Apart from loss of collective rights of the indigenous people over forest resources, the gradual migration of the Bengalis from the plane lands and oppression of forest officials in the MSF area had changed the distinct status of women in the Garo matrilineal society to a large extent (Islam et al., 2016). In recent past, the greens of MSF were turned vermilion red in the bloodshed of Piren Slan against the government-induced Eco Park project or a slain Chalesh Richil during the army-backed caretaker government regime in 2007.

The department of Forest of Bangladesh has initiated many donor-driven development projects in the MSF area with the view of conflict resolving between ethnic minorities and Bengalis, but none of them have successfully resolved the land rights issues and systemically addressed the livelihood of the ethnic people. In later stage, Department of Agricultural Extension Education (DAEE) of Bangladesh

Agricultural University (BAU) implemented the action research project with the facilitation of local NGO named Mohila Kollayan Somity which was financial support by ETC Foundation, Netherlands.

The research team visited the MSF areas several times to identify the interested and relevant household (both ethnic and Bengalis) for forming the group. Consulting with the staff of the Department of Forest (DOF) and Department of Agricultural Extension (DAE) the group was finalized. The following criteria were taken into consideration while selecting farmers for the project. The criteria were: resource poor; should be either small or marginal farmers; should have interest to participate in social forestry program and to cultivate organic vegetables and fruits. Following the above-mentioned guidelines, finally four (04) groups were formed consisting of 25 members in each group. Among the four groups two were ethnic groups and two were Bengali groups.

The project team took the initiative to get access to some fallow land for the project participants. The team succeeded in securing access to some land where groups started planting trees. Total area under tree plantation was 638 decimal/6.38 acres and total numbers of 3828 acacia (*Acacia verticillatum*) saplings were planted by the group members of the project. After tree plantation farmers started sowing different vegetables seed and seedlings (e.g., eggplant, amaranth, spinach, bottle gourd, radish, coriander, patshak (jute), and peas) in the same field.

Field coordinators of the project and the NGO personnel regularly monitored farmers' field and provide them necessary suggestions and consultations (i.e., weeding, irrigation, vermi-compost application, botanical pesticide spraying and staking to the saplings). Data was collected from the respondent farmers twice (before and after the project interventions) by the research team using structured interview schedule.

The research team also organized hands on training for the group members on vermi-compost and botanical pesticide preparation for starting organic farming (i.e., forest trees, pineapple, papaya, pumpkin, radish, spinach etc.). The local NGO and research team also provide both groups of farmers with technical support and advice whenever necessary. They also organized a monthly joint consultation meeting for them which helped in minimizing the social gaps remains among them, improving trust in each other and resolving conflicts.

Findings of the study revealed that due to the introduction of alternate livelihood approaches income of both groups of people from social forestry as well as organic farming have increased significantly.

Additionally, the introduction of improved cookers by the research team also contributed in minimizing the dependency of ethnic and Bengali people on forest for firewood has reduced in great extent. The project team also made a market linkage for both groups to ensure premium prices of their organically produced fruits and vegetables from the social forest. A small number of them have started to sell their

additional vermin-compost and botanical pesticides to neighbouring farmers that have created an opportunity of additional income for them.

The findings of the study also revealed the both the groups of people are enjoying better food security as well as better income at present due to adoption of organic farming in social forestry programme. All these initiatives of the research team have contributed to conflict minimization and creating a peaceful environment between the ethnic Garo and Bangali people. Thus, based on the experience of the pilot project, it can be concluded that if it is possible to replicate the same model of organic farming along with social forestry in total MSF areas that might works in sustainable peace restoration as well as permanent conflict resolution. However, to let it sufficient funding and legislative support from all concerned agencies are essential.

MD. ASADUZZMAN SARKAR

Dr. Md. Asaduzzaman Sarker is a Professor in the Department of Agricultural Extension Education at Bangladesh Agricultural University, Mymensingh. He has been continuing as a faculty in Bangladesh Agricultural University since 2003. He received his Bachelor of Science in Agriculture (B.Sc.Ag.) Degree and Master's in Agricultural Extension Education degree from Bangladesh Agricultural University. He has a second masters in Agricultural Sciences from Yamaguchi University, Japan in 2007.

He has completed PhD in Bio-production Science from Tottori University, Japan in 2010. He also continued a post-doctoral fellow at Yunnan Academy of Agricultural Sciences, Kunming, Republic of China in 2018. Additionally, he has served as Head of the Department (2015-2017) and Director, Bangladesh Agricultural University Extension Centre (2020-2021).

FARMER-LED RESEARCH (FLR) TO PROMOTE CLIMATE-RESILIENT ORGANIC AGRICULTURE FOR ENHANCED FOOD SECURITY

BY KUSTIWA ADINATA (INDONESIA)

The Indonesia Peasant Community Organization/ Jaringan Masyarakat Tani Indonesia (JAMTANI) works in villages located in the low-lying coastal area in the Provinces of West Java (Pangandaran Regency) and Central Java (Cilacap Regency).

In this area, climate-related disasters strongly affect farmers on land close to the sea. A rise in sea level increases inundation risks through abrasion of coastal land and tidal floods. It has also led to the salinization of surface water and groundwater reservoirs, which has been intensified by global sea-level rise. Therefore, farmers´ fields are partly flooded for longer time periods and contain too high salt levels for good crop growth. Farmers' harvests – especially for the main staple crop, rice – are therefore shrinking. Sea-level rise also causes shortage of drinking water in more exposed villages. Reduced end-of-season rainfall causes cracked soils, making them difficult to manage. Farmers must also cope with strong winds that push over rice plants and new and faster-spreading plant pests and diseases.

Approach

The farmer-led research (FLR) approach recognizes that the most relevant contribution to adaptation and livelihood improvement often stems from farmers' innovations. Based on andragogy (adult-learning principles) whereby farmers are involved from the beginning in planning, monitoring, and evaluation, FLR is based on real problems identified by farmers in the field, and merges ideas from both sides: professional researchers and farmer researchers. Together, they go through a learning cycle that is jointly and transparently designed, carried out, monitored, evaluated, and documented. While external knowledge and innovations developed in other contexts are brought into the process, local knowledge and experience are at the centre of attention. The farmers, as self-determined agents of the research are in the centre of the investigation and innovation process – and in the driver's seat.

The FLR approach builds on JAMTANI's Climate Field Schools (CFSs) being conducted in all farming communities in the project area. Monthly or bimonthly sessions during on crop growing cycle also include joint reflection on farmers' perceptions of climate variability and climate change. The farmers discuss how temperature and rainfall have changed locally during the last 30 years, how to use weather information during the planting and growing seasons and how to use simple tools like rain gauges and make temperature and humidity readings. They discuss the impacts of climate change that they have in terms of floods, salinity, drought, pests, and diseases. In each CFS group, female and male farmers

select one plot for joint experimentation and learning. CFSs are crop specific (e.g., rice) and last for one growing cycle.

Since 2017, JAMTANI's FLR approach took the CFS approach a step further, as it facilitated collaboration between the farmers and researchers from UNPAD University (Universitas Padjadjaran). Since then, UNPAD cooperates with the participating farmer researchers and JAMTANI, adding scientific know-how and knowledge in the process. Farmers were encouraged to formulate research questions and conduct more systematic trials on experimentation plots and in their own fields. Thus, farmers are not only conducting experiments themselves; they are also the ones deciding on their goal and research questions. The universities support them in designing and implementing a trial according to a jointly developed standard protocol by farmers and researchers.

In order to identify, test and select resilient organic-farming practices, an inventory of ideas and existing farming practices was developed by farmers. This includes practices already implemented in the area that respond to the farmer-identified problems as well as practices that farmers had seen elsewhere or had merely heard of. The research farmers screened these practices, checking against a set of jointly developed criteria used in agroecology. The more criteria are met, the more likely that farmers improve their adaptive capacity when implementing the respective practice.

Continuous monitoring, exchange and consultations enabled learning on all sides. JAMTANI helped farmers to monitor results in weekly gatherings, university students followed and assisted in the documentation.

In order to share results of the FLR, larger community meetings were held, as well as field days with guests from outside the villages including farmers from neighbouring villages, government officials from the agricultural department, and journalists. JAMTANI organised farmer exhibitions at UNPAD ("farmers go to campus"), where farmer researchers presented their most relevant innovations and research results, while staff, students, government representatives and politicians asked questions.

Selected Outcomes

Innovations for Enhanced Organic Climate-Resilient Agriculture

A.1 Organic Rice Production

Farmers in the project area managed to make more than 112 ha of land "productive again" through their joint efforts in selecting and multiplying salt-tolerant rice varieties. In addition, they investigated organic production methods (e.g., applying compost and plant growth-promoting rhizobacteria, using natural and biological pest and disease control methods), which helped them achieve very good yields of more than 5.6 tons/ha of dried un-hulled rice. Currently, farmers are seeking to improve compost quality and application by trying out compost briquets.

A.2 Already Five Salt Tolerant Rice Varieties

Five salt-tolerant and flood tolerant rice varieties were identified and developed – Mendawak, Inpari 35, Inpari Unsud 79, Inpari 43 and Inpara 9 – have been officially registered and JAMTANI farmers multiply them as certified seed producers. Besides enhancing food security, this gives farmers additional income through the sale of seed. The selected varieties are known to be more climate friendly because of their relatively lower carbon and methane emissions.

A.3 Azolla – An Ideal Multipurpose Organism for Organic Farming Production

The fern Azolla, which grows free-floating on fresh water, is one of the fastest-growing plants on the planet because of its symbiotic relationship with a cyanobacterium ("blue-green algae") called *Anabaena*. The participants in the FLR brainstormed and tested multiple uses of Azolla. Currently, almost all participating farmers and many neighbours are cultivating organic Azolla. By adding Azolla to Green Liquid Biofertilizer to enhance soil fertility and plant growth, farmers increased the average yield of organic rice by 700 kg (from 6.5 to 7.2 tons/ha).

Some farmer researchers successfully tested Azolla as a substitute for non-organic rice bran in poultry feed, thus making chicken and duck-egg production more profitable. Also successfully tested Azolla for human consumption and are now producing and marketing organic Azolla chips.

KUSTIWA S ADINATA

Kustiwa Sudrajat Adinata was born in 1971 in Bandung Indonesia. Growing up and being raised in a farming family, he is familiar with the agricultural environment. After graduating from Senior High School 1990, he became a farmer and since then, have been very active in applying ecologic cultivation techniques. He pursued a diploma at the Faculty of Agriculture, University of Padjadjaran, graduating in 2012.

Kustiwa founded the Indonesian Integrated Pest Management Farmers Association (IPPHTI) on 20 July 1999 and has been active up to June 2018.

On 12 December-2018, he founded the Indonesia Peasant Community Organization / Jaringan Masyarakat Tani Indonesia (JAMTANI) focusing on Climate Friendly issues. JAMTANI is also a medium in the struggle to defend his rights as a farmer.

Since 2011, he has worked on climate change issues in numerous projects e.g.: CALP (Climate Adaptation Learning Process), CRAIIP (Climate Resilience Agriculture Innovation and Investigation Project), Adaptation to Climate Change Mitigation and Disaster Risk Reduction.

He is the author of several publications including the book ‘‘Practical Assessment of soil ecology to promote Climate Resilient Agriculture” published in 2022. Other publications in scientific national journals and international journals include such topics as floating paddy field, salt tolerant rice varieties, Covid Impacts on farmers, briquets organic, Green Manure, Climate Model Village, Climate Field School etc.

Kustiwa is also an active participant and speaker in national and international conferences such as IAASTD, UNFS, Tropentag, WSSD and UNFCCC-COP.

FORMULATION OF BIOORGANIC FERTILIZER FOR SUSTAINABLE AGRICULTURAL PRODUCTION UNDER PAKISTAN'S CLIMATIC CHANGE SCENARIO

BY NOSHIN ILYAS (PAKISTAN)

Pakistan is the seventh most climate change-vulnerable nation. In an environment where sustainable agriculture is at risk from climate change, it is imperative to manage these risks. Because soil is a finite resource, pressures like salt, dryness, and heavy metals negatively impact agricultural productivity.

All around the world, agricultural chemicals are degrading soil's physicochemical and biological makeup and upsetting agroecosystems. Alternative eco-friendly approaches are becoming more popular due to soil and environmental health concerns. Utilizing plant growth-promoting microorganisms, various biomasses are bio-converted into value-added bio-fertilizers for direct application in fields.

Our goal was to determine if Plant Growth Promoting Rhizobacteria and other modified biomasses may be used as efficient soil amendment strategies to enhance plant growth in response to the abiotic challenges projected to result from climatic change. Experiments were carried out to identify and assess the potential of stress-tolerant Rhizobacteria, compost, biochar, and bio-organic fertilizer as modified biomasses for being used as soil supplements. We looked at different morphological, physiological, biochemical, growth, and production factors.

From the stressed areas, microbial strains were isolated. Isolated microbial strains were identified through physiochemical and 16s rDNA sequencing, whole genome sequencing, and phylogenetic analysis. Stress tolerance and different plant growth-promoting traits of isolated strains were evaluated under normal and stressed conditions. Inoculation of seeds with PGPR, compost, biochar, and bio-organic fertilizer improved all growth and productivity parameters, increased nutrient status, and improved osmolyte production and hence helped survival and growth under stress conditions. Building our understanding of the interdependence of micro-organism communities, soil nutrient status, and plant health will be necessary for understanding climatic effects on soil health and plant growth.

DR. NOSHIN ILYAS

Dr. Noshin Ilyas is working as an Associate Professor in the Department of Botany, PMAS Arid Agriculture University Rawalpindi, Pakistan. Earned her Ph.D. in Plant Sciences from Quaid-i-Azam University, Islamabad, Pakistan. Always distinct in the academic carrier with a first-class first position in master's and did Ph.D. under a fellowship from Higher Education Commission, Pakistan.

She has a good publication record in prestigious journals with an impact factor of above 200 and 2000 citations. She is on the editorial board of various journals like PLoS one and sustainability. She has earned research grants from HEC and PSF. She is an active member of the scientific community and combines a focus on achievement with a passion for scholarly work presenting at various international conferences.

She is president of Pakistan Asian PGPR society and a member of various professional societies. She has received Research Award in the female category of Assistant Professor /Lecturer from PMAS-Arid and 1st Prof. Dr. Abdul Hameed Gold Medal in Applied and Environmental Microbiology from Applied Zoological Society of Pakistan.

THE IMPACT OF MYCORRHIZAL FUNGI, PARTIALLY ACIDIFIED PHOSPHATE ROCK AND COMPOST EXTRACT OF PALM WASTES IN AVAILABILITY OF SOIL PHOSPHORUS AND IN PRODUCTIVITY OF MAIZE

BY JWAD ENA MAHD (IRAQ)

The yellow corn (*Zea mays* L.) is one of the important strategic and economic crops in the world including Iraq. It is grown in large areas all over the world and ranks first in term of grain yield per unit are, it stresses the soil and responds to the added chemical fertilizers due to the soil's lack of organic matter, macro and micronutrients.

In accordance with the world's trends towards the use of alternatives to industrial and chemical farm inputs, the importance of implementing this research came.

This experiment was carried out in the autumn of year 2021, in a field in Baghdad province that belongs to the National Center for Organic Agriculture / Iraq Ministry of Agriculture, where the soil has silty clay texture (SiCL). In aim to evaluate the efficiency of Mycorrhizal fungi inoculum and three phosphate sources: partially acidified phosphate rock (40%), natural phosphate rock, and triple super phosphate at a rate of 60 kg P ha^{-1}, as well as the addition of liquid fertilizer (extract of palm wastes compost) (i.e. the studied treatments were A0: without addition, A1: partially acidified phosphate rock with a percentage of 40% (8.02% P), A2: natural phosphate rock P 10.22 with a minute size of 0.5, A3: triple super phosphate P 21%, O0: without adding compost extract, O1: with addition of palm waste compost extract, which was extracted from a quantity of (10) mega gram ha-1, D0: without bio fertilizer inoculum, D1: pollen.

Bio fertilizer inoculum At a depth of (15 cm) placed in a capsule and the inoculum was added at a rate of 50 gm / hole when planting seeds), They have been assessed as a single effect, a double and triple interaction in term of availability of soil phosphorus and the yield of yellow corn.

The experimental units were as follows: 4 sources of phosphate fertilizer x 2 treatments of organic fertilizer x 2 treatments of bio fertilizer x 3 replicates = 48 experimental units. This experiment was designed as a Randomized Complete Block Design (RCBD), and factorial analysis is used by three replicates, and the treatments were randomly distributed to each sector. Planting dimensions were 0.75 m between lines versus 0. 30 m between plants.

The available phosphorus was measured in the soil after harvest according to Olsen method then estimated by spectrophotometer at 882 nm (Page *et al*., 1982), and ten plants at full maturity were harvested, the corncob were separated, and air dried, the dry weight of grains was calculated, then

separated after adjusting the weight on the basis of 15.5% humidity, as well the amount of the total yield was evaluated according to Al-Sahoki (1990).

The results showed that the addition of mycorrhizae resulted in a significant increase in the available phosphorous concentration and the yield of maize plants, with the highest values (22.764 mg. kg^{-1} soil, 6.46 mcg. ha^{-1} respectively), whereas they were (22.234 mg P kg^{-1} of soil, 6.06 mcg. ha^{-1}) by the treatment of partially acidified phosphate rock (40%).

The fertilization with compost extract also showed a significant effect in the studied indicators, as they reached (22.764 mg P kg^{-1} of soil, 6.38 mcg. ha^{-1}, respectively).

Interaction between acidified phosphate rock 40% and liquid fertilizer (compost extract of palm residues) gave a significant superiority in both studied traits, they were (25.597 mg P kg^{-1} soil and 6.43 mcg ha^{-1}, respectively).

Also, the interaction between acidified phosphate rock 40% and mycorrhiza gave a significant superiority in the concentration of available phosphorous and the yield, reaching 25.387 mg P kg^{-1} soil and 6.38 mcg ha^{-1}.

The interaction of liquid fertilizer and bio fertilizer was also resulted positively in terms of available P and productivity (28.248 mg P kg^{-1} soil and 6.73 mcg ha^{-1}, respectively).

The triple superphosphate treatment with compost and mycorrhizal agent (A3O1D1), exceeded and gave the highest value 33.035 mg P. kg^{-1} soil, followed by the treatment of the triple interaction between acidified phosphate rock (40%), compost extract and mycorrhiza inoculum (A1O1D1), which gave 30.581 mg P. kg^{-1} soil.

Consequently, with regard to yield, the triple interaction between phosphate fertilizer sources, liquid fertilizer and mycorrhizal inoculum well affected, as this treatment (A3O1D1) was superior, and it gave the higher value reaching (7.23 mcg. ha^{-1}), followed by the triple combination of acidified phosphate rock (40%), liquid fertilizer and mycorrhizal inoculum (A1O1D1), in which grain yield was about (6.91 mcg. ha^{-1}), finally came the treatment of natural phosphate rock with liquid fertilizer and mycorrhizal inoculum (A2O1D1), which recorded a yield of (6.73 mcg. ha^{-1}).

In searching for a scientific explanation for the effect of these fertilizers, we found that natural phosphate rock improves plant growth and its root mass, as the plant has the ability to liberate mineral elements through root secretions or reduction the medium pH in the rhizosphere region.

Adding organic fertilizer (compost extract) contains organic acids that coat the surfaces on which phosphorus is adsorbed, and this helps to reduce the adsorption of phosphorus, and leads to a decrease soil pH.

A positive trend when added mycorrhizal inoculum may be due to the fact that mycorrhizae have an important and significant role in the secretion of the enzyme phosphatase by fungi hyphae, which works to dissolve organic phosphorus and convert it into forms ready for absorption by the plant.

In conclusion the chemical fertilization can be replaced by those from natural resources to improve soil nutrients and plant productivity, which opens way for producing corn according to organic agriculture system, achieving higher profit and providing new marketing and export opportunities under sustainable conditions, that also ensures the preservation of environment components from pollution, and provide a safe diet for humans.

Key words: mycorrhiza, phosphate rock, compost extract, yellow corn. soil phosphorus, yield.

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International researcher and inventor

- Member of the Australian Biologists Association.

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Academic Achievements

- Bachelor of Plant Protection/ College of Agriculture/ University of Baghdad / 1991-1995

- Master of Soil Science (Microbiology) / University of Western Australia 2010-2013

- Ph.D. Soil Science (Soil Fertility)/ College of Agriculture/ University of Baghdad/ 2015-2017

- Head of Prevention Department / Najaf Agriculture Directorate / 2001-2003

- Director of AL- Hurea Agriculture Department / Najaf / 2003-2009

- Engineer at the National Center for Organic Agriculture/ Baghdad/ 2013 - until 2020

RESTORATION OF SUSTAINABLE LAND USE MANAGEMENT SYSTEM AT BIBLE AREA IN INTERMEDIATE ZONE OF SRI LANKA FOR CLIMATE CHANGE ADAPTATION AND NATURAL RESOURCE MANAGEMENT FOR FOOD

BY VICTOR ATHULA PRIYANTHA (SRI LANKA)

Sri Lanka is an island situated off the south –eastern tip of India, covering an area 6.5 million hectares. Its population exceeds 21 million, about 77% of whom are rural residents. Rainfall is uneven and broadly divides the country into three main climatic zones: Wet Zone, (mean annual rainfall, above 2500mm), Intermediate Zone (mean annual rainfall, 1800-2500mm) and Dry Zone (mean annual rainfall,1200-1800mm).

Since Sri Lanka is a tropical country, amount of sunlight is received throughout the year. Therefore, a high amount of biological production occurs within available high biodiversity and density of vegetation cover. These conditions were very wisely used by ancient Sri Lankans and developed into a sustainable land system, which followed nature phenomena. The different land use patterns in different places of catena according to the condition of the soil topography, micro-climate and hydrology by conserving natural resources including bio- diversity, soil water and micro-climate were utilized to produce food, medicine and other requirements to sustain rural livelihood and food security. Especially natural forest cover was conserved in highest elevation of the catena for this conservation proposes.

Sri Lanka has a history of over 2500 years where a population of over 90 million had been present. One of the world's most advanced irrigation civilizations was present at that time and even the export of rice had taken place. This agro-ecosystem consisted of three main components: home garden, *Chena* Cultivation and Paddy cultivation which were sustainable land management systems and compatible with nature conserving soil water, micro-climate, biodiversity adapting to extreme weather condition while providing foods, medicine, timber, and firewood for community.

This suitable land use pattern is still available in *Bibile* area which is situated in intermediate Zone and its administration area is *Monaragala* District in *Uva* Province. This is the main catchment area of the largest reservoir in Sri Lanka it is named *Senanayake samud*raya which is capacity is 770000 acer feet and it feeds over 120000 AC of Paddy field in dray Zone of eastern part of Sri Lanka.

The topography of the *Bibile* area is hilly terrain at upper elevation where natural forest cover or forest home gardens are presented, and lower elevation consists of valleys where Paddy fields and upland crops cultivation are prevalent. These forest home gardens have different canopy layers with timbers trees such as *Lunumidella*, *Sapu,* Teak and etc, tree foods crops such as Coconut, Jack, Mango, *Rabutan*,

Break Fruits, *Magusteen*, Durian, spices such as Pepper, Ginger, Turmeric, Vanilla, Cinnamon and cte, vegetables, green vegetables, and medicinal plants.

Many traditional James which can be used as stable foods are also presented in these forest home gardens. An average of over 20 types of plants species are presented at each and every home gardens. In addition, some home gardens consist of animal husbandry such as poultry, Cattle, Goat etc. Average SLRS .1 million (US$ 3000) income is given by one ac of this type of home garden per year, in addition to the timber, firewood and medicines provided by these forest home gardens.

Much scientific research confirms that these forest home gardens are analogues to natural forest cover of the area in architectural structure and ecological functions, in addition to socio economic benefits provide from these home gardens. These home gardens are still maintained by farmers in *Bibile* area without using chemical external inputs with agro-ecological practices. However, agrochemicals are used for Paddy cultivations as well as commercial monoculture crops cultivation presented at lower elevations of this area. Hence Lanka Organic Agriculture Movement (LOAM) decided to restore this land use of the *Bibile* area as a sustainable land use management system using agro ecology technologies for climate change adaptation and natural resource management with food security and peace as demonstration model for Sri Lanka as well as for international community.

This is being done with collaboration of relevant government agencies such as Department of Agriculture, Department of Agrarian Services, divisional secretaries offices etc. The main strategy used for restoration of sustainable land use management systems is the application of total ecosystem management system as per the landscape of the area.

Traditional organic rice varieties which are highly adaptation for climate change impacts, which have high nutritional value and medicinal value, and which can be grown organic farming technologies, are being introduced for the paddy field situated in lower elevation of the area and agroecological technologies are being introduced for commercial level crop cultivation in lower elevation.

Existing forest home gardens are being improved by using analog forestry technologies by mapping existing situation of each forest home gardens and developing designing plans and management plans. Shade management, introducing new crops, trees or suitable places and promoting animal husbandry, introducing compost and liquid fertilizer preparation are main activities that are being done in improving forest home gardening.

Generated firewood from these forest home gardens is being supplied to power generation plants as well as for the dryers of tea factories as a promotion of renewable energy. Farmer organizations will be formed and strengthened to implement processing and marketing of the products produced from the

area .by developing entrepreneurship among farming communities to implement the processing and marketing system.

At first, communities are encouraged to consume organic products produced from them at their home gardens and paddy field, then establishing village level fairs in every week for selling the products produced within the village and the leftover balance to be sold to neighboring townships and urban cities through direct marketing system. In addition, some products produced from the area will be supplied to organic exports companies through developed famers organization. PGS, local third-party certification and international certification will be introduced for this area as per the requirements with suitable processing facilities.

There are three main races (Sinhalese, Tamil, and Muslims) are living in this area and each race has special expertise to implement the restoration process. The Sinhalese have expertise on traditional farming knowledge while the Muslim community have expertise in entrepreneurship specially marking and processing and the Tamil community have expertise in animal husbandry as well as management of plantation crops such as rubber, coconuts, and pepper. This diverse expertise can be used properly for restoration activities while improving interrelationship among these communities' assuring peace among them.

The restoration of existing sustainable land use management system in the *Bibile* area will conserve soil, water, microclimate, and biodiversity while providing the required diverse foods and medicine assuring food security with healthy foods for the community living within the areas by improving their socio-economic status through increased production and value addition and marketing. This also conserves the largest Sri Lankan water catchment reservoir which provide water to the dry zones of eastern part of Sri Lanka, highly vulnerable to climate change impacts.

This will be a demonstration model for other parts of the Sri Lanka and Asia on sustainable land use management system for climate change adaptation and natural resource management for food security and peace.

V.M.B ATHULA PRIYNATHA

V.M.B Athula Priynatha, BSc Agriculture (Sp), MSc (NRM), was born in Central hills of Sri Lanka.

In 1991, Analogue forestry technology was introduced as an Agro-forestry model at Maho region in dry zone of Sri Lanka and at Welimada region in central hill of Sri Lanka through National Cooperative Council (NCC) of Sri Lanka with financial support of Canadian Cooperative Association (CCA).

In 1995, joined to Lanka Organics (Pvt) Ltd which is pioneering company in growing, processing and exporting organic products in Sri Lanka as extension officer and small scale organically certified farmer groups were developed with small scale farmers who have implemented agroforestry model with national cooperative council in 1991. The first Sri Lankan group certification was started in this project area, and it was expanded to other areas of the county.

In 2009, joined to *Seethavelley* Biodynamics (Pvt) as a senior manager and developed small scale certified farmers groups in many areas of the county and contribute to develop the Marginalized Organic Farmers Association (MOFA) as fair- trade farmer organization.

In 2011, incorporated *Mihimandla* products (Pvt) Ltd for market the organic products produced by small scale famers and in 2013, marketing organically certified organic products was started with collaboration of *SriCert* Certification body through Sri Lankan Leading Super Market Chains.

Since 2000, served as an executive committee member of Lanka Organic Agriculture Movement (LOAM) and currently serving as the secretary of LOAM.

BIODIVERSITY ENRICHMENT AND CARBON SEQUESTRATION AS BASIS AND RESULT OF ORGANIC FARMING

BY WALTER SIEGFRIED HAHN (GERMANY / PHILIPPINES)

Farming is widely known today as one of the big contributors to the environmental challenges of our time, be it loss of topsoil, warming of the planet, biodiversity loss, destruction of landscapes. This was not always so and need not be so at all. In fact, many landscapes of Asia, Africa, Europe, and the Americas give testimony to how the rich biodiversity - of both cultured and wild plants and animals - are results of early holistic farming systems.

The discovery of terra preta a few years ago in the Amazon region made it clear that carbon sequestration within agricultural systems need not be invented today - it has been part of indigenous heritage in many parts of the world for thousands of years. And the fragile rice terraces in many countries of Asia are but one example of sustainable landscape development. Obviously, the huge variety of farmed animal races and plant varieties which existed still a few years ago is part of the heritage of farmers of many generations. But very probably, even some of what we understand as wild varieties, may have also come out of breeding activities.

Dedicated organic farming today should be seen as a cultural task, a science-based approach that can reach into the sacred, through which food security can be reached expressively through proper management of natural resources and development of flexible systems able to adapt to changing circumstances. In fact, carbon sequestration and biodiversity enrichment should not be seen as additional to other farming tasks, but as the basis of agriculture in general, because a rich biodiversity and the keeping of carbon in the soil make a farm more sustainable, more resilient, and healthier.

The development of landscapes in general and of agri-cultural biodiverse islands must be seen as a task of organic agriculture and a basis of food security. The notion that agriculture is a big contributor to the environmental challenges clearly hints to the fact that agriculture is an important co-creator of the world as it is. Now, the destructive spiral must be turned around into a creative spiral.

Chinese philosophy talks about the five phases, mostly wrongly translated as five elements. The five phases can go towards the destructive or the constructive, generating direction, id est: the same elements or phases can be used either way. We should be done with the stress on the destructive cycle for now and start implementing more of the generating cycle: fueling, forming, containing, carrying, and feeding.

The cycle starts with the wood phase = fueling and the sign of rabbit belongs to wood. We are in the year of the rabbit, a perfect start to the generative cycle. This year and this Organic Asia Congress, in

particular, are obviously meant to fuel this cycle of re-generation and my contribution is especially meant to fire us up, to encourage us to take responsibility for our thoughts and deeds and make a strong contribution to re-generation, much stronger than we maybe so far thought we could give. How to start?

First, we must understand that our thinking defines what we see. Do I see environment = something outside of me and opposed to me? Or do I see myself as part of ecology (the „common house “)?

Second, we must understand that we humans are now co-creators of our world. We were born into a world that already existed and we are called to understand its laws. Based on that, we can destroy or build up - these are the basic directions we can take. When we build up, it makes a lot of sense to see our activities, small as they may be on even a hectare of land or two, in the context of the whole planet and our neighbors far and wide. Even with a small piece of land, we are part of the development of landscapes, biodiversity, and climate.

Third, understand that we farmers - as the term agriculture suggests - are actually cultural workers. We co-create based on our never-ending efforts to understand. Never cease to try and understand landscape, weather, plants, animals, terrestrial and cosmic influences. Be aware that biodiversity enrichment is not only a goal of environmental activists but adds to the overall health of our farm and our landscape. We must understand the overall role that plants and animals play. What are so-called pests are real indicators to show us an im-balance or a farming mistake. Medicinal plants also have healing properties on farms or landscapes: as an example, take the marigold which many farmers already plant within their farms as it is known how it balances insect populations.

Fourth, while we must observe ourselves, somewhat become scientists ourselves, we need the support of dedicated scientists. We need their help to understand plant sociology: which plants belong to a place. We need to be able to document our progress in biodiversity enrichment, carbon sequestration, food security, facilitation of peace. When we do not just talk, but we can document, then farmers should also be rightfully paid for their contributions to culture, civilization and the wellbeing of mankind and earth.

In our own farmlands in Palawan and in the farms that we advise, the above-mentioned considerations have been implemented. They come with surprising effects for the health and the satisfaction of all people concerned. As an example, lettuce cannot be grown properly in the tropics - it never makes a big, full head as we know it from temperate climates. It is much easier to grow, for example, cock´s comb, brasilean spinach, camote tops, pansit pansitan, alugbati, talinum, saluyot. These plants are also very resilient. But what is even more interesting: the nutrition values and health benefits are so much higher, that there is no rational reason at all to grow and consume lettuce. And we are not even mentioning the amazing treats for the taste buds that come with such plants. As for the satisfaction of

the people, the farmers and farmworkers certainly experience their humanity more when seen as cultural workers and contributors to the wellness of people and planet than just as farm hands, maybe paid on a daily basis.

WALTER SIEGFRIED HAHN

Walter Siegfried Hahn was born in 1958 in Bavaria and has spent all his life farming and gardening. Born into a peasant family, he grew up with all kinds of animals and crops on a conventional but to today's standards, quite romantic, holistic farm.

At 14, he discovered the organic approach and started trying things out on his own research plots. After high school, he underwent a formal gardening training of four years, which together with the following engagements, led him to experience the most diverse forms of gardening, from landscaping to herbs, vegies, fruits, and tree nursery to different approaches of organic and biodynamic farming.

Becoming more and more aware of the lack of consciousness of consumers as well as the lack of young farmers, he started reaching out to the public through his sensory experience fields since the end 1990ies. Through these, he was able to expose hundreds of thousands of visitors to natural phenomena including agriculture in Europe and North America, and in the last few years in Asia, especially in China.

Besides building sensory experience fields, he is today engaged within South-East Asia as the only certified biodynamic advisor of the Philippines and also as the President of Koberwitz 1924 Inc, located in Puerto Princesa, Palawan, which is dedicated to agriculture, nutrition, health and education.

SOIL ORGANIC CARBON DYNAMICS UNDER THE VISAYAS STATE UNIVERSITY IN THE PHILIPPINES CONDITION

BY KATHYLN QUION (PHILIPPINES)

Soil organic carbon (SOC) influences the soil's physical, chemical, and biological properties, thus affecting fertility. Soil organic carbon accounts for 50% of the total soil organic matter (SOM). High SOC usually results in increased crop yield, thus benefiting agricultural production, food security, and climate mitigation. However, changes in SOC are associated with carbon input from organic materials.

This study was conducted in the experimental area of the Department of Agronomy, Visayas State University, Visca, Baybay City, Leyte, Philippines, from August to December 2017 to assess the organic carbon dynamics of lowland soil from first to sixth cropping. It was laid out in Randomized Complete Block Design (RCBD) with four replications and three treatments. Twelve plots measuring $30m^2$ (5m x 6m) with an alleyway of 2m between replication and treatment plots were utilized in the study. The same treatments were used for the croppings except for the fifth or residual cropping was applied. The designated treatments include T1– best bet production system, T2– Organic farmers' practice in Leyte, and T3 – Conventional farmers' practice in Leyte.

Three soil samples per treatment per replication per cropping were collected from the experimental area before land preparation and after harvesting per cropping at a depth of 0-20 cm. These samples were air-dried, pulverized, sieved, and analyzed. The results of the study revealed that SOC changes with cropping. The second cropping showed higher SOC than the rest of the cropping period. There was also a noticeable reduction of SOC from the first to the fourth cropping due to alternate drying and wetting of the soil. The soil was exposed to dry conditions with T1 when rice was alternately planted with mungbean (*Vigna radiata* L.) as green manure about seven weeks after the rice was harvested.

Similarly, T2 and T3 were exposed to the same condition due to synchronous rice planting among treatments. Although, an increase of SOC in the fifth or residual cropping was noted, which was attributed to the temporary cessation of the application of treatments wherein it had not undergone prolonged alternate wetting and drying. In the sixth cropping, SOC in all production systems was comparable. The results suggest that organic amendments can be a good substitute for inorganic fertilizers in improving soil fertility aside from producing safe food to eat.

Keywords*:* lowland rice, lowland soil, production systems.

KATHYLN QUION

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She teaches some subjects about organic agriculture, agricultural production and technology development. She completed her BS degree in Agriculture at BISU–Bilar Campus and MS in Agronomy (minor in Agriculture Extension) at Visayas State University last 2018 as a DOST-SEI NSC-ASTHRDP scholar.

Currently, she is a study leader and project staff level II of a research project on Bohol Cacao Industry Information System (BCIIS) Project Phase II and GIS Resource Assessment of the Marginal Lands in Central Visayas projects, respectively. She is also currently doing research on the potential of Adlay (*Coix lacryma-jobi* L.) in the province of Bohol.

COMPOSTING OF ORGANIC WASTE: A SUSTAINABLE ALTERNATIVE TO FACE CLIMATE CHANGE

BY KHALED SASSI (TUNISIA)

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This study goes in pursuit of investigating the relationship between climate components being the precipitation amount, temperature and CO2 emissions and the concept of food security, thus climate change could disrupt all dimensions of food security in convoluted ways. Furthermore, climate change may damage the agriculture sector in several ways summed up on reduction in crop yields, over cost on food marketing, increased extent of pest invasion, restraint water availability, aggravation of drought periods, reduction in soil fertility, low livestock productivity and high production cost.

These considerations are valid at global, continental, and local scales, therefore in order to increase food security and environmental sustainability in agricultural systems in Tunisia, an integrated approach to soil fertility management is needed to maximize agricultural production while minimizing depletion of soil reserves, nutrients and degradation of physical and chemical soil properties. In this context, an experimentation was carried out within the composting unit managed by the Association

for the Safeguarding of the Oasis of Chenini (ASOC, Gabès, Tunisia), for the purpose of studying the effect of adding compost and its extract on soil properties and the production of organic barley (*Hordeum vulgare* L.). Results of physico-chemical (pH, EC, TOC, N Kjeldahl, etc.) and microbiological (faecal pollution indicators, count of pathogenic bacteria, microbial biomass, etc.) analyzes revealed a finished product (compost) that compliant with the AFNOR NFU 44-051 standard relating to the quality of organic amendments.

Additionally, the results demonstrated that soaking organic waste in water in the presence of cow dung accelerated the composting process (a gain of about 25 days compared to the multilayer windrow) while increasing the duration of the thermophilic phase (hygenization phase). As well, the assessment of the produced compost quality was determined by means of the percentage of barley seed germination in response to different compost extract concentrations (0%, 25%, 50%, 75% and 100%).

Obtained results showed that produced compost has a positive impact on seed germination along with plant growth. Besides, the effectiveness of the compost and its extract as an organic biofertilizer was also studied on the production and nutritional quality of organic barley. A total of 4 treatments were arranged ((T1) Control; (T2) organic soil amended with 50 tons/ha of compost; (T3) organic soil amended with 50 tons/ha of compost associated with foliar spraying of compost extract during different growth stages and (T4) three foliar sprays of compost extract). It was approved that the compost and its extract increased most of the yield parameters. The treated samples showed an improvement in the plant absorption of macro and micronutrients (N, P, K, Ca, Mg, Mn, etc.) which improved their protein content compared to the control.

Hence, this study shows how adoption of good practices in Agroecology and Organic agriculture could alleviate the impact of climate changes on food security.

KHALED SASSI

Dr. Khaled Sassi is a Full Professor in sustainable agriculture at the National Agronomic Institute of Tunisia (INAT). He's a PhD graduate in Crop Production Sciences from the INAT since 2008. He also has a postgraduate degree in agronomic sciences and bioengineering from the Gembloux Agricultural University (Belgium).

In 2015/2016, he successfully participated in the Organic Leadership Course (OLC) that was organized by IFOAM - Organics International. After this training, in April 2017, he was selected to be part of the first OLC Master Class that took place in South Korea. In 2019, he served as a trainer in the OLC course of the OM4D project in Togo.

Presently, for four years now, he's the General Manager of the Technical Center of Organic Agriculture (CTAB). With his CTAB team, he leads the national technical coordination of the organic sector in Tunisia. During the Organic World Congress 2021, he was re-elected in Rennes (France) as Member of the new ISOFAR World Board for the tenure 2021 to 2024. He has also coordinated several international projects funded by GIZ, USAID, AFD… mainly in agroecology.

POLICIES AND INITIATIVES FOR INTEGRATING LIVESTOCK IN ORGANIC FARMING SYSTEMS AND THE EFFECTS ON OUR CLIMATE

BY MAHESH CHANDER (INDIA)

India has huge livestock (536 million) and poultry (851.81 million) resources, which are very well diversified in terms of species and breeds. These livestock contribute not only milk, meat, eggs and leather but also farmyard manure (dung and urine) which is recycled into farms to fertilize soil as a part of circulatory agriculture. However, the huge livestock numbers with low productivity are often blamed for causing adverse environmental impacts too.

Livestock farming and climate change has strong linkage since both impacts each other. The livestock sector is the major contributor to climate change by emission of greenhouse gases (14.5% of the global greenhouse gas emissions). If effectively integrated, livestock can also deliver a significant share of the necessary mitigation effort.

The local breeds in India are well adapted to local situations doing well under limited feed and fodder availability, sustain well on crop residues, grazing on harvested field etc. But these native breeds must produce more, for which research is underway along different dimensions of animal production including nutritive feed and fodder. The Government of India is putting high emphasis on productivity enhancement, conservation, and promotion of Indigenous breeds through supportive policies and various programmes.

The livestock research institutions are also working on dietary supplements and feed alternatives are being evaluated to assess whether they can reduce methane emissions from livestock. Also, some interesting work is currently going on which can help reduce the adverse impact of livestock on climate change. For instance, efforts are underway for the development of efficient low-cost livestock manure management practices as a mitigating effort. India is having strong heritage of animal health management systems which can contribute to the development of climate friendly organic livestock production systems.

To make effective use of farmers' traditional wisdom on animal health management, there is need of capacity building of various stakeholders for identifying local and regional agro-ecological practices followed by various farming communities for scientific validation and wide propagation of the same for better adoption in a systematic way. The National Dairy Development Board (NDDB) is promoting use of herbal medicines through its Network of Dairy Cooperatives, which is helpful in reducing the use of antibiotics and other synthetic drugs which are restricted under organic livestock production systems.

Organic farmers often raise livestock following organic guidelines, which can be certified as organic livestock too, for which group certification is being explored. Good agricultural and livestock management practices can compensate for most of the sector GHG emissions, while providing food and livelihoods. The traditional farming systems among the local and indigenous communities of farmers in India may stand chances of better adaptation to mitigate climate change, if their age-old farming practices can be incorporated in the innovative farming concepts like organic agriculture through proper validation.

Organic agriculture principles and practices blended with farmers' traditional knowledge of ecological processes, offer farmers in developing countries many accessible and affordable opportunities to strengthen their farms' resilience. Livestock greenhouse gas emissions can be reduced by following the four approaches, viz. husbandry (animal breeding, feed supplements, improved pastures), management systems (stocking rates, biological control), numbers of livestock and manure management.

Research and Development agencies in India are making efforts needed for increasing the supply of new and improved mitigation technologies/practices. Possible interventions to reduce emissions from animals are largely based on technologies and practices that improve production efficiency at animal and herd levels. Climate change adaptation, mitigation practices, and policy frameworks are critical to protect livestock production. Besides, better management of grazing lands has potential to improve productivity and create carbon sinks with the possibility to help offset livestock sector emissions.

The SWOT Analysis of Organic Livestock Production

In a survey of 2220 farmers with the help of 37Krishi Vigyan Kendra (KVKs) across 12 states, we collected information concerning inputs like veterinary medicines, fertilizers, feeds, fodder, prevalence of diseases in livestock etc. Also, we conducted focused case studies of 180 registered organic farmers in Uttarakhand and Mizoram to see the potential of organic animal husbandry. We found that the level of external input use was very low especially in case of livestock; antibiotics, anthelmintics, and other market purchased inputs were not in much use in dryland areas of India.

Most of the production practices of farmers in hilly regions and dryland areas were in consonance with the Organic Animal Husbandry Standards (OAHS). It was observed that the farmers of hill areas as also from dryland/rainfed conditions can effectively convert their farms to organic livestock farming, if they are properly oriented, trained and marketing support is provided to them as being done in case of organic crop production. Overall, 55.14% farmers did not have any irrigation facility and the dryland states had maximum farmers without irrigation facility.

Also, in hilly regions, the majority of the farmers did not have the irrigation facility. Such groups can be the target group for promoting organic livestock farming, since these farmers are likely to be applying less chemicals and fertilizers in the field as also maintaining local breeds which have low input requirements. The rainfed conditions discourage use of green revolution technologies like chemical fertilizers, pesticides, so farmers sustain on local practices having minimal or no role of chemicals in agriculture.

A majority of farmers (87.38%) reported that they don't spend any amount on veterinary medicines for their animals and rest of them were incurring expenditure ranging from INR 100 to INR 2000 annually. The farmers of the dryland (30.8%) were using FYM, compost in their field indicating the better scope of popularization of organic farming in these states. Almost all the farmers surveyed (98.3%) reported that livestock is an essential component of farming for them. Around 62.1% of the farmers were rearing local breeds and this number was maximum in case of farmers of dryland states (69.6%) followed by hill states (54.6%) and irrigated states (18.9%). A good percentage of farmers were feeding their animals with home grown feed and fodder, which is appreciated under organic management of livestock.

The farmers' willingness to convert to organic farming was taken, whether they would convert to organic farming if technical support, financial support, marketing support and all other support was given to them. 78.5% of the farmers said that they would consider switching to organic farming if all support is provided to them. We could conclude that there was strong possibility of Integrating animals for organic production of crops and livestock towards ensuring climate friendly production of milk, meat, eggs alongside cereals pulses, fruits, nuts etc.

Many Farmer Producer Organizations (FPOs) including women groups and cooperatives well supported by government agencies are engaged in organic farming including milk and milk products, processing, and marketing, which shows how women can do well collectively towards organic milk production, processing, and marketing. Similarly, Hills & Valleys (Govind Dairy), Akshaykalpa and some other companies are now selling certified organic milk and milk products.

National institutions like the National Institute of Management of Agricultural Extension (MANAGE), National Centre of Organic and Natural Farming (NCONF) and many others are imparting training in organic and natural production systems. These are some inspiring examples of initiatives on organic livestock farming from India which incentivize farmers who reduce the cost of production by reducing chemical fertilizers, pesticides, veterinary drugs, and antibiotics while earning price premiums on organic products, so can possibly be replicated in other Asian countries to help indigenous communities and other disadvantaged small holders as a pathway out of poverty.

This paper will elaborate on various government programs and initiatives on organic and natural farming, wherein livestock can be integrated towards sustainable climate friendly organic animal husbandry.

MAHESH CHANDAR

He is the Principal Scientist, Agricultural Extension Education, with the Indian Council of Agricultural Research. In a career spanning over 32 years, he guided 45 master's & PhD students as Chairman including three theses on organic farming.

He has also completed the IFOAM Organic Leadership Course (OLC) in 2012 and the Organic Masterclass in 2017 (South Korea). He raised funding for organizing the Pre-conference on Organic Animal Husbandry in conjunction with the 19th IFOAM Organic World Congress in 2017.

He has written several international publications on organic agriculture including a book, "Organic Livestock Farming" published by ICAR in 2013 and reprinted in 2017. He has guided the State Government of Sikkim, especially the Sikkim Organic Mission (SCM) by developing a roadmap for organic animal husbandry development in Sikkim. For his outstanding work in the area of organic agriculture since 1996, he was awarded this year with Rafi Ahmed Kidwai Award by the Indian Council of Agricultural Research.

He has been a Member of the International Advisory Board of EU2020 Horizon Project: Organic Plus implemented in 14 Countries. He has been a member of several IFOAM Committees (Organic Standards Committee, Organic Standard Criteria Committee, World Board Nomination Committee) & sector platforms like TIPI & Steering Committee of IFOM-IAHA.

He has been World Board member of ISOFAR for three terms & Associate Editor of Springer Journal ORGANIC AGRICULTURE. He has been member of several national committees on organic Agriculture development in India.

PARTICIPATORY GUARANTEE SYSTEMS (PGS) - ROTAN LESTARI (ROLES)

BY ANANG SETIAWAN (INDONESIA)

Introduction

Rattan has long been known as an important Non-Timber Forest Product (NTFP) in Indonesia. With annual rattan production potential being about 622,000 tons per year, Indonesia is considered the largest producer of rattan in the world[3].

About 1 million people are involved in the cultivation and trade of rattan canes, while about 4 million are involved in the rattan-based industry, including manufacturing[4]. Regardless of the potential of such a large industry, government attention in the industry, especially in the producers in the supply chain, has been minimal in relation to the interest and efforts placed in the timber industry. Needless to say, rattan's economic potential has largely been under optimized and its ecological value largely unrecognized[5].

Participatory Guarantee Systems (PGS) are locally focused quality assurance systems[6]. They certify producers based on the active participation of stakeholders and are built on a foundation of trust, social networks, and knowledge exchange. In 2012, The Non-Timber Forest Products - Exchange Programme (NTFP-EP) – Indonesia launched a project to certify rattan through a PGS scheme. This project aims to apply an appropriate, effective, cost-efficient certification to rattan harvested from gardens and forests by community-based suppliers. It aims to contribute to the overall goal of increasing benefits for rattan producers and promoting sustainable forest management.

PGS rattan brings together different standards, incorporating fair trade principles, and sustainable resource management, and looks at the aspect of rights (long-term sustainability depends on long-term tenure, etc.) and thus is holistic. It is innovative as it places the action in the hands of the community

[3] Zulfikar W. 2012. Implementasi kebijakan ekspor rotan dan produk rotan di Kabupaten Cirebon. Jurnal Sosiohumaniora, Volume 14, No. 2, Juli 2012 : 167 – 174

[4] Hirschberger, P. 2011. Global Rattan Trade: Pressure on Forest Resources Analysis and Challenges. WWF Austria, Vienna, Austria

[5] Nur Supardi, M.N., Hamzah, KA. & Wan Razali, W.M., 1999. Considerations in rattan inventory practices in the tropics. INBAR Technical Report No. 14. 57 pp.

[6] This is the definition of IFOAM, The International Federation of Organic Agriculture Movements.

members. Through certification, premiums and/or access to new and niche markets may provide more opportunities for the value chain actors. Through the participatory approach, costs are minimized, and communities are empowered.

Methodology and the Process

The PGS ROLES system and the standard were developed through research, interviews, and discussions with stakeholders both at the district and national levels. Several focus group discussions and workshops were held to gather input and feedback from farmers, weavers, government officials, scientists, private sector representatives, and NGO representatives. The standard developed for sustainable rattan consists of five (5) criteria: legality, production sustainability, ecological sustainability, sociocultural factors, and traceability[7]. One criterion that has been discussed is business ethics.

After the standard finalized, the rattan weavers and farmers then organized themselves into a group to avail themselves of PGS certification. The group was then provided orientations on the PGS system, standards, and the responsibilities and tasks of weavers and farmers using this system. Recording formats were introduced as well as a timeline to accompany recording procedures. An example of recording tables completed by BUR is shown in Figure 1.

The next step is the establishment of the PGS Unit. The PGS Unit consists of a coordinator, inspectors, a promotion division, a field assistance division, and an approval body. The PGS unit is responsible for coordinating, monitoring, and approving applications for certification by farmer and weaver groups under the PGS System. The PGS Unit consists of representatives of Local NGOs, Rattan Farmers, the Forestry Department Province level, Academics, and the Department of Industry, Trade, and Cooperative.

The next step was building the National PGS Council to strengthen the system and provide the final layer of recognition for the system. This unit consists of representatives of the Ministry of Environment and Forestry, Private sector organizations, civil society organizations, and rattan farmer organizations.

[7] Natasya, M and all, 2015. How Certification Can Further Benefit Forest-Based Communities: The Case of Rattan Gardens and Forests and Participatory Guarantee Systems (PGS) World Forestry Congress, Durban, South Africa

Example of Recording Table: Source of Rattan

Date of Harvest	Rattan Source (code of rattan garden)	Amount/ Volume	Code of Rattan	Date of Production	Product	Total	Code of Product
20/04/2014	*Rattan garden BR04*	*100 canes*	*KB/BR04/200414*	*07/05/2014*	*Anjat*	*1 piece*	*KB/BR04/200414/BR04/1*
				10/05/2014	*Anjat*	*1 piece*	*KB/BR04/200414/BR04/2*
				12/05/2014	*Anjat*	*1 piece*	*KB/BR04/200414/BR04/3*

Notes:

KB/BR04/200414
KB (Kutai Barat) → code of district
BR04 → code of rattan garden
200414 → date of harvest

KB/BR04/200414/BR04/1
KB (Kutai Barat) → code of district
BR04 → code of rattan garden
200414 → date of rattan garden
BR04 → code of weaver
1 → first product from the batch

Figure 1. Example of recording table: source of rattan.

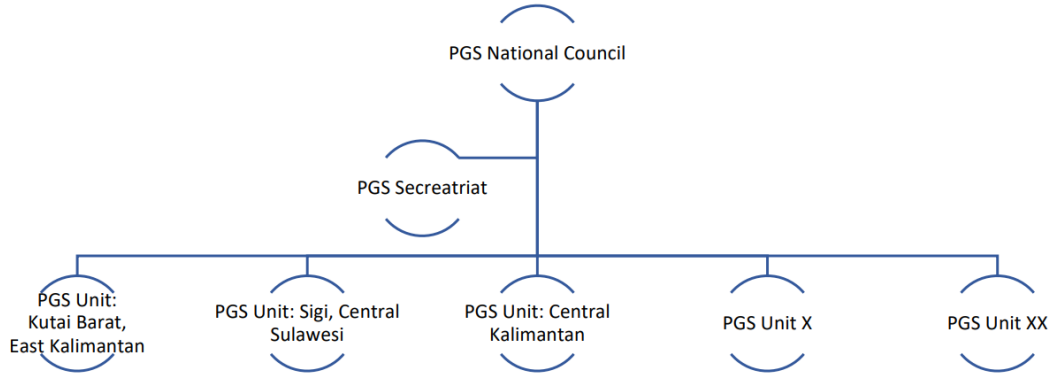

Figure 2. PGS ROLES structure.

The flow on the certification process is below:

1. Rattan farmers or gatherers prepare the document to be submitted to the PGS Unit District level. The document is a farmer group profile, a list of rattan farmer group members, a list of rattan area/land, evidence of the area/land, maps of the area/land, harvest protocol, notes with the coding of the raw material process (members group), and notes with the coding of the raw material process (buyer/company).

2. The document will be submitted by the rattan farmers to the PGS Unit.

3. PGS Unit will review the document.

4. PGS Unit sends the document to the PGS National Council

5. The PGS National Council will send an auditor to audit the process. It will collaborate with auditors from the PGS Unit level will.

6. The result of the audit will be discussed with the members of the PGS National Council.

7. The PGS National Council will send a letter of recommendation to PGS Unit level and rattan farmers.

8. Rattan farmers get the certification certificate.

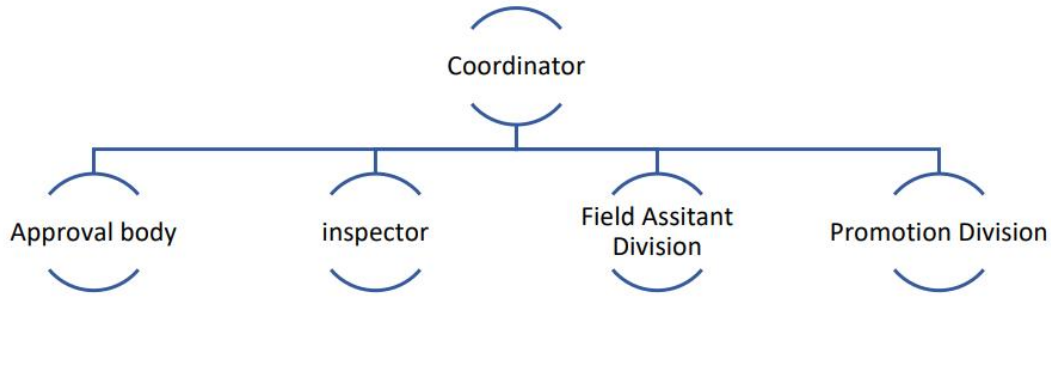

Figure 3. PGS Units Structure.

Result and Conclusion

Key Challenges

The PGS system requires significant input from various stakeholders. It involves documentation about rattan gardens, from the rattan gatherers up to the PGS unit. In starting the PGS system, it was initially difficult for rattan gatherers to gain the skill to do regular recording and reporting. But they have been improving and are more eager now to keep the records updated.

Different stakeholders at first had different levels of understanding of the system and thus patience and repeated orientations were needed.

Another challenge is making sure PGS standards are applied well and that the whole system runs smoothly. It will be important to test the whole system from the farmer level to the national level. PGS Unit must also be accountable for the certification decisions they will make.

Finally, the perception that all certification systems are complicated and expensive makes stakeholders from the private sector initially wary of the system and there is some resistance, it is only in slowly understanding the system with an open mind that more private sector participants are warming up to the system.

Key Opportunities

The rattan that has been certified is used by PT Lamin Betang Persada (Borneo Chic) – PGS Kutai Barat, Fairtradefurniture UK (https://fairtradefurniture.co.uk/rattan-conservatory-furniture/), PT Fajar Baru – PGS, PGS Katingan for Vandersar.nl Company (https://www.vandersar.nl/), and PT Indonex Decobasket. In 2023, IKEA started to make assessments of PGS ROLES that can be applied to their rattan products.

Table 1. List of certified clients of PGS – ROLES

No	Certified Clients	Source of Materials	Supply Chain/ Partner Destination	Product	License Code	Registered
1	Kelompok Bina Usaha Rotan (BUR)	East Kalimantan	BC	Traditional Dayak Woven Rattan Baskets	KB/BR/BR	R-KB-0115
2	Borneo Chic (BC), South Jakarta	East Kalimantan	U S A	Traditional Dayak Woven Rattan Baskets	KB/BR/BR/EP	C-NAS-0115
3	Kelompok Rotan Namo	Central Sulawesi	Fair Trade Furniture U K	Green rattan	SG/HDNa	R-SG-0116
4	Kelompok Citra Usaha Bersama (CUB)	Central Kalimantan	VDS	Green rattan	KTG/JP	R-KTG-0121
5	Van Der Sar Import B.V, Netherlands	Central Kalimantan	Europe	Raw Material, Rattan Basket	KTG/JP/VD1/VDS	C-NAS-0121

PGS ROLES rides on the trend towards sustainable consumption (not only sustainable production), but it provides the consumer the opportunity to purchase products that are “green” but also products that are socially empowering and priced fairly in such a way that producers have also gotten their fair share of the value of the products which also provides psychological income as well.

PGS ROLES also supports climate change mitigation and adaptation efforts. Through PGS ROLES efforts, the carbon stock in a given forest ecosystem will be kept for longer as there are no felling activities involved. Rattan vines are harvested, allowing the trees and the whole forest to remain standing.

PGS certification is feasible for NTFPs such as rattan that are harvested and managed often on the basis of traditional knowledge. PGS can provide added value to rattan farmers and weavers, and at the same time promote sustainable forest management. It is an important marketing tool that can provide rattan farmers and gatherers with increased income by also promoting tradition and biodiversity.

References

Hirschberger, P. 2011. Global Rattan Trade: Pressure on Forest Resources Analysis and Challenges. WWF Austria, Vienna, Austria.

Nur Supardi, M.N., Hamzah, KA. & Wan Razali, W.M., 1999. Considerations in rattan inventory practices in the tropics. INBAR Technical Report No. 14. 57 pp.

Natasya, M and all, 2015. How Certification Can Further Benefit Forest-Based Communities: The Case of Rattan Gardens and Forests and Participatory Guarantee Systems (PGS) World Forestry Congress, Durban, South Africa.

Zulfikar W. 2012. Implementasi kebijakan ekspor rotan dan produk rotan di Kabupaten Cirebon. Jurnal Sosiohumaniora, Volume 14, No. 2, Juli 2012: 167 – 174

ANANG SETIAWAN

Anang Setiawan is Executive Director of NTFP-EP Indonesia. He joined NTFP-EP Indonesia in 2014, based in Bogor, West Java, Indonesia.

He is a forester, and his professional interest is in maintaining the forests as a source of livelihood, agroforestry issues, databases, remote sensing, and geographic information systems. He has experience in forestry, agroforestry management, remote sensing, and geographic information systems.

BIO-KG FEDERATION OF ORGANIC DEVELOPMENT-KYRGYZSTAN ORGANIC *AYMAKS*

BY ASAN ALYMKULOV (KYRGYZSTAN)

Kyrgyzstan faces significant challenges in land use due to soil erosion and salinization in improperly managed farmland. Approximately 60 percent of the country's land is affected by topsoil loss, and 16 percent by salinization, both of which have more serious long-term effects than short-term effects. Overgrazing is another significant problem, with livestock herds averaging twice the carrying capacity of pasturage land. Uncertain land tenure and financial insecurity have caused private farmers to concentrate their capital in the traditional form of livestock, exacerbating the degradation problem.

The introduction of organic agricultural production in Organic *Aymaks* has focused on enabling all members of the community to develop skills and take greater control of their farms and has contributed to inclusive local development. By improving marketing possibilities and creating jobs, the initiative has created a sustainable cycle, enabling farmers to provide necessary services and organic products while allowing more people to purchase additional goods and services.

The project has achieved this through a systematic and complex approach, linking theoretical knowledge, practical implementation, communication, and advocacy. The approach includes community capacity building, innovative use of data and digital technologies, and financial or legal mechanisms to maximize impact. The BIO-KG Organic Standard, which is included in the IFOAM Family of Standards, has played a crucial role in the success of the initiative.

The use of organic fertilizers, crop rotation, and biological methods of protecting plants have replaced the use of chemicals. The introduction of artificial insemination with locally adapted breeds has decreased the number of livestock by 24 percent but improved their quality by 36 percent, and the pressure on pastures has decreased by 30 percent. By introducing data collection of organic farmers on their land, monitoring, and peer-review of farms on meeting organic standard requirements, the initiative has drastically decreased the cost of printing paper surveys, transportation to the project sites, survey filling, and data-analysis time.

BIO-KG has lobbied for organic legislation for the past ten years, leading to the design and approval of the Law on Organic Agricultural Production, the establishment of a state body for promoting and developing organic agricultural production and policy, and the offering of incentives and exemptions for organic farmers in government development programs. Additionally, PGS has been included in the document as an alternative quality assessment system.

The annual Fair-Exhibition of organic products in the capital promotes organic production and brings climate and ecology issues to the agenda.

The promotion of Organic *Aymaks* (23 villages with more than 1100 farmers), organic production, and project villages have included traditional festivals with elements of Farmers' days in each organic *Aymak* annually. The farmers share their knowledge and practices based on traditional agricultural activities followed by cultural events and games.

The project has been recognized for its vision and dedication to the promotion of organic agriculture in the world, receiving the Organic Medal of Honor from IFOAM Asia. It has also received the Equator Initiative Prize 2021 organized by UNDP for demonstrating the benefits of placing indigenous and local communities' knowledge and practices of nature-based solutions at the heart of local development. At a time when the world is facing an unprecedented planetary crisis, showcasing actions that restore sustainable food systems, mitigate climate change, and protect nature is essential, all while also contributing to the green recovery from the pandemic.

The introduction of PGS influenced much on uniting and bringing together like-minded farmers. With less cost effectiveness and having overall control over the inspection processes, PGS was suitable for small holder farmers.

PGS certification in case of Organic *Aymaks* had following instruments to be promoted:

Organic farming: capacity building, agronomic technologies, irrigation and nutrition.

Agro-eco-ethno tourism: promotion of the quality assessment system through introducing produced products to tourists.

PGS structure: including traditional unions of people (Council of Elderly people, zhamaats (communities) of villagers from 1 tribe, communities of women and youth) to enhance and strengthen peer-review process and overall control of the system in Organic Aymaks.

Last 2 years PGS initiative of BIO-KG has passed through IFOAM PGS Recognition Process and in April 2023 received accreditation as an IFOAM PGS.

ASAN ALYMKULOV

- Project Coordinator at the BIO-KG Federation of Organic Development Kyrgyzstan

- 2016 Trainee of the ALGOA Organic Foundation Course

- Founding Member of the Asian organic Youth Forum

I have been involved in organic agriculture for more than 15 years. I started my organic journey from Public Fund Bio Service as a translator. After a year of involved work, I was trained to be a consultant. In 2014 was invited to join BIO-KG Federation of Organic Development team, the main work of which is to lobby organic agriculture in the country, promote it with practical implementation of organic agriculture in organic aymaks (villages).

As an alumnus of ALGOA Organic Leadership Course (2016), I became part of an active group of young people to establish the Asia Organic Youth Forum, which unites youth all over the world under the organic umbrella. In 2018, in the Philippines during Organic Asia Congress I was nominated as an Organic Youth Ambassador.

Currently, the project under my coordination – Organic Aymaks – was awarded the Organic Medal of Honor in 2021 by Xichong County and IFOAM Asia. The project was also awarded the “Equator Initiative Prize” as a best model of sustainable development of rural communities in the same year.

I work closely with farmers and communities in organic aymaks, as well as actively participate in lobbying and promotional campaigns with BIO-KG (FOD, Federation of Organic Development – Kyrgyzstan) team.

PGS DEVELOPMENT IN VIETNAM

BY TU THI TUYET NHUNG (VIETNAM)

PGS Viet Nam was established in 2008 under the technical and financial support of ADDA_VNFU project. After the end of the project in 2012, PGS Viet Nam continued to be operational and over the years built sufficient financial sustainability and consumers recognition to be able to self-maintain its operations and to improve farmers´ livelihoods.

Linking producers to the market is crucial for the sustainability of a PGS. To maintain a PGS operation, membership fees both for farmers and retailers have been applied since the end of the project in 2012. From this initial PGS Viet Nam was created and is still active today, with its pioneering work has inspired several other actors who have also started developing PGS in the country as a way of improving livelihoods for small farmers. PGS became popular in Vietnam and its approach has been also used as quality assurance for other food production standards.

PGS Viet Nam has been successful in connecting retailers with intergroups and producers´ groups. Additional trust is built by encouraging retailers to become members of PGS Viet Nam to support farmers and monitor quality. PGS Viet Nam has its own digital traceability system and is managed by the coordination board. Currently, there are 17 PGS initiatives across the whole country but not all PGS are operational.

Most PGS are created and facilitated by NGOs through development projects, and then local partners take over the management of the PGS when the project ended. Local partners are farmers unions (FU), women unions (WU), different state agencies and operators as companies exporting organic commodities.

More PGS initiatives appeared in the country following the example of PGS Viet Nam, It is somehow natural that strengthening a network among local PGSs into a formalized National Organic PGS network. Those PGS initiatives will consolidate into a national PGS network to enhance the marketing capacity and the voice and power of organic small-scale farmers to advocate better for policy frameworks. Such development is also part of the VOAA´s strategy towards fostering integrity in the organic Vietnamese sector. Since one of the objectives is to strengthen the presence of PGS on the Vietnamese market, a marketing strategy for the network will be developed. This includes the creation of a single logo for all products certified within the network. It will also be the responsibility of the network to create and maintain a database of its PGS members and their certified farmers.

TỪ THỊ TUYẾT NHUNG

President. Vietnam Organic Participatory Guarantee System (PGS Vietnam)

Mrs. Nhung is the President of PGS Vietnam belonging to Vietnam Organic Agriculture Association (VOAA) where PGS is run as an important function according to IFOAM guidelines. She is also working as an independent consultant on Organic Agriculture development and Participatory Guarantee System.

With the task as VOAA's Executive Committee member, she is now working closely with the local partners and NGOs to develop organic farmers network and PGS in the country.

She holds Bachelor of Agronomy in Hanoi Agriculture University (HAU); attended the graduate training on vegetable production at AVRDC (Thailand 1992), Organic Agriculture Development (in Sweden, Denmark and Thailand and other short training on participatory methodology.

Working 43 years in agriculture and rural development, she has 20 years as a researcher and extensionist at the Hanoi Horticulture Technology Center of DARD; 6 years on IPM; 17 years on organic including 14 years on PGS since 2008.

SUSTAINABLE CULTIVATION OF ORGANIC VEGETABLES THROUGH SUNKEN-BED METHOD IN THE ALPINE REGION

BY CHOEKI WANGCHUK (BHUTAN)

Abstract

Agricultural season is short, and the climate is harsh in the alpine regions of Bhutan. Nevertheless, highland agriculture plays a central role in ensuring food security and self-sufficiency through traditional farming techniques. Owing to prolong extreme duration, the agriculture season is short extending from May to September. In summer, farmers grow diverse vegetables for nutritional purposes and surplus for sale within the locality whereby self-sufficiency is achieved.

However, people are unable to access fresh vegetables in the winter season because of unfavorable weather conditions for cultivation. As a result, they must consume dried vegetables either conserved themselves or imported ones. In addition, highlanders can grow staple crops once a year because of freezing temperatures most of the year. Highlanders also raised livestock such as yak, sheep and goat as their alternative source of food and income. Therefore, highland communities in Bhutan are critical in securing the country's socio-economic security. In a way, the livelihood of those in the lowlands depends on their livelihood in the mountains.

Moreover, all most all the highland areas in Bhutan practices an organic farming for the environment sound food production that supports sustainable livelihoods and food security. However, in recent years, the rising temperature is having a direct effect on pest and diseases on crops even in higher altitude making highlanders difficult to take-up organic farming. On other hand, rising temperature can favor cultivation of multiple crops in highland areas which can help food security for the highlanders in future.

Agriculture production has been through significant structural changes over recent decades and has dealt with multiple and varied challenges in that time. The agriculture sector is a major supplier of food for domestic consumption and is a significant source of nutrition for the Bhutanese population. Therefore, greenhouse technology has been introduced for more than decades to boost vegetable production in highlands.

However, implementation of existing low-cost poly house technology in the highland areas is not viable, especially for growing winter vegetables due to harsh climatic conditions. Considering the adversity in the extreme season, the sunken bed technology was introduced and promoted in the year 2020 at Laya under Gasa district. Laya is located at an altitude ranging from 3000 - 4000 meters above sea level (masl) which is above the tree line. Such technology was introduced with the objective to extend the vegetable

cultivation period in the extreme seasons, making access to fresh vegetables and improving the nutritional status of highlanders, and replicating the same technology in other highland regions of the country.

Furthermore, it aims to ensure sustainable social and economic well-being of the highlanders through adequate access to food and natural resources. Thus, we have introduced the sunken bed technology and very recently the district agriculture sector is also conducting experiment on infrared heating system in the greenhouses at the highland areas to promote active and passive frost protection technologies to encourage farmers for vegetable cultivation in extreme season. The technologies are meant to be promoted in highland regions and in extreme season to create favorable environment for agriculture farming.

The principle of sunken bed is to regulate the soil and air temperature within the area to make favorable and conducive environment for the growth and development of vegetable crops during extreme weather conditions. The opaque plastic or tarpaulin is needed to place above the vegetable inside the sunken bed house to retain the heat that being trapped in during daytime. Consequently, the temperature will be regulated inside the sunken bed favoring growth of vegetables and development at night.

The sunken bed was constructed measuring 7 meter in length, 3 meters in width, and 1.5 meters in depth. A depth of 1.5 meters was dug in order to regulate and maintain the soil temperature at night as the soil temperature is critical for the growth and development of crops. Then the trench is covered with an opaque plastic sheet by erecting wooden poles of about 1.5 meters from four corners of the trench. After that, the topsoil is mixed with manure and other organic matter before being taken back into the trench, and crops are cultivated. The mixed soils are put into the trench and beds are prepared and seeds are sown within the trench.

In winter, the temperature declines below freezing point, and the growth of vegetables are retarded. The average temperature recorded inside the sunken bed during summer was 30^{o}C (highest) and 3^{o}C (lowest), and in winter the highest was recorded at 20^{o}C with -10^{o}C lowest. Summer vegetables are grown from April – September, and winter from October to March. Further, sunken bed technology was also found in improving the soil texture as well as water retaining ability since the base of the trench is away from long hours of the direct sunlight.

In the past, before introducing sunken bed technology, highlanders could grow only few vegetables such as mustard green, spinach, coriander, turnip, and radish which lacks access to nutritious food to the highlanders. However, now with the introduction of the sunken bed method, and with the warming temperature due to climate change in the highlands, highlanders can grow more varieties of lowland

vegetable crops such as beans, cucumber, eggplant, chilies (pepper), broccoli, cauliflower, pea, slippery gourd, pumpkin, cabbage, and even oyster mushroom can be grown within the sunken bed.

The vegetable production in Laya district increased from 16 metric tons (MT) in 2020 to 20 metric tons in 2022 after introduction of sunken bed technology. This has also made highlanders discontinue buying vegetables from lowland areas or from other districts making them self-sufficient, unlike in the past. Today about 98% of the highlanders in Laya district are practicing sunken bed technology to grow vegetables especially during winter season which they could consume green and fresh vegetables.

The sunken bed technology is the first of its kind in Gasa district which was a promising one in the alpine region during the extreme season. Considering its significant positive impact, the agriculture sector of Gasa District is replicating such technology in other highland regions of the district and in the upper reaches of the country to make highlanders self-sufficient in vegetables and improve their nutritional status through sustainable organic farming for food security.

CHOEKI WANGCHUK

Name: Choeki Wangchuk

Current Position: Asst. District Agriculture Officer

Department/Agency: Department of Agriculture, District Administration, Gasa

Ministry: Ministry of Agriculture and Livestock

I was born as a farm boy in Kanglung eastern Bhutan and developed a passion for agriculture since childhood. As a result, I attended an agriculture college and became an agriculture development worker in Bhutan. I joined the Department of Agriculture in the year July 2004 as an agriculture extension officer in delivering extension services such as on promoting an organic farming program in the community and disseminating new agriculture technologies in the field.

I provide technical support services to smallholder farmers who make their living through vegetables and horticulture crops. I have maintained a deep interest in learning and playing an active role in helping the humble farming communities of Bhutan by providing guidance on the planning and production of farm produce based on marketing opportunities. Additionally, my experience includes organizing farmer groups and working with farmers' associations to create better opportunities for farmers to market their produce. I am very passionate about agriculture business enterprises, particularly small-scale farms.

USE OF BIO-STIMULATORS FOR ORGANIC STRAWBERRY PRODUCTION

BY JAMAL UDDIN (BANGLADESH)

Due to the growing population, a major challenge of agriculture is to increase food production to meet the global food demand without damaging the environment. In agricultural industries, chemical fertilizers and synthetic pesticides are dramatically used to enhance crop production. The excessive use of agricultural chemicals deteriorates the soil quality and is one of the major constraints in improving crop productivity (Dwivedi et al., 2007), and pollutes the air, water, and soil leads to serious health problems. In the recent era, consumer preference for organic and safe production as well as public concerns about the negative effects of chemicals fertilizer on the environment and human health are increasing.

Therefore, the use of Organic amendments acts as a sustainable tool to recovery fertility in intensive agricultural systems without negative effects on human health and the environment (Scotti et al., 2015). Bio-fertilizer application is very efficient for organic and safe crop production. The use of organic fertilizer increases plants vegetative growth and yield (Rakibuzzaman et al., 2019b). Neem has proven use as a fertilizer contains organic and inorganic compounds acting to enhance soil quality as well as quality crops. Neem oil and neem cake provides the macronutrients essential for plant growth (Lokanadhan et al., 2012) and acts as bio-fertilizer (Rakibuzzaman et al., 2019a).

The main ingredients of Bordeaux mixture are copper (Cu^{2+}) and lime (Ca^{2+}). Copper is an essential micronutrient for all living organisms including plants and it plays role as cofactor for several enzymes involved in respiration and electron transport proteins (Sommer, 1931), and Calcium of lime significantly increased soil pH and available phosphorus (Nduwumuremyi et al., 2013). Furthermore, various studies on horticultural crops have shown that the use of beneficial microorganisms improves vegetative growth and boosts crop yield (Jamal Uddin et al., 2020, Rakibuzzaman et al., 2021a), and suppress diseases (Rakibuzzaman et al., 2021b).

Clybio is the unique and complex microbe that contains bacteria like Lactobacilli bacteria, Lactic acid bacteria, Bacillus natto bacteria, yeast fungus, and Lactic acid bacteria (Shrestha et al., 2014), Bacillus bacteria (Tiwari et al., 2019), Yeast (El-Tarabily and Sivasithamparam, 2006) are a fruitful factor to maintain ecology, efficient bio-fertilizer that increases soil fertility, bio-control agent against bacterial diseases and have bio stimulating effect to promote growth, yield and obviously for quality. Strawberry (*Fragaria ananassa*) is an important high value crop and one of the most delicious fruits in the world. Therefore, the aim of this present study was to investigate the influence of different bio-stimulators on growth and yield attributes of strawberries for organic production.

The field experiment was accomplished at Horticulture farm, Sher-e-Bangla Agricultural University, Dhaka Bangladesh. The experiment consisted of four treatments, T_0: Control; T_1: Neem oil; T_2: Bordeaux mixture; T_3: Clybio; and arranged in Randomized Complete Block Design (RCBD) with three replications.

Both foliar and soil application of Neem oil, Bordeaux mixture and Clybio were applied three times (first application was 12 DAT; then 2nd and 3rd application was at 20 days interval).

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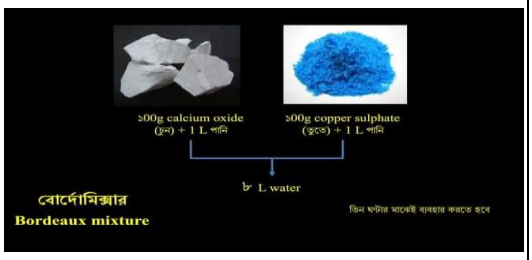
</td><td colspan="2"> 
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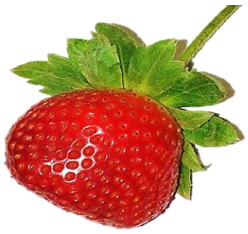
<tr><td>  </td><td>  </td><td>  </td><td>  </td></tr>
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Showing strawberry plant growing variability with application of different organic stimulator

(Treatments, T_0: Control; T_1: Neem oil; T_2: Bordeaux mixture; T_3: Clybio).

Significant variation was observed among different treatments of organic bio-stimulator on SPAD value and total number runner of strawberry plants. Maximum SPAD value (54.1), runner number (5.8) was recorded in T_3 treatment. However, the lowest SPAD value (38.3) and minimum runner number (2.7) results were found in T_0 (Table 01). It may be the effect of Clybio. Clybio made of yeast and yeast promotes different essential amino acids, vitamins, and phytohormones that led to the growth and improve the chlorophyll content (Taha et al., 2020).

The yield-attributing variables varied remarkably among the treatments and were stimulated by the application of neem oil, Bordeaux mixture and Clybio (Table 02). However, the application of Clybio

showed better performance in strawberry yield and yield components. Maximum number of flowers per plant (39.3), number of fruits per plant (26.3), fruit length (43.4 mm), fruit diameter (35.1 mm), the weight of individual fruit (25.3 g), yield per plant (0.64 kg), yield per plot (5.12 kg). The lowest results recorded in control treatment. However, yield percentages increased with different organic stimulator applications.

Increased yield of different organic bio-stimulator application treatment was calculated as (69.6%, 30.7% and 22.7%) from Clybio, Bordeaux mixture and Neem oil treatment. Clybio is a unique and complex microbe that contains bacteria like Lactic acid bacteria, Bacillus natto bacteria and yeast fungus and the improving tendency of plant growth and development. Among them, Lactobacillus bacteria which helps nitrogen fixation and accumulation of auxin and cytokinin that trigger plant growth, flowering stage. Bacilli solubilize soil P, enhance nitrogen fixation, and produce siderophores that promote its growth (Hashem et al., 2019); yeast stimulates plant hormones like auxins, gibberellins, cytokins, synthesis of vitamins, antifungal and antibiotic compounds, ability to solubilize minerals like phosphorus and other nutrients that enhances plant growth, enhance photosynthesis (Agamy et al., 2013). Neem extracts supply nutrients to plants and improve plant growth (Ramachandran et al., 2007).

Bordeaux mixture is a combination of copper sulfate, lime, and water, and is an effective fungicide and bactericide that has been used for decades to control diseases for crop production. These natural minerals provide long-lasting protection to plants against diseases and yield losses due to disease (Teng et al., 1984). Furthermore, due to the presence of essential nutrients such as copper (Nurul et al., 2014) and Calcium (Jamal Uddin et al., 2021) increased crop growth as well as yield.

Table 1. Effect of organic bio-stimulator on SPAD value, number of runners, number flowers, number fruits and brix percentages on strawberry

Treatment	**SPAD value**		**Runner number**		**Flower number**		**Fruit number**		**Brix levels (%)**	
T_0	38.3	c	2.7	d	25.3	d	19.3	c	4.2	c
T_1	46.0	bc	3.8	c	29.7	c	21.7	b	4.7	c
T_2	50.1	ab	4.7	b	32.3	b	22.7	b	5.5	b
T_3	54.1	a	5.8	a	39.3	a	26.3	a	7.1	a

LSD	7.84	0.32	1.15	1.20	0.58
CV%	8.32	3.75	1.82	2.67	5.37

Here, T0: Control; T1: Neem oil; T2: Bordeaux mixture; T3: Clybio; and different letter means they are significant each other and same letter means they are statistically similar

Table 2. Effect of organic stimulator on yield and yield attributes of strawberry

Treatment	**Fruit length (mm)**	**Fruit diameter (mm)**	**Fruit weight (g)**	**Yield/ plant (kg)**	**Yield/ plot (kg)**	**Yield over control (%)**
T_0	33.9 d	29.7 c	19.6 c	0.38 c	2.98 d	_
T_1	35.5 c	33.1 b	21.7 b	0.46 b	3.69 c	22.7
T_2	38.4 b	33.1 b	22.3 b	0.49 b	3.90 b	30.7
T_3	43.4 a	35.1 a	25.3 a	0.64 a	5.12 a	69.6
LSD	1.27	0.27	0.75	0.05	0.07	
CV%	1.68	0.41	1.69	4.70	0.87	

Here, T0: Control; T1: Neem oil; T2: Bordeaux mixture; T3: Clybio; and different letter means they are significant each other and same letter means they are statistically similar

Due to various organic stimulator applications brix value of strawberry fruit varied significantly. The maximum brix percentage (7.1) found in T_3 and the lowest (4.2) recorded in T_0 which was statistically similar (4.7) with T_1 (Table 01). This might be the application of plant growth promoting bacteria (Karlidag et al., 2013).

The present study considers that Neem oil, Bordeaux mixture and Clybio have bio-stimulating impact and these organic stimulators enhance for mass production of strawberry plants led to growth and yield also with quality. Furthermore, Clybio application could be the effective bio-stimulator for strawberry production with higher yield and Brix levels, and this study recommend Clybio as an effective bio-fertilizer for organic strawberry production.

References

Dwivedi, B. S. and Dwivedi, V. (2007). Monitoring Soil Health for Higher Productivity. Indian Journal of Fertilizers, 3(1), 11-23.

El-Tarabily, K. A. and Sivasithamparam, K. (2006). Potential of yeasts as biocontrol agents of soil-borne fungal plant pathogens and as plant growth promoters. Mycoscience, 47(1), 25-35.

Hashem, A., Tabassum, B. and Abd_Allah, E. F. (2019). Bacillus subtilis: A plant-growth promoting rhizobacterium that also impacts biotic stress. Saudi Journal of Biological Sciences, 26(6), 1291-1297.

Jamal Uddin, A. F. M., Sabrina, N., Husna, M. A., Imam, M. H. and Rakibuzzaman, M. (2020). Bio-Efficacy of *Trichoderma harzianum* Spore Concentrations on Tomato Production. International Journal of Business, Social and Scientific Research, 8(3), 124-129.

Karlidag, H., Yildirim, E. and Turan, M. (2013). Plant growth-promoting rhizobacteria mitigate deleterious effects of salt stress on strawberry plants (Fragaria× ananassa). Horticultural Science, 48, 563-567.

Lokanadhan, S., Muthukrishnan, P., and Jeyaraman, S. (2012). Neem products and their agricultural applications. Journal of Biopesticides, 5, 72-76.

Nduwumuremyi, A., Vicky, R., Mugwe,J. N. and Rusanganwa, A. C. (2013). Effects of Unburned Lime on Soil pH and Base Cations in Acidic Soil. ISRN Soil Science, 2013.

Nurul, S., Jahan, M. S., Khandaker, M. M., Nashriyah, M., Khairi, M., Nozulaidi, M. and Hudzari, M. R. (2014). Application of Copper Increased Corn Yield through Enhancing Physiological Functions. Australian Journal of Basic and Applied Sciences, 8(16), 282-286.

Rakibuzzaman, M, Mahato, A. K., Husna, M. A., Maliha, M. and Jamal Uddin, A. F. M. (2019a). Influence of natura one and neem oil on growth and yield of brinjal (Solanum melongena). Journal of Bioscience and Agriculture Research, 20(02), 1694-1699.

Rakibuzzaman, M., Akand, M. H., Siddika, M. and Jamal Uddin, A. F. M. (2021b). Impact of Trichoderma application as bio-stimulator on disease suppression, growth and yield of potato. Journal of Bioscience and Agriculture Research, 27(01), 2252-2257.

Scotti, R., Bonanomi, G., Scelza, R., Zoina, A. and Rao, M. A. (2015). Organic amendments as sustainable tool to recovery fertility in intensive agricultural systems. Journal of soil science and plant nutrition, 15(2), 333-352.

Shrestha, A., Kim, B. S. and Park, D. H. (2014). Biological control of bacterial spot disease and plant growth-promoting effects of lactic acid bacteria on pepper. Biocontrol Science and Technology, 2, 763-779.

Sommer, A. L. (1931). Copper as an essential for plant growth. Plant Physiology, 6, 339-345.

Taha, S. R., Seleiman, M. F., Alhammad, B. A., Alkahtani, J., Alwahibi, M. S. and Mahdi, A. H. A. (2020). Activated Yeast Extract Enhances Growth, Anatomical Structure, and Productivity of *Lupinus termis* L. Plants under Actual Salinity Conditions. Agronomy, 11(1), 74.

Teng, P. S., Shane, W. W. and David, M. R. (1984). Crop losses due to plant pathogens. Critical Reviews in Plant Sciences, 2(1), 21-47.

Tiwari, S., Prasad, V. and Lata, C. (2019). Bacillus: Plant Growth Promoting Bacteria for Sustainable Agriculture and Environment. Microbial Biotechnology in Agro-Environmental Sustainability, pp 43-55.

Uddin, A. F. M. J., Sharmin, S., Afrin, F., Dina, A. and Rakibuzzaman, M. (2021). Influence of Gypsum Fertilizer on Growth and Yield of Kohlrabi. International Journal of Business, Social and Scientific Research, 9(2), 40-45.

JAMAL UDDIN

Prof. Jamal Uddin was born in Cumilla, Bangladesh on 31 December 1965. He graduated in 1987 in Agriculture and subsequently obtained Master of Science degree in Horticulture from Bangladesh Agricultural University, Mymensingh in 1989. He started his professional career at Crop Diversification Project of the Department of Agriculture Extension as a 'Horticulturist' in 1991.

He conducted higher research studies on ornamental horticulture and obtained Ph.D. degree from Kagoshima University, Japan in 2003. During the PhD program, he attended different local and international seminars and conferences such as the XXVI the International Horticultural Congress, Toronto, Canada (August 11-17, 2002) and got the best presenter award.

In 2004, he returned to Bangladesh and joined in the Department of Horticulture, Sher-e-Bangla Agricultural University as faculty for undertaking both teaching and research on horticultural crops with special emphasis on ornamental horticulture.

In the year of 2007, he joined in a postdoctoral research program on advanced molecular biology at River Basin Research Center (RBRC), Gifu University, Japan for 18 months.

Currently he is working as Professor, Department of Horticulture, Sher-e-Bangla Agricultural University and has published more than 300 scientific research works in national and international journals in his own field of research and studies.

PRODUCING BOKASHI FROM FARM BY-PRODUCTS AND USE IT TO FERTILIZE OLIVE GROVE

BY GHADA KAT (SYRIA)

By Dr. Ghada Kattmah* Dr. Inaya Kanshaw* Eng. Daoud Al said** Ch. Ghada Nemeh**

*Principal Researcher, **Assistant Team, General Commission for Agricultural Scientific Research

Abstract

Nowadays, the world is moving towards adopting sustainable farming systems to secure safe and sufficient food without harming the environment, so the best way to achieve this is to recycle the farm by-products in the manufacture of the fertilizers which provide plant nutrients and maintain soil fertility at the lowest cost, this ensures the sustainability for a long period, unlike chemical fertilizers that have temporary effects on the plant and negative impact on the environment.

To keep pace with this trend, we have implemented this research during the period (2019-2021) in Nabeh Al Fawar site followed to Al Quneitra Center of Agricultural Research, Syria, in olive orchard planted with some local varieties, its coordinates: Longitude: 35.55, Latitude: 33.14, its height of 492 m, an annual rainfall is about 600 mm. in order to study the effect of Bokashi and bio fertilizer EM-1 in chemical and biological properties of soil of low content of organic matter, and in tree productivity.

The soil is silty-clay, poor in its content of organic matter and nitrogen, its bacterial count ranged between 1 and 2 × 10 5/ g of soil.

Four treatments were applied in this experiment: in the first one (T1) Boashi fertilizer was added, in the second (T2) Bokashi fertilizer was applied with a foliar spray of EM-1 every 15 days, the third treatment in which we add bokashi, and EM-1 fertilizer as watering every 15 days, treatment (T3) bokashi, and EM-1 fertilizer were applied as spray foliar and watering at the same interval mentioned previously, whereas the T4 was left without any addition.

The bokashi heap consists of 40 kg pyreen, 40 kg wheat straw, 265 cm3 molasses, 265 cm3 EM-1, 26.5 liters of distilled water. It was moistened with EM-1 fertilizer (to about 40%) and left to ferment anaerobically for 15 days. that was added two times: the first before fruit set and the second during July, at a rate of 4 kg / tree. The secondary EM were given as foliar spraying or watering in three batches: before and after flowering, and during July, at a rate of 16 liters / tree.

The agricultural practices which carried out in the olive grove during the experimental period: Pruning is balanced and annual during the spring, tillage was done twice, and supplementary irrigation was conducted three times during summer at rate of 75 L/ tree/ each watering.

The organic matter was determined based on the oxidation of organic carbon by potassium dichromate in the presence of sulfuric acid, according to the method of Walkley and Black (1934), Electrical Conductivity was estimated in soil saturated paste extract using an electrical conductivity meter (Corwin and Lesch, 2003), NPK content With regard to the soil content of nutrients, the total nitrogen content was estimated according to the Caldahl method (Bremner, 1996), phosphorus by (Murphy and Riley, 1962), and potassium by the flame photometer (Jackson, 1958), and pH were estimated in soil saturated paste using a pH test (Schofield and Taylor, 1955).

All these indicators were estimated at Laboratory of Soil Analysis belongs to Administration of Natural Resources Research in GCSAR, then the bacterial count was conducted according to (Kucey, 1989) in Biochemistry Lab. in Faculty of Agriculture/ Damascus University.

The experiment falls into Completely Randomized Blocks, and the least significant difference (LSD) was used to compare the averages of studied indicators at the 95% confidence level with three replicates, using the GenStat 12st program.

The results showed significant differences between experimental treatments, and they all exceeded the control one in terms of the chemical properties of soil and its content of biological population.

The soil pH values decreased in the organic treatments, and electrical conductivity improved, in compare with control one, The (T1) Bokashi treatment gave the highest percentage of organic matter and nitrogen in the soil they were (6.372%, 0.32% respectively) due to its slow decomposition, the plant is likely to benefit from it later in the second seasons, followed by treatment (T2) (6.14%, 0.31% respectively), the values of these indicators were (1.89, 0.094%) at the control, the material decomposed faster in treatments T3 and T4 because of the addition of bio-fertilizer EM-1 to the soil.

The biological analysis showed that bacterial count was the highest significantly in treatment (T4) compared to the rest of ones it reached 11×106/ g soil in the second season, then came treatment (T3) which averaged 8× 106/ g of soil, it reached 2×105 at plot without any addition, this indicates a great activity of microorganisms in the decomposition and mineralization of organic matter in treatments (T3 and T4).

Regarding the productivity, all fertilization treatments were superior to the control, where the highest was in treatments T4 and T3 which achieved 41.54, 39.49 kg/tree, whereas it was 24.2 kg/tree in the control plot, which confirmed the role of using a mixture of bokashi and bio-fertilizer in improving the productivity of olive trees.

From an economic point of view, the addition of one type of fertilizer is the least expensive, i.e., the use of bokashi fertilizer with one of the two addition type of EM-1 will cost the farmer more, but in a neglected orchard or those with low fertility soils, the soil and plants need a several fertilizers to fill the entire plant requirements of nutrients.

This study confirmed the possibility of using alternatives to chemical fertilizers to rebuild the soil and increase its fertility, which ensure better sustainability of the soil and entire farm increasing productivity of olive orchards which is important considering the climate changes taking place in the region.

Key words: soil, Bokashi, Bio fertilizer, chemical properties, viable count, productivity.

UTILIZATION OF DRIED BANANA LEAVES AS ORGANIC MULCH FOR WEED MANAGEMENT IN VEGETABLES

BY DR. SHEEJA RAJ (INDIA)

By Sheeja K Raj, Jacob D, Shalini Pillai P., Sinchana J.K., and Seethal Rose Chacko

Weeds pose a major obstacle to crop production, leading to a yield decrease of 34% in India. Unfortunately, organic crop production has limited options available to manage weeds, one of which is mulching. This technique works by blocking the sun's rays, which stunts weed seed germination, and also by smothering existing weeds and favours crop growth by maintaining soil temperature and moisture. Covering the soil surface with suitable mulch can lessen weed seed germination.

In Kerala, bananas are a widely cultivated fruit crop, grown in homesteads, uplands, and converted wetlands, thus resulting in large amounts of dried banana leaves as organic waste. To explore the potential of dried banana leaves as organic mulch for weed suppression, two different studies were conducted during the *Kharif* 2019 and *Rabi* 2020, in two separate crops namely bush-type vegetable cowpea (*Vigna unguiculata* subsp.*unguiculata*) and okra (*Abelmoschus esculentus*).

Materials and Methods

Experiments in the field were conducted at Coconut Research Station, Balaramapuram, Thiruvananthapuram, Kerala. The station is located at 8° 22’ 52’ North latitude and 77 º 1’ 47” East longitude and is at 9 m above sea level. The climate of the region is warm, humid tropical. During *Kharif* 2019, the total rainfall recorded was 919 mm and 248.4 mm in *Rabi* 2020. The test crops were 'Bhagyalakshmi', a bush-type vegetable cowpea variety planted at 25 x 15 cm in *Kharif* 2019 and 'Anjitha' an okra variety planted at 60 cm x 45 cm in *Rabi* 2020. The sandy loam soil at the experimental site was acidic in reaction, low in organic carbon, low in available nitrogen, medium in phosphorus and potassium. The experiment was conducted in a randomized block design following the recommended practices for crop production in Kerala.

Dried banana leaf mulch @ 10 t ha^{-1} alone (DBL mulch @10 t ha^{-1}), hand weeding twice at 20 and 40 DAS (HW at 20 and 40 DAS) and weedy check were the treatments in the first experiment with cowpea. The treatments in the second experiment with okra comprised of DBL mulch @10 t ha^{-1}, DBL mulch @10 t ha^{-1} *fb* wheel hoe weeding (WHW) at 30 and 45 DAS), DBL mulch @10 t ha^{-1} *fb* HW at 30 and 45 DAS, HW at 15, 30 and 45 DAS and weedy check. Banana leaves free from sigatoka disease that had been treated with copper oxy chloride were used as mulch. Dry banana leaves with their petioles were positioned between the rows five days after the germination.

45 days after sowing (DAS) in bush type vegetable cowpea and 60 DAS in okra, a 0.25 m x 0.25 m quadrat was randomly set down at two locations in each treatment to determine weed density and dry weight and expressed as no. m^{-2} and g m^{-2}, respectively. Weed control efficiency (WCE) was calculated at 45 DAS for cowpea and 60 DAS for okra. Additionally, the number of pods/fruits per plant and total yield per hectare, weed index (WI), net return and benefit: cost ratio (BCR) were also assessed. ANOVA was used to statistically analyse the data, and the different treatments means were compared at 5 per cent probability.

Results

Weed flora present in the experimental field of bush vegetable cowpea during *Kharif* 2019 comprised of *Setaria barbata, Digitaria sanguinalis, Alternanthera sessilis*, *Phyllanthus amarus, Synedrella nodiflora* and *Cyperus rotundus.* Results revealed that DBL mulch @ 10 t ha^{-1} resulted in significantly lower weed density compared to HW twice at 20 and 40 DAS. However, the lowest weed dry weight and the highest WCE (89.4%) were observed with HW at 20 and 40 DAS. With DBL mulch alone @ 10 t ha^{-1}, the weed density and dry weight recorded were 16.0 no m^{-2} and 7.87 g m^{-2}, respectively. Weed density and dry weight values recorded in HW twice treatment were 34.67 no. m^{-2} and 5.13 g m^{-2}.

Dried banana leaf mulch @ 10 t ha^{-1} resulted in higher number of pods per plant (39.2) pod yield ha^{-1} (7009.3 kg), higher return (Rs 54797) and BCR (1.64). In comparison to HW twice, DBL mulching increased pod yield by 16 percent. Covering the soil surface with DBL mulch inhibited the weed seed germination by trapping solar radiation and suppressing the weeds, so higher pod yields were achieved with DBL mulching.

Grasses and BLW were the predominant weed flora in the experiment field of okra during *Rabi* 2020. The predominant weeds present in the field were, *Setaria barbata* and *Digitaria sanguinalis, Synedrella nodiflora Phyllanthus niruri*, *Boerhavia diffusa*, *Mimosa pudica*, and *Tridax procumbens*. DBL mulch@ 10 t ha^{-1} *fb* WHW at 30 and 45 DAS recorded the lowest weed density (29.67 no. m^{-2}) which was followed by HW at 15, 30 and 45 DAS (32.0 no. m^{-2}). Weed dry weight and WCE followed the same trend as that of weed density. The highest WCE was observed in DBL mulch@ 10 t ha^{-1} *fb* WHW at 30 and 45 DAS (89.2%). DBL mulch alone @ 10 t ha^{-1} recorded significantly lower weed density and dry weight compared to weedy check and resulted in a WCE of 63.34 per cent.

The highest number of fruits per plant (37.8) and fruit yield per hectare (3936 kg ha^{-1}) and the lowest weed index were noted in DBL mulch@ 10 t ha^{-1} *fb* WHW at 30 and 45 DAS. Weedy check resulted in a weed index of 52.95 per cent. The highest net return of Rs 80305/- and BCR of 2.04 was recorded DBL mulch@ 10 t ha^{-1} *fb* WHW at 30 and 45 DAS. The yield enhancement in DBL mulch@ 10 t ha^{-1} *fb* WHW at 30 and 45 DAS over DBL alone was 57 per cent and over weedy check was 112 per cent. The highest yield observed in DBL mulch@ 10 t ha^{-1} *fb* WHW at 30 and 45 DAS was due to higher number of fruits

per plant resulting from the better management of weeds due to mulching with dried banana leaf and wheel hoe weeding.

Conclusion

It can be concluded that dried banana leaves, which are generated as organic waste in farming, can be used effectively as mulch for controlling weeds in both close and wide inter-row spaced crops. The most prominent effect was found in bush-type vegetable cowpea that was cultivated at a close inter-row spacing of 25 cm, where dried banana leaf mulch @ 10 t ha^{-1} alone could control weeds adequately. However, dried banana leaf mulch alone was insufficient to control the weeds in the 60 cm wide inter-row okra crops, where the highest weed control efficiency was achieved through mulching with dried banana leaves @ 10 t ha^{-1} followed by wheel hoe weeding at 30 and 45 DAS.

DR. SHEEJA K RAJ

Dr. Sheeja K Raj earned her Master of Science in Agronomy from the Tamil Nadu Agricultural University and a Doctorate degree from the Kerala Agricultural University. She began her career as an Agricultural Officer in the Department of Agriculture, Government of Kerala in 1996. She embarked on her career as Assistant Professor in Agronomy at the Rice Research Station, Moncompu in the Kerala Agricultural University in 2011. Currently, she is working as an Assistant Professor (Agronomy) in the Department of Organic Agriculture at the College of Agriculture, Vellayani, Kerala Agricultural University.

Her primary domain of research is the management of weeds in Organic Crop Production. She has formulated four technologies that have been integrated in the Kerala State Package of Practice Recommendations for crops, to the advantage of the farmers of Kerala. She has a total of 26 years of experience in Extension and research, with six of her M.Sc. students having already submitted theses. Presently, three Ph.D. students and one M.Sc. student are conducting research under her guidance.

She was honoured in 2016 with Best Agronomist Award from the Society of Science Education Research. Her designs of Wheel Hoe Weeder (Design No. 346280-001 dated 14/07/2021) and a Seed cum Fertilizer Drill (Design No.359570-001 dated 28/02/2022) were awarded Certificate of Registration from The Patent Office of The Government of India. She had published 57 research papers in peer reviewed NAAS rated journals, three booklets, one training manual, and a multitude of research and extension leaflets.

Presently, she is involved in two research projects and has participated in more than 16 national and international seminars. She is an associate of the Project Co-ordination group of Kerala Agricultural University. She was the organizer of different training courses for farmers, agricultural officials, and vocational higher secondary school students. During her tenure at the Coconut Research Station, Balaramapuram, she established a soil and plant analysis laboratory. She holds life membership of Indian Society of Agronomy, Indian Society of Weed Science and Journal of Crop and Weed.

INNOVATIVE PREPARATIONS TO USE INSECTICIDAL, FUNGICIDAL PROPERTIES OF ANAMU (PETIVERIA ALLIACEA) FOR ORGANIC PEST AND DISEASES CONTROL

BY PALIHAWADANA AJANTHA PRIYADARSHIN (SRI LANKA)

Anamu (*Petiveria alliacea)* is a perennial herbaceous fast-growing shrub native to South America. It is in the family of *Phytolaccaceae* and belongs to the genus *Petiveria.* It is also known as tipi, mucura, apacin, guine, and guinea hen weed. Because of its strong, garlic-like odor, it is also referred to as "garlic weed" in addition to its other names. Even though Anamu is native to the Amazon rainforest it thrives well in tropical climates including Central America, the Caribbean, and Southern United State and Asia. In Sri Lanka the plant grows from sea level all the way to mountainous regions up to an altitude of 1500m.

I first encountered Anamu in 1991 during a farm visit to Matale in central Sri Lanka where a farmer pointed out what had been a plant that had hitherto been unknown to me. He also extracted a plant from the soil to let me smell first-hand the pungent garlic order of the root. I collected a plant along with its roots and after a year, I managed to propagate it successfully in the regions in and around Colombo.

Despite not being aware of the source and scientific name of the plant at the time I decided to test the possibilities of utilizing components of the plant as a pesticide. Towards this aim, I created a decoction made by fermenting its leaves with molasses and diluting it with water. I tried it on tomatoes to observe if it had any effect on aphid infestations. Over a period of two days, the aphids were resistant to the application. However, on day three, I observed that the aphids were dead. This positive outcome drove me to know more about the unknown plant and therefore, having prepared an herbarium specimen I forwarded it to the Royal Botanical Garden in Peradeniya for identification. The director of the gardens reverted back identifying it as *Petiveria alliacea* (Anamu*).*

Subsequent inquiries indicated that the plant was native to the Americas but was widely present across the southern hemisphere as well and that it was used in various forms as a remedy for a wide range human ailments including arthritis, allergies, as therapy for fever and malaria and in that context, has been reported be used to eliminate bacteria, fungi, candida, and viruses giving a firm indication of its multiple and multifaceted uses in human medicine.

Subsequent inquiries indicated that the plant was native to the Americas but was widely present across the southern hemisphere. Anamu's leaves and especially its roots are known for their strong garlic-like order, which comes from the Sulphur compounds in the plant. Traditionally, its leaves and roots have been used in folk medicine for various purposes, including boosting immunity, fighting cancers,

and reducing inflammation in addition to being used as an antiviral, antibacterial, antispasmodic and anti-pain agent.

Additionally, it has also been used against poison arrow frog poison by Native American tribes. According to the published literature, its potential benefits are believed to stem from its variety of plant compounds, including flavonoids, triterpenes, lipids, coumarin, and sulfur compounds. It is thought that the high levels of Sulphur in Anamu produce its antimicrobial and antifungal properties. Anamu contains a massive 18 sulphur compounds, and these are particularly concentrated in the roots. Of these, the sulphur compounds of significance are benzyl-containing thiosulfates.

Uses as a Pest Controller / Repellent in Organic Agriculture

Since the plant has such a wide-ranging set of uses as a human-ailment remedy, I was naturally inclined to think that it would have equally strong uses in organic agriculture were identifying possibilities and determining extract composition is a challenge despite the fact that such remedies are completely natural and have relatively no side effects either on the plants themselves or the environment.

Through subsequent experiments that I conducted over a period of four years I found that Anamu has insecticidal, repellent, antimicrobial and antifungal properties. A quick, general preparation I identified was based on grinding the whole plant (leaves, stems, and roots) and drying it to make a power which could then be infused into hot water to make a diluted tea that was effective as an insect repellent. For a more concentrated and stronger decoction, I found that utilizing only the roots was indicated since that was the component of the plant that contained the highest concentration of its biologically active compounds. I found that a range of variously diluted teas were effective in controlling mealy bugs and aphids while it would repel those very same pests when intercropped with chili plants.

Additionally, and as positive collateral, I found that anamu tea could be used to control ticks in cows and therefore had applications in animal husbandry as well.

Given its chemical properties, its widespread prevalence and ease of decoction, I identified it as a highly effective and cost-effective solution for organic farmers faced with insect pest infestations of both their crops and their livestock.

Planting Areas and Methods

The plant grows in almost all the agro-ecological zones of Sri Lanka as well as in similar temperature, rainfall, and elevation zones across the world. This indicates that it is easily accessible to both rural and urban communities. It is very easily cultivated from cuttings, seeds, and seedlings. When grown from seeds, the soil must be kept warm and moist in an area where it is brightly lit but not exposed to direct sunlight and quick growth can be ensured by applying any type of good organic fertilizer.

Germination generally takes between 2 and 8 weeks. Since the structure of the plant is bushy and shrub-like and its growth is up to about 1 meter in height its overall footprint is relatively small and can therefore fit easily into any home garden layout even if space is at a premium. In larger quantities, the remedies may be applied to reciprocally wider, multi-crop based organic agriculture plantations.

The Requirement for Propagation of Knowledge on the Uses of Anamu

While the manifold properties of anamu and its uses against human ailments have been well documented elsewhere, the possibilities for its use in organic agriculture have been relatively sparse despite it being widely available across a large swath of agricultural terrains across the world. Providing farmers with this option by imparting knowledge on how to create and apply teas and other decoctions to the entire size spectrum of organic plots would be highly beneficial to many farmers regardless of their geographic location on the planet.

PALIHAWADANA AJANTHA PRIYADARSHIN

Ajantha started his career in Organic Farming when he was appointed as the Manger of Uva Herbarium in 1987 which was entirely managed as a poison free herb production. While managing Uva Herbarium, he was also involved in researching about Analog Forestry with Dr. Ranil Senanayaka who was the founder of Analog Forestry in Sri Lanka.

To highlight, he published a book on Analog Forestry and Organic Farming in 1992 for the interpreted Development Project in Nuwaraeliya in Sri Lank (IRDP Nuwaraeliya). Moreover, he completed the IFOAM Organic Leadership Course in Sri Lanka in 2012. He is one of the founding members of the Lanka Organic Agriculture Movement (LOAM).

Currently, he is serving as the Executive Director to the Forest Garden Product Inspection and Certification (FGPIC) in Sri Lanka while practicing as an operation manager at SriCert Pvt Ltd (Organic Certification Sri Lanka).

Following are some of his notable publications:
Impact of organic cultivation and agro ecosystem diversity on natural populations of amphibians and fungi in Sri Lankan agricultural landscapes. – IFOAM Organic WORLD CONGRESS held in Korea in 2011.
Traditional Treatment of Cattle Diseases in Sri Lanka, Rahmann G & Godinho D (Ed.) (2012): Tackling the Future Challenges of Organic Animal Husbandry. Proceedings of the 2nd OAHC, Hamburg /Trent horst, Germany, Sep 12-14, 2012.

INFLUENCE OF NEEM OIL AS ORGANIC PESTICIDE ON GROWTH AND YIELD OF BRINJAL (SOLANUM MELONGENA)

BY MAISHA MALIHA (BANGLADESH)

Introduction

Brinjal (*Solanum melongena*), known as eggplant belongs to the Solanaceae family and is one of the most common and popular vegetables in the world (Harish et al. 2011). In Bangladesh, brinjal is considered as the second most important vegetables crop in respect of production. Brinjal production is increasing day by day. But its yield potential is very low compared to other countries due to incidence of insect pests (Das et al. 2000).

Farmers show a tendency of chemical fertilization to increase yield as well as control insect pests. To control insects as well as improve crop growth and development, application of pesticides and chemicals against insects is not cost effective and environment friendly. Beside these synthetic pesticides that work on contact often build up in the surrounding environment, leaving toxic residue behind that can harm and even kill pets and other animals in the area.

On this point, we badly need potential alternatives regarding these harmful chemical pesticides. Neem oil is a naturally occurring pesticide found in seeds from the neem tree which is organic, biodegradable nontoxic and the active ingredient in the oil is azadirachtin, which repels and kills a wide variety of insects, including aphids, mealybugs, whiteflies, Japanese beetles, leafhoppers, thrips, and other garden pests like spider mites and nematodes. Neem oil can also kill fungal diseases like powdery mildew, black spot, scab, anthracnose, and leaf spot.

In fact, the Environmental Protection Agency has found neem oil to have “no unreasonable adverse effects,” making it safe for the U.S. population and the environment. Brinjal shoot and fruit borer (*Leucinodes arbonalis*) is the serious insect for brinjal production which damage brinjal fruit more than 31-86% in Bangladesh (Alam, 2003). Farmers spray insecticides which are expensive and also harmful for farmers and consumers’ health as well as the whole environment. Neem oil is responsible for the toxic, repellent, antifeedant, growth-inhibiting, oviposition-inhibiting and sterilizing effects in insects (Mordue and Nisbet, 2000). Therefore, the present investigation was designed to evaluate the neem oil for quality brinjal production.

Methodology

The experiment was conducted at the horticultural farm, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh to evaluate the function of neem oil on Charki brinjal variety. Neem oil was collected from the local market. The experiment was conducted under Randomized Complete Block Design (RCBD). There were 8 seedlings transplanted in each plot and the size of each unit plot was 3.0 m × 1.0 m; line to line and plot to plot distances were 0.5 m and 1.0 m respectively while plant to plant distance was 60 cm.

Manure and fertilizers were applied according to the recommendations of Bangladesh Agricultural Research Institute (BARI) (Mondal et al. 2011). Intercultural operations and watering were done as and when necessary. In case of foliar application, neem oil @5ml L^{-1} with liquid soap was applied as treatment. Data on plant height, number of branches, infested branch no., branch infestation (%), no. of leaves/plant, chlorophyll percentage (using SPAD-5 Chlorophyll meter, no. of fruit/plant, no. of infested fruit, fruit infestation (%), single fruit weight(g), yield/plant (kg), yield/ha (ton) and yield increase (%) were recorded and arranged accordingly.

Result

From the findings of the study, Neem oil shows the best result in all parameters including the tallest brinjal plant (85.3 cm), maximum number of leaves (41.0). maximum number of branch (14.7), Minimum infected branch (0.2), minimum shoot infestation (11.9%), Maximum number of fruits per plant (13.3), the minimum number of infested fruit (0.2), the maximum weight of total fruit was (2.25 kg) was found from Neem oil treatment. On the other hand, the shortest plant (68.7 cm), maximum infected branch (3.0), Maximum shoot infestation (37.0%), the minimum weight of total fruits (1.81kg), minimum number of fruits per plant (11.0), maximum number of infested fruits (4.3) was found in control treatment. Finally, the minimum yield of brinjal was (50.5 t ha^{-1}) and maximum yield (57.3 t ha^{-1}) was found under neem oil treatment which was (13.47%) higher yield over control treatment.

Potentiality of Organic Pesticide

By using pesticides on crops, humans come in direct contact with them, and they can cause two types of poisoning: “Acute poisoning” and “Chronic poisoning”. For Examples stinging eyes, rashes, affect the skin, eyes, mouth, and respiratory tract, blindness, nausea, dizziness, headache, vomiting, rashes on the skin, cancers, birth defects, reproductive harm, immunotoxicity, neurological and developmental toxicity and so on.

That's why we need to ensure the production of organic safe food by increasing the use of organic pesticides instead of depending on chemical pesticides. Then we can stay healthy and protect the environment from these harmful pesticides. Due to climatic change impacts, the agriculture sector is

under thread. That is why the Government and concerned authorities put emphasis on organic agriculture by following the Principles of Health, Ecology, Fairness, and care which are the basis on how organic agriculture grows and develops. They express the contribution that organic agriculture can make to the world, and a vision to improve all agriculture in a global context.

Conclusion

Neem oil showed effective performance to combat shoot and fruit borer, increase growth attributes, decrease infestation, and increase the yield among all the treatments. So, it can be said that foliar spray of neem oil would be the prominent way to reduce the infestation as well as increase yield. Organic farming can reduce the dependency on harmful chemical pesticide. Overall, by ensuring the use of neem oil instead of synthetic pesticide we can provide the farmer with a safe working environment and so they can supply safe food. Finally, we can also protect the environment from hazardous chemicals.

References

Alam, M. M. (2003). Studies on the soil borne nature of Phomopsis blight and fruit rot of eggplant. An M.S. thesis submitted to the Dept. of Plant Path., Bangladesh Agricultural University, Mymensingh, Bangladesh. pp. 01-89.

Das, A. N. and Singh, B. R. (2000). Field reaction of brinjal varieties against shoot and fruit borer, (Leucinodes orbonali). Environ. Eco. 8(2), 761-762.

Harish, D. K., Agasimani, A. K., Imamsaheb, S. J. and Patil Satish, S. (2011). Growth and yield parameters in brinjal as influenced by organic nutrient management and plant protection conditions. Res. J. Agric. Sci. 2(2), 221-225.

Mondal, M. R. I., Islam, M. S., Jalil, M. A. B., Rahman, M. M., Alam, M. S. and Rahman, M. H. H. (2011). Krishi Projukti Hatboi (Handbook of Agro-technology), 1st part, 5th edition. Bang. Agri. Res. Inst. Gazipur-1701, Bangladesh. p. 390.

Mordue, A. J. and Nisbet, A. J. (2000). Azadirachtin from the neem tree Azadirachta indica: its actions against insects. Anais da Sociedade Entomológica do Brasil 29, pp. 615-632.

MAISHA MALIHA

Maisha Maliha is a horticulturist who completed her Bachelor of Science degree in Agriculture in 2018 from Sylhet Agricultural University, Bangladesh. She completed her master's degree in Horticultural Science in 2022. She was awarded the National Science and Technology Fellowship by the Ministry of Science and Technology, Bangladesh, for her master's research.

Now she is working as a research assistant at Horticulture Innovation Lab.BD. under the supervision of Professor AFM Jamal Uddin, Department of Horticulture, Sher-e-Bangla Agricultural University, Bangladesh. Moreover, Maisha is highly fascinated with research work and has published twelve papers and is involved in research work related to advanced technology in the agriculture sector. She would like to develop research-oriented career where she can serve the country by her skills, policy, and development, contributing to a more resource-efficient and sustainable development of agriculture that can cope with the challenges of population growth, globalization, and climate change in a site-specific manner.

MANGO WASTES AS A POTENTIAL BIORESOURCE FOR ORGANIC FARMING

BY KARUPPAN PERUMAL (INDIA)

The most important challenge the world has been facing in this 21st century is population growth projected to be around 10 billion in 2050. This is particularly visible in Asian countries like India (the most populous country in the world) followed by China. The eradication of poverty and hunger and the sustainable growth of citizens are most important for developing nations, which can be achieved by utilizing the available limited natural resources with appropriate technological interventions.

Sustainable organic and biodynamic farming is the need of the hour and the only way to produce 50% more food by 2050 to feed the growing population and to achieve food security. Since all the agriculture produces are perishable and necessary steps or industrial sectors has to be established for food preservation and storing to meet the demand. During processing of agricultural commodities, agro-based industries generate huge quantities of waste materials that could benefit mankind deployed with science and technological interventions.

In the present study, mango fruit wastes such as mango peel, mango seed kernel and mango stone were collected and utilized into economically important products such as mangiferin, a formulated biopesticide and energy pellets for household cooking. Mango wastes can also be converted into manure and can be used as soil nutrient booster and conditioner. Mango fruits are commercially and economically viable and are cultivated in India as a cash crop.

The majority of mango fruits are processed into pulp by fruit processing industries. Mango fruit pulp processing industries were major in India's Chittoor district of Andhra Pradesh and Krishnagiri district of Tamiladu. On average, a pulp industry in Krishnagiri district generates about 140 tonnes of mango stone and mango peel as waste or industrial residue per day. Twenty-five mango pulp industries located in Krishnagiri district generate about 3500 tonnes of mango waste every day during the mango season.

On average, the mango season operates for about 70 days and the enormous quantity of waste generated from the pulp industry accounts for about 2,450,000 tonnes yearly. Hence Bioconversion of mango wastes was investigated for its utility. In this study 3 types of mango fruit processing wastes such as mango peel, mango seed stone and mango kernel were collected from M/s. Capricon Fruit Processing Industry which has been located at Kalguddapatti, Bannihalli Taluka, Krishnagiri district of Tamil Nadu.

The methanolic kernel extract mangiferin was purified using coloum chromatography technique and the purity of mangifeirin was compared with UV/Visible spectral scan of standard mangifeirn. The λ

max of partially purified mangiferin exhibit maxim UV/Visible absorbance at 267 nm which is similar to that of absorbance of standard mangiferin.

The eluted samples further pooled and dried in room temperature and pale-yellow crystals of mangiferin were obtained. The partially purified mangiferin extract obtained from different solvents were tested for antimicrobial activity against selected bacteria such as *Escherichia coli, Pseudomonas putida, Pseudomonas aeruginosa, Shigella sonnei, Klebsiella pneumonia, Xanthomonas oryzae* and *Staphylococcus aureuss*.

The partially purified mangiferin extracted from methanolic mango kernel recorded growth inhibition zone for all the bacteria tested ranging from 16 to 24 state that chloroform extract. Further the partially purified mangiferin form methanolic mango kernel extract was tested for anti-fungal property against *R. solani, Curvullaria lunata, Alternia alternate* and *Fusarium oxysporum* and maximum fungal mycelial growth inhibition was recorded in *R. solani* as 92.90 ± 0.31 % at 1% concentration.

The anti feedent and mortality ability of mangiferin extracted from methanolic mango kernel extract was tested against 2nd instar larvae of *Spodoptera litura* and *Helicoverpa armigera.* The anti feedent activity of 1% of methanolic mango kernel extract was recorded as 77.37 ± 0.75 % for *Spodoptera litura* and 55.04 ± 1.06 % for *Helicoverpa armigera.* The mortality rate was recorded as 17.8 ± 2.2 % for *Spodoptera litura* and 100% for *Helicoverpa armigera* respectively.

The evaluation of aphid's infection after applying formulated mangiferin was studied as a field trail experiment. The first spray application of formulated biopesticide mangiferin (0.3%) was done on the visibility of the sucking pests' aphids (Myzus persicae) infection in the brinjal crop. After spraying the biopesticide the infection of aphids (M. persicae) was decreased gradually and compared with commercial vijay neem.

The infection percentage was 77.00±1.04% recorded before applying formulated mangiferin (0.3%) and decreased to 49.56±1.95% in day one after spraying and up to 30 th day the infection rate (5.51±1.23 %) was recorded. The aphid's population gradually decreased from day 1 to day 30 th day. Every five days interval the population count was done manually and recorded.

The data represents the aphid's density in control was increased and in commercial Vijay neem and formulated mangiferin applied plots the aphid population density decreased. The aphids control efficacy was about 93% recorded in formulated mangiferin applied plot. The circular bore hole infection percentage was gradually decreased for a single spray of formulated mangiferin (0.3%). After 30th day of spraying of formulated mangiferin biopesticide the circular bore hole infection of brinjal leave due to H.armijera attack was reduced and recorded as 8.40±1 percent The P. solenopsis (Mealy bug) infection in tomato plant was decreased gradually from day 1 to 30th day and recorded very minimal

count (6.67±0.31) of P. solenopsis (Mealy bug) infection. The biometric parameters for brinjal and tomato plants such as height of plant, number of leaves and flowers were also recorded.

The production of biochar from mango stone was carried in a kiln. The collected mango stone (shell) was placed in kiln for pyrolysis. The pre weighed dry mango stone was loosely packed into cylindrical metal kiln which is made up of old oil drum. The mango stone biomass was loaded into the kiln, and the kiln top was closed with metal lid which was fitted with a conical chimney. A small quantity of biomass is used in the firing portion to ignite in the kiln and the fire portion lids are closed tightly to start the pyrolysis process. Due to the absence of air the heat spreads over the biomass through inner holes.

A two hours' time slot was taken for complete conversion of mango stone into biochar. After pyrolysis, the cooled samples were weighed, and 35 % biochar yield was recorded from mango stone after pyrolysis. A grooved screw extruder briquetting mould (Model No.32) and a 2HP electric motor are fitted appropriately to the briquetting machine.

The briquettes production capacity 100 Kg/hr with different mold diameter 5, 10 25 mm and length 300mm were fabricated and used. The binder material is used for strengthening the briquettes. The carbonized char powder is mixed with binding material starch. The starch powder was allowed to disperse without any clumps and heated the solution for 10 minutes and did not allow it to boil (the final stage identified by the stickiness of the solution). After boiling, the liquid solution is poured into char powder and mixed to ensure that every particle of carbonized charcoal material is coated with binder. The binder enhances charcoal adhesion and produces identical briquettes.

The charcoal mixture is made into briquettes using machine by pouring the mixture directly into the briquetting mould / machine to form uniform-sized cylindrical energy pellets and tested as fuel source for cooking. The prepared energy pellets from mango stone wastes were distributed among 40 households for use as an alternative fuel in cooking and the cooking efficiency was recorded as a feedback survey. A form comprising set of questions were distributed among the beneficiaries and answers in terms of ignition time, burn out time, cooking time were recorded.

Nearly 80 % of beneficiaries responded that mango stone energy pellets were easily ignited (less than 10 minutes), had longer burn out time, were emitting less to no smoke. All the beneficiaries reported that carbon deposits at the bottom of the cooking vessel was almost nil and cleaning of bottom of vessel was easy and required less water (less than 50% when compared to normal firewood). Further the beneficiaries indicated that the energy pellets burned without any smoke, odor, spark, and soot.

With the lab test results and feedback form survey study results, the present conversion of mango waste stone into energy pellets are better alternatives to firewood, wood charcoal as a clean,

renewable energy source and an easy method of conversion of mango stone waste into useful source of income generation for beneficiaries.

The overall conclusion of the present study revealed that the (*Mangifera indica* L. cv Totapuri) fruit processing industrial waste can be utilized to produce value-added products. Mangiferin, a bioactive xanthone extracted from mango kernel (MK) can be purified and used as an antioxidant, antibacterial, antifungal, biocontrol agent in agriculture against insect pest *S. litura, H. armigera, M. persicae* (aphids), *P. solenopsis* and also to control *R. solani* infection in plants.

KARUPPAN PERUMAL

Dr K. Perumal hailed from rural India with passion on applied research in Life Sciences and organic and Biodynamic Agriculture towards Reaching the Unreached through Cost effective ecofriendly sustainable approaches and social networking. He is also a social worker since 1995 and holds the position as honorary Secretary in a nonprofit voluntary organization called Inba Seva Sangam, Sevapur, Karur District, Tamil Nadu, India.

Dr Perumal is trained as an Applied Mycologist and did my PhD from C.A.S in Botany, University of Madras Chennai. Immediately after completing his PhD, he joined the Shri AMM Murugappa Chettiar Research Centre (MCRC) as a technologist in 1998 and was later promoted as Research Scientist, Senior Scientist, Principal Scientist, Deputy Director (R&D and Admin), and Chief Scientist.

Dr Perumal was responsible for developing, executing research and extension activities on Unexplored Novel secondary metabolites from fungi/ microbes, sustainable agriculture (Organic and Biodynamic farming) and development of ecofriendly product/process technologies. He has completed 35 major projects sponsored by national and international funding agencies. And also published about 50 research articles in national and international journals.

Currently Dr Perumal is serving as Director, The School of Biodynamic Farming, Inba Seva Sangam Sevapur Karur district. Since 2014 I am also the coordination Head in BERAS India – networking self-organized likeminded organizations (about 40) and promoting Organic Sustainable Food System in India. BERAS India is a partner organization in BERAS International, UNEP/FAO on 10 Year Framework Programme (10 YFP).

EMPOWERING ORGANIC SAFFRON (CROCUS SATIVUS L.) SMALLHOLDER FARMERS TO SCALE UP FOOD SECURITY THROUGH GROWER GROUP CERTIFICATION IN IRAN

BY ALIAKBAR SHAFIGHI (IRAN)

“Food security” and development have always been challenges for leaders and governments alike for centuries. In food security, it is time to acknowledge the benefits of being part of something smaller because in global agricultural development, small is crucial. The 600 million “smallholder farmers” around the world working on less than two hectares of land, are estimated to produce 28-31% of total crop production.

In Iran, smallholder farming is an important aspect of livelihood, where 37% of farmers are smallholders working with land under 10 hectares. Now we have an opportunity for a rethink since a golden chance to feed the planet is to value and invest in smallholder farmers, who produce about one-third of the world's food supply. Transition to a sustainable food system by implementing agricultural innovation and technology for producers needs an integrated and long-term oriented approach to support rural and economic development and resiliency of smallholder farmers.

Organic regulations have defined “group certification” as one of those approaches that regulated by a specific set of requirements. Group certification has simplified access of smallholders to organic certification and hence to organic markets and their associated benefits, where not only all the principles of organic farming but smallholders’ necessity has been met. Despite the essential role of smallholders in food production, sustainable rural communities and biodiversity stewardship, many smallholders are very poor and have insufficient access to resources and support.

Recently, the mind-set of converting to organic agriculture has been evolved in different dimensions in Iran. One of these fundamental mind-sets was implementation of grower group certification to not only minimize the negative effects of climate crisis, but alleviate poverty, gender discrimination and incrassating smallholders’ income in Iran. Concurrently, “climate change” has known as a major threat to “international peace” and security. Global climate change advocates are raising awareness towards the food system vulnerability in exposure to extreme climate variability. In between, climate readiness as a key solution recommended locally adapted crops cultivation alongside the traditional farming practices as targeted action to preserve and improve our farmers economy, livelihoods, infrastructure, and resources while safeguarding our community members' health, safety, and quality of life.

Over the past 5 years, a certified organic smallholder farmers project under” Internal Control System” approach has been successfully implemented with 119 farmers in 25 different villages by one of the

famous knowledge-based saffron producer companies in Qayen city, South Khorasan province, Iran, where the climate is dry, and the region has historically known as the main ecological niche for producing one of the famous high value crops named saffron (*Crocus sativus* L.).

Saffron as the most expensive spice in the world, has a special situation among Iran's export products. The purpose of saffron cultivation is to harvest its stigma and long style, which is transparent red in colour and has a lot of medicinal and nutritional value. Iran has been known as “the world’s first and largest producer and exporter of saffron”, with a 92-95% share of world production. Although international markets have a great desire to buy Iranian organic saffron, but only 2% of saffron is produced under organic management in Iran.

During this study the benefit of saffron smallholders from organic farming through their improved food security was investigated which is discovered from their yield stability and farm income. Saffron production is based on family farming in small farms less than 2 ha, this innate potential leads to naturally considering this crop as a great example into the low input farming systems. For these reasons, saffron farms have a great potential for converting to organic agriculture. In this project, an internal control system manual has been designed to cover all “fundamental internal procedures” according to the saffron demands such as scope of activity, registration system, internal inspection/control, record selling-buying, training, risk assessment, and record keeping system procedures in 2018. Five years of data were collected by the project staff and were crosschecked with the base line. The smallholders were selected from 25 villages of Qayen city, and the farmers (119) were the beneficiaries of the organic agriculture promotion project.

This study explored that the number of villages and smallholder producers under the management of organic farming increased by 84% and 83% during the implementation of this project respectively. Due to adoption of organic practices in a period of 5 years, organic saffron producers enjoy 84% to 86% premium prices which have enhanced their farm income significantly. The study also showed that the area of certified organic land had a growth of 93%.

At the initial year of joining organic agriculture project their total farm size was about 4.55 ha and it increased continually in the successive years reached to 65.27 ha. Meanwhile, yield stability of organic saffron smallholders was higher than conventional saffron producers within 5 years. In some cases, it crossed the yield compared to conventional farming. The results also revealed that organic farming is gaining recognition among 82.8% of saffron smallholders in the group certification system, and 95.3% believed that organic farming has high-profit returns.

However, 82.1% of the smallholders agreed that the required standards for organic farming are too restrictive while a further 71.3% indicated that organic farming certification is difficult to obtain. Findings of the study explored that the highest amount of Safranal essential oil was obtained in saffron

cultivated in 3 villages (central part of the area) with a maximum absorption of 41. Also, the highest amount of crocin (maximum absorption 268) and picrocrocin (maximum absorption 104) were obtained. Thus, adoption of organic agriculture effectively increased smallholders' access to international markets, free education, better livelihood, sustainable peace and food security.

The study also explored that farm size, continuous training, access to national and international markets and access to institutional support are the most important pillars in improving smallholders' sustainable food security through participation in organic agriculture program. Based on the results, it can be concluded that there is a great need for higher investment in organic smallholder science, technology, infrastructure, services, and innovation and for policies at all levels to promote sustainable organic smallholder systems and businesses in near future.

ALIAKBAR SHAFIGHI

I hold a PhD degree in Agronomy with a focus on sustainable agriculture and throughout my study and thesis conduction, I have particularly focused on oilseeds, cereals and medicinal plants sustainable production and have successfully published several articles in both international and national scientific journals.

Recently, I successfully published my last paper at ISOFAR (International Society of Organic Farming Research) scientific workshops in Goesan, South Korea. Meanwhile, participating in various scientific training courses and conferences such as Organic World Congress and IFOAM Organic Leadership Course Europe, have drastically helped me to change my mindset and build my professional network in this sector.

I'm also YPARD (Young Professionals for Agricultural Development) country representative in Iran. YPARD is an international movement for young professionals that operates as a network in 72 countries through its chapters.

Apart from my academic background, I'm an organic lover with 7 years inspection and certification experience in organic crop production, processing, wild collection, ICS and 100% grower group production in Iran, Uzbekistan, Kazakhstan, Indonesia, Ukraine, Russia, Moldova, Turkey, and United Arab Emirates. All these years provided a great opportunity and gave me a broad experience to be familiar with the terms and concepts of research, regulations, inspections, and certification requirements of many organic crops in several countries. Based on these experiences, I have developed a strong understanding of organic agriculture philosophy, research, regulation, and process in different types of projects.

BENEFITS OF ORGANICALLY GROWN VEGETABLES IN RAISED BEDS

BY RICO TABAL (PHILIPPINES)

Benefits of Organically Grown Vegetables in Raised beds: Experienced of Selected Urban Barangays in Zamboanga City, Philippines Amidst CoVid 19 Pandemic

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Abstract

Prior to Covid 19 pandemic, most of the supply of vegetables comes from the Province of Bukidnon in northern Mindanao and nearby municipalities and cities of Zamboanga Peninsula supplying nearly 60% of the total vegetable demand to about 977,234 people living in Zamboanga City, Philippines. More than 80% of this population resides in highly urbanized zones where demand for food is high.

However, the pandemic COVID 19 has crippled not only the Philippine economy but more so the local food production and supply chain. Two dimensions of the food system that were affected include the production and distribution systems. Farm inputs and labor are major components in the production system, while logistic support is needed from harvest to market the produce. But, the Covid 19 pandemic crisis had significantly caused disruptions on local food production and distribution from local buying to wholesaling of farm inputs and from cross-regional logistics to consumptions of farm products at city and down to barangay level in the City of Zamboanga.

This scenario was observed the same across the Zamboanga Peninsula and the entire country. More so, during the enhanced and general quarantine periods, supply of vegetables was limited to meet the demand due to movement restrictions, with this limitation comes food insecurity and malnutrition issues especially to poor families and those living in highly urbanized zones where scarcity of food is hardly felt. Addition to this, the lack of access to technical support and limited assistance on the establishment of urban vegetable production worsened the limited supply of assorted vegetables in the city. This posed the need to address the production and sustainable distribution of vegetable produce within the urban communities.

Government subsidies became prevalent and various approaches have been employed to address the immediate need of the people. It is imperative for the local government unit (LGU) of Zamboanga City

to provide agricultural assistance to hasten the development of sustainable production and distribution systems of locally produce vegetables through the establishment of organic urban agriculture. This is to help ensure access to adequate food supply in face of the pandemic crisis.

Reported in various literatures, organic urban agriculture offers a multifunctional system combined with different production approaches within a given land unit. Understanding the need to address food scarcity, urban agriculture was proposed as a solution to an increasing demand for safe and cheaper food. Considered as an approach, organic urban agriculture may have a role in urban food security and self-provisioning of assorted vegetables. Its long-term impact includes direct access to safe and healthy food, and additional income.

In the USA and Europe, raised bed gardening is a popular technique for growing plants, where vegetables, fruits, flowers, trees, and shrubs are grown with improved soil media, adding attraction to the landscape. In Zamboanga City, this is not practiced although there have been various set ups of urban gardening. This paper presents the experienced of selected urban barangays amidst Covid 19 pandemic.

The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development or PCAARRD funded a project to evaluate the yield level and income of organically grown assorted vegetables in raised beds with 150 participating beneficiaries. Majority of the beneficiaries are the Pantawid Pamilyang Pilipino Program members or popularly known as the 4Ps – "a human development measure of the national government that provides conditional cash grants to the poorest of the poor". There were twelve (12) urban barangays selected for this project in collaboration with the Office of the City Agriculturist, City of Zamboanga and the Department of Social Welfare and Development (DSWD) whose main job is to determine the list of the beneficiaries.

Of the 150 total beneficiaries, ten (10) raised beds were required for each beneficiary where 1.0 sqm raised bed was utilized for one vegetable crop making a total of 1,500 raised beds. On the other hand, the Office of the City Agriculturist identified the priority leafy and fruit vegetable crops to be planted such as lettuce *(Lactuca sativa)*, pechay *(Brassica rapa)*, mustaza *(Brassica juncea)*, camote tops *(Ipomoea batatas L.)*, alugbati *(Basella alba)* and upland kangkong *(Ipomoea reptans)*, tomato *(Solanum lycopersicum L.)*, eggplant *(Solanum melongena L.)*, pole sitao *(Vigna unguiculata)*, pepper *(Capsicum annuum)*, and okra *(Abelmoschus esculentus)*.

While the PCAARRD provided the farm inputs, technical support and the training required with the College of Agriculture, Western Mindanao State University on the development and production of soil mixes and various organic homemade concoctions as fertilizers and pesticides. Individual garden set ups in different locations were established after the training was completed, while regular monitoring and data collection were done in weekly basis.

Results showed, a total of 5,446.1 kg of assorted vegetables were harvested in eight months period from June 2021 to January 2022. Of this total, leafy vegetables contributed 79.8 percent (4,347.5 kg), while fruit vegetables shared 20.2 percent (1,098.6 kg), respectively. The total vegetables produced generated PHP236,630.50 (~4,732.6 USD) in total sales. Among the leafy vegetables, pechay gave the highest yield at 1,061.4 kg contributed 19.5% of the total vegetables produced and 20.2% share in total sales, while eggplant gave a total harvest of 246.0 kg.

Compared to leafy vegetables, fruit vegetables were affected by frequent typhoons and low pressures and extended rainy days until the months of November 2021-January 2022. Vegetable grown in raised beds also offered direct access to safe and healthy food. While, production, supply and distribution were disrupted, the project beneficiaries enjoyed the benefits of consuming about 40 percent of the total vegetables produced which provided a total savings or this is indirect income of PHP94,652.20 from the total food consumed, while 60 percent (PHP141,978.30) derived from direct sales of surplus vegetables, or this is direct income.

Direct access to safe and healthy food, and income are the potential benefits of organically grown vegetables in raised beds in addressing food security and unemployment amidst the CoVid 19 pandemic. Organic vegetable production in raised beds is one initiative to further enhance the capability of urban communities to be resilient and self-sufficient. Expansion of this type of production system with improved soil mixes using locally available organic substrates, plus the utilization of home-based organic inputs and concoctions can be achieved if government interventions and community supports are in place.

Keywords: Organic vegetables, raised beds, urban barangays, direct income, indirect income

RICO TABAL

Rico Tabal obtained his Master of Science in Agronomy in Western Mindanao State University, Zamboanga City, Philippines in 2014 and his Doctor of Philosophy in Agronomy with cognate in soil science in the University of the Philippines Los Banos (UPLB), Laguna in 2019.

He both finished the degrees as a government scholar. He was accorded with academic excellence award conferred by the Institute of Crop Science, College of Agriculture and Food Science, UPLB in 2019, and a recipient of several others including the Outstanding Local Technician and Outstanding Alumna in Agriculture awards in 1997 and 2022.

He is a faculty member and a researcher of the Agricultural Sciences Department and Graduate School where he teaches farming systems, crop science and methods of crop research. Currently, he is the dean of the College of Agriculture, Western Mindanao State University, Zamboanga City, Philippines.

His area of research includes farming design and analysis, energy accounting in various agricultural landscapes, organic and urban agriculture, biomass and carbon analysis. He has been a project leader to various government funded projects and author to various scientific papers published in both the local and international journals. He lives with his wife and family in Zamboanga City, Philippines where he does consultancy jobs.

CROP DIVERSIFICATION WITH PEANUT (ARACHIS HYPOGAEA) IN ATTAINING FOOD SECURITY AND BIO-RESOURCE MANAGEMENT

BY MD. JASHIM UDDIN (BANGLADESH)

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Introduction

Crop diversification is one of the most eco-friendly, cost-effective, and sustainable ways of reducing uncertainties in agriculture, especially for small-scale farmers. It enhances biodiversity or bio-resources at farm level and increases resilience i.e., the ability of an ecosystem to return to its original productive state after being disturbed (Njeru, 2013). Crop diversity may be a viable option in reducing the risks associated with soil, food and climate change insecurity. Soil quality maintenance with the enhancement of soil biodiversity or bio-resources has received much attention worldwide now-a-days because of its important role in the global carbon cycle.

Many authors reported that soil quality and bio-resource management is intimately related to crop diversification, especially with leguminous crops. It is also reported that mono cropping has resulted in diverse levels of soil related problems accelerating yield reduction. Moreover, a low content of organic matter in the soils of Bangladesh is serious threat in attaining food security and maintain soil health. BARC (2018) reported that more than 50% of the agricultural soils in Bangladesh have <0.86% organic carbon.

The reason for low soil organic carbon (SOC) is perhaps due to the low residual input with higher cropping intensities without any fallow periods. Consequently, the physical fertility of the soil regarding loss of SOC either remains stagnant or worsens. This causes a general decrease in the yield of crops per unit area all over Bangladesh. Food crop productivity stagnation is a serious challenge for Bangladesh with its population of 162 million and an annual growth rate of 1.6% (Unnayan Onneshan, 2014). If the present trend of population growth (two million people per year) continues, Bangladesh will potentially face severe food shortage.

To meet these silent challenges, crop diversification with leguminous species is very vital in enhancing soil quality and bio resource management in attaining food security. Considering the above issues, a study was initiated to evaluate the effects of four different kinds of soil treated green manure species on soil quality and bio-resource management.

Materials and Methods

The experiment was laid out in pots comprising of 7 treatments viz T_0=Control, T_1= Azolla (*Azolla pinnata)*, T_2= Grass (*Phleum pretense)*, T_3=Water hyacinth (*Pontederia crassipes)*, T_4=Peanut (*Arachis hypogaea),* T_5= Azolla + Water hyacinth and T_6= Peanut+ Grass. The control treatment contains only soil and without any green manures.

All the treatments are laid out in duplicate. It may be noted that fresh green manure was collected and washed with tap water and then cut into fine mesh with scissors and mixed thoroughly. Afterwards 100g fresh green manure was weighted and mixed properly with 500 g soil to make it uniform and homogenous mixer. Then 10 ml of water was added in order to accelerate the decomposition rate and then kept in large jars freely exposed to the air and sunshine for 12 months in a well-ventilated room. Water was added regularly to maintain the optimum soil moisture level which helps to keep favorable condition for decomposition.

The initial soil properties of organic carbon, total nitrogen, Carbon and nitrogen ratio and cation exchange capacity (CEC) were analyzed following standard methodology. These parameters were also analyzed sequentially three times in the experimental soils over a year to observe the changes in physicochemical properties. The carbon nitrogen ratio of the fresh green manures was also determined. Microbial colony growth was also observed in the experimental soils at the final stage.

Results and Discussion

The present study revealed that SOC increased by 0.3% in a year where the other soil properties viz soil pH, soil nitrogen, cation exchange capacity (CEC) increased substantially in the peanut treated soils than the other treatments. In the peanut treated soils, the values of pH, nitrogen, and CEC reached at an optimum level over a year to support microbial growth. The carbon nitrogen (C: N) ratio of peanut fresh materials was 16.18 where the other green manures contain higher level (>32.0) of C: N ratio.

The carbon and nitrogen ratios are an important indicator in soil resilience and ecosystem management. The pea nut treated soils showed the highest level of microbial colony growth indicating more nitrogen fixation abilities. From the Paris climate Agreement, this has been formally recognized through the '*soil carbon 4 per mille' initiative*, the aim of which is to increase global soil organic stocks by 4 per 1000 (0.4%) per year as compensation for global emissions of greenhouse gases (Minasny *et al*., 2017). The aim of increasing SOC by 0.4% per year is encouraging for the restoration of soil quality, attaining food security, and offsetting global CO_2 emissions. It aims to boost carbon storage in agricultural soils by 0.4% each year to help mitigate climate change and in increasing food security.

Similarly, it may be said that SOC storage can be increased at 0.3 % level annually in the agricultural soils with peanut cultivation under crop diversification program. An initiative may be adopted with a

slogan '*soil carbon 3 per mille*' for Bangladesh or similar climatic regions. As such situation, crop diversification with leguminous cropping pattern may be an important attempt in achieving sustainable development goals (SDGs).

Conclusion

The adoption and extension of peanuts in the cropping pattern would be an important option of reducing input costs, especially nitrogen fertilizers for the small-scale farmers. A new slogan for Bangladesh or other similar developing countries may be '*soil carbon 3 per mille*' as per 'Paris climate agreement' to combat climate change relates issues.

References

BARC (2018). Fertilizer Recommendation Guides. Bangladesh Agricultural Research Council. Dhaka, Bangladesh. 223p.

Minasny et al. (2017). Soil carbon 4 per mille. Geoderma, **292**: 59-86.

Njeru EM (2013). Crop diversification: a potential strategy to mitigate food insecurity by smallholders in sub-Saharan Africa. Journal of agriculture food system and community development. 3(4): 63–9. https://doi.org/10.5304/jafscd.2013.034.006

Unnayan Onneshan (2014). Recent trends of growth in agriculture, industry and power. Bangladesh Economic. Update on March 2014. Vol. 5, No 3.

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Dr. Uddin is experienced in teaching and has undertaken research for more than 25 years. There are 55 research publications and 04 books on his credits which were published at national and international levels. His field of specialization is in precision farming, soil organic carbon stocks and dynamics, sequestration, and climate change issues.

EVALUATION, CHARACTERIZATION, AND STANDARDIZATION OF ORGANIC FERTILIZERS IN THE VISAYAS

BY SUZETTE LINA (PHILIPPINES)

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With the advent of the organic agriculture program of the country, various organic fertilizer products are produced with varying levels of formulations. Most of these products ranged from liquid to granulated forms and composted products such as vermicast. These are the commonly used and readily available organic fertilizers in the local market. However, the composition of these products in terms of nutrient contents and microbial population present are unknown to the end-users specifically the farmers.

The absence of data on the contents of the organic fertilizer would lead to an erroneous and hit-and-miss recommendation by the technician in-charge. Hence, this study was conducted to evaluate and assess the composition of the locally produced organic fertilizers in the Visayas region and improve the quality of the organic fertilizer produced by the local practitioners.

The study was conducted by collecting available materials produced in the Visayas Regions (*Negros Island, Panay Island, Guimaras, Cebu, Bohol, and Siquijor*). Collected samples were brought to the laboratory for the analysis of the following parameters: moisture content, pH, Electrical Conductivity (EC), Organic Carbon or Organic matter, Total Nitrogen, Extractable phosphorous, Exchangeable minerals (K, Ca, Mg and Na), and C:N Ratio. These parameters are the minimum requirement according to Bureau of Agriculture and Fisheries Standard (BAFS).

Interestingly, the most dominant organic amendments locally produced in the Visayas is vermicast. Though, concoctions, Bokashi, and ordinary compost were also produced locally. Results revealed that organic fertilizers have variable values in terms of the different physico-chemical parameters considered. Even the same kind of organic fertilizer like vermicast differ among places. The pH of the organic materials ranged from 4.58 to 9.08. Such variation on the pH of the different products could be attributed to the nature of raw materials used, processes implemented in making of the product and to the production of organic acids produced during the vermicomposting process. Just like the sample

taken from site 5, the vermicast production of the said site was highly dependent on the raw material that was available in their area (mostly plant residue).

This observation on the pH of the sample could be attributed to the uptake of plant material used as raw material with some basic cations in the soil since the area was located near a fishpond and was surrounded by brackish water. Moreover, a sample taken from site 5 was found to have the highest Na content compared to the rest of the samples collected.

In the study, total N contents of vermicast samples from regions VI, VII, and VIII range from 1.75- 0.52, 1.86- 0.99, and 0.35- 1.92 % respectively. In terms of the other products collected in region VI, VII and VIII, the highest P content was obtained from the FOF product from Carmen, Bohol followed by the bokashi product of Dao, Capiz and FOF product of Marabut, Samar. Such high P content of the FOF product from Carmen, Bohol could be attributed to the addition of chicken manure to the product. Chicken manure is known for being an excellent source of P.

Another interesting observation was also found in potassium, vermicast from Dao, Capiz had the highest K content in all samples collected from Region VI. On the other hand, samples collected from Naga, Cebu (i.e. vermicast and compost) and Negros Oriental (vermicast) were superior in Region VII. Also, vermicast from Santa Margarita, Samar, and compost from Marabut, Samar found to have high K content. The high amount of this nutrient may be attributed to the raw materials particularly rice straw and banana (trunk and peelings) which are known for high potassium content.

The highest amount of Ca was obtained in samples collected from Region VII. Region VII is found to have a calcareous type of soil such situation can affect the plant nutrient uptake making it possible to have more calcium present in raw materials. Likewise, total Mg was high on the samples collected from Region VIII. Further, Mg content of vermicast in Region VII ranges from 0.37 % - 0.74 %. On the other hand, other bioorganic fertilizer was found in site 23 (bat manure). Samples with high Mg have common substrate used such as leaf litter and vegetable waste.

On the other hand, in Region VI, the Fe content of the sample collected ranges from 12.77 to 59.64 mg kg^{-1} while Fe content of the samples collected from Region VII ranges from 6.04 to 35.82 mg kg^{-1}. Also, a more considerable amount of Fe compared to that of Regions VI and VII, with Fe content ranging from 12.72 to 143.94 mg kg^{-1}. For the Cu content of the samples collected, all vermicast samples collected from Regions VI VII and VIII contain <1 mg kg^{-1} Cu. For the Zn content of the vermicast samples, most of the samples collected from Regions VI, VII, and VIII have a Zn content of <1 mg kg^{-1} except to that of the samples collected from Hinunangan So. Leyte (1.89 mg kg^{-1}) and Maria siquijor (1.16 mg kg^{-1}).

For the heavy metal contents (Cr and Pb) of the samples collected, all the samples collected had an allowable level of Cr and Pb. According to the PNS/BAFS the allowable level of Cr and Pb for organic fertilizers either solid or liquid should only be at 150 ppm and 50 ppm respectively.

In this study, all the samples collected either vermicast or other types of fertilizer had a concentration of less than 2 mg kg^{-1} in both heavy metals examined in this study. PNS specified that solid organic fertilizers must have at least 20% organic matter, should contain 5 – 10% N-P_2O_5-K_2O, and 10 - 35% moisture level. From the samples analysed, the rotary composter-produced composts from Naga, Cebu qualified as organic fertilizers, whilst the majority could qualify as potential soil conditioner.

Vermicast was improved in this study by varying the formulation of substrates fed into the African Night crawlers. The selected substrate for vermicast production differs in terms of their chemical composition. For the nutrient contents (i.e., total N, P and K), the highest N content was obtained in vermicast derived from mudpress + madre de cacao + rice straw (OF_B). On the other hand, vermicast derived from mudpress + cow manure + banana peelings (OF_A) had the highest total P and K contents as compared to OF_B.

SUZETTE LINA

Dr. Suzette B. Lina is a Professor in Soil Science (Soil Fertility and Management) at the Visayas State University (VSU), Baybay City, Leyte. She's a recipient of Erasmus Mundus program (post-doctoral studies) and a Visiting Lecturer in 2011-2012 and January 2018 to February 2018, respectively at George August University, Gottingen, Germany. She finished her PhD at Tokyo University of Agriculture and Techonolgy, Japan in 2009 and at VSU with hvirer BS and MS degrees.

Dr. Lina is active in teaching, both graduate and undergraduate programs. She is involved in research and extension projects, as a project leader or study leader. Her field of expertise focuses on integrated nutrient management strategies. Noteworthy of these is the ACIAR funded Project on "Soil and Nutrient Management Strategies for Sustainable Vegetable Production in Southern Philippines in 2016-2019. Through this project she was able to join an invitation from the Queensland Government - Department of Agriculture for a site visit and training workshop on soil and crop nutrition in 2016.

She is also active in extension projects. She is very instrumental in the development of Soil Health Cards among the farmers of Region 8 up to the present which followed the Bhoochetana principles and approaches, a Yamang Lupa Program endorsed by the Department of Agriculture that enabled her also to enjoy a grant to attend a training workshop in ICRISAT, India in 2014.

LONG-TERM ORGANIC AGRICULTURE ENHANCES SOIL-CENTERED AGROECOSYSTEM SUSTAINABILITY

BY ZIYI HAO (CHINA)

Instability is one of the characteristics of an agricultural ecosystem. As agricultural environmental conditions change constantly, the developing rules and trends of agriculture are generally difficult to observe during a short-term field study.

To achieve both high crop productivity and soil eco-functionality remains a long-standing agroecological challenge in theory and practice.

Many researchers have paid great attention to long-term field studies, and the data from these studies have been employed to solve some agricultural problems both theoretically and practically.

The long-term experiment reported here is focused on organic vegetables and was started in June 2002 at the Agricultural Experimental Station (36°52'N, 115°01'E) located at Quzhou, Hebei, China. The average annual precipitation in this area is about 600 mm with a primary peak in July and August that accounts for 60% of the rainfall for the entire year. The maximum yearly evaporation was recorded as 1841 mm. Spring is the most serious drought season for the year. The climate in this area is warm and semi-humid with abundant sunlight and heat. The temperature ranges from –2.9°C in January to 26.8°C in July, with an average of 13°C. The annual frost-free period is around 200 days. Based on the climate, it is possible to grow two crops a year.

The experiment was conducted in three side-by-side greenhouses consisting of three different systems: organic farming (ORG), integrated (INT), and conventional farming (CON). The greenhouses were built up in a typical format with a semi-round arch that is widely used in North China. Each one is 52 m long east–west and 7 m wide south–north, with an area of 0.04 ha.

Our experiment shows that organic agriculture (ORG) synergistically promotes soil fertility (with an average of 5.0% organic matter compared to 2.5% in conventional farming) and biodiversity, thus improving vegetable yield by 11.6% over conventional farming.

The organic agriculture (ORG) system failed to produce as much vegetables as the conventional (CON) and integrated (INT) systems in the first growing season. However, as compared to the CON system, the average yield of ORG, when combined from 2003 to 2018, increased 13.6% and 7.2% in the spring and autumn cropping season respectively, suggesting that ORG can ensure high yield of vegetable production depending on sufficient nutrient supplies. The root system plays a critical role in conditioning plant growth and yield improvement. In agreement with yield increase, the root length of

ORG plants was >46.7% longer than that of CON plants, indicating larger capacities for nutrient and water absorption, which underpins robust aboveground growth and higher biomass accumulation during sink organ formation.

We further analyzed the tomato fruit quality and found significantly higher content of Vc, soluble sugars, carotenoids (lycopene and β-carotene), and total phenolics in contrast to less nitrate accumulation in ORG fruits compared to CON and INT ones. Thus, the IOA holds the potential to promote both crop yield and quality.

Importantly, ORG forges a disease suppressive microbiome, exemplified by the >55% lower bacterial wilt incidence upon enhanced Bacillus antagonism. With such organic soil microbiome, tomato seedlings unexpectedly accumulate 61% less jasmonic acid and down-regulate expression of signaling- and disease resistance-related genes, possibly saving defense costs for superior root growth and overyielding.

Together, ORG enhances soil-centered agroecosystem services for high productivity and sustainability, providing a strategic solution to optimize current agricultural systems to feed a growing population worldwide.

ZIYI HAO

A Ph. D of the College of Resources and Environmental Sciences and Dean of Organic Recycling Research Institute (Suzhou), China Agricultural University (CAU). Her research is focused on the study of organic farming and ecological agriculture.

PRODUCE YOUR OWN ORGANIC: A BEST PRACTICE TO SUPPORT RURAL DEVELOPMENT

BY JOE-AN ESCOBAR (PHILIPPINES)

Annual variations in crop production are expected to increase due to climate change effects on weather patterns and increases in extreme weather events. Soil and water quality and quantity are expected to decline due to increasing extremes in precipitation. This increases the risk of drought. This risk directly affects the amount of water available for irrigation and domestic use as the scarcity of water will cause prices to increase. Increasing prices will result to a more difficult life for farmers with a present lower income from their crops.

Every year, the status of the environment is getting worst. Air and water may not be safe anymore for the crops. The price of Inputs continuously increases, becoming an additional burden of the farmers. Prices of goods and services also increase, in line with, people cannot afford to buy safe and healthy foods. The youth lose their interest in going to school. Worst is, some take its position to go against the government program that causes insurgency.

With that, the Central Philippines State University took the initiative to create those life changing technologies that will augment the development of rural communities. First is the establishment of technologies in the twelve campuses that will serve as demo areas for stakeholder and partner clientele. Those are vermi-composting, Farmer based vermitea, naturally grown vegetable and mushroom production. As part of the mandate of University in Extension and Community services program, we initiate different training workshops to the different deserving groups of people.

Arm forces of the Philippines is the lucky first group of people who availed the training workshop in Mushroom and vermi-composting technology last September 2019.The team conducted an onsite training to 67 soldier of 542nd Engineering Infantry Battalion. With their eagerness to learn, after three months, they already produce their own 1500 fruiting bags that give a significant impact with the lives of military. Their production gave them food security, an idea of hope for rebel returnees and an opportunity to produce healthy food for their adopted community also. As a result of intervention, they signify again an expansion of doing that technology. This time is for the rebel returnees in the mountainous area of southern negros.

The University assisted the Arm forces of the Philippines in conducting training to 75 men and women returnees who hope for a positive change in coming back to the programs of government. We gave them a starting kit, and closely monitored the project. After a month, they already produce 800 fruiting bags as their livelihood. But that was a tradeoff. The Arm forces of the Philippines and the Kapatiran

will serve also as *"Bantay Lasang "*of their area. Instead of charcoal making, they will use mushrooms as their source of food and income. They have access to individualized technical assistance and one on one consultations with the experts of the university.

Rebel returnees returned to the fold of the government, laid down their arms and reemerged as farm entrepreneurs of their own organic farm. This was an *"Arm to Farm"* extension activity of the university. It fosters peace through Agri related Development in the conflict area of negros occidental. It addresses sustainable agriculture food security while re- integrating ex-combatants in order to build and retain in a sustainable society.

Extending help to the individual farmers in the establishment of organic fertilizer. One farmer in the municipality of Sipalay availed the disbursement of African night crawler and trained in the production of vermicast in 2018.He own a 1.2 hectare of rice field, and feed 22 members of his family including his grandchildren. His area was contaminated by mining.

The soil was degraded and acidic resulting in its lowest production. A 1.2 hectare of rice field produces fourteen cavans of rice only. His debt was doubled, and the produce cannot sustain the needs of his family. So, the University trained the said farmer and closely monitored his activity. The farmer has admirable patience and hard work in making the technology.

After 3 months, he already harvested 350 kilos of vermicast and doubled its production until it hit 2 tons per month. He slowly converted his farm into organic practice of farming and in 2020 his farm was 100 percent organic. His baseline was 14, then 75 and now 126 sacks of rice were produced, zero chemicals. With his experience in farming, we provide additional inputs, those were life changing technology which improved their living and brought the following impact: food security, profitability, and sustainability.

Because of the breakthrough of his produce, the Provincial Agriculture Office declare his farm as one of the best model farms in Negros Occidental. He was awarded by LGU Sipalay as best integrated farmer. He was featured in a national agriculture magazine. He started to train his fellow farmer and the best thing is, one village was converted into organic as the people there were inspired by the change brought by organic to the lives of the farmer. Family ties were getting closer, and farming was their way of bonding. The statement of the farmer melts the heart of everyone as he says, "I don't have debt anymore and now I can secure the needs of my family".

Youth values transformation. In one of the University Campus, the CPSU Murcia, there are 151 poorest among the poor students, striving hard to finish their studies. The teachers tried their best to provide conducive learning for the students even if there was a lack of facilities and most importantly, teaching the students the learning they all deserve. Again, those were CPSU life changing technology that

brought also change to the whole inner conditioned mind of the students. They realized how hard the life of the farmers is and with that, they will give their best to innovate technology for the farmers and learn more to help address the needs of the farmers.

Now, they farm for the food security of their poorest schoolmate and nearby communities. They farm to show to the world that youth can do more to save the earth for future generations and promote sustainability. And they do farm to influence the community with the importance of ecologically sound farming practices and provide chemical free enough food to feed the world and will have an opportunity to end the world hunger. We all practice "*Gulayan sa University"* and that will serve as food for teachers and poorest students. Because of having food security, the students avoid their absences and cut barriers of learning. Their learning from school was already extended to the different communities of Murcia.

Clientele are the main priority of CPSU. From Armed Forces of the Philippines, Individual farmers, flower growers, Students, out of school youths, teachers and other partner were given an equal chance to avail the services of the university. As its main goal is to increase everyone's production, safe and healthy foods should be available everywhere, sustainable, and stable income for everyone, youth are active in bringing change, peace and order are maintained in every area.

JOE-AN ESCOBAR

CPSU Director for International Affairs

Joe-an is 30 years organic, sustainable and food security advocate, an elder sister of her brother and a responsible daughter.

She lives in Himamaylan, Negros Occidental and came from a poor family. She graduated at Central Philippines State University with the course, Bachelor of Science in Agribusiness as Cumlaude. She finished her master's degree at Northern Negros State College of Science and Technology year 2018 and pursued her Doctor of Philosophy in Technology Management at same school also in year 2021. Now, she is again studying in her 2nd Doctorate degree, taking up the course, the Doctor in Public Administration.

She is a licensed agriculturist, an honor graduate eligible, NTTC Holder, TESDA Organic Agriculture trainer, a college instructor, an extensionist and a mushroom trainer. She attended different training courses and presented research in local and international countries.

She is now working as assistant professor 3 of Central Philippines State University, designated as Campus Administrator of CPSU MURCIA and University wide Director for International Affairs.

Aside from teaching, she devoted her life to bringing hope to the life of the farmers and other partners by giving training workshops on life-changing technologies. Her stress reliever was her extension works as she loved community service and bringing change to the lives of those who need her service in technology.

INFLUENCE OF WATER QUALITY AND FISH DIVERSITY ON FOOD SECURITY, FISHERMEN'S LIVELIHOOD, AND SOCIAL HARMONY IN JAMUNA RIVER OF BANGLADESH

BY TONMOY PANDIT (BANGLADESH)

Introduction

The Jamuna River is the prominent central river in Bangladesh and fifth (5^{th}) largest in the world considering discharge volume. The river plays a vital role in fish production and ecological habitat as well as a livelihood for the fishing community living beside it. The fisheries sector supports a country's food and nutrition security, while the decline in fish resources is likely to result in food insecurity and fisheries conflict. Local fishermen are dependent on fisheries resources for their livelihood. The study was conducted to assess the water quality, fish diversity, livelihood, and social harmony of the fishing community in the Jamuna River at Bhuapur region from October 2017 to September 2018.

Methodology

A total of ten (10) water samples were collected from 02 feet below the water surface at selected sampling sites and analyzed for various physicochemical parameters including Temperature, Turbidity, pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Sulfate (SO^{2-}_4), Ammonia (NH_3) and Nitrate (NO_3^-).

Fish diversity (species and quantity) data were collected through surveys of fishing gear and visits to fish markets by observing fish species and interviewing local fishermen according to IUCN (2015) categories of fish availability. Fishermen's livelihoods status data were collected from respondents through questionnaires, personal interviews, and focus group discussions (FGD).

Result and Discussion

The concentration of parameters was compared with water quality standards set by the Environmental Quality Standards (EQS) guideline of the Department of Environment (DoE) and Asian Development Bank (ADB). Among all the physical parameters tested; pH, temperature, and BOD exceed standard levels. Moreover, the chemical analysis finds COD, NO^-_3, SO^2_4- and NH_3 levels higher than the permissible amount.

Fish are usually harvested using several types of gear such as gill net (*Current Jal*), sein net (*Ber Jal*), push nets (*Thela and Moiya Jal*), lift net (*Dharma Jal*), cast net (*Jhaki Jal*), hook & line (*Borshi*) etc. A total of fifty-five (55) species of fish were recorded belonging to Thirteen (13) orders and Twenty-seven

(27) families. Both Siluriformes and Perciformes were the most dominant order contributing each 27.27% of the fish species diversity (15 species and 07 families) followed by Cypriniformes (21.82%) which established moderate dominancy among the orders (12 species and 2 families). On the contrary, Synbranchiformes (3 species and 2 families) and Clupeiformes (2 species and 1 family) showed the least dominancy and demonstrated 5.45% and 3.64% of fish diversity.

The rest of the orders (Cyprinodontiformes, Syngnathiformes, Tetraodontiformes, Pleuronectiformes, Osteoglossiformes, Mugiliformes, Beloniformes and Myliobatiformes) include a single species with single family. The dominant family was Cyprinidae comprising 20% of the total number of species recorded. A total of Thirty-two (32) species, representing 61.54% of the total community, were considered as Least Concern (LC) while Eight (08) species were Endangered (EN), Four (04) species were Near Threatened (NT), Eight (08) species were Vulnerable (VU), only one (01) species Bagarius bagarius (*Baghair*) ranked as Critically Endangered (CR) and Two (02) species were not listed according to IUCN (2015).

The highest number of species was observed in the rainy season while the lowest was in the summer. Population indices, i. e. Shannon-Weaver Diversity Index (H), Margalef's Richness (D), and Pielou's Evenness (E), were applied to demonstrate the diversity, richness, and evenness of the species and their overall values were 3.455, 6.374, and 0.891, respectively. The link between population indices (diversity & richness) and pollution indicates that river water is marginally polluted in a few areas, because of the direct discharge of domestic effluents into river and human activities along the banks of the river. The study result indicates that natural fish production and species diversity in this river have declined over the years compared to previous studies.

The fisheries sector plays a crucial role in poverty alleviation and food security. Local fishermen are poor by any standard and the economic condition was unsatisfactory. 60% of the fishermen belonged to 31 to 40 years with 3-4 family members. The illiteracy rate among the fishermen was 22% while most of them could sign only. Most fishermen (65%) have Kutcha houses reflecting the distressed condition while some have semi-Pucca and Pucca houses.

- 58.5% of the fishermen depend solely on fishing as their occupation which is gradually declining. According to respondents, due to environmental and man-made catastrophes fish productivity has declined over time leading to a progressive decline in fishing activity.
- Previously, the average daily catch was 12-15 kg/day while during the study period, the catch comes down to 5.5-8 kg/day. The main constraints of the catching and selling of the harvest are low annual catches, lack of appropriate fishing gear, local extortion, overfishing, migration of fish species, fishing area of conflict, degradation of fish habitats, and pollution of water.

Table 1. Major Challenges according to respondents (Source: Field Survey, 2018)

Rank	Main Challenge	Percentage
1st	Low Annual Catch	40%
2nd	Inappropriate fishing gear	23%
3rd	Fishing Area of Conflict and local extortion	18%
4th	Overfishing	10%
5th	Water Pollution & Degradation	5%
6th	Migration of Fish Species	4%

45% of fishermen sold their catch to direct consumers while 20% sold their catch to retailers and the remaining 35% handled their catch to wholesalers. The fishermen of the surveyed area were mostly poor, and their annual income ranged from 35,000 to 50,000 BDT (1 USD=82 BDT). In addition, part of their earnings was used to buy fishing nets and other equipment. With declining fish resources and low income, supplementary income from other than fishery is of great importance.

- Consequently, fishermen seek and diverts to alternative livelihood with 17.5% involved in agriculture, 8% in daily labor activities, 4% in livestock rearing, 6% in small businesses and 6% in other sectors (such as migration to town, boat building, CNG driving etc.). A significant number of fishermen (41.5%) adapted to these different options to maintain their livelihoods.
- Fishing activity is severely hindered by the transformation of these alternative livelihood possibilities, which adversely impacts food security and nutrition, particularly for women and children.
- Fishing is a traditional and cultural entity rather than just an economic source of income.

Conclusion

Based on the findings it is recommended that the river must be preserved for its sustainable use. Fish farming is essential for food security considering the protein source and reducing malnutrition throughout life. To improve the fisheries sector's, livelihood improvement and for social harmony, the following conservation and management plans can be considered:

- Prohibiting illegal and brood fishing, avoiding or limiting the use of destructive fishing gear, establishing fish sanctuaries in specific parts of the river and strictly enforcing the Government fishing laws/act.
- River management policies should be adopted and developing river awareness which will contribute to the effective utilization of river resources and building social harmony among the fishing communities.
- The government can establish an institutional credit system to issue soft loans. In addition, market facilities, fishing gear, and designated fishing zones can also be provided to control conflict between fishermen.
- Educating the fishing community about engagement to off-season livelihoods and capacity building.

There is tremendous opportunity and potential for the effective use of fisheries resources to ensure food security, meet protein needs, support the livelihood of the fishing community, and promote social solidity.

References

ADB (Asian Development Bank). 1994. Training manual for environmental monitoring. USA: Engineering Science Inc., pp. 2-16.

EQS (Environmental Quality Standard) of ECR (Environment Conservation Rules), 1997. Bangladesh Gazette, Ministry of Environment and Forest, Department of Environment, Government of the People's Republic of Bangladesh. pp. 4-49.

IUCN Bangladesh. 2015. Red List of Bangladesh, Volume 5: Freshwater Fishes. IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh. pp. 360.

Key words: Jamuna River, Water Quality, Fish Diversity, Livelihood, Food Security, Social Harmony.

TONMOY PANDIT

Tonmoy Pandit completed his undergraduate and postgraduate degree in Environmental Science & Resource Management at Mawlana Bhashani Science and Technology University, Tangail in 2015 and 2017 respectively.

He has completed various professional training courses in environmental management, safeguard monitoring, health and safety, chemical and waste management, and advanced use of analytical software. His area of interest includes environment, sustainability, ecology, agriculture, climate change, livelihood resilience, food security, and so on.

Tonmoy started his career in 2017 as an Assistant Consultant (Environment) at Development Solutions Consultant Limited and for the last 5 years, he has been working on different projects in transport, infrastructure, energy, agriculture, water, and environment sector in Bangladesh.

He is also an expert in preparing Environment (IEE, EIA, EMP, ESIA, etc.) and safeguard reports that comply to monitor/mitigate the adverse environmental and social impacts. He has completed multiple assignments under national and international organizations including Asian Development Bank (ADB), World Bank (WB), Japan International Cooperation Agency (JICA), Asian Infrastructure Investment Bank (AIIB) and Government of Bangladesh. He is currently working as a Consultant (Environment) at EnviroCare International Limited.

DIET IMPORTANCE OF EACH PREY GROUP IN VARIOUS SIZE CLASSES OF THREE NERITIC TUNA SPECIES IN MINDANAO WATER

BY LEEGIE MANOZA (PHILIPPINES)

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Abstract

Neritic tunas are migratory fishes found in both coastal and oceanic waters and are part of the major food diet of the Filipino people. These include Eastern Little Tuna (*Euthynnus affinis*), Frigate Tuna (*Auxis thazard*), and Bullet Tuna (*Auxis rochei*). Data on prey composition of these Tuna species are fragmented and few studies only focus on this field of research. However, it is essential to provide concrete data on this in order to develop policies on the sound resource management of these food resources. This study was conducted to identify each prey item in the diet of various size classes of the three neritic tuna species; and to determine the most important (main) and the complementary prey groups of these three neritic tuna species per size class.

Prey items were extracted from dissected stomach, characterized, and identified using a dichotomous key. Data gathered were vacuity index (VI), frequency of occurrence (FO), number of individual species (N), and weight of individual species (W). Indices calculated were the index of relative importance (IRI) from FO, N and W, and index of preponderance (IP) from FO and W. There were 1,141 stomachs found empty with a VI of 85.9%. Each of the 200 stomachs had at least one prey item in it.

Three prey groups (fish, cephalopod, and crustacean) were among the dominant diet of the three neritic tunas. Fish was the main prey group for size one Frigate Tuna (%IRI, 4.45). For size 2 Frigate Tuna, fish was still the main prey group (%IRI, 5.96). The Cephalopod was the main prey group for size three Frigate Tuna (%IRI, 20.86).

For size two Bullet Tuna, crustacean had the highest percentage IRI (24%) and IP (4%). Crustacean still had the highest %IRI (97.86%) and %IP (95.72%) for size three Bullet tuna. For Eastern Little Tuna, fish was the main prey group with %IRI of 69.78% and %IP of 74.02% for size one, %IRI (74.91%) and %IP (73.72%) for size two, and %IRI (20.04%) and %IP (22.00%) for size three. Thus, the identified prey items

for sizes one and two of Frigate Tuna and all sizes of Eastern Little Tuna were fish, crustacean, and cephalopod.

The most important (main) prey was fish and the complementary was crustacean and cephalopod. For Bullet Tuna, crustacean was the most important (main) prey while fish and cephalopod were the complementary diet. Cephalopod was the most important (main) prey for Size three Frigate Tuna; and fish and crustacean were the complementary diet. Therefore, in crafting policies on Tuna resource management, it is important to focus on the conservation measures of these prey items.

Keywords: natural resource management, sustainable development, fish diet, stomach content analysis.

MANAGEMENT OF AQUATIC WEED BIOMASS FOR A CLIMATE RESILIENT AGRICULTURE AND ASSESSMENT OF ITS MANURIAL VALUE

BY APARNA BALASUBRAMANIAM (INDIA)

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Introduction

The total amount of crop residues generated in India is estimated as 350 x 10^6 kg yr^{-1}. The management of this voluminous residue is a major challenge, and the farmers generally get rid of this waste by burning it in the field itself. The burning results in huge losses of N (up to 80 per cent), P (25 per cent), K (21 per cent) and S (4- 60 per cent) besides polluting the air, thereby depriving the soils of its organic matter. Therefore, there is a need to explore some eco-friendly, low cost, easily adoptable residue management strategies that can replenish the soil of its nutrients.

Agriculture waste recycling can bring tremendous benefits to agriculture and land management in long run. In addition, there are the benefits of a cleaner environment, a healthier habitat, and an intelligent use of all available recyclable resources without condemning them as wastes.

Composting is the solid-phase biological decomposition of organic residues that occurs in aerobic condition by exploiting substrate self-heating as a consequence of microbial oxidative reactions. This process leads to the production of compost, a humus-like, dark, crumbly material that can be used as fertilizer to reintegrate organic matter in agricultural soils. In nature's laboratory, there are several organisms (micro and macro) that have the ability to convert organic waste into valuable resources containing plant nutrients and organic matter, which are critical for maintaining soil productivity.

In this context the present study entitled "**Management of aquatic weed biomass for a for a climate resilient agriculture and assessment of its manurial value** was conducted at the Department of Organic Agriculture, College of Agriculture, Vellayani under Kerala Agricultural University. is envisaged under the Kerala State Plan Project of State Planning Board with the following objectives.

- Characterization of the lignocellulosic biomass from selected plant sources
- Assessment of various microbial and enzymatic sources for degrading the lignocellulosic biomass into compost.
- Evaluation of manurial value of the resultant composts.

Materials and Methods

This involved collection of representative samples such as water cabbage (*Limnocharis flava*), water hyacinth (*Eichhornia crassipes*), farm wastes (dried leaves and pseudostem of banana) and coir pith from different locations. These plant materials were then subjected to chemical characterization for identifying the constitutional makeup.The design adopted for the experiment was Completely Randomized Design (CRD) with four treatments and five replications.The substrates used in the study are S_1-Water cabbage ,S_2-Coir pith,S_3 -Water hyacinth,S_4 -Farm waste. The inoculants used in the study were I_1 - *Trichoderma reesei,*I_2 - *Pleurotus sajor,* I_3 - Composting Inoculum developed by the Dept. of Agricultural Microbiology, College of Agriculture,.Vellayani, I_4 - Commercial enzyme cocktail (Cellulase / pectinase and laccase) . The resultant composts from the previous stage were evaluated for their performance as manure in a pot culture experiment with test crop amaranthus (variety - Arun).

The experiment was completed in three stages. Representative samples of water cabbage (*L. flava*), coir pith, water hyacinth *(E. crassipes)* , and farm wastes (dried leaves and pseudostem of banana) were collected and analysed for bio-chemical composition. Water cabbage recorded 2.74 per cent N, 0.30 per cent P, 0.33 per cent K, 16.98 C:N ratio, and no detectable levels of heavy metals except Ni (0.55 ppm) and inferred as the best substrate in terms of nutrient content followed by water hyacinth, farm wastes and coir pith respectively.

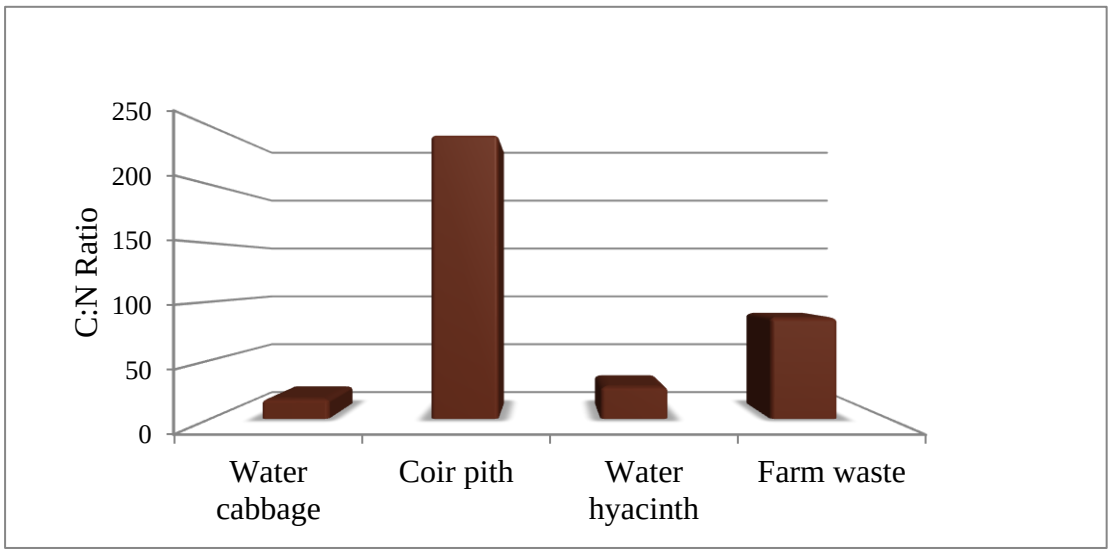

Figure 1. C:N ratio of four substrates.

The substrates were converted to composts using various inoculants *viz. T. reesei, P. sajor-caju,* Composting Inoculum and commercial enzyme cocktail (cellulase/pectinase and lactase) and physico-chemical and biological characteristics were analyzed. A mixture of water cabbage and Composting Inoculum) was concluded as the best in terms of nitrogen content, cellulase activity, maturity period, C:N ratio and no detectable levels of heavy metals except Ni (0.414 ppm) followed by the mixture of

Water hyacinth and Composting Inoculum had comparable N, P, K, EC , C:N ratio, and heavy metal content below the detectable limit.

Considering the effect of inoculants on different substrates, Composting Inoculum was concluded as the best in terms of moisture content, EC, N, P, K, dehydrogenase activity, cellulase activity, maturity period and C:N ratio.

The resultant composts from the previous stage were evaluated for their performance as manure in a pot culture experiment with test crop amaranthus (variety - Arun). Application of 100 % N as compost water hyacinth and Composting Inoculum was noticed as the best treatment in terms of yield, plant height, number of branches, girth of stem, soil properties *viz.* water holding capacity, available N, available P, available K, available Mn, available Cu, bacteria population, and plant content of micronutrients *viz.* Mn, Cu, and B. With respect to the yield, treatments imparted significant effect on the yield of the crop.

The treatment receiving 100 per cent N as compost prepared from water hyacinth and Composting Inoculum combination recorded the highest yield. The compost prepared from water cabbage and Composting Inoculum also recorded very similar yield. This might be due to the similar nutrient status and other biochemical properties of the two composts.

Composting basically being a microbiological process, enzyme activities can be a part of reliable measure of compost stability and maturity. Soil enzymes increase the reaction rate at which plant residues decompose and release plant available nutrients. Enzymes respond to soil management changes long before other soil quality indicator changes are detectable Soil is a dynamic system where all biochemical activities processed through enzymatic processes (Tabatabai, 1982).

Dehydrogenase exists as an integral part of intact cell involved in oxidative phosphorylation and reflects the total oxidative potential of soil microbial community by transferring hydrogen and electrons from substrates to acceptors. From the study it was evident that the application of water hyacinth and Composting Inoculum had reported to increase the dehydrogenase activity in soil which was similar in effect to water cabbage and Composting Inoculum.

Application of 100 % N as compost water hyacinth and Composting Inoculum was noticed as the best treatment in terms of soil properties *viz.* available N, available P, available K, and dehydrogense activity. Major enzymes *viz.* dehydrogenase, urease, and aryl sulphatase imposed significance on yield and yield attributes. Application of 100 % N as compost from water cabbage and Composting Inoculum was found to be good and on par with T_{13} in many of the characters. Application of various composts did not result any heavy metal accumulation in the soil.

Thus it was inferred from the study that water cabbage was the best substrate in terms of its chemical composition followed by water hyacinth. S_1I_3 (water cabbage + Composting Inoculum) and S_3I_3 (water hyacinth+ composting Inoculum) were yielded best composts.

T_{13}{100 % N as compost (water hyacinth + composting Inoculum)}and T_5{100 % N as compost (water cabbage + composting Inoculum)} were performed better in pot culture. With regards to inoculants used on different substrates, composting Inoculum was found to be the most effective for composting the agrowastes.

DR. B. APARNA

Dr. B. Aparna, presently working as Professor and Head, Department of Organic Agriculture, College of Agriculture, Vellayani. She has served in KAU for over a period of 18 years. The major field of specialization is Organic Agriculture, Soil Enzymology and Soil Biochemistry, currently focussing research on Organic Agriculture, Integrated nutrient management /Soil enzymology.

She is the Recipient of the Kerala State Council for Science Technology and Environment YOUNG SCIENTIST AWARD during the year 2007 and winner of several awards for oral and poster presentations in various National and International seminars.

She is a member of the scientific panel NITI AAYOG of Government of India for standardization of quality standards for liquid manures. She has published several papers in national and international journals and has also contributed chapters in Books. Leaflets and pamphlets on vermicomposting, liquid manures, coir pith composting, soil testing, biochar. Presently works with commitment and dedication with for escalating the standard of research, education, and teaching for the benefit of students and farmers.

INSECTICIDE FREE RICE PRODUCTION IN RESEARCH STATION AND FARMERS FIELD: A SUCCESS STORY OF BANGLADESH

BY MIR MD. MONIRUZZAMAN KABIR (BANGLADESH)

Rice is the staple food crop of Indian subcontinent, especially in the wetter and populous northeastern part which includes Bangladesh. Insects, diseases, vertebrates, and weeds attack is increasing due to the climate changes (Z Islam and D Catling, 2012). Insect pest causes average 18% rice yield loss, consequently farmers fully depend on chemical insecticides to control rice arthropods (Islam et al., 2003).

Generally, rice farmers spray 3 to 4 times more insecticides in a single season to control harmful pest eg. yellow stem borer (YSB), green leafhopper (GLH), leaf folder (LF), rice hispa (RH), brown planthopper (BPH) and rice bug (RB). Insect pest control in rice field solely depends on insecticides which have negative impact on biodiversity, environment, animal, and human health (Ali et al., 2020). At the same time, insects developed insecticides resistance and resurgence capacity. For this reason, insecticide use is dangerously high and is still increasing day by day.

To reduce their detrimental impact on our society we need to cut pesticides use from agricultural practices. Farmers use prophylactic methods in which insecticides are applied without judging the insect infestation level in the field. Routine wise application of insecticides for crop protection is not mandatory which is commonly found in rice (Ali et al., 2017).

To mitigate this problem, we initiated an integrated approach (perching and sweeping) to reduces insecticide uses in Bangladesh Rice Research Institute (BRRI), regional station, Barishal during Boro 2019-20. The primary objective of the experiment was to reduce the use of insecticides in Sagordi and Charbodna farms of BRRI R/S, Barishal.

In these methods, firstly the seedbed was swept four times every seven (7) days interval by rectangular hand net. After transplanting, established a perching in every 10 m^2 area of rice field to facilitate birds to sit on. Then, sweeping was carried out from 6.00 am to 12.00 am. Sweeping was done every seven-days after 14 days of transplanting till the heading stage all plots in the farm. After every full plot sweeping, harmful insects were destroyed, and beneficial insect/natural enemy were released in the field. Then, 20 complete sweepings were done for counting insect pests and natural enemies in selected plots.

Seedbed insect pest caught by newly developed rectangular hand net at 7 days interval in Boro 2019-20 and T. Aman 2020, BRRI farm is shown in Fig. 1. A higher number of insect pests and natural enemies were found during T. Aman season than Boro season at 20 m^2 seedbed. After the whole seedbed was

swept, number of insect pest were destroyed, and the natural enemy was released in the seedbed. Seedbed insect pest eg. GLH, YSB, thrips, BPH remained under economic threshold level (ETL) for sweeping.

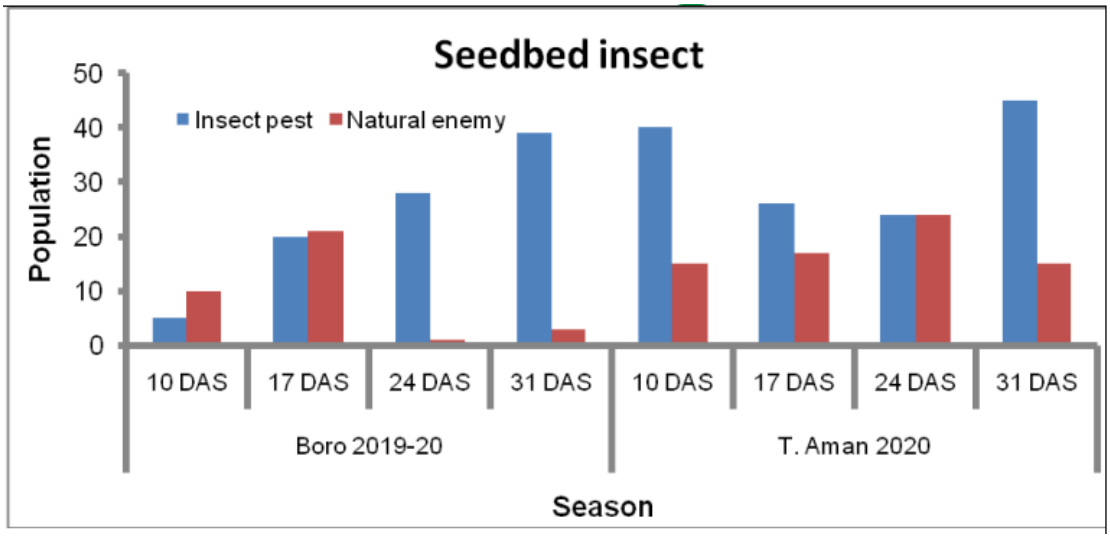

Fig. 1. Insect pest and natural enemy scenario of rice seedbed at 7 days interval sweeping in Sagordi and Chorbodna farms, BRRI, Barishal.

Generally, yellow stem borer (YSB) is harbored in the upper part of a leaf in the morning so that we did sweeping between 6 am to 12 am. After every 20 complete sweeping insect pest and natural enemy were counted manually. In Boro 2019-20, a higher number of insects was destroyed in BRRI dhan67 (167) followed by BRRI dhan89 (113) and BRRI dhan88 (71) on Fig. 2. Harmful insects, i.e., GLH, white leafhopper (WLH), YSB and BPH were found in all selected plots. On the other hand, a higher number of beneficial insects was found in BRRI dhan89 (164) to followed by BRRI dhan88 (143) and BRRI dhan67 (139). At the same time beneficial insects: green mirid bug (GMB), staphylinid beetle (STPD), carabid beetle (CDB), spider (SPD), lady bird beetle (LBB), damsel fly and dragon fly were observed.

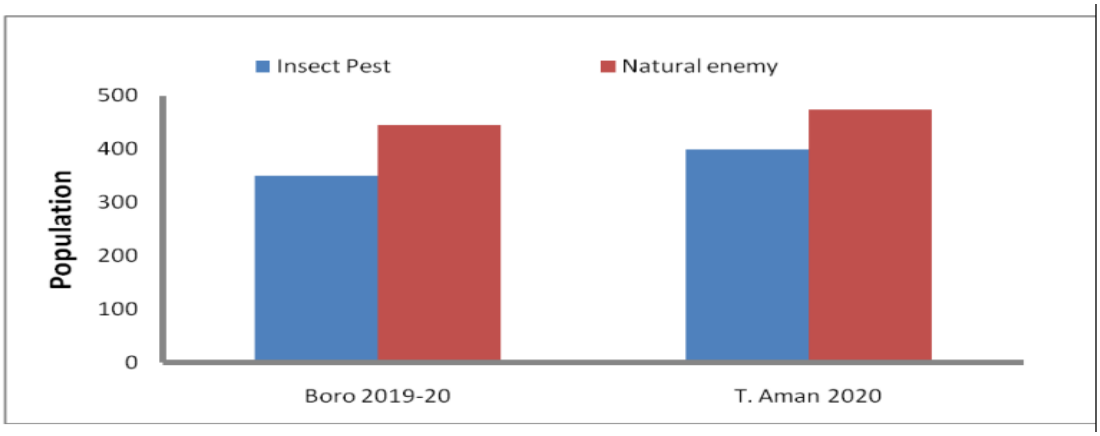

Fig. 2. Insect pest and natural enemy scenario of different high yielding varieties (HYV) of Boro 2019-20 and T. Aman 2020.

In T. Aman 2020 season, the highest number of insect were in BRRI dhan77 (153) followed by BR23 (141) and BRRI dhan76 (106). Harmful insects: GLH, WLH, YSB, white back planthopper (WBPH), LF and BPH were found in all sample (swept) plots. On the other hand, there was a higher number of natural enemies in BRRI dhan77 (178) followed by BR23 (164) and BRRI dhan76 (132). Beneficial insect found was same as Boro 2019-20.

Table 1. Yield performance of different varieties in swept plots BRRI, Charbadna and Sagordi farm

Boro 2019-20		**T. Aman 2020**	
Variety	Yield (t/ha)	Variety	Yield (t/ha)
BRRI dhan67	5.86	BR23	4.75
BRRI dhan88	6.71	BRRI dhan76	4.31
BRRI dhan89	7.09	BRRI dhan77	3.54

In Boro season, higher yield was found in BRRI dhan89 than BRRI dhan88 and BRRI dhan67 (Table 1). T. Aman season, higher yield was found in BR23 than BRRI dhan76 and BRRI dhan77 in BRRI, Charbadna and Sagordi farm.

Validation

Ten acres as a validation trial for insecticide-free rice production was established in Rowga block, Amtoli upazila, Barguna district which is in coastal southern part of Bangladesh. Firstly, we selected ten rice farmers for conducting this trial using BRRI dhan76 which is high yielding rice variety for non-saline tidal area. Then distributed seed, fertilizer and rectangular and round hand net among farmers and gave a

small brief how to conduct this trial. Firstly, they eradicate seedbeds yellow stem borers, thrips, green leafhoppers, and trips by rectangular hand net. After that thirty-five days old seedlings were transplanted in the main field.

Later 15 days after transplanting (DAT) farmers set up 400 perch for ten acres of rice field. Consequently, rice farmers done full plot sweeping and destroyed harmful insects and released every 7 days up to heading stage. After harvesting, on the average crop cut result was 4.17 t/ha which was like the yield observed in the farmers plots where insecticides use was sprayed ¾ times higher in the same village. We arranged a farmer gathering called field day for awakening other rice farmers about the negative impact of insecticides and about this technology.

A salient feature of this technology is that it helps to increase beneficial insect population that ultimately controls eggs and larva of harmful insect pests. Using this technology, farmers can save about 1000-1500 tk per acre of rice production. Also, it reduces 50-100% insecticide use at farm level.

Fig. 3: Insecticide free block demonstration activities in north Rowga village, Barguna district.

References

Ali MP, Bari MN, Ahmed N, Kabir MMM, Afrin S, Zaman MAU, Haque SS and Willers JL. 2017. Rice Production without Insecticide in Smallholder Farmer's Field. Front. Environ. Sci. 5:16. doi: 10.3389/fenvs.2017.00016

Panna Ali, B Nessa, Ms. T Khatun, M U Salam, and M S Kabir. 2020. Doubling rice productivity in Bangladesh.A way forward to combat insect pest in rice. Bangladesh Rice Research Institute, Gazipur, Bangladesh: pp. 263

Islam Z., Catling D. 2012. Rice pests of Bangladesh and their ecology and management. The university press limited. Dhaka-1000.

Islam, Z., Rahman,M. A., Barrior, A. T., Polaszek, T., Chancellor, K. L., Heong, N., et al. 2003. Diversity of arthropods in irrigated rice in Bangladesh. Bangladesh J. Entomol. 13, 1–25

MONIRUZZAMAN KABIR

I have already completed my Bachelor of Science in Agriculture and master's program from the Department Agronomy at the University of Sher-e-Bangla Agricultural in Bangladesh. Currently, I am working as a Senior Scientific Officer at Entomology Division, Bangladesh Rice Research Institute (BRRI) at the regional station Barishal. I was appointed on 6 January 2013 as a Scientific Officer of the same organization.

I have conducted many research activities for insecticide reduction, insect and natural enemy survey, insect resistant breeding and have worked to develop sustainable eco-friendly technology for more than nine years. I developed an organic tool – a rectangular hand net to induce insecticide-free rice seedlings cultivation in seedbeds to control green leafhopper, thrips, yellow stem borer, leaf roller etc.

I have more than 20 scientific papers, books, abstracts, and proceedings published in different renowned national and international impact factor journals. I have completed more than twelve professional training in different organizations in Bangladesh. I have more than 50 articles published on organic and sustainable agriculture in different newspapers. I have also worked at the Asian Food and Agriculture Cooperation Initiative (AFACI) as a co-principal investigator in brown planthopper (BPH) programme. Organic Agriculture is one of my passions and thrust for research.

ECONOMIC AND SOCIAL INITIATIVES FOR SMALL SCALE FARMERS VIA SUSTAINABLE SUPPLY CHAIN OF ORGANIC RICE PRODUCTION IN PREAH VIHEAR PROVINCE, CAMBODIA

BY OEUR SAM ATH (CAMBODIA)

Policy paper on paddy rice production and promotion of milled rice export was developed and approved by the Council of Ministers of the Royal Government of Cambodia in 2010, with the ambitious vision of transforming Cambodia into a major exporter of “Rice-White Gold”, and of achieving milled rice export of at least 1 million ton set the year 2015.

In order to contribute to this policy paper, Preah Vihear Mean Chey Union of Agricultural Cooperative (PMUAC) was created on 25th April 2016 by 8 founding Agricultural Cooperatives (AC) in Preah Vihear province, and officially registered and recognized as a first Union of Agricultural Cooperative in Cambodia on 19th July 2016 by General Directorate of Agriculture, under the framework of the Support of Commercialization of Cambodian Rice Project (SCCRP) implemented by Supreme National Economic Council (SNEC), and funded by the French Agency for Development (AFD).

The objectives of PMUAC creation are to concentrate on the means of production and strengthen their capacity in agricultural production, agro-industry, agribusiness, and related services to promote agricultural products in both quantity and quality to compete in the market as well as to protect the interests of farmers and the farming community in a fair and equitable manner. As of 2023, PMUAC has 25 AC members (equal to 5,403 farmer households) and is located in Aekapheap village, Sangkat Palhal, Krong Preah Vihear, Preah Vihear province, Cambodia.

The main reasons of establishing PMUAC were to deal with challenges faced by Preah Vihear rice producers: 1) lacking of guaranteed market for organic paddy, gathering big volume for wholesale, and negotiating power with potential buyers, 2) unavailability of Internal Control System management within AC level to maintain their compliance to the required standards of European Union (EU) and National Organic Program (NOP) by markets, and 3) capacity limitation on organic rice production standards that every producer needs to follow.

In dealing with the above challenges with the objectives in mind, the newly established Union developed its 5-year-strategic plan (2018-2022). In the strategic plan, PMUAC has launched four main programs: three for operational projects and one for institutional development: 1) Market Support Unit, 1) Standards Compliance Unit, 3) Cooperative Capacity Support Unit, and 4) Admin and Finance Unit. All above programs previously conducted by SCCRP project were now handed over to the Union.

For market support, PMUAC keeps maintaining its existing buyers and works for renewal ordered volume of organic paddy rice from season to season. In addition, PMUAC also approached new potential organic paddy buyers in order to buy the remaining volume from its members. The model of the business was formulated under Contract Farming (CF) endorsed by Department of Agriculture, Forestry and Fisheries of Preah Vihear Province.

There are 3 key steps of organic rice commercialization via Contract Farming: 1) selecting contract partners and contract negotiation and signing, 2) Implementing organic production and organic certification, and 3) implementing responsibilities and commitment in the signed contract farming.

In response to the signed contract achieved by the unit of market support, standard compliance unit is responsible for Internal Control System of Organic Grower Group (OGG) and the whole process to get farmers' products organically certified by Certification Body (CB). The 3 main steps implemented for this task are:

1) selecting internal inspectors (create Term of Reference for selecting internal inspector, select qualified internal inspectors, sign contract and conflict of interest with internal inspector, and build their capacity both theory and practice on internal inspection),

2) conducting internal inspection (check compliance of farm plots, check compliance of farm map, check rice production methods, check traceability and balance from previous season, check farm records, and summary result of inspection and make report), and

3) facilitate external inspection from Certification Bodies (determine recognized CBs, sign service agreement with CBs, complete and send application and required documents to CBs, facilitate external inspection from CBs, produce corrective actions and planning regarding non-compliance points during the inspection, and receive organic certificate.

The capacity support unit oversees building capacity of farmers and ACs to be able to comply with organic standards. 4 key steps are mentioned in organic rice production procedures. First, farmers and rice plots are identified and approved. Second, all selected producers are trained and coached on organic standards which were developed to meet minimum requirements of EU and NOP aligned with rice production.

This also includes a farmer book used to record farm activities. Third, organic rice production techniques are applied by organic rice producers. The techniques include seed selection, land conversion, soil preparation, fertilization, pest management, land and water conservation, and post-harvest. Last, storage and delivery of organic rice need to be recorded by farmers for traceability verification. For example, sale invoices of organic paddy need to be well kept by farmers.

With full implementation of the above three units, the market of organic rice is maintained from year to another.

Demands and supplies have been successfully linked via Contract Farming scheme between the Union/ACs and millers/exporters. The Union has more negotiating power and has been approached by others to engage/support the value chain. Around 10,000 metric tons of organic paddy on average is contracted and delivered annually. The number of buyers/exporters notably increased from 2 in 2016 to 5 in 2022.

The Internal Control System (ICS) has been well implemented by the Union with the set-up ICS manual. ICS personnel (ICS managers, ICS assistants, and Internal Inspectors) can perform their roles. Thanks to the capacity support unit, over 3,000 organic rice producers have knowledge and knowhow to produce organic rice and they commit to respect organic standards. As a result, more than 3,000 rice producers with over 10,000 hectares cultivated rice area are successfully certified every year under OGG.

Regarding benefits, economically additional value generated from selling organic paddy via Contract Farming was 74 USD (local value of conventional paddy = 217.9 USD/ton vs contracted organic paddy = 294.9 USD/ton). Therefore, additional value of organic paddy in Preah Vihear is around 740,000 USD/year since around 10,000 metric tons is supplied annually (additional value at processing and export level is not included). This additional value is divided into 3 pieces with 8.5 USD/ton each to the Union and ACs, and the rest (58 USD/ton) to farmers.

With this benefit division, the Union can perform it service from year to another to its members to continue maintaining organic rice market and the organic certificate as well as building capacity of rice producers and the cooperatives. This is a sustainable model that farmer organization itself can support its members without resource from outsiders. Beside this, it also provides social benefit by creating more jobs for local communities, lifting their live with more income, and sharing knowledges to farmers. Last but not least, this also contributes to food safety and environmental protection through organic standards application.

To conclude, value chain of organic rice is maintained at production level in Preah Vihear province by establishing the Union of agricultural cooperative (PMUAC) that has run sustainably by its own from the additional value of organic certified paddy supplied to millers/exporters via Contact Farming scheme.

DEVELOPMENT OF CLIMATE RESILIENT ORGANIC PADDY SEEDS THROUGH ADOPTION OF INHANA RATIONAL FARMING TECHNOLOGY

BY RANJAN BERA (INDIA)

By R. Bera, A. Seal, A. Datta, S. Bose and S. Dutta

Inhana Organic Research Foundation, Kolkata India

Abstract

Today when hunger and food insecurity persist at a staggering rate and increasing food production is a priority, globally; climate change poses the biggest challenge. Moreover, extreme weather events have far-reaching implications on the rural communities, especially small and marginal farmers, considering their tiny farmlands, huge dependence on agriculture for their livelihoods and food, less resource and practically no access to sustainable technology that can sustain/ improve crop production, withstanding the climate change impact. Also, considering that these vulnerable resource poor farmers contribute more than 70 % of the total food produce in the world, any turmoil at this end can affect the entire mankind, as 60 % more food has to be produced to feed a world population of 9.3 billion by 2050.

To sustain crop production under the existential climate change, we must move towards sustainable organic farming which can increase system resilience, enable safe food production, reduce GHG emission, offer long term sustainability and reduce the challenges towards food security. However, to achieve all of these, “climate-resilient seed” forms the prime requirement. Today, 99% of the seeds are high yielding varieties (HYV), which are high fertilizer sensitive leading to limited response under any low input farming initiative.

Moreover, they lack the quality traits like disease resistance and resilience against biotic and abiotic stress that make them more vulnerable under the changing climatic patterns. Organic production of seed can help in infusing such quality traits that can enable “better adaptability towards climate change and support safe and sustainable agriculture”.

Rice is the most widely consumed cereal and the staple food for over half of the world's population, particularly in Asia and Africa. In India, more than 60 % population takes rice as main food, but the rice production system is also one of the most climate change sensitive agro-ecosystems, which faces huge threat of crop loss under any drastic fluctuation in the weather pattern.

In this background, an initiative was undertaken to develop climate resilient, organic paddy seed through farmers’ participatory program during 2021-22 under IBM-IORF Sustainability Project in Nadia district of West Bengal (India). The objective was to evaluate yield, seed quality and climate resilience

potentials under organic management with the adoption of “Inhana Rational Farming (IRF) Technology”, which is a complete organic package of practice that ensures ecologically and economically sustainable crop production through its unique approaches of soil and plant health management.

The technology (developed by Dr. P. Das Biswas, scientist and pioneer of sustainable organic tea cultivation in India), which is based on the “Element Energy Activation (EEA)” Principle, strives to regenerate the soil and reactivate the plant physiology. The Inhana ‘Energy Solutions’ are the primary drivers of the dual approaches under this technology.

Conventional paddy seed, variety Satabdi Miniket (IET-4786), moderately fine grain that has wide acceptance; was taken as the test crop. The program was taken up in two different physiography with 4 treatments i.e. (i) control (C) (ii) conventional farmers’ practice (CFP) (iii) organic soil management using Novcom compost (OSM) and (iv) complete organic management (both soil and plant) using IRF Technology (COM); and 5 replications.

In respect of soil management, under CFP, NPK was applied @100:50:60 per ha in split dose as per farmers’ practice; while under both OSM and COM, 40-ton Novcom poultry litter compost (NPK @420:100:400 per ha) developed under Novcom Composting Technology was applied per ha, during land preparation.

Evaluation of paddy yields revealed highest productivity under COM (4335 kg ha^{-1}), 13 % higher as compared to CFP (3165 $kgha^{-1}$) followed by 3645 $kgha^{-1}$ under OSM’; despite adverse weather conditions. The higher grain yield under COM as compared to CFP was contributed by 18.3 % higher productive panicles per hill, 12.2 % higher filled grains per panicle and 1.4 % higher grain weight. The finding pointed out better plant physiological functioning under IRF technology, which was perhaps contributed by the focus on plant health management, a component that is completely ignored under conventional farming.

Paddy seed quality parameters *viz*. pure seed (%), inert matter (%), husk less seeds (%), other crop seeds (%), total weed seeds (%), germination (%) and moisture (%) were analyzed as per the Indian Seed Certification Standard and the values were found to be well above the standards in case of all the treatments. However, comparative study of seed vigour tests (SV-I & SV-II) indicated 11.8 and 18.4% higher value in the case of organic seeds (COM) w.r.t. conventional seeds (CFP) which reflected a higher potential of these seeds to produce normal seedlings under less than optimum or adverse growing conditions; similar to those which may occur in the field. This was corroborated by the uniform and healthy growth of the organic seedlings (COM), with 17.8 % higher root: shoot ratio (w.r.t. CFP), indicating a higher capacity to survive withstanding environmental stress factors.

Climate resilience of the seeds was evaluated through study of germination under water stress (GWS %), salt stress (GSS %), accelerated ageing (GAA%) and electrolyte leakage (EC) followed by "Climate Resilience Index (CRI)". The study of germination under water stress (GWS%) revealed that the germination potentials of all the seeds reduced considerably under water stress, but a higher resilience was observed in the case of COM which scored 11.0 % and 3.8 % higher performance as compared to CPF and OSM respectively.

Similarly, a study of germination under salt stress (GSS %) and germination under accelerated ageing (GAA%) indicated that seeds receiving organic management under IRF Technology (COM) showed a better performance over both CFP and OSM. Electrical conductivity (EC) test which indicates the cell membrane integrity in relation to tolerating adverse field conditions; showed a significantly higher (up to 29.2 %) leakage of exudates from the conventional seeds (CPF), reflecting the loss of cell membrane organization and selective permeability. "Climate resilience index (CRI)" which was developed majorly as a function of seed germination under abiotic stress showed 35.5 % and 14.6 % higher value in case of the organically developed seeds (COM) as compared to CFP and OSM respectively. The overall better performance of the organic seeds (COM) especially when compared to seeds developed under OSM critically indicates that the concept of "feed the soil" for sustainable organic farming does not hold true till focus is generated towards "plant health management".

Evaluation of economics of seed production at field level indicated a comparatively higher cost under organic seed production as compared to conventional. But if the farmers undertake individual or community seed development programs, it can practically reduce their expense on seeds by at least 50 % when compared with the market price of good quality conventional seeds.

Thus, this farmers' participatory, organic paddy seed development program with adoption of IRF Technology led to higher yield and enabled the development of higher quality and climate resilient seeds, that can help in reducing their market dependence, reduce the uncertainty associated with seed quality and alleviate the risk of crop failure under the existential climate change. Most importantly, such program can help to inculcate resilience in the production system of rice, a crop of critical relevance in respect of alleviating global hunger and towards securing farmers' livelihood, especially the resource poor marginal and small farmers.

RANJAN BERA

Dr. Ranjan Bera is the Chief Scientist of Inhana Organic Research Foundation (IORF), which has developed Inhana Rational Farming (IRF) Technology – the only Scientific Organic Farming Method, which ensures: No Crop Loss, No Hike in Cultivation Cost and Time Bound Sustainability; through the unique approach of Plant Health Management- a criteria that is completely ignored under chemical farming practice.

Dr. Ranjan Bera has a profound knowledge and vast experience in sustainable agriculture, and he has been working tirelessly for the past 16 years to disseminate Scientific Organic Farming that ensures Ecologically & Economically Sustainable Crop Production. He has been an important member of the research team for number of sustainable projects in India that IORF has undertaken in collaboration with Universities and Research Institutes of repute and has more than 80 published research articles.

He has a remarkable scientific acumen and was the key mind behind the development of 'Clean Food' Model that enables complete elimination of chemical pesticides, to provide an adoptable solution for those Crop Producers who are unable to completely convert to organic due to resource scarcity for organic soil management. This program has subsequently led to clean efood 'NET ZERO' Model, that not only enables complete reduction of chemical pesticides but also eliminates N- Fertilizers (*one of the most unsustainable inputs under conventional farming*) through safe bioconversion of Waste, especially the Hard to Biodegrade, Toxic and High GHG Emitters like Landfill materials.

AN EVALUATION OF VARIOUS NUTRIENT SOURCES AND QUANTUM ENHANCERS AS ALTERNATIVE TO CHEMICAL FERTILIZERS FOR RICE PRODUCTION

BY BERTA RATILLA (PHILIPPINES)

By Ratilla, B. C. / Professor 4, Department of Agronomy, Visayas State University (VSU), Visca, Baybay City, Leyte, Philippines.

Abstract

Sustainable practices like organic, nature and quantum-related farming are potential alternatives to improve crop production and soil properties. This study aimed to evaluate the effects of various nutrient sources on the growth and yield performance of lowland rice; determine their profitability; and assess their influence on some soil properties and nutrient uptake of rice.

It was laid out in Randomized Complete Block Design (RCBD) with 3 replications and 12 treatments as follows: T1= untreated control, T2= 70-60-30 kg N, P2O5, K2O ha-1(RR), T3 = half dose of RR + 5 t ha^{-1} composted cow manure (CCM) using IMO, T4 = half dose of RR + 25 g ha^{-1}BD 500, T5 = half dose of RR + 30 g ha^{-1} Agnihotra ash, T6 = 5 t ha^{-1} untreated cow manure, T7= 5 t ha^{-1} CCM, T8 = 5 t ha^{-1} CCM + 25 g ha^{-1} BD 500, T9 = 5 t ha^{-1} CCM + 30 g ha^{-1} Agnihotra ash, T10 = 4 L ha^{-1} IMO, T11 = 25 g ha^{-1} BD 500 and T12 =30 g ha^{-1} Agnihotra ash.

Results showed earliest heading and maturity with the application of a half dose of RR + 5 t ha^{-1} CCM (T3) comparable to the untreated control (T1). Application of 5 t ha^{-1} untreated cow manure (T6) produced significantly taller plants with bigger leaf area indices which resulted in significantly heavier straw yield than the rest of the treatments except for those with full dose inorganic fertilizer (RR)(T2) and those applied with a half dose of RR combined with either CCM or Agnihotra ash. Similarly, T6 produced significantly more productive tillers, with longer panicles and more grains $panicle^{-1}$ than the untreated control (T1) and those with quantum enhancers.

However, a much heavier 1000 seed weight was in treatments with a half dose RR + composted cow manure (T3) than the untreated control yet comparable with those with quantum enhancers alone or in combination with other stuff. T6 showed a significantly higher grain filling rate resulting in markedly higher grain yield than the rest of the treatments. This made T6 yield better by 38% over the control (T1) followed by T2 and T3, by 27% and 30% yield advantage, respectively. T6 also generated higher net income (PhP38,926.00 ha^{-1}), ROI(PhP1.98), and net return per cash investment (PhP1.35) than other treatments. Quantum enhancers obtained higher net income than control and higher ROI than inorganic fertilizers.

Soil analysis also revealed that cow manure alone or combined with other stuff indicated higher OM and P while K and bulk density values were all reduced after harvest. T6 had the highest total N uptake. Results imply that cow manure and quantum enhancers are potential alternatives to chemical fertilizers.

BERTA RATILLA

Dr. Berta C. Ratilla obtained her Ph.D. in Agronomy from the University of the Philippines, Los Baňos, Laguna Philippines in 2011 and her MS (1989) and BSA (1982) Degree major in Agronomy from then Visayas State College of Agriculture (ViSCA) now Visayas State University (VSU). She previously worked as Research Assistant and Instructor (VSU), and Agriculturist (National Tobacco Administration).

She is currently teaching undergraduate and graduate courses in Agronomy and acts as thesis adviser to students while conducting research, extension, and production activities. Her research interests include crop production and management, organic and sustainable agriculture, and recently published these papers, among others:

Sermona, J. T. and B.C. Ratilla. 2022. Field performance and profitability of Bengawan Black Rice (Oryza sativa L.) grown under various production systems. Science and Humanities Journal. 16:1-16.

Geleca C. Igdanes-Marañan and B. C. Ratilla. 2022. Growth and yield response of lowland rice (Oryza sativa L.) to planting density and nutrient management. Annals of Tropical Research. 44(2):163-181.

Dela Pena W.R. and B.C. Ratilla. 2022. Assessment of pests, natural enemies and soil microorganisms in lowland rice field under organic and inorganic production systems. Asian Journal of Agriculture. 6(1):40-46.

Gaurana, M. L. and B. C. Ratilla. 2020. Agronomic response, nutrient uptake, and profitability of PSB Rc18 lowland rice under organic production systems. Philippine Journal of Crop Science (PJCS) April 2020, 45 (1):46-55.

IMPROVEMENT OF CAMBODIAN SMALLHOLDER FARMERS' LIVELIHOODS THROUGH THE SUPPORT OF ORGANIC RICE AND PALM SUGAR PRODUCTION LINKED TO NICHE MARKETS

BY MEANG SAVEOURN (CAMBODIA)

Abstract

Traditional family farming systems were predominant in this country but in recent years as push for fast modernization and the increase of yields are creating aside effects on farms as productive units, farmers' health, their local agro-ecosystem and on Cambodian consumers through the widespread utilization of synthetic fertilizers and pesticides. According to FAO statistics 2021, global pesticide use increased during the period 2000-2019 by 36%, to 4.2 million tons in 2019; and agricultural use of inorganic fertilizers in 2019 was 189 million metric tons of nutrients, of which 57% was nitrogen.

To contribute to dealing with the above challenges and to improving the livelihoods of the Cambodian farmers, Agronomists and Veterinarians without Borders (*AVSF- Agronomes et Vétérinaires Sans Frontières*) is a French international non-governmental organization that promotes international solidarity. We support rural communities and farmers organizations (FO) that are threatened by exclusion and poverty. In Cambodia, AVSF has, since 1991, started its interventions through providing the smallholders farmers with professional skills in agriculture, livestock farming and animal health, as well as the creation and support of FOs (groups, agricultural cooperatives (AC), unions…). We seek to support small-scale farmer households as they strive to improve their living conditions, sustainably manage the natural resources upon which they depend, and contribute to socio-economic development.

Why AVSF support organic agriculture: the application of agro-chemical (fertilizers, pesticides…) by producers to get high yield has been rapidly increased in the last three decades. To help solve this issue, AVSF has, since 2013, so actively supported the value chain of organic crops via the mobilization and organization of public-private partnership and producer organizations as commercial stakeholders to bring their organic products direct to the local and international markets for higher profitability in the framework of the Support of Commercialization of Cambodian Rice Project.

This is a concrete success of AVSF approaches in supporting smallholder producer farmers to produce and sell the organic rice, peanut, and palm in the provinces of Preah Vihear and Kampong Speu by supporting 2 permanent local farmer organizations of PMUAC (Preah Vihear Mean Chey Union of

Agricultural Cooperative) in Preah Vihear province and KAMPATRACO (*Thnoat*[8] Kampong Speu Agricultural Cooperative) in Kampong Speu province. At first, the organic product business models of the PMUAC and KAMPATRACO were identified and designed. Based on the results of designed economic business model, AVSF offered a financial start-up for hiring staff to be responsible for Internal Control System (ICS) management and organic certification application.

At the same time, fund resources for covering the cost of staff hiring and operation of their organizations was collected from ICS service fee by premium price allocation of organic product sale for the long-term sustainability of organic cultivated crop production and supply after project passed out. Also, a series of capacity building programs were delivered: 1) Facilitation of contract farming preparation and signing; 2) Identifying potential areas and selecting producers; 3) Improve technical capacity building in compliance with organic standard requirements; 4) Development of internal control system documents; 5) Facilitation and support of external audition and certification; 6) Support for certified organic product buying-selling processes to local buyers; and 7) Support for exporting certified product to clients at oversea.

Thanks to the AVSF intervention, PMUAC was engaged in 906 producers and 1 buyer with 1,800 tons of organic paddy in 2012, and rapidly increasing with 3,234 producers and 4 buyers with more than 14,600 tons of organic supplied in 2019. Generally, an average of 10,000 tons of paddy are produced and supplied by producer members of PMUAC to the contracted buyers. In 2017, KAMPATRACO produced 2.20 tons of organic palm sugar with 10 producers; and increasing 22 tons with 26 producers in 2019 to be supplied to one client in France. Organic peanut production was supported in 2020 with 35 producers with12 tons of shelled peanut.

Economic Analysis of the gross added value for the 2 certified commodities of rice and palm sugar sold to the contracted buyers (compared to the price that would offer local collectors in the same geographical location – village level – and for a similar palm sugar, rice and peanut, but sold as conventional). Then we'll see how this gross added value is distributed between the three levels (producers, KAMPATRACO and PMUAC) and if the level retained are sufficient to sustain the implementation of their functions with fund mobilization of the shared distribution so that they have enough budget and human resources in supporting their organic farmer members and scaling up and diversify their organic commodities.

[8] *Tnoat*: palm tree

According to a case study on contract farming for organic paddy supply in Preah Vihear province in 2018, organic rice paddy and certification were provided the gross additional value generated by selling organic paddy to the contracted buyers instead of selling paddy as conventional to middlemen (74 USD/ton). The distribution of the gross added value paid to farmers (53 USD/ton), to PMUAC (12.5 USD/ton) and to ACs (8.5 USD/ton). With this analysis, in 2017, PMUAC members (or "pre-members" for the new ACs joining in this year) signed contracts with the 2 local buyers for a total volume of 21,688 tons of paddy. Even if the farmers manage to produce and deliver only 90 % of this volume (or approximately 19,500 tons), the total additional value generated locally (compared to the local value for conventional paddy) would represent +1.44 million USD (based on the same average of +74 USD/ton of paddy).

For Organic Palm Sugar: according to the price survey of conventional palm sugar in harvest season 2020, around 1.5 USD Riel/kg offered by local collectors. Thanks to AVSF support, the premium price of organic palm sugar provided by KAMPATRACO to its contracted farmers was + 0.25 USD/kg above the local price. Regarding the contract signing between the buyer (Ethiquable) in France and KAMPATRACO, the agreed price was 2.25 USD/kg. With this estimation in 2020, the gross additional value generated by selling organic palm sugar to Ethiquable (instead of selling the palm sugar as conventional to local middlemen) was +0.25 USD/kg for producers, and + 0.50 USD/kg for KAMPATRACO. For 20 tons of palm sugar delivered in 2020, it represents a gross additional value of + 5,000 USD for producers, and of + 10,000 USD for KAMPATRACO.

In conclusion, the approaches of AVSF intervention in supporting smallholder farmers are working through the 2 local permanent FOs of PMUAC and KAMPATRACO as a key player in ICS management, certification application, and capacity building on organic farming as well as contract farming facilitation and coordination to implement organic agricultural products to their producer members.

Therefore, the concrete success is the clear economical business models and roles of the 2 organizations defined. Hence, around 1 million dollars every year has been made by the participating farmer members through selling organic agricultural products. In addition, it has also impacted to non-farmer members, with increasing the market price of their agricultural products because the local middlemen couldn't lower the price anymore.

MEANG SAVOEURN

MEANG Savoeurn received a master's degree in integrated management of Agricultural and Rural Development in 2010, and a Bachelor degree of Agriculture Science in 2006. He also successfully completed the virtual 2021 ALGOA Organic Foundation Course and training on Geographical Indications.

He has more than 15 years of professional experiences in the fields of agriculture development and project implementation and supervision, including management of Monitoring and Evaluation systems, rural community development and support to Farmer Organizations engagement in value chain and in certified quality labels. He was part of the AFD funded SCCRP project (Support to the Commercialization of Cambodian Rice) as a National Capacity Building Consultant. There, he has notably worked on the engagement of cooperatives in paddy commercialization and in contract farming with millers and exporters, and in supporting numerous cooperatives in production of SRP rice and organic rice and in the management of internal control systems and in the collection and traceable sales of products.

PRODUCTIVITY OF SELECTED LOWLAND RICE (ORYZA SATIVA) APPLIED WITH COMMERCIAL AND LOCALLY MADE WISE 1 FOLIAR FERTILIZER

BY RESSIE UMARAN (PHILIPPINES)

Abstract

The Black rice Locally Adapted High-quality Inbred Rice Seed (LAHIS 01) of SAFEGCC Inc. has been annually grown since 2014 with a minimum average yield of 4.5 tons per hectare. SAFEGCC Inc. is located in over 1,400 hectares alluvial ricescape in Balingasag, Misamis Oriental. Since its inception and operations in 2012, SAFEGCC Inc. adopted a Sustainable Agriculture system (without synthetic chemicals and Genetically Modified Crops) on its 1.5 hectare fully circulated organic/biodynamic production system. By 2020, SAFEGCC Inc. started the TESDA (Technical Education and Skills Development Authority) Farm Field School (FFS) with 74 enrolled rice farmers anchored on the understanding and application of 9 Palay Key Checks to increase yield with reduce production cost in order for farmers to increase income.

To operationalize the Key Check 1 on Seed and Variety Selection using High Quality rice seeds of recommended variety, LAHIS 01 was grown by FFS learners together with the Department of Agriculture (DA) recommended variety of RC 160. The FFS quadrant yield samples showed the comparable yields of LAHIS 01 with RC 160 that prompted the FFS alumnae to try in the family's 4,000 m2 (0.4 hectare) on 2022. Relatively, in Dry and Wet Seasons of 2022, LAHIS 01 yielded an average of 5.5 ton per hectare with Php 7.00 – Php 8.00 (USD 0.13) production cost per kilogram unmilled black rice.

The LAHIS 01 yield that was applied only by locally made WISE 1 (WYMORE Inititative on Sustainable Enterprise) foliar fertilizer was at least 25% higher than the reported Philippine's conventional national average yield of 4 tons/per hectare at Php 12- Php 13 (USD 0.22) production cost per kg unmilled rice. Relatively, LAHIS 01 (Black rice) commands a higher price with at least 60% more than the conventional price in the market.

To scientifically validate the performance of LAHIS 01 with control recommended variety of RC 160, an undergraduate thesis was set up in the alluvial landscape of SAFEGCC Inc. – BREAD LIFE Family Farm Entrepreneurial School geographically located in 124o48'07.2" East longitude and 08o43'37.7" North latitude.

The experiment was laid out in Split-Plot Statistical Design (SPSD) with LAHIS 01 and RC 160 as main plots and subplots for commercial foliar fertilizer and WISE 1 locally made foliar fertilizer, respectively. Three soil micro profiles with 14 Visual Field Indicators (VFIs) at 20 cm depth was collected and

quantitatively analyzed for pH, N, P, K, FE, and Zn in the DA's regional Soil Laboratory and qualitatively analyzed by SAFEGCC's Soil and Plant Health Accounting Clinic (SPHAC) for minerals, biological life, enzymes, and vitamins among others using the Pefiefer Paper Chromatography (PPC) and to collectively generate the Soil Health Status of the experimental area.

The experiment is currently cultivated using the SAFEGCC's Modified Organic FFS management protocol wherein the sustain production of Healthy and Safe rice is dependent on the complex interdependence of 9 Palay Key checks and relatively dependent of healthy farm ecology and or healthy soil. A weekly Agroecosystem Analysis (AESA) with 17 on experiment/field observations was collected 14 Days After Transplanting (DAT) to establish the correlations that affected the most significant economical and profitable yields of LAHIS 01, and RC 160 applied by commercial and WISE 1 locally made foliar fertilizers. The experimental results will be completed on April 2023 and reported to the IFOAM Asia's 6th Organic Asia Congress in Kauswagan, Lanao del Norte, The Philippines on June 4-9, 2023.

Key words: agroecosystem, sustainable agriculture, LAHIS, ricescape, foliar fertilizers, Farm Field School (FFS), Palay Key Checks.

RESSIE UMARAN

Ressie Alaan Umaran a young organic farmer from Balingasag Misamis Oriental, Philippines. At a very young age, she was hardened in rice farming. She recalled her journey, of how she started as a member of 4H Club in the Philippines and of how she has been mentored and motivated to become a young farmer-agriculturist rooting from a small village of Brgy.Rosario Balingasag Misamis Oriental. She actively participated in several training courses about Farming as Business, Organic Agriculture and Rice Farming Technologies that was organized by different agencies in Agriculture.

She recently joined the Safe Young Organic Farmers (SYOF) when she was a participant of the Farmers' Field School in Farm Mechanization. Safe Young Organic Farmers was an organization organized by SAFEGCC, Inc. a corporation advocating organic agriculture. Because of such engagement, she was luckily given opportunities to join Organic World Congress and 7th ALGOA and 2nd GAOD Summit as her bridge to connect worldwide through IFOAM ASIA. She recently received an award as a National Champion in Pitching Competition (Intermediate Category at National Youth in Agripreneurship program.

Ressie Umaran is a student in the University of Science and Technology of Southern Philippines (USTP) Claveria, Misamis Oriental Campus taking up Bachelor of Science in Agriculture majoring in Crop Science.

INTERESTING AND MODERN SIGNIFICANCE OF INTEGRATED DUCK AND PADDY RICE SYSTEM

BY TAKAO FURONO (JAPAN)

1. Aigamo Duck scene

The scenery changes completely when you release ducks into the paddy fields after rice planting. The paddy fields will be bright and lively, and it will be peaceful. People who have seen it say in unison, "My heart softens, and I forget the passage of time." This is not a peculiar sense of Asian rice farmers, but people all over the world say so.

2. Super system

Aigamo Duck is alive. I'm alive so I can do anything. Weed control, pest control, nutrient supply, stimulation of rice, muddy water effect, jumbo snail control effect, and so on. It has various effects.

The most popular effect in Asia is pest control. In this area, once every 4 to 5 years, there is an abnormal flight of the planthopper. The planthopper comes from China. It seems that pesticides with the same ingredients are used in China, and the planthoppers that have survived and are resistant to them are flying to Japan. A large number of plant hoppers have caused serious damage in various parts of western Japan. Aigamo Duckta is beautiful, and the rice is growing. Aigamo Duck eats more and more planthoppers to keep the density low.

"The above effects are not controlled by humans one by one." It is a super system in which rice and ducks grow quickly by allowing ducks to move freely.

3. Creative unification of rice and livestock farming

Simultaneous cropping of duck and paddy rice is not just a weeding technique. Rice and side dishes are produced at the same time in the rice field. I think this has great significance for sustainable organic livestock farming in Asia.

4. Reduce methane gas

In paddy fields, methane bacteria take in hydrogen and acetic acid and produces methane gas. However, in an oxygen-rich environment, the competing iron-reducing bacteria take up hydrogen and acetic acid first, and the activity of the methanogenic bacteria weakens. It is the movement of iron that controls the amount of oxygen in the soil. Stirring with Aigamo Duck causes divalent iron in the soil to become trivalent iron, which precipitates and increases the amount of oxygen. According to a survey by Dr.

Hiroyuki Morii, former University of Occupational and Environmental Health, the surface water of my Aigamo Duck paddy contains 270 times more trivalent iron than ordinary paddy.

5. State-of-the-art technology, direct sowing of dry rice fields in Aigamo Duck

Combining duck and dry field direct seeding for labor saving. Weeding in the dry field season is not possible with Aigamo Duck, so in 2016 we developed a hand-made weeding technique, Hawking, using spring steel wire. As a result, weeding between plants, which used to be a bottleneck in direct seeding in dry fields, has become possible. Hawking is versatile for selective weeding of all crops. Hawking is applied 3 to 4 times a month during the dry field period.

Just before flooding, a roller is placed on the dry paddy while the rice seedlings are growing in a slightly damp state. This is to prevent vertical permeation of water after flooding. After flooding, leave it to Aigamo Duck.

TAKAO FURUNO

1950 Born in Fukuoka Prefecture

1975 Graduated from Faculty of Agriculture, Kyushu University

1978 Began organic farming.

1990 Systematized techniques for integrated rice and duck farming system in paddy field.

2000 Selected as one of the "World's Most Outstanding Social Entrepreneurs" by the Schwab Foundation in Switzerland

2003, he begun to challenge integrated rice and duck farming system in dry field

2007 Ph.D. (Agriculture) from Kyushu University

2016 Developed a tool called "Hawking", a selective weeding technology.

It is effective for intra row weeding rice, wheat, soybeans, corn, and various vegetables in dry field.

Publications in English

"The power of Duck"(TAGARI)

"The one duck revolution"

WOMEN AND THE PANDEMIC: WOMEN'S VITAL ROLE IN ORGANIZATIONAL STRENGTHENING AND FOOD SECURITY IN TIMES OF PANDEMIC

BY VIRGINIA NAZARENO (PHILIPPINES)

Abstract

The COVID-19 pandemic caused a global health, food and socioeconomic crisis that impacted most especially the poor sectors in the urban and rural communities. It revealed the deep-seated problems in the public health system and the agriculture and food system and the absence of adequate and accessible basic social services that have historically rendered millions of Filipinos poor, unhealthy and food insecure.

In the midst of these challenges, communities responded to the needs of sectors hardest hit by the pandemic, including the front liners. MASIPAG, a farmer-led network of people's organizations, NGOs and scientists working towards the sustainable use and management of biodiversity through farmers' control of genetic and biological resources, agricultural production, and associated knowledge, continued to adapt and developed new systems to continue its mission of improving the lives of small-scale farmers in the country.

Women and the Pandemic

In the course of the pandemic, MASIPAG saw how the women organizations or women-led organizations were able to cope, provided food, medicine and inspiration by leading the organizational processes, processing, marketing and sharing of organic products in the community. In one of the online forums, women leaders boasted that the lockdown and restrictions brought challenges as well as new innovations in creating processes to continue providing healthy, affordable, and organic produce to the communities. Farmers became more focused in food production and have developed their farm to produce more surplus that provided not only food but medicines as well.

Food and medicine processing also flourished during the lockdown as many organizations spent more time in community work or bayanihan that led to the improvement of the members entrepreneurial capacities. In one of the communities in Gabaldon Nueva Ecija, women farmers produced turmeric teas which they donated to the rural health workers as their part in ensuring the wellness of health workers in their municipality. Their group, Gabay ng Bagong Pag-asa, also produced and donated facemasks during the time where face masks are becoming scarce or expensive due to limiting supply while the cases of COVID-19 infection was rising.

A Community of Learning and Sharing

Despite the lockdowns, communication and education continued wherein community hubs were installed in many communities where farmers can participate in online education and learning sessions, assemblies, forums, and meetings. Many of these hubs were accessible and in areas wherein restrictions were partially lifted to ensure that health protocols were still being followed and ensured by the participants.

It was in these hubs that they were able to learn more about the COVID-19 pandemic, the bird flu, African Swine Fever, and even conducted learning sessions about participatory guaranteed system after the signing of Republic Act 11511 or the Amended Organic Agriculture Law. Ensuring participation have been the special tasks of women leaders so that members of the organizations remain updated and well versed on the issues and happenings in agriculture.

In Luzon, an online festival, called PATIKIM Festival, was held were farmers organizations gather in their hubs and share local and organic food. Imbued by the spirit of solidarity, the festival symbolizes the aspiration of farmers to be freed from the clutches of transnational corporations that hold the monopoly of seed and technology in maintaining a highly oppressive agricultural system. Patikim Festival is a celebration of the farmers' will to overcome impoverished conditions. It also gestures towards building a welcoming and unifying community of farmers which advocates for natural and organic farming.

“Let us not be disheartened during this crisis. Let us strengthen our organizations so that we can help each other in producing healthy food for our communities. Let’s start with our own vegetable gardens, our own food processing. We are farmers, we are the ones producing food, we should not go hungry, especially in this health crisis.”

Heart of the Organization

The COVID-19 pandemic revealed the fragility of our food systems and the urgent need to shift to a sustainable, farmer-led agriculture and food system that addresses the food and nutrition needs of people and not markets.

In the midst of this crisis, small farmers have found creative ways to sustain their organizing work and sustainable agriculture practices such as their bayanihan, preservation and exchange of indigenous seeds, communal farming, and DIFS—which enabled them to also creatively respond to the food and health needs of people badly affected by the pandemic, as well as help build the social solidarities and social movements asserting people’s right to food (Tan, 2022).

And at the heart of all of these are hardworking women have proven that the pandemic is not an obstacle in their ability to increase the production of safe food for each family while not forgetting to share with their communities. Women's committees, youth committees and women's organizations have shown great enthusiasm in stimulating heroism in production and action that eases organizational work.

VIRGINIA NAZARENO

Virginia Prudente Nazareno is the Chairman of the Board of Trustees of MASIPAG. She is also the Advisor of the Kiday Community Farmers Association (KCFA), located in Sitio Kiday, Bragy. Peza, General Nakar, Quezon. Nanay Virgie, as she is fondly called, is a farmer-trainer who specializes in organic agriculture production, organizational development, food processing and marketing.

As a leader, Nanay Virgie is a strong advocate of environmental protection and women’s rights and is against development aggression such as the Kaliwa-Kanan Dam, proliferation of genetically modified organisms and continued use of harmful pesticides such as glyphosate.

In her stint as the Chairman of KCFA, Nanay Virgie lobbied for support and access of funds of the Local Government Units and agencies in their municipality for the farmers. Together with the local leaders of MASIPAG, nanay Virgie continued to lobby for the passage of Organic Agriculture Ordinances to continuously support the increasing number of organic producers in their community.

EAT LOCAL KOBE

BY HIROAKI KOIZUMI (JAPAN)

Abstract

EAT LOCAL KOBE is an activity to promote local production for local consumption in the field of agriculture/food in the Kobe area, and to try to install a layer of "agriculture" into the daily lives of citizens in Kobe. At the start of the activities in 2014, despite the fact that, the urban area of Kobe is blessed with a 30-minute drive to farmland, awareness of Kobe vegetables was very low, and there was no image of vegetables being grown.

What we learned from interviewing residents on the city side and farmers on the rural side was that despite their proximity, they have a psychological distance from each other. It turned out that the residents on the city side think that the farmers should just bring their produce and sell it, while the traditional farmers think that the people on the city side should just come and get it. Then, we started meeting with young new farmers and found out that there are many organic farmers with high ideals who started farming just after the Lehman Shock and the Great East Japan Earthquake.

However, they were all struggling to sell their vegetables due to logistics problems. The EAT LOCAL KOBE Farmers' Market that we launched in 2015 was motivated by the idea of bringing together these young up-and-coming farmers to sell and educate citizens in the city. The market has been held almost every Saturday morning, with stalls set up not only by farmers in Kobe, but also by fishermen, food vendors, and food and beverage businesses trying to make use of local ingredients. The weekly market has been a great success in providing a place for farmers to sell their products and raise awareness, but it has also produced some positive results as a byproduct.

One of these is that farmers have become united with each other. Many of the farmers who participated in the farmers' market had changed their careers from other professions to farming because they had doubts about today's consumer society, and they tended to be isolated in the traditional farming community. By meeting each other every week at the market, they became friends across various barriers and began to exchange information on farming methods, soil cultivation, and weather conditions, and their isolation began to ease as they made friends to work together.

Not only farmers, but also restaurants and food product sellers participate in the market, and by working together with a common goal, collaborative products are born, and business transactions are expanded. In addition, the market may have offered a career path as a farmer to young people who were unsure of their future career paths. These young people got involved with us, and some of them are now gradually moving on to the farming industry.

The Farmer’s Market has created a weekly meeting place for those involved, but there was a discussion about creating a place where people can buy Kobe food not only weekly, but also daily. With the Farmer's Market, the farmers had to gather in the city, but at FARMSTAND we are the ones who go around with our trucks four times a week to pick up the vegetables. Since there is no small logistics connecting with the farming villages of Kobe, the farmers and we are working together to mutually take on the small logistics.

In 2020, from the viewpoint of revitalizing Kobe's farming villages, which was our original goal, we purchased an old private house in a rural area of Kobe and built a base and started a school project called "Micro Farmers School" where young people will explore a lifestyle that combines farming and a dual job. The school accepts 15 students each year, 45 of whom have already completed the course, and graduates are gradually starting activities in rural areas. The school promotes part-time farming because of its location near Kobe’s city center where there are plenty of jobs, and part-time farmers who travel back and forth between the city and farming villages are beginning to emerge. The city of Kobe has also supported the micro-farmers' school and created the Next Farmer program, easing restrictions on farmer qualifications, which were initially strict.

We have also started an activity called "urban farming" to increase the number of places where urban residents can farm in their neighborhood, and currently operate five urban farms in the Kobe area. We believe that creating places where people can easily farm in the city is one solution to the problem of vacant houses and land, which is a major issue in Japan's shrinking population, and can contribute to the creation of a healthy community through agriculture. We also hope that by having city residents themselves do the farm work and learn about the hardships of growing vegetables, we will be able to increase the number of good consumers who seek out local organic vegetables.

Kobe City is facing a population decline, with the population being absorbed into convenient urban areas, and the aging inner cities, suburban new towns, and farming villages that are being abandoned in the process, present a major problem. We believe that land that was originally farmlands and mountains need to be restored to its original state, without going against nature.

In the city center, which is becoming more and more inorganic due to large-scale condominium developments and buildings, we would like to see garden farms, and farmers' markets that serve as points of contact with agriculture for urban residents.

In inner cities that are being undermined by the problem of vacant houses, urban farming can provide a mechanism for rebuilding communication between local residents centered on agriculture.

In suburban new towns, the sites of houses should be merged and widened to create an environment for vegetable gardens, and the process of returning each one to nature should be carried out.

Farming villages will be opened and function as places where young farmers who provide food for urban residents can play an active role.

In this way, we believe that the ideal is to have "agriculture" firmly installed in all areas of a city. During the period of rapid economic growth, food was needed in large quantities and rapidly, and efficient production using pesticides in single-crop production was required. However, as the population continues to decline in Japan, consumers will demand fresher, safer, and more secure food, and will be more conscious of organic and natural farming.

When this is considered, various styles of farming in Kobe city, which makes it difficult to use pesticides, is a perfect match for organic farming, and there is nothing better than proximity for freshness. Food is self-sufficient locally, and people raised on healthy vegetables are actively enjoying their lives. Such a city of local supremacy is truly a sustainable and beautiful city. These attempts are working in close cooperation with Kobe City, and we would like to continue our activities under the shared roles and collaboration with the administrative body toward the organic urbanization of the Kobe area in the future.

Project website: https://eatlocalkobe.org/

HIROAKI KOIZUMI

Hiroaki Koizumi has a master's degree in urban and Regional Planning from University of California, Irvine. In 2010, he started his own business and established Lusie Inc. in Kobe, where he performs small area development projects with the aim of "cultivating an area within 10 minutes walking distance". Representative Director of KOBE FARMERS MARKET.

He started working to create a local economy in Kobe as an alternative to the global economy after the Lehman Shock and the Great East Japan Earthquake. He created hubs that bring together professionals from different professions such as agriculture, food, design/build, crafts, and tourism through hosting farmers market, running a local food grocery store, consulting for Kobe city, running shared offices and farming schools, conducting renovation, real estate brokerage, and design services, and hosting hub events.

Through these activities, he has set up the concept of turning the Kobe area into "an organic city" and working closely with Kobe city in these endeavors. He will continue to do so in cooperation with the city government as he shares roles and works toward the transformation of the Kobe area into an organic city.

ESTABLISHING FOOD FOREST ORGANIC HOME GARDENS FOR NUTRITIONAL SECURITY AND INCOME GENERATION FOR WAR WIDOWS IN NORTHERN SRI LANKA

BY FAZLY MOHAMMED (SRI LANKA)

In Sri Lanka the 30 year long civil war that engulfed the northern part ended in 2009 with a heavy cost on civilian lives. The end of the war period has devastated the agriculture sector as well as other livelihoods. War has resulted many vulnerable groups such as widowed, disabled or lost their livelihoods. Out of this, war widowed women have faced many challenges. Many of these widows were young, losing their husbands due to the war and left with many small kids to feed and take care of. Many of these mothers were compelled to leave their kids at the guardianship of their relatives and migrate to middle eastern countries to work as housemaids and to earn money to support their families and kids' education. But this situation has resulted in different sets of problems such as child abuse, neglect, and related social issues.

With regard to agriculture in this region, northern part of Sri Lanka is considered as a semi dry zone as it receives rain only for a period of 4/5 months and have to cultivate the remaining period with the water received during rain. Due to this condition, there was a peak cultivating period with high demand for labour and an off-peak cultivating period with lower demand for labour. This has resulted in a problem for feeding the family for these single mothers.

On deeper analysis, their agricultural lands also have many problems that needed a broader approach with a holistic view. All the people have turned their entire lands on cultivating cash crops during the rainy season and fallowing the land on the remaining periods. The open fallow land has resulted in draining away the water during rainy season and quick drying of the soil moisture during dry season. There was lack of large standing trees which increased the water recharge during rainy season and contributed to water conservation during dry period.

Northern Sri Lanka has started to experience high occurrence of chronic kidney disease of unknown (CKDU) etiology. High calcium level of the ground water and contamination of pesticides and heavy metals (introduced through chemical fertilizers) are identified as the reason for this CKDU. Many widows have lost their husband and also some of their family members are suffering from chronic kidney failure which is life threatening. Planting trees around wells which has water filtration quality and dense root system has been found as a method to address this issue. Focus on chemical free farming methods, such as organic farming, is also found to be of much importance.

To address these problems, an organization working in the northern Sri Lanka, Rainforest Rescue International with the financial assistance of "Almayuda Foundation" has implemented an organic farming-based crop diversification and home garden strengthening program targeting the war widows. The government local administrative unit "Vengalacheddikulam Divisional Secretariate" belonging to Vavuniya district in northern Sri Lanka is selected as the project location and 150 war widows from 9 villages were selected. This selection was done with the collaboration of the 'Women Development Officer' who is responsible for women welfare within the division.

These selected war widows were provided initial training on organic farming including land preparation, compost and liquid fertilizer preparation, soil care and enrichment, crop establishment and pest and disease management. Initially a survey was conducted to analyse the situation of the widow's family status and the land available. Following that, a land design was prepared on establishing perennial trees with food and economic importance to provide nutritional security, economic benefit, ground water recharge and conservation among other benefits. Based on this survey and design, a diversified crop list was identified which can contribute to nutritional and food security and income generation. Land development techniques used in analog forestry[9] which is a method of agroecology is followed during the planning and designing process.

During the first rainy season, a vegetable seed pack was distributed to ensure a diverse food crop is established. 2 varieties of selected cash crops were provided for income generation. At the same time, some perennial food plant seedlings were provided to be established around the house and the well area. This was done according to land development design prepared under the analog forestry method.

Categories of crops provided included foods crops, cash crops, fruits, yams, medicinal and spices etc., Objective of the land design was to provide food and income while establishing a food forest in part of the area surrounding the home and well to provide soil conservation, water purification and other eco system services. Over a period of 6 years, these widow community was assisted to enhance their lands in crop diversification.

As a climate change adaptation, promotion of large trees capable of providing food was done. Low water requirement crops were incorporated into the food forest model. To facilitate natural pest control and nutrient recycling which are key features in organic farming, crop species with multiple attributes such as nutritional value, high harvest, contribution to biodiversity and nitrogen fixing etc., are selected for the food forest.

[9] https://www.analogforestry.org/about-us/analog-forestry/

By the time of 2nd year, selected war widows were empowered through organizing into small village level groups. Representing 9 villages there were 9 groups working on home garden improvement at assisting each other. All these 9 groups were made into single society representing the war widows in 'Vegalacheddiulam division'. A successful seed saving, and exchange program was introduced to enhance continuation of farming activities. This was done as a counter measure against the hybrid seeds in the market which provided yield only upon addition of chemical fertilizer.

Many open pollinated and heirloom seeds as well as planting / propagation materials for the food forest were among the group's interests. By the 4th year, they started to receive yield from many diversified crops which were previously not cultivated. Training was provided on harvesting and processing these crops as well as on value addition. These groups were facilitated on collective processing and marketing as village self-help groups. As marketing support, these women groups products were promoted at regional and national exhibitions as well.

These women groups represented 3 ethnically diverse communities. They were Tamil language speaking Hindus, Christians, and Muslims. Even after the civil war, there were some minor misunderstandings occasionally erupting among communities. Lack of understanding, bonding and close working relationships were a few of the reasons which escalated into bigger issues. Working as a group in seed saving, exchange, product processing and marketing which are associated with their livelihoods has increased the understanding among communities and importance of co-existence.

End of the 6-year project period, the women group has grown in to supply their products to outside markets as well as to some small-scale exporters to gain financial benefit. The food forest has increased the nutritional security for the family as well as conserving the water, thus increasing the length of the planting season. Increase of canopy cover in the landscape has greater impact on the village water conservation during the dry spell benefiting the whole village while creating a climate resilient far model.

FAZLY MOHAMMED

Fazly Mohamed: Coming from central hills of Sri Lanka and with a B.Sc. in Agriculture and M.Sc. in Environmental Science, counts 16 years of experience in managing organic agriculture home garden development project.

He is proficient in both local languages and has specialized in organic agriculture project management and farmer mobilization. Over the years, he has managed many nutritional security programs based on organic farming and sustainable agriculture.

He has focused on empowering rural economy, eco-friendly farming methods, climate resilient farming methods, community networking on value addition and collective marketing are areas of interest.

Apart from project management, he is an accredited international trainer on Analog forestry which is a method of establishing food forests, an inspector of organic agriculture and FGP (Forest Garden Products) certifications.

As a project manager, he has achieved international recognition for implementing successful farmer mobilization program under EU funded “Improving dry zone agriculture resilience of war effected community’s project” This project won the global 2nd place out of 786 projects under small scale projects submitted to “International call for best sustainable development practice – Expo Milan 2015 ” held in Milano, Italy.

NSLA METHODS TO SPREAD ORGANIC SCHOOL MEALS

BY MIKI SOEJIMA (JAPAN)

INTRODUCTION

It all started on March 11, 2011. On that day, the Fukushima nuclear power plant accident happened, spreading radiation over a wide area in this country. At that time, I felt that I was the one responsible for this terrible event because I did not care about society and did not do anything to help it.

I asked myself if there was anything I could do, even if there was only one person to take a step forward for the future of my children. I searched for something that would clean up the polluted environment, something that would benefit the physical and mental health of the children, and something in which I could be involved as a mother.

My answer to this question was "organic." Organic is good not only for humans, but also for everything on the earth. This was exactly the way of life I was seeking for. “Organic” has become my basic philosophy in acting for the future of children. For the next eight years, I worked hard alone to promote organic school meals in Ama City in Aichi prefecture.

I built Natural School Lunch Action (NSLA) in Aichi prefecture in 2019 because I met Ms. Zen Honeycutt in that year.

Since then, the NSLA's efforts have led to the implementation of organic school meals in four cities in 2021, the third year of its establishment, and in seven cities in 2022. We have now expanded to 40 branch initiatives all around the country.

Key words: Organic agriculture movements, Organic school meals initiatives, NLSA methods, Participatory Guarantee System (PGS)

History of the Development of NSLA

In December 2019, I had an opportunity to meet Ms. Zen Honeycutt who has been a leader and a pioneer in the organic movements in the U.S. since 2012 and was also the Founding Executive Director of Moms Across America [1]. After listening to her talk, as a fellow mother of three children I felt that what I had done in Ama City was very little compared to her contribution to society. Inspired by her, I think that I might be able to do something like her in Japan. Soon after that day, I called mothers who might be interested in organic school meals initiatives, and seven of them got together. I told them about how and what l have done in Ama City and said to them; "This is how I want others to promote

organic school meals in Japan." They were so impressed by my talk, that an action group of mothers was organized shortly to promote organic school meals. This is the beginning of NSLA. (See Fig.1)

Since then, I have held a number of seminars for those who would like to make school meals organic. As a result, some existing organizations joined us, and more people started their own organizations as NSLA branches in Aichi Prefecture. However, around the spring of 2020, the COVID-19 pandemic prevented me from going out and collecting people; therefore, we decided to hold webinars to introduce the NSLA methods created by me.

In fact, webinars worked well to spread the methods of the NSLA across the country. The number of NSLA branches has rapidly grown, and organic school meals have been implemented at many schools in several cities through our efforts as shown in Fig.2. Organic school meals share has grown sharply by the enthusiastic efforts of NSLA.

The progress of organic school meals share is faster and higher than that of the organic lands share. This means the demand exceeds supply. It is obvious that school meals are good outlets for the organic agriculture sector.

NSLA Methods

To realize organic school meals, it is necessary for us to build trust and cooperation between NSLA members and relevant stakeholders in the school meals program. It is not an easy task, but NSLA Methods have been making it possible. In Japan today, many organizations are appealing to local governments for organic school meal's introduction, but each of them is not doing as NSLA has been doing, and in only a few cases they are successful. Our success was dependent not on forceful and aggressive attempts and communications, but on gentle and d friendly manners.

(1) Transmission of Miki's ideas to other potential NSLA members

The most important key element of NSLA methods is Spiritual Mindset. When I started the activities, I took the same aggressive approach as many activists had done, but the results were not successful. I reflected on myself and analyzed my behaviour sincerely to make my way of doing more successful. Through this process, I realized that what is needed for success is not to persuade or confront others, but let the stakeholders walk together heading for the organic school meals achievement.

This is the same as parenting, and when I applied the Adlerian psychology that once helped me raise my children to this activity, it dramatically became more successful than before [2]. So I built the "Miki's Ideas" based on this way, while also referring to "The Seven Habits of Highly Effective People" and other books [3]. This Miki's Ideas is shared with potential NSLA members via webinar, and those who agree with me will become NSLA members. (See Fig.3).

(2) Actions based on the Miki’s ideas

Based upon Miki’s ideas, we NSLA members have promoted our activities according to the established procedures as shown in Fig.4.

First, before contacting school meals officials we build NSLA branches and launch social network sites.

These preparations are to show them that we are ordinary mothers, not radical groups, and to make them comfortable during the meetings with us. Then, in order to make clear the effective approaches, we must carefully research school meals in our local governments and understand the current situation. This is because in Japan, each local government has the authority to manage school meals, and the way they are operated in different ways. In doing so, the key persons as shown in Fig.5 involved in the operation of school meals in each local government are identified.

At the meetings, we will provide information on relevant national projects to promote organic school meals and respective subsidies from the government. We do not ask them to do something for us, but to ask how we can work together with the school meals stakeholders for the healthy future of our children and then offer our support.

Of course, there are times when things don't go smoothly, but in those cases, we review Miki's ideas, update them, and then approach stakeholders repeatedly. It might take some time, but, at the end of the day, we can establish trust and cooperation between the local NSLA and the School meals stakeholders. Similarly, we could build relationships of trust with farmers, suppliers, and other stakeholders. In addition, through a series of various community service activities, such as serving for the town community revitalization committee, NSLA has succeeded in building good relationships with the local government people and city council members including mayors and gradually deepened their understanding of organic school meals.

Finally, after building good relationships of trust with key people involved in school meals, we connect them to each other horizontally. NSLA has made bridges among school meals officials, local government people, farmers, and suppliers, and has been successful in achieving organic school meals.

Future Works

In Japan, "Measures for achievement of Decarbonization and Resilience with Innovation (MeaDRI)”, the Green Purchasing Law, and the Fourth Basic Plan for the Promotion of Food Education have paved the way for encouraging organic school meals in villages/towns/ cities [4][5][6]. The Ministry of Education, Culture, Sports, Science and Technology has allocated a budget to support organic school meals initiatives in the FY2023 budget [7]. Additionally, a joint public-private organic school meals forum was

held in 2022 where about 50 mayors participated [8]. This apparently shows that interest in organic school meals is gradually penetrating in this country.

We are working for a variety of more effective outreach plans than ever before to move this trend forward as shown in Table I.

Conclusions

(1) NSLA methods created by me have grown into practical ones, gaining various experiences so the movements have become more streamlined year by year.

(2) By the methods, we were able to successfully implement organic school meals by the mother's power which has been said to be difficult to achieve them by social movements.

(3) To catch up the situation where organic school meals demands exceed organic food supplies the IFOAM Recognized PGS Initiatives set up among local organic farmers' groups would be desirable. NSLA runs the IFOAM Recognized PGS Initiatives in Aichi prefecture in order to gain trust between organic farmers and school meals stakeholders through the annual organic farm peer reviews by relevant stakeholders.

(4) Since NSLA methods are based on capturing the human heart, it is commonly applicable to other social movements, even in different languages and countries.

Organic movements such as conversion from conventional to organic increase the organic food supply to meet the organic school meal's demands, will definitely accelerate organic farm and organic school meal's developments around the world.

References

[1] Moms Across America https://www.momsacrossamerica.com/

[2] Shunsaku Noda, Yoshikazu Hirade, Hiroka Tabeta and Toshinori Iwai, "Textbook of Adlerian Psychology",Tokyo: Human Guild 1982

[3] Stephen R. Covey, "The 7 Habits of Highly Effective People", New York: Free Press 1989

[4] MeaDRI, "Measures for achievement of Decarbonization and Resilience with Innovation", May 2021

https://www.maff.go.jp/e/policies/env/env_policy/attach/pdf/meadri-4.pdf

[5] ENV, "Act on Promoting Green Procurement of Eco-Friendly Goods and Services by the State and Other Entities (Act on Promoting Green Procurement)", Act No. 100 of May 31, 2000, https://www.env.go.jp/en/laws/policy/green/index.html

[6] MAFF, “The Fourth Basic Plan for the Promotion of Shokuiku”, March 2021
https://www.maff.go.jp/j/syokuiku/attach/pdf/kannrennhou-30.pdf

[7] MEXT, “Key points of the budget request for the fiscal year 2023”, The list of the budget request for the fiscal year 2023. Aug 2022. No.01, https://www.mext.go.jp/a_menu/yosan/r01/1420668_00004.html (in Japanese)

[8] MAFF, “Initiatives for promoting organic school meals”, 8 December 2022
https://www.maff.go.jp/j/seisan/kankyo/yuuki/attach/pdf/jichinet-104.pdf

(In Japanese)

FIGURES

Figure 1: Timeline of NSLA

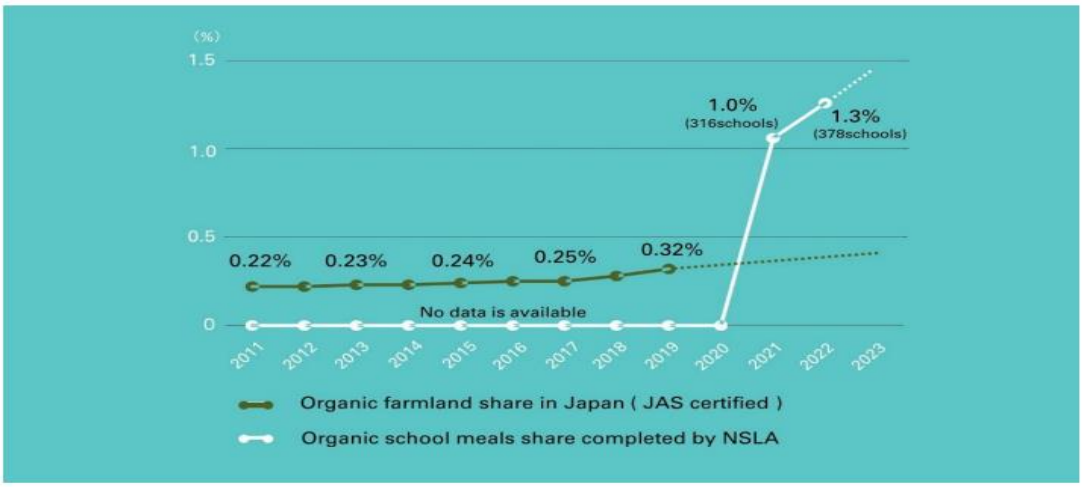

Figure 2: Annual developments of Organic Farmlands share (to total arable land areas) & Organic School Meals shares (to total elementary/junior high school numbers)

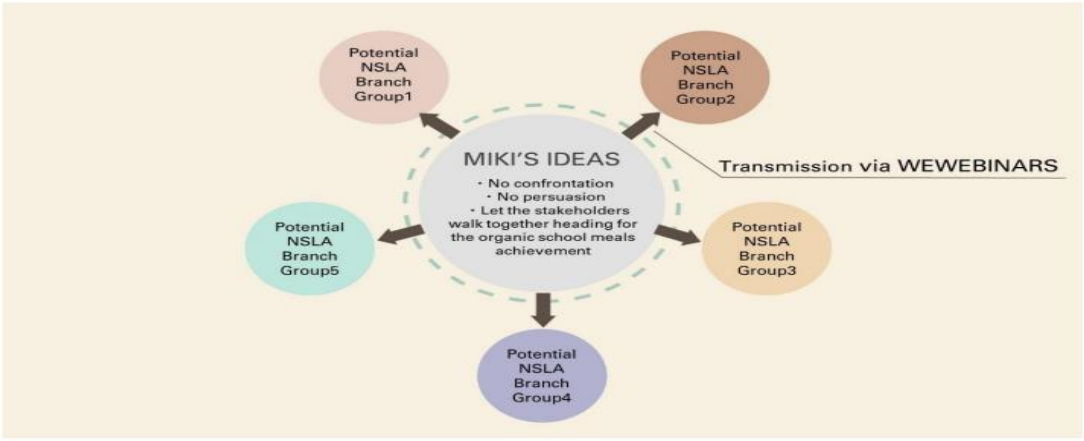

Figure 3: Transmission Miki's Ideas

Figure 4: NSLA Actions based on the Miki's ideas

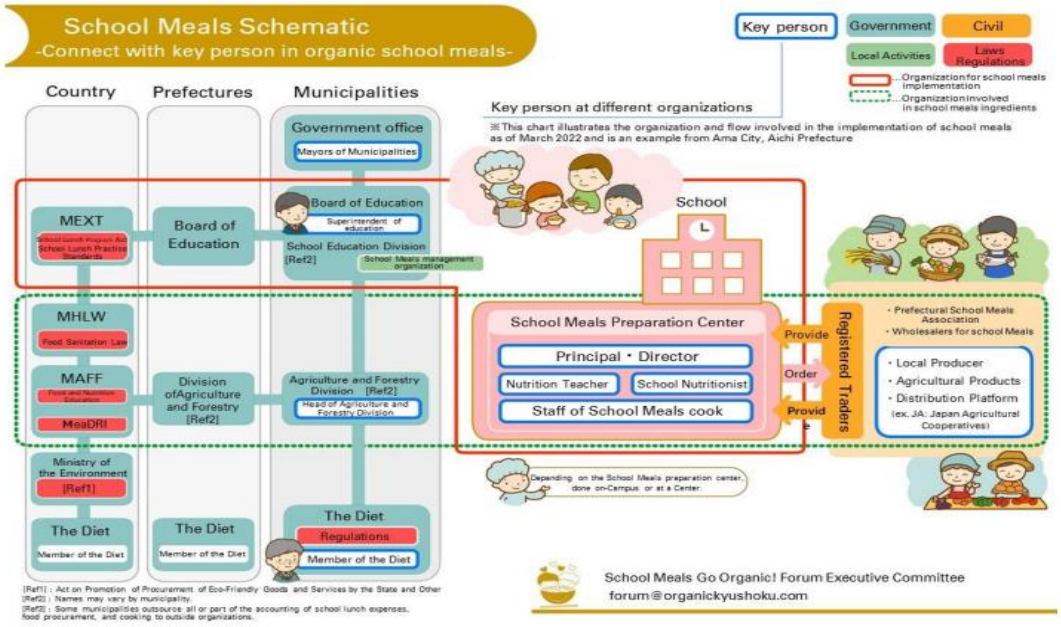

Figure 5: Respective school meals stakeholders in Japan

Photo1: Helping harvest at an organic farm in Ama City

Photo2: Washing organic carrots for school meals by NSLA and organic farmers

Photo3: School meals with organic carrots and radishes in Chiryu City

Photo4: Meeting with the Mayor of Ama City and the Aichi Prefecture Council Member

Photo5: Discussion meeting with Hokkaido branch of MAFF

Photo6: Give on-site classes at an elementary school in Ama City

Photo7: NSLA Board Members

Photo8: Organic Rice Harvest Festival at PGS Initiatives

Table I Future works

Present issues	NSLA's challenges
Insufficient supply of organic produce Organic farmlands share in Japan share is 0.3% (JAS certified) and organic school meal share is 1.3% respectively in 2022	NSLA is preparing to launch the IFOAM Recognized PGS Initiatives in Aichi Prefecture to grow PGS certified produce to be supplied to school meals
Awareness of the significance of organic food among children, parents and school meals stakeholders are low.	NSLA creates the packages of educational programs for organic foods and the SDGs are to be taught at schools.
Strict School lunch requirements especially in terms of price	・Purchase directly from local organic farmers to reduce intermediate costs ・Use Organic foods instead of expensive processed foods ・Use legumes that can meet the required amount of protein, instead of expensive and environmentally hazardous meat

MIKI SOEJIMA

I was born on June 26, 1973, in Gifu Prefecture, Japan. In 1994 Graduated from Aichi Gakusen University Junior College with a degree in Early Childhood Education and a license to teach nursery school and kindergarten.

In 1994, I joined Kawai Musical Instruments Mfg. Co., Ltd. and taught physical education to children through play as an instructor at Kawai Physical Education Class. In 1999 , I joined Daiei Olympic Sports Club Co., Ltd. (now Konami Sports Co., Ltd.) as a sports trainer. I got married in 2005 and am currently raising three boys. In 2014, I became a certified vegetable sommelier, and since 2018, I have given 90 lectures as an instructor of Adlerian psychology parenting courses. I founded the “Natural School Mom's Association @ Ama City” in 2011 in Ama City, Aichi Prefecture, where I currently live. 7 years later, in 2019, I founded the “Natural School Lunch Action” and serve as its representative.

THE SRI LANKAN EXPERIENCE: TOWARDS A PEACEFUL AND SUSTAINABLE ORGANIC ISLAND AFTER THREE DECADES OF WAR

BY ANURADHA RANASINGHE (SRI LANKA)

Sri Lanka, the small Island nation in the Indian Ocean suffered from brutal three-decade civil war since 1983 to 2008. The war was mainly a clash between the Sinhalese community-dominated Sri Lankan government and the insurgent group, represent the Tamil minor community in the North and East Provinces of the country. However, these two provinces with the adjoining north central province of the country have been a significant producer of food and cash crops since independence in 1948.

Production was generally far greater than the requirement of their populations, these provinces became net exporters of many agricultural products to rest of the country. As a result of that a vibrant commercial agriculture sector in the region developed during the pre-conflict period. However, due to extensive mining of agricultural lands, restriction of fuel, fertilizer and pesticide supplies, transportation bottlenecks and stringent security measures during the war, the previous successful commercial mode of agricultural production transformed into a subsistence or survival mode of production.

After the settlement of the conflict in 2008 there was an urgent need to provide livelihood support and create income sources to the victims in the war affected areas. Agriculture and livestock development was the immediate focus to uplift the income of the people. The government introduced various programs to revamp the agricultural economy with the support from many local and international organizations. But rebuilding broken supply chains was not an easy task than expected because many alternatives have been taken to replenish the depleted food requirement of the nation through imports during the 30 years' war period. However, after several years of struggle, powerful farmers who had bigger land extents started the commercial scale agricultural production with the support from banks and other financial institutions. They were able to produce larger quantities and connect with the major supply chains of the country. Banks and financial institutes were happily and efficiently granted loans to them as they had favorable extents of lands and assets as collaterals.

But smallholder farmers were not able to overcome the challenges faced even after being settled in their inherent lands because they didn't have the capacity, assets and volumes to compete with the larger producers. Apart from lack of financial capacity, price fluctuations, sudden changes of the weather patterns and transportation difficulties and high cost of production related to lower volumes were the burning issues faced by the small holders in the region. Developing alternative markets and shortening supply chains was the only possible option to overcome these challenges.

“Via Village Entrepreneurs Center” is a place located in northern Sri Lanka founded in 2013 to find solutions faced by local entrepreneurs and small holder farmers who were affected from the war. The focus of this operation was to strengthen the livelihood of the victims by helping budding enterprises or small holder agribusinesses through value addition and introducing high value crops. Main objective was to increase the income levels of the villagers directing their products or services to the markets outside from their villages to obtain a premium price. Organic farming is one of the key business initiatives introduced to the villagers to get a higher income over highly price fluctuating conventional farming. Heirloom rice, vegetables and fruits were selected to grow under organic farming conditions through this initiative.

Due to 30 years of abandonment and restrictions, most of the lands were clean and free from agrochemicals which was a blessing to start the program. But the lands were converted into conventional farming at an alarming rate due to agricultural expansion with many local and international organizations. As a result of that the area has become a new battlefield for fertilizer, pesticides, and seed companies.

Being accepting all the challenges, 30 farmers were selected and trained to produce crops under organic farming practices. They have been certified through participatory guaranteed system (PGS) to sell products as organic at local markets. Farmers started growing but when they tried to sell the produce, they did not receive the expected price premium. Even though markets identified in the capital city, which is situated 250 Kms away from the farmer fields, transportation was the biggest hurdle to come across. As a result, several farmers were discouraged due to lower prices, and they have moved again to conventional farming. Therefore, buy back guarantee system was required with a confirmed buyer to sell the produce at a guaranteed price.

OWITA Natural Pvt Limited is a retail organic market chain founded by me together with 4 friends to provide a market platform for organic producers and consumers. Its major role is to act as a fair middleman networking organic value chain players under one umbrella to provide market opportunities. It has been managing two physical stores and an online market based in the capital city, Colombo, with a delivery network.

In 2017 “OWITA” came up with a partnership with “Via Village” producers to provide market support for their organic certified products. This was a turning point to both businesses because “OWITA” abled to get a guaranteed vegetable and fruit supply through “Via Village” and farmers were assured with a market at guaranteed price. And also, OWITA supported the farmer network with crop planning, diversification and providing production forecast based on their market demand. As a result of that farmers shifted to grow multiple crops at a time to gain multiple revenue cycles per year without

depending on growing few crops during the season. This method was resistant to price fluctuations because products were not over supplied during the season.

OWITA provided a 30% organic price premium considering the conventional market price and when the market price was very lower during some seasons of the year, farmers were supported with an agreed minimum price. The transport mechanism used to channel products from farmer fields to the stores was very cost effective because OWITA used the train network as they were situated close to the railway hub in the city. Even smaller quantities were able to be transported at a very low price and both farmers and consumers benefited because of this.

“Know your farmer – Know your food” is a slogan promoted by OWITA and today this business partnership is successfully continuing connecting northern and southern parts of the country where Tamil speaking minor community growing and supplying Sinhala speaking major community in the capital.

It is a strong business relationship based on the trust between two communities and also an alternative marketing strategy to shorten the supply chains to benefit organic farmers and consumers in the country. This is a realistic experience where organic farming can network distracted communities into common objectives while building sustainable business relationships.

ANURADHA RANASINGHE

Founder - ABBA Agri Consultancy, Director Supply Chain -OWITA Organics, Technical Member – Lanka Good Market Participatory Guarantee System (PGS)

I was born in Galle, Southern Sri Lanka, obtained primary education at Sridhamma College Labudwa and qualified to attended Royal College Colombo 07 after passing the grade 5 scholarship exam. From a small age, I had a passion for Agriculture and actively involved many farming activities during the school career. I obtained Bachelor of Science in Agriculture from Wayamba University of Sri Lanka specializing horticulture and landscape gardening in 2016.

Since 2010, I gained experience working with small holder traditional rice farmers, and organic farmers in the country while serving for two non -profit companies named Rural Returns Guarantee Limited and Lanka Good Market Guarantee Limited. Upon graduation in 2017, I initiated a social enterprise called ABBA Agri Consultancy (https://abbaconsultancy.com/) to provide organic farm management and consultancy services. At the same time, I extended services towards organic product retail market chain establishing another institute called OWITA Organics Pvt. (www.owita.lk) Ltd. which serves as trading platform for organic farmers and consumers.

Recently I have completed a master's degree in agriculture enterprise and technology management at Wayamba University of Sri Lanka. At present I manage 120 acres of my own farm under organic farming practices and over the past 5 years, the business has been steadily growing and it provided services to interested farmers and organizations in several areas of the country while generating 13 direct employment opportunities.

STRENGTHENING COMMUNITY DEVELOPMENT WORKS: STRENGTHENING TRIBAL GROUPS

BY JOANNA GARCIA (PHILIPPINES)

Long before, community organizing has been very challenging for some of the rural areas in the Caraga Region. Most of the farmers in far-flung places especially Indigenous People are sometimes hardly reached by the government services. These people owned vast amounts of the land but unfortunately, some of it is left unused. Either they were not aware of suitable methods of using the land, or some were just uninterested in farming.

This status quo has inspired Ms. Jhoanna B. Garcia to help IP members of the Mayapay Tribal Council. In 1999, she's already been an Organic Agriculture advocate since she started working in a non - government organization Tribal Mission Foundation International Davao as a community development worker under Breakthrough Ministries in Sarawak, Malaysia. She was assigned to a tribal community called *Matigsalug Tribe.* Since then, she acquired knowledge on organic farming to help farmers sustain their agricultural operations.

By teaching the IP community about organic agriculture, they now recognized the value of soil as a foundation for food production. By knowing the fundamental principles of organic farming, the community began to reconnect with nature. As custodians of the ancestral domain, they play an important role in upholding biodiversity. Thus, knowing how to farm sustainably must be incorporated into their customs. Most of them are conventional farmers and only a few know little about organic farming. Struggling, Ms. Garcia is more determined to promote organic agriculture.

With a persistent heart, Ms. Garcia spearheaded community organizing with the help of the City Local Government Unit of Butuan City. Training on organic farming using natural farming techniques was successfully conducted in the community and she was the speaker in all of these said training.

Another challenge Ms. Garcia dimly handled is out-of-school youth and youth migration in the community. Just like in other countries the aging of farmers, she believed needs to be articulated. She believed that the country needs young blood in agriculture to sustain food production and improve poverty in the community. Herewith, she participated in some educational campaigns through social media with the help of the Department of Agriculture (DA). Being an eloquent speaker and advocate for organic agriculture paves the way for a lot of opportunities not only for her but for the tribal community. The tribal community is a recipient of some of the equipment and facilities from DA such as a corn mill and other livelihood support.

In 2022, Ms. Garcia was nominated in the Department of Agriculture's CY 2022 Outstanding Rural Women Contest. Where she got first place at the regional level. This also inspire a lot of organic farmers especially women in the agriculture sector to be more active in this advocacy.

Lastly, in all her undertakings, she always hopes that more Indigenous People understand that they are not only custodians of the domain but are part of the natural well-being that should take part in sustaining agriculture and preserving the community and the environment for the next generation. She wished that by sharing her experiences, more youth can appreciate and will engage in organic agriculture.

JHONNA B. GARCIA

Butuan City, Agusan del Norte, Philippines

I am Jhoanna G. Garcia, a natural farming consultant for 20 years. Before, I worked as a consultant engineer at Marriott Hotel and Libya Tripoli and later on in an NGO named Tribal Mission Foundation as a Community Developer Worker for 5 years, (1999-2001). Aside from being a community developer, I am connected to a Manobo Tribe as "Bai Mangkahadalang".

Most of my time is dedicated to community service. I am involved in the dissemination of information activities about organic and sustainable farming with the help of the Department of Agriculture. As a community development worker teaching organic agriculture to Indigenous People (IPs) and youth has been my advocacy – it is where I found my passion.

Further, I am engaged in various farmer's organizations. I currently act as Vice-President of the Women for Organic Agriculture Association (WOA) – Caraga Chapter and secretary of Butuan City Organic Producers and Processors Association Inc. (BICOPA). In 2022, I got first place in the Search for CY 2022 Outstanding Rural Women, and as a farmer, my farm (Jabez Farm) was also awarded last Nov. 20, 2022, as Outstanding Organic Farm.

Finally, IPs and youth has always been close to my heart. For me, their participation and cooperation contribute remarkable impact on achieving food security and agricultural sustainability.

REDESIGNING AGRICULTURE FOR SMALL FARMERS FROM A TRIBAL COMMUNITY IN CENTRAL INDIA

BY DHANIKODI THANGAPANDIAN (INDIA)

Co-Authors: Ms. ANTHONISELVI, JOYFUL AGRICLINIC, SEVAPUR, TAMIL NADU, INDIA

"It is impossible to survive as a farmer." *Karpe*, a farmer from Chilgavhan Village of Yavatmal District in the Vidarbha region of Central India left his "suicidal note" and poisoned himself along with his entire family on 19th March 1986. It has been already three decades passed, but the stories of "farmers' suicide" continue among the small and marginal farmers not only in India but anywhere and everywhere in Asia.

This paper addresses the issues prevailing with small farmers, particularly from a tribal community whose land holding is minimal, and their resources are limited. The authors showcase a new model called "Holistic Collective Natural Farming" in which the entire landholdings are pooled along with other resources within the community and farming is carried out collectively following regenerative agricultural practices while a Social Entrepreneur handhold the entire operation providing financial, managerial, technological, and marketing inputs and guidance.

The Context

India is a country with a population of 1.38 billion. More than 70% of the rural population still depends on agriculture. Some 126 million farmers are small and marginal with an average landholding of 1.08 hectares. These farmers live in penury and sometimes take the worst decision in their life to commit suicide. There are many reasons viz. fragmented small landholdings, vagaries of nature (drought, floods, unseasonal rains, pest attacks, etc), non-availability of farm credits, exploitation by the middlemen and last but not the least misguided policies of successive governments driven by politicians focused mostly on vote-bank politics. Further, a lopsided focus on urbanization has isolated the small farmers in many aspects and made them extremely vulnerable.

The New Solution

"Holistic Collective Natural Farming" is a model created by *Mr. Raghavan from Tamil Nadu* and supported by a small group of his friends with social conscience.

What is Holistic? This means "The Wholeness". When applied to farming, it converts the soil to regenerate, harvests the entire rainwater within the pooled land area and grows multi-layer crops to maximize productivity and profitability.

What is Collective? Collectiveness among the farmers and also with the Social Entrepreneur so that efforts are put together collectively alongside of pooling all resources to work with a common goal to remove the impediments of the small farmers and bring fortune to the community.

What's Unique?

- 145 acres of fragmented (contiguous) landholdings are pooled into a single agricultural project site keeping the original bunds untouched so that the farmers will have trust that their land remains with them forever.
- An FPC (Farmer Producer Company) comprising members from the community works on Water bodies, Soil enrichment, Crop plans, Farm mechanization, Harvesting, etc.
- *Mission Samriddhi,* a Social Entrepreneur (Non-Governmental Organization) handhold the entire operation apart from bringing required finances and the managerial skills so that the FPC doesn't depend on bank borrowings.
- Family members of the farming community are being paid their wages while working in the project.
- At the year end, the profit sharing is done (in the form of dividend) proportionate to the land-share of the individual farmers to the project.
- The real uniqueness of this model is the "ZERO RISK" at the farmers' side. When the project makes profit, it will be shared by the farmers apart from their wages and in case of loss, it will be absorbed by the Social Entrepreneur.
- A Social Trust is formed, and a corpus is being created to work on the long-term social needs of the community such as Education, Health, Skill development, Social harmony, etc.

Where is the Project? The project is located in Shiratoki, a tribal hamlet *(PVTG – Particularly Vulnerable Tribal Group)* in Yavatmal District of Vidarbha Region in The Central India. The Ground-breaking Ceremony was done on 26th March 2022 and the project has started rolling.

What's Natural Farming? It means farming with Natural resources and farming with bare minimum external inputs which is very close to *LEISA concept (Low External Input Sustainable Agriculture)*. Palekar recommends a good microbial population in the soil, proper seed treatment, covering the soil and appropriate water management as "Good Agricultural Practices".

Natural Farming stands on the following four pillars.

1. Jeevamirtham: This is a fermented microbial culture which promotes the activity of Microorganisms in the soil. This is made of Cow dung, Cow urine, Pulse flour and Jagery mixed in non-chlorinated water and fermented for 48 hours.

2. Bijamirtham: It's made of Cow dung, Cow urine, Lime and Soil and seed treatment is done with this powerful microbial fungicide. Further, it protects roots and fight against any soil based fungal attacks.

3. Mulching / *Acchadana*: There are three types of mulching recommended by Subash Palekar viz. Soil mulch, Straw mulch and Live mulch. Mulching protects topsoil and promotes aeration and water retention.

4. Moisture / *Whapasa*: Palekar challenges the idea that plant roots need a lot of water as recommended in The Green Revolution methodologies. Instead, roots need only "water vapor". *Whapasa* is the condition where both air and water molecules are present in the soil.

Project Implementation – Current Status

- Farmer meetings were conducted and explained the advantages of this Holistic Collective Natural Farming model and an FPC "*Shiratoki Samriddhi Collective Farmers Producer Company"* is registered.
- An extensive training on "Natural Farming" has been given to the entire group members by the experts.
- Water budget has been prepared and appropriate water shed survey was also carried out. Compartment bunds, Farm ponds, Open wells and Recharge pits were made. We had a wonderful rainfall this year and most of the waterbodies are filled which should be enough for two crops this year.
- Farm equipment such as Tractors, Mobile Solar Pumps, Grain Processing Units, Soil Testing Unit (for field level testing) and other hand tools are purchased.
- Drip and Sprinkler Irrigation installations are done with government subsidy programs.
- Wheat, Cotton, Small Millets, Pulses, Vegetables, etc are being cultivated incorporating farmers' experience and the expert's knowledge.
- Applications for electrical connection for water pumps are submitted to the State Electricity Company.
- Proper arrangements are being done for value addition, packaging, transportation and marketing of produces.

The Way Forward

The results are quite visible. Economic prosperity and social upliftment are gradually happening in Shiratoki. Holistic Collective Natural Farming model is a unique concept and first-time kind in India. Hence, we encountered many problems, particularly in bringing the farmers together. But there is a say in Tamil "*Vaimaye Vellum*", truth always triumphs. And it triumphed in Shiratoki.

We have plans to spread this concept anywhere and everywhere so that the farming community is truly liberated and lives a life of utmost dignity.

Acknowledgements

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COMMUNITY-BASED AGRO-ECOTOURISM FOR INTEGRATED SUSTAINABLE FARMING SYSTEMS: THE CAS IN BARANGAY LANTUD, TALAKA, BUKIDNON

BY JERELYN MEDALLA (PHILIPPINES)

Community participation in agroecotourism development in Barangay Lantud, Talakag Bukidnon is vital for their socio-economic well-being and the sustainable management of natural and cultural resources. However, due to the heterogeneity of communities, not all communities have equal opportunities to participate in agroecotourism planning and development. This research intends to explore the viability of developing a community based agroecotourism for integrated sustainable farming system in Barangay Lantud, Talakag Bukidnon.

The study particularly attempts to investigate the socio-demographic condition of the area; conduct a community asset mapping; assess the perception of the residents in terms of the economic, social, political and environmental components on the possible impacts or benefits of agroecotourism; conduct a market study in establishing agroecotourism using the community-based approach and conduct an in-depth investigation and analysis of the possible strategies or policies which are relevant in addressing the challenges of agroecotourism development.

A survey among 100 adult community members was conducted using simple random sampling. Cross-sectional design was used in the study. It also employed the triangulation method to have an in-depth understanding of the data thereby increasing the validity and utility of the findings. These methods include the conduct of in-depth interviews with different groups of stakeholders, key informant interviews, and focus group discussions.

The main respondents of the study were the residents of Barangay Lantud, Talakag Bukidnon. The consent of these randomly selected residents was secured before the survey was conducted. Both primary and secondary data were utilized in the study. Primary data was collected through a facilitated survey via face-to-face using a semi-structured questionnaire. Resource mapping and a transect walk were also done in order to identify the assets and resources available in the area which can be used for community development related activities. It was a participatory exercise where members of the community, barangay officials and other people's organization representatives walk through different areas of the neighborhood, interviewing passers-by and drawing a map with observations of characteristics, risks, and existing solutions after the walk. A literature review was also done for further analysis.

Data was analyzed using descriptive statistics and multivariate statistical tests such as Mann Whitney U test and Principal Component Analysis. The results of the study show that the local community as

well as the natural resources available in the area play a vital role in the establishment of community based agroecotourism.

Findings of the study reveal that the area is rich in natural resources and has several attractions within and nearby locations. It has tourist spots, wide agricultural area and nice landscapes that would support a range of farm activities such as diversified planting of vegetables/crops, farming activities, trekking/hiking, walking, and camping, scenic nature tourism and many others. Demographic profile of the community reveals that majority of the respondents comprise of productive age cohort aging between 29 to 39 years old (29%) and mostly were males (66%), with a household size of 4 to 6 members (49%).

Most of them finished elementary level (58%), and farming is their main source of income (68%) with a monthly income below the poverty line (38%). It is dominated by Higaonons (76%) and Maranaos (18%) and about 38% of the respondents stayed in the community for 41 years and above. Most of the respondents included in the study perceived positive benefits on community-based agroecotourism and are very willing to participate in it. In terms of the community assets, the community is very rich in both human skills and natural resources which includes the environmental and ecological assets like green spaces and biodiversity (flora and fauna), fertile soil, landscape and land availability for community gardens and crop production. Furthermore, there is a significant difference in the level of participation and perception to community-based agroecotourism of the respondents when grouped according to religion and ethnicity. This underscores the need of considering these factors to elicit maximum participation from the community to assure a long-term sustainable agroecotourism development. The principal component analysis (PCA) shows three important components among the various indicators that should be considered in establishing the agroecotourism namely: biodiversity conservation, community participation and government support for agroecotourism.

These features could potentially give farmers additional livelihood aside from selling of their products and services that eventually contribute to the community's additional income, employment generation and economic diversification as mentioned by some literatures. However, active participation of the local community, the local government unit's support, line agencies and other stakeholders play a vital role in the establishment of the community based agroecotourism in the area. Engaging all the stakeholders and the locals in decision making, planning, development, and management of the community-based agroecotourism offer clear benefits to all if implemented well.

Further training related to skills development specifically in establishing and managing a community-based agroecotourism and agroecological practices for all the stakeholders are deemed important in order to have a common understanding about the project. According to some literature, knowledge, capacity building and training of the stakeholders are necessary for the agroecotourism endeavor to be

successful. Lack of awareness, general knowledge about tourism, local leadership, entrepreneurial skills, organizational structure, and networks are some of the common obstacles to effective tourism development.

Through this study there are four major policies that have been identified in the study namely: Biodiversity conservation and wildlife protection (Environment); Information, education, and communication (Social); MSEs operation and farm diversification through agroecotourism (Economic) and Government stability, accountability, and transparency.

Keywords: agroecotourism, community participation, level of awareness, perceived benefits

JERELYN MEDALLA

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In terms of work experience, she was a Year of Service Volunteer (YOS) for one year in one of the periphery areas in Bukidnon, Mindanao, Philippines. After her volunteer year, she continued her service to the smallholder farmer communities by working with the Non-Government Organization located at Impasugong, Bukidnon Philippines for three years. At present, she is an assistant professor and currently the Coordinator of the Agribusiness Program under the College of Agriculture, Xavier University-Ateneo de Cagayan.

RISING TO THE OCCASION: A YOUNG WOMAN'S JOURNEY IN CARRYING ON AND EXPANDING THE FAMILY'S ORGANIC FARMING ENTERPRISE

BY AMOR MAHISTRADO-LUCEÑARA, GMA (PHILIPPINES)

Grace Marie Amor Mahistrado-Luceñara grew up surrounded by the beauty of nature and agriculture as she was the eldest and only daughter of a farming couple, Mrs. Grace and Benjohn Mahistrado. Her parents are a daughter and son of farmers. Growing up, their idea of farming was more on conventional farming. Until they have worked on a farm that practices the Integrated and diversified farming approach. In 2013, her parents embarked on organic farming by growing lettuce as their primary crop. Their mission was simple - to grow the freshest, healthiest lettuce and sell it to their community. With that goal in mind, they put all their efforts into establishing Alomah's Nature Farm at Barangay Dahilayan, Manolo Fortich at the foot of Mt. Kitanglad range.

In 2015, Amor earned her degree in BS Accountancy and took the board exam twice, but despite her efforts, success eluded her. She took a job at a big company, but the work did not bring her the sense of fulfillment and happiness she sought. Then her parents asked her to join the farm and she realized that this was her true calling. She was after all the daughter of a farmer, and she felt a strong sense of responsibility to continue the legacy of her parents who at that time had started to establish their names and their farm in the organic agriculture community.

Unknowingly she loved the farm and vowed to herself to pursue organic agriculture certification. She enrolled in an Organic Agriculture Production training program sponsored by Agricultural Training Institute- Regional Training Center X (ATI-RTC). The training fueled her interest and passion, leading her to pursue further education through additional training. Her expertise in organic farming was later recognized and became a trainer herself.

Alomah's Nature Farm became an accredited and recognized Learning Site by the Department of Agriculture Agricultural Training Institute-Regional Training Center X. They cultivate a wide selection of lettuce and a variety of herbs utilizing sustainable farming systems such as Natural Farming, Vermicomposting, Plant-Based Composting, and an Integrated and Diversified Farming Approaches. It attracts farmer practitioners from various regions for benchmarking purposes. Training, benchmarking activities, farm tours, and farm immersion of students and young farmers were conducted on the farm. The farm also participated in food expos and fairs to promote organic products in the municipality, province, and in the region. The farm made significant progress in 2018, achieving an upgrade in its ATI accreditation to a School for Practical Agriculture and being accredited as a Farm Tourism Site by the Department of Tourism.

As she leads, the farm also became an accredited provider for TESDA-registered programs in the field of Organic Agriculture to teach youth, women, farmers, and interested individuals. She hoped to motivate the next generation, especially the farmer's children, to engage and grasp the significance of organic agriculture, to conserve, secure, and develop farm resources through sustainable and holistic practices. As she dreamt of a better future in organic agriculture, she applied and attended the 4th IFOAM Asia Organic Youth Forum in Taipei, Taiwan last March 26-31, 2019. It inspired her, even more, to dedicate herself to the promotion and adoption of organic farming through the sharing of like-minded youth all over Asia. This experience strengthened her resolve to have that organic agriculture certification.

With her learnings and experiences, the marketing strategies of the farm became more mainstream and expanded all throughout region 10. From booking to local markets, Amor takes on social media and scheduled meet up in the city of Cagayan de Oro. Orders came in from Butuan City and even from Zamboanga. The farm installed the best internet connection for them to manage their marketing transactions timely and efficiently through the farm’s Facebook account, messenger, and emails.

Under Amor's leadership, the farm flourished and became known for its fresh, quality, and healthy produce, grown in sustainable and holistic practices. Amor as a speaker in numerous local and national forums, training, and meetings used her platform to inspire the youth, especially the children of farmers, to become involved in organic agriculture and to realize its importance in conserving, protecting, and cultivating resources. At some point, inspired and teary-eyed audiences approached and expressed their gratefulness for her experiences, wisdom, and compassion at a such young age.

Thus in 2019, Amor’s effort and perseverance along with her family paid off. The farm was accredited as a Certified Organic Farm by the Organic Certification Center of the Philippines (OCCP). The certification process was rigorous, with numerous requirements and supporting documents necessary. It was overwhelming for her and the whole family to finally reap the affirmation of all their efforts.

Since the farm started, her parents encountered a lot of challenges and one of which is choosing the right market. They relied on to sell their produce with a “trader” like most farmers do. With the aim to sell in in “fair price” and to sustain the farm, her parents manage to find the right customers just right in their farm. They have supplied to nearby restaurants and sold retail to the farm’s guests, they always promote its quality and more importantly that it is grown organically. It has spread through word of mouth and since then, the number of our customers buying on the farm increased.

Then at the height of the pandemic, they experienced the biggest challenges in their operation. Covid restrictions became stringent. No training, guests, and visitors are allowed for many months. Movement is restricted, which affects their marketing and production program. They strategized programming the planting and marketing on a staggered basis based on their established markets and

provide an allocation for new buyers. With the temporary closing of nearby restaurants and guest restrictions, they experienced an oversupply of 100-150 kilos of lettuce per week which led them to give the lettuce to the neighbors, community pantries and to the LGU which was running the covid isolation center at that time.

Amor and her brothers, sought to expand their market once again turned to digital technology, creating the Farm's Facebook Page to reach wider coverage of clients and buyers, and scheduling more meet-ups in nearby cities of Cagayan de Oro and Iligan. The farm added more products, including herb cuttings, innovative fresh herbs in tea packs, organic fertilizers, and ornamental plants. His brothers were assigned to monitor Facebook comments and Messenger messages for orders.

Amor negotiates the orders through calls and texts at the same time taking care of her baby at that time. Her husband and mother supervised the preparation of the packing of orders. While his father manages the field harvesting and planting. While her brothers and husband operated the delivery and meet-ups. Because of the established social media presence, new buyers came and continuously patronized their products. That kept them afloat and regularly paid all their farm workers at that time, which was not the case in most farms.

Through this farmer-consumer marketing strategy, Alomah's Nature Farm has built a strong relationship with customers, who trust and have confidence in the farm. This approach not only promotes their products but also helps to spread awareness about the benefits of organic agriculture in the most trying time.

With her hard work and dedication, Amor continues to innovate strategies and marketing approaches for the farm's organic products. She was able to fulfill her parents' dream of a successful organic farm that served the community and promoted sustainable living. She had finally found her true purpose and was living her best life, surrounded by the beauty of nature and the satisfaction of helping others.

Amor is a shining example of perseverance and dedication, having realized her dream of making a positive impact on her community through organic farming and who having successfully fulfilled her parents' dream of creating a thriving organic farm. As of today, Amor and the farm already conducted 660 trainings on competencies of Organic Agriculture Production, hosted 393 immersion activities (10 days for each immersion) for students and young farmers, facilitated 58 farm tours, became a speaker for 16 times local and national, conducted 1-2 deliveries and meet-ups in a week, marketed 200-250 kg lettuce, 50 - 100 potted herbs, 20 herb tea packs per week and has 13,000 social media followers of the farm's FB account and FB page.

Alomah's Nature Farm is a beacon of sustainability, that serves the community through its fresh and healthy produce and is a great source of inspiration, knowledge, and model of organic farming

technologies. Amor’s passion for farming and her commitment to organic agriculture helped her overcome many challenges, and her hard work paid off.

As a mother to her daughter, a wife to her husband, a sister to his brothers and a daughter to her parents, Amor found a sense of fulfillment and purpose in her work on the farm. She was proud to be carrying on her family's legacy and making a positive impact on the world around her. With her family by her side and her passion for farming in her heart, the young woman farmer knew exactly where she is meant to be.

GRACE MARIE AMOR MAHISTRADO LUCEÑARA

A woman, a daughter, a mother, and a wife

Finance Manager and Trainer on Organic Agriculture of Alomah's Nature Farm

Started her advocacies on Organic Agriculture when she embraced to be a young farmer together with her parents. Despite finishing BS in Accountancy in college, she finds a way to apply her learnings and knowledge in helping on the farm's developments. She also attended trainings and forums that focuses on Organic Agriculture to be adapted in their farm's operations and for her to gain knowledge and ideas on the agriculture side.

Faced different struggles along the way... Yet today, she is now a Trainer on Organic Agriculture, a Resource Person to different trainings and seminars and is also inspiring the youth to be in the agriculture sector by giving lectures with their On-the-Job Trainees, Senior High School Immersions, Trainees and guests in the farm.

"RAINBOW STAR": ORGANIC AGRICULTURE AS THE STARTING POINT TO REALIZE COMMON PROSPERITY

BY LAIKU WANG (CHINA)

Hello everyone, there are various titles of mine, “father of two daughters,” “merchant of organic eggs,” and “the middleman.” I established a social enterprise called ‘Rainbow Star’. And I spent eight years perfecting the eggs I sell.

During the past two years, our team achieved hundreds million RMB sales of our eggs and other organic products and gained 2 million followers on TikTok China in 2022. Most of our sales have been made on TikTok. All these years, we have visited and investigated thousands of ecological organic farms across the county. Today, as one of the forefront organic brands in China, Rainbow Star faces some of the worst slanders on E—commerce platforms.

Before I share the problems I encountered ，I would like to share the problems that we all encountered in the past 8 years.

Topic 1: What are the real problems we are facing today? Is that how to increase market share?

——the relationship between Organic and "sustainable development"

Nowadays, when capitalistic Economy is the mainstream economic model, we can see that the globalization of enterprises is accelerating the squandering of the natural resources shared by all humanity. According to *Capitalism 3.0* by Peter Barnes, enterprises that pursue profit maximization tend to have more advantages than others in the current economic system. The problem is the present economic system tacitly approves that our order is benign, the supervision is in place, and the public sphere has been taken care of. In reality, enterprises that pursue profit maximization benefit only a small group of people.

These lead to two disastrous consequences that everyone cannot ignore: the destruction of the natural environment and the gap expansion of wealth. The gap between rich and poor within or between countries will lead to division and strife worldwide. It can be shown as a war or trade friction under our noses.

Topic 2: What problems do we want to solve by supporting organic agriculture?

——Is "organic" just for agriculture or food?

If we want to make this world better and more peaceful, we need a new approach. We hope to use organic agriculture as a beginning to promote a new social enterprise model. This is the mission and practical subject of Rainbow Star Birth. Social enterprise is an innovative type that does not take profit as its primary purpose but exists to solve social problems and uses business methods to solve social issues while achieving sustainable development.

Since 2015, Rainbow Star has spent more than 10 million RMB on testing and checking food safety. At the beginning of Rainbow Star establishment, I also promised that I would return 90% of my personal stake income and 60% of the company's net profit to society and continue to use it for food safety and environmental protection.

Among them, 40% is invested in the organic industry: by helping the development of the organic agricultural sector to protect soil, clean water as well as biodiversity, and 30% is used for public welfare. We will also be dedicated to improving rural areas, ecological environment, and food safety. 20% will be used for public promotion, which will drive consumers to pay attention and act together through our knowledge popularization and food education; 10% will be used for organizational protection by supporting, assisting, training and other methods for employees to establish a stable and healthy team to solve more social problems.

This is the specific operation we hope to practice for enterprises to participate in the third distribution. We will use these profits to promote social development positively and then help shared prosperity.

Topic 3: For organic development, what is needed? Is capital?

technology? Youth power? and what?

——The Biggest Problem of "Organic": Trust

" Knowledge and action are one" │ To build trust with time and standard:

Take our egg as an example. To find eggs that do not use antibiotics in the whole process, since 2015, we have searched domestic and foreign egg-related standards, communicated with professors and third-party testing agencies, and ran nearly 100 farms to build our standard for eggs that were containing 117 testing items, which we called "*Shi Ling Eggs*." In November 2021, the standard of "*Shi Ling Eggs"* was upgraded to 300 testing items and a high-frequency testing system.

To build trust with perfectionism：

"Better food for chickens, better eggs for people. "We have been looking for organic rations for chickens since 2022 and have reached out to at least 11 ration suppliers with organic certificates. But after the test of 12 transgenic sites, only one could pass it and offer a continuous supply. Finally, our *Shi Ling Eggs*" have since switched to organic bean cakes and organic corn.

Earned from organic food and gave back to society for sustainable development:

If we want more people to accept and enjoy organic food, the price can be a fundamental problem, and we've been working on it for 8 years.

By February 2023, *"Shi Ling Eggs"* have been sold to more than 100,000 families. As the prices of various raw materials are rising, we have achieved a reduction in the price of *"Shi Ling Eggs*" by expanding the production scale, deepening the supply chain, and providing derivative processed products such as "soft-boiled cheese" and "eggs with sesame sauce." In 2023, we hope to further reduce the price of eggs with the support of our consumers.

From an Antibiotic-Free Egg to an Environmentally Friendly Egg

Until July 2022, Rainbow Star invested in and expanded an organic egg farm in Jia County, Henan Province, planted organic corn as feed, insisted on antibiotics-free, artificial coloring-free, artificial hormones-free, etc. and continued to protect the soil organically. We served our consumers with high-quality organic eggs while contributing to the development of ecological agriculture.

Giving back to the earth, living up to trust:

Over the past eight years, Rainbow planet has supported organic farms by contract farming, down payment and developing processed foods, helped hundreds of farms sell more than 2 million products, and protected 3,270 acres of land. We achieved indirect carbon fixation of at least 229.336 tons and carbon reduction of at least 662.747 tons.

I always believe that food is not only a commodity. The problem we are facing is the entire industrial chain; only through cooperation and mutual assistance between consumers and producers can we develop a virtuous circle in business and improve food safety.

LAIKU WANG

Laiku Wang founded Rainbow Star in 2015 and it is committed to improving food safety and environmental protection. It connects consumers and producers in the form of contract farming and sets strict food standards to ensure food safety.

From 2020, it has established organic farming and breeding bases and through the expansion of organic egg factories, the reconstruction of organic villages, the protective planting of old soybean varieties, etc., it helps to revitalize the countryside.

In July 2022, Rainbow Star was certified as a social enterprise by SCECC and will make more contributions to rural revitalization, common prosperity, and ecological civilization. Laiku Wang promised to return 60% of the company's net profit and 90% of his personal stake income to society and would continue to use it for food safety and environmental protection.

WORKING WITH PEOPLE WITH DISABILITIES: THE CASE OF PLUSLIGION

BY YUMIKO FUKUI (JAPAN)

BACKGROUND 1: Population in Japan[10]

Japan faces a rapidly aging society with fewer children. The Japanese Government's long-term estimation indicates; Japan's population peaked out at 127.8 million in 2004; and is expected to decrease to 47.7 million in 2100. The aging rate at 19.6% in 2004 would be 40.6% in 2100. It means, in 100 years, our population will return to what it was 100 years ago. This change is a very rapid decline, unprecedented in the last few thousand years.

Population of Farmers[11]

In 2020, the population of farmers was 1.36 million. This is almost one 10th of the population in 1970, which was a little over 10.25 million. The average age of the farmers is over 68. Declining farmer population means more abandoned farmland. Focusing on organic farmers, the number of organic farmers is 12,000; that includes 3,678 certified in 2018. The average age of this organic farmers group is 59, which is younger than the whole farmers.

Population of People with Disabilities[12]

The Japanese Government reports that the population of people with disabilities in 2020 is 9.64 million, of which 4.36 million people are with physical disabilities, 1.09 million are with intellectual disabilities, and 4.19 million are with mental disabilities. In recent years, the number of people with mental disabilities has been increasing. The total number of people with disabilities is equivalent to 7.6% of Japan's total population. The employment of people with disabilities is 0.59 million and increasing every year.

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[10] Long-term population transition in Japan by Japanese Ministry of Internal Affairs and Communications https://www.soumu.go.jp/main_content/000273900.pdf

[11] Strategy for Sustainable Food System (MeaDRI), Japanese Ministry of Agriculture, Forestry and Fisheries, 2022 https://www.maff.go.jp/j/kanbo/kankyo/seisaku/midori/attach/pdf/index-112.pdf

[12] Trends in the Welfare Field for people with disabilities, Japanese Ministry of Health, Labor and Welfare, 2022 https://www.mhlw.go.jp/content/12401000/000918838.pdf

BACKGROUND 2: Social Security Expenditures in Japan [13]

Japanese social security expenditures exceed 132 trillion yen, increasing by 1 trillion yen each year. Social security expenditures include pensions, medical care, and welfare. Welfare includes both for the elderly and for the people with disabilities. Each item is increasing, and the situation is becoming increasingly strained.

Abstract

In the agricultural sector, there is a shortage of producers, while in the welfare sector, there is a shortage of workplaces for people with disabilities. Employment of people with disabilities in the agricultural sector is expected to solve these problems at the same time. Some people may be concerned about the ability of people with disabilities to work. This is to showcase a workplace where people with disabilities can work without any disadvantage can actually be a great workplace for everyone bringing diversity.

PLUSLIGION, established in 2008, is a small social business company. This company provided employment opportunities for people with disabilities by producing organic processed products from organic agricultural waste, outsourcing the production process to the welfare sector.

In 2008, PLUSLIGION completed the development of the business model; that enables a value chain cycle that incorporates the involvement of people with disabilities and realizes a work environment where they can work comfortably. This not only made the manufacturing factory a good place to work for people with disabilities especially with autism, but also made it easier to maintain the high-quality control standard by introducing the principles of TEACCH (The Treatment and Education of Autistic and Related Communication Handicapped Children)[14] and HACCP (Hazard Analysis and Critical Control Point).[15]

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[13] Trends in the cost of social security, Japanese Ministry of Health, Labor and Welfare, 2022 https://www.ipss.go.jp/ss-cost/j/fsss-R02/R02-houdou.pdf

[14] TEACCH: the University of North Carolina TEACCH Autism Program creates and disseminates community-based services, training programs, and research for individuals of all ages and skill levels with autism spectrum disorder (ASD), to enhance the quality of life for them and their families across the lifespan. https://en.wikipedia.org/wiki/Treatment_and_Education_of_Autistic_and_Related_Communic ation_Handicapped_Children

[15] vi HACCP: “Hazard Analysis and Critical Control Point” is a food hygiene control system in which FBOs assess hazards such as contamination of pathogenic microorganisms, foreign objects etc. throughout the process from receiving raw materials to shipping final products and control the process focusing on the critical steps to remove or reduce these hazards to an acceptable level. https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/kenkou_iryou/shokuhin/haccp/index_0000

In this initiative, we engaged a wide variety of people such as value chain experts, organic farmers, welfare services, academic researchers, designers, organic products distributors, etc. This diverse group of people worked closely together to deliver this business model. PLUSLIGION also aims to realize fair trade for all players involved in the supply chain. In the area of product development, we made a strategic choice to focus on agricultural products that can be handled all year-round, pressurized and thermally processed products against food poisoning risk and with long shelf life, and semi-processed products that can be jointly developed with companies that lead to the employment of people with disabilities.

A simple onion paste was completed and achieved sales of over 0.4 million servings. Since it can be used as a raw material for most processed products, we launched collaborative products such as healthy menus using onion paste to combat metabolic syndrome at the food court of an IT company, and a cooking kit that became the top selling item among all items at the largest cooking studio in Japan.

After a decade, PLUSLIGION has finally proven the potential of people with disabilities and zero defects. Throughout the project, it was proven that people with disabilities faithfully and accurately perform their tasks in accordance with TEACCH and HACCP, and the productivity is the same for people with and without disabilities. Furthermore, it was found that a work environment with visual assistance that does not rely on language is easier to work in for a diverse range of people, including not only autistic people, but also people with other disabilities and foreigners who cannot read Japanese. These are ingenuity on the hardware side. On the soft side, we have developed activities to enhance their self-esteem.

Many people with disabilities have secondary disabilities. They are hurt and lack self-confidence. We have proven that they can grow in a psychologically secure working environment with the HACCP program and through our unique meeting method that recognizes each other. In the environment based on the HACCP principles, failure is not attributed to the individual, but to the environment. It is essential to implement both hardware and software into the work environment with the respective experts' support. This project triggered the employment of people with disabilities, mainly in large companies. PLUSLIGION received the "Governor's Award for Creating a Universal Society" from the prefecture.

2.html#:~:text=HACCP%2C%20an%20abbreviation%20for%20%E2%80%9CHazard,hazards%20such%20as%20contamination%20of

Future Prospect

After the COVID-19 pandemic, social problems in Japan that had existed before became apparent. Our project for the past 10 years has made us aware that it's time for us Japanese to rethink our vision and economic indicators. It will be necessary to change from the economic performance indicator of economic growth, such as GDP, to new indicators such as the overall cycle and the well-being of everyone.

We have learned that our project is organic itself. The business model can be restructured into the Organic Social Farm according to the “Four Principles of Organic”, including “The Principle of Fairness”. Furthermore, social farms, where people with and without disabilities work together, have the potential to be a sustainable solution to save Japan's agriculture amid the population decline and an aging society. The next challenge in Japan will help other Asian countries in the future when they face similar social problems as Japan. Organic approach can find a sustainable solution.

YUMIKO FUKUI

Founder/President of PLUSLIGION /Organic Inspector

Board Member of IFOAM-Organics Asia

Advisor appointed by Ministry of Agriculture, Forests and Fisheries of Japan for Organic Processing with diversified working environment for People with Different Abilities (PWDA) I started the company “PLUSLIGION” in 2008, to support people with disabilities. One successful example is onion caramelizing, processing organic onion by PWDA. This product is supporting organic farmers as well as people who have difficulty working by creating a diversified working environment. With this experience of creating jobs and workplaces for PWDA by using organic produces, I have advised more than 100 farmers as an advisor appointed by Ministry of Agriculture, Forests and Fisheries of Japan. In 2013, PLUSLIGION received Universal Social Award by the Governor of Hyogo Prefecture (Province).

I support and promote Organic Agriculture by serving as an organic inspector, also as a committee member of Creative Design City Kobe and Council for Agriculture, Forestry and Fisheries Policy of Hyogo prefecture. I advised Hyogo Prefecture to include the promotion of Organic Agriculture in its 2030 vision and SDGs action.

OUTCOMES AND IMPACTS OF THE “FROM ARMS TO FARMS”

BY GRACE TARUC (PHILIPPINES)

This study evaluates the outcomes and impacts of the “From Arms to Farms”, a community-based sustainable agriculture program in Kauswagan and neighboring communities in Lanao del Norte, based on the rebel returnees' and other stakeholders' perspectives and experiences. It is descriptive qualitative research using a case study, key informant interview, focus group discussion, and Participatory Rural Appraisal tools.

The research participants were Moro National Liberation Front/Moro Islamic Liberation Front (MNLF/MILF) rebel returnees such as commanders, members, and Bangsabae (Bangsamoro women fighters) and other stakeholders. The “From Arms to Farms” program aims to mainstream rebel returnees in a society with peaceful coexistence, trust, and confidence. It makes them a channel for peace, dismantling violence and creating a culture of peace. Moreover, to ensure food security and provide basic services such as education and health. The program aims to address the fundamental causes of conflict and violence-the vicious cycle of poverty and hunger. Therefore, eradicating poverty, creating sustainable livelihoods, ensuring food security, and fostering peace are the motivations for LGU-Kauswagan and other stakeholders to join the program.

Rebel returnees participated in the program mainly for economic reasons to access livelihood and support services to provide the basic needs of their families. They aspired to live a safe, peaceful, and productive life. Rebel returnees joined after observing and realizing the benefits of the “From Arms to Farms” program in uplifting the living conditions of the rebel returnees. Moreover, they were convinced of the program's objectives and regained their trust in the government because they were not required to surrender their firearms in exchange for support services but had the heart to work with the government.

Rebel returnees wanted to acquire knowledge, skills, and technologies in farming and later developed their interest and passion for it. Furthermore, the agriculturists' dedication and commitment to the training and practicum also inspired the rebel returnees to join the program. Capacity-building is at the very core of the “From Arms to Farms” program. There has been an emphasis on community organizing and capacity building to allow rebel returnees to identify and solve their problems. It also helps rebel returnees develop a sense of ownership and responsibility or a stake in the program's success.

To institutionalize organic farming, the municipality, through the Sangguniang Bayan, approved an ordinance in April 2014 declaring Kauswagan an organic farming municipality. The “From Arms to Farms”

program stands out for its capacity for policy support in implementing sustainable agriculture in the municipality through a municipal ordinance and establishing an Organic Trading Post (OTP).

The LGU-Kauswagan used various strategies for the promotion, advocacy, and sustainability of sustainable agriculture programs in the municipality, such as the establishment of demonstration farms at the different levels (household, communal, Barangay Local Government Unit, Local Government Unit, Gulayan sa Paaralan) and the Agro and Aqua Organic Agriculture Fair every year to showcase the organic products produced by local farmers.

The program operates in Kauswagan, Lanao del Norte, and extends its services to neighboring Munai and Tangcal municipalities. The participatory and inclusive community participation is evident in the involvement of MNLF/MILF commanders, members, men, and women or Bangsabae, including the children, regardless of geographic location, social status, and gender.

The “From Arms to Farms” program shows the ability to tap local knowledge, skills, and initiatives. It is manifested in developing farmer's learning sites in the communities, tapping rebel returnees as resource speakers, practicing indigenous knowledge systems, and recognizing farmers' initiatives and technological innovations (e.g., sibujing technology, Jadam technology, and among others).

Peaceful coexistence between Meranaws and nonMeranaws is also evident. Rebel returnees are transformed into self-reliant and resilient farmer entrepreneurs. Thus, the program allows the rebel returnees to become productive, boosts their sense of personal well-being, and gives them a sense of purpose in life.

The program promotes division of labor, cooperation, and unity in the family. It helped perpetuate learning and knowledge sharing on sustainable agriculture through a wide variety of means, including training, exposure, lakbay-aral, learning site, farmer-to-farmer exchanges, farmer-to technician/agriculturist exchanges, communal demonstration farm, and formal schooling at Dona Laureana School for Practical Agriculture. Thus, there is a potential for knowledge sharing between farmer-rebel returnees, first-hand and hands-on knowledge holders/indigenous knowledge holders, and outside scientific communities for mutual enhancement.

The program contributes to reducing inequality through its participatory and collaborative approach in which access is afforded, and benefits are distributed among rebel returnees without regard to remoteness or location, gender, and social status. The economic gains achieved by rebel returnees are increased family income, acquired family assets, access to credit, farm capital and inputs, sufficient, healthy, and nutritious food supply, children's education, reduced dependency on external farm inputs, and diversified farm operations and livelihood strategies.

Rebel returnees increased their family income now compared to before with estimated monthly earnings of a minimum of PhP10,001-20,000 and a maximum of PhP50,000 and above (with an average mean monthly income of PhP20,954). This is due to the income generated from diversified farms integrated with high-valued crops (abaca, coffee, cacao), livestock raising, draft animals, fish (tilapia), and organic fertilizer production. These imply that farming is not only a source of food but also an income.

The program promotes diverse technologies and good practices in sustainable agriculture, which are adoptable, adaptive, and environment-friendly. Rebel returnees now being exposed to, experimenting with, and adopting promising practices in sustainable agriculture technologies from organic rice production, abaca, and other high-valued crops, crop rotation, contouring, and organic fertilizer production (vermicompost, Bokashi, chicken dung, Jadam, biodynamic), livestock production, fish production, integrated pest management, indigenous knowledge system, and innovation of sibujing technology.

The program effectively promotes on-farm experimentation and informal farmer-to-farmer and agriculturists-to-farmer exchanges. Good practices in sustainable agriculture among rebel returnees prevent land degradation and promote a healthy environment. As a whole, food security and improved rural livelihoods in the communities contribute to mitigating and preventing conflicts and securing sustainable peace and development. Moreover, food-security-related policies and programs build resilience to conflicts.

Capacity building, collaborative efforts, financial support by stakeholders, policy support, and good governance are facilitating factors of the program's success and sustainability. However, the great challenge encountered by farmer rebel returnees is climate change. Insufficient supply of organic inputs/fertilizers is supplemented by the local government of Kauswagan through its vermicompost production at the LGU demonstration farm. Keywords: From Arms to Farms, sustainable agriculture, impacts, rebel returnees, stakeholders.

GRACE TARUC

Grace M. Taruc is currently a full-time permanent Assistant Professor of the Sociology-Anthropology Department of the Mindanao State University-Main Campus, Marawi city. She has been working with a Non- Government Organization for seven years on Sustainable Integrated Gender-Responsive Area Development program with men and women farmers in hinterland barangays in Iligan city promoting sustainable agriculture and community enterprise development.

Her research, work experiences and training are focus on rural community development, community organizing, participatory and action research such as Participatory Rural Appraisal, ethnography, gender, peace, monitoring and evaluation, institutional development and organizational strengthening and impact assessment of community-based programs and projects on sustainable agriculture.

ACCELERATING CIRCULAR RURAL ECONOMY (ACRE) FOR SUSTAINABLE FARM ECOSYSTEM

BY JOY DANIEL (INDIA)

India has the largest number of certified organic farmers in the world. However, a lot more organic areas are uncertified. There is a great potential to bring these lands under the ambit of certified organic area, and thus bring about better markets and incentives for agroecosystem management.

Currently, there are 4.3 million hectares of organic lands certified under third party organic certification systems and 0.8 million hectares certified under PGS systems.

The organic produce in these areas include:

- Organic Cereals: Wheat, rice, maize or corn.

- Organic Pulses: Red gram, black gram.

- Organic Fruits: Banana, mango, orange, pineapple, passion fruit, cashew nut, walnut.

- Organic Oil Seeds and Oils: Soybean, sunflower, mustard, cottonseed, groundnut, castor.

- Organic Vegetables: Brinjal, garlic, potato, tomato, onion.

- Organic Herbs and Spices: Chili, peppermint, cardamom, turmeric, black pepper, white pepper, Amla, tamarind, ginger, vanilla, clove, cinnamon, nutmeg, mace.

- Others: Jaggery, sugar, tea, coffee, cotton, textiles.

Apart from the organic agricultural land, there is organic land dedicated to other activities, most of which are areas of wild collection and beekeeping. Other areas include aquaculture, forests, and grazing areas on nonagricultural land.

For instance, the country has 70 million hectares of forest lands. Some of these are reserved for wildlife sanctuaries or national parks. If we only consider the fringe forests and the people who depend on them, there is 25 million hectares of fringe forest areas, and 100 million people depend on Non-Timber Forest Produce (NTFP) for their livelihoods. The NTFP includes non-wood forest products industry, which produces latex, gums, resins, essential oils, flavours, fragrances and aroma chemicals, incense sticks, handicrafts, thatching materials, and medicinal plants. All these lands are organic, and the harvest is done in sustainable ways.

Apart from the forest areas, there are grasslands, tribal habitats, and dry land areas in different parts of the country, where lands are organically managed. India has 10.2 million hectares of permanent pasture or other grazing lands, 3.09 million hectares of land under non-food tree crops and groves – often managed in tribal habitats, 32 million hectares in hot arid zones, and 7 million hectares in cold arid zones. All these can be considered organic areas.

The Northeast states of India have majority of the lands as forest areas. Mizoram has 85% forest cover, Arunachal Pradesh has 79%, Meghalaya 76%, Manipur 75.4%, and Nagaland has 75.3% forest cover. These states have rich biodiversity and are considered among the biodiversity hotspots of the world. Besides the forests, the agricultural lands in these States are mostly organic though organic certification has not reached most of the farmers.

About 1.2 million hectares of agricultural lands in these States could be brought under the ambit of certified organic farms.

If the 25 million hectares of fringe forests, 3 million hectares of groves, 30 million hectares of arid lands, and 1.2 million hectares of lands in the Northeast states are covered as certified organic areas, India has the potential to become market leaders in organic foods with a wide array of organic produce –

- Economically important wild plants such as Sea buckthorn - from Ladakh
- Large cardamom, orange, ginger, turmeric - from Sikkim
- Pineapple - from Meghalaya, Nagaland
- Naga chilly, Soyabean - from Nagaland
- Organic livestock: Piggery, Poultry. Sticky rice, black rice, red rice. Tea. – from Nagaland and Tripura
- Medicinal herbs. NTFP from forests, sacred groves.
- Various types of millets from arid zones

JOY DANIEL

Joy Daniel has over 25 years of work experience in different types of organizations that include grassroots organizations of central India, bilateral national/ subcontinental projects, and United Nations Development Programme (UNDP) in different countries of Asia. He has been associated with International Federation of Organic Agriculture Movements (IFOAM) for close to two decades in addition to other networks such as URGENCI International, PGS Organic Council (India), and Biodynamic Association of India (BDAI).

He currently works in Marathwada region which is infamous as the hotbed for farmer suicides in the country. The region is among the worst drought affected regions of the country and faces several woes as a result – increased migration, unemployment, ill-health, infant mortality, and disempowerment of women. The evaluator has worked in such drought affected villages to improve accessibility and availability of water for farms and households, increase livelihood opportunities, and empower men and women to effectively mobilize themselves for their common and inclusive benefits. As such, he is well aware of the challenges of small farmers and peasants in the face of climate change. All the interventions initiated or facilitated by him is aimed toward climate change resilience. For more information on his present work - https://lipok.org

ORGANIC EXPERIENCE IN MOUNT KANLAON

BY LUVISMINDA FABILLAR (PHILIPPINES)

Mount Kanlaon was covered with a vast forest area which was a home of endemic flora and fauna and some of the parts are dedicated for the multiple used zones where the farmers used to do their farming activities. Volcanic soils on the foot of mount Kanlaon are fertile and suitable for crop production, however through continuous production on the area the soil is gradually depleted with its elements that are essential for plant growth and development. This called for organic farming.





Farmers' practices on farming are diverse based on the crops they are cultivating. Most of the farmers who engage on vegetable farming preferred the conventional kind of farming, it is the use of synthetic inputs in their farms such as synthetic fertilizer and chemical pesticides. Other farmers who are engaged on taro, chayote coffee, banana and fruit trees farming does not use any synthetic nor organic inputs that is why it is called a default crops (Organic by neglect).



Establishment of banana plantation on the foot of mount Kanlaon faces many constraints such as unstable road to haul planting materials and farm inputs from the highway to the site, no water source for the newly establish banana seedlings.

The usual practice of the farmer is to dig a trench and cover the surface with plastic to prevent water from percolating the soil. These trenches were used by the farmers as a source of water to spray or drench the dissolved fertilizers to the plant. Tissue cultured planting materials unacceptable to farmers for it is new to them, they are used to a conventional of sword suckers as a planting material not knowing that these planting materials are infected by the seedborne diseases such as Panama, Moko, bunchy top and sigatoka which are responsible for the losses of production.

Aside from these challenges, one of the causes for losses in production these past two years is the natural calamity typhoon Odette last December 2021 when most of the banana in the vicinity were destroyed. Another problem that was not anticipated was the improper planting distance of banana, x 2.5 meters apart was not an ideal planting distance for banana. Tissue cultured planting material banana produced numerous suckers that added the population of the plant thus, 2.5 meters.

The local government of La Castellana and other NGOs in the province provide some training about organic farming by teaching the farmers how to make foliar fertilizer and pesticide such as Fermented Plant Juice (FPJ); Fermented Fruit Juice, Fish Amino Acid (FAA) and Oriental Herb Nutrient (OHN).

This training was availed through Cabagna-an Active Producers for Social Enterprise Association (CAPSEA). Farmers was hesitant to adopt the technology being introduced for several reasons:

1. Laborious – the farmers tend to buy synthetic fertilizers rather than making concoctions because formulation of the concoction takes time and effort to produce.
2. The Effect is gradual – farmers are used to an instant. Organic fertilizers are gradually in effect to plants which the farmers can't wait to see the effects.
3. Limited ingredients to produce the concoction – Some of the ingredients to produce the concoction are limited in the area such as molasses, Enhanced Microorganism (EM) bones and eggshells.
4. Neighboring farms use synthetic pesticide which the insects tend to migrate to the farms who are using organic pesticides.

Suggested Solutions

1. Establishment of Organic Demo/Model Farms assisted by the LGU.
2. Intensify connection with LGU's campaign toward organic farming.
3. Connect with other private agencies and for aid and support on training and interventions toward organic farming.
4. Constant practice and campaign of organic farming by the adapting farmers.
5. Must establish buffer zones between farms to prevent or minimize the insect's pest migration from one farm to another.
6. Establishment of backyard vermi-culture on farm areas.
7. Focus on sustainability benefits of organic farming instead of temporal production.

THE SLOWFOOD MOVEMENT IN NEGROS

BY REENA GAMBOA (PHILIPPINES)

What is Slow Food?

SLOW FOOD INTERNATIONAL (https://www.slowfood.com) is an organization that was founded by Mr. Carlos Petrini in Italy. To quote the explanation in their website, "Slow Food is a global, grassroots organization, founded in 1989 to prevent the disappearance of local food cultures and traditions, counteract the rise of fast life and combat people's dwindling interest in the food they eat, where it comes from and how our food choices affect the world around us."

Furthermore, we advocate GOOD*, CLEAN and FAIR* food for everyone. In Negros Occidental, we have formed what is called a Slow Food Community which is affiliated with Slow Food International.

We believe that the preservation of local food cultures and traditions is important not only for historical and sociological purposes but also for a balanced local biodiversity and food security in our nation. The advocacy is an opportunity to open the eyes of our fellow Filipinos in nurturing plants and animals that are indigenous to our country. By doing so, we will be able to advocate supporting local farmers and produce.

Slow Food has many projects, to name a few, Ark of Taste, Presidia, Earth Market, Chef Alliance. A new program is the Slow Food Travel Program where tourists get to know more about the farmer and the grassroots in a specific area, thus, learn about the community's culture, history, and environment. Today, Slow Food International's community covers 160 countries.

Ark of Taste was created to make the community and the whole world aware of what produce exists and those that may be at risk of disappearing especially due to a number of reasons like climate change, industrialization, changing consumption patterns, abandonment of rural areas, migration and conflict. It catalogues all these produces so one may do their research on the existing produce registered in the Ark of Taste. It encourages everyone to take action like consuming again produce that have been forgotten in one's diet and must be revived in the culinary history of the community. Producers must be supported and allowed to their stories of such produce.

Since 2021, the Slow Food Community of Negros has been working with the Department of Tourism Region 6, on a project entitled FOOD *AND TOURISM FOR RURAL DEVELOPMENT FOR WESTERN VISAYAS*. The first task was a Mapping Project where we did research on food items and food sources, even dishes, that are slowly disappearing. To date we have mapped 161 items for Western Visayas. I am referring to the provinces of Negros Occidental, Iloilo, Antique, Capiz, Aklan and Guimaras. We are happy to announce that 10 items have been approved. These are Badila Sugarcane, PInakas or Dried fish, Dayok, Tultul Salt, Swake or Local Sea Urchin, Tuba, Artisanal Muscovado, Puso and Capiz Shells. Slow Food International is currently 10 more food items to be approved as part of the Ark of Taste Catalogue.

Mapping is an ongoing activity as we continue to search and protect those that are in danger of disappearing. That is part of our mandate as a Slow Food community.

The Earth Market is where the farmers directly sell their produce and guarantee the quality of their products. They only sell good, clean, and fair food. The products sold are what are usually in season and are local and fresh.

The Earth Market is also a venue where one can create exchange and communication among farmers and direct buyers (home cooks, chefs, etc.). This allows consumers to understand how the produce is grown and the different ways of how it can be cooked or eaten.

The Slow Food Community of Negros has been holding pop up Earth Markets in the cities of Silay and Bacolod. We are currently applying for an authorized Earth Market permit from Slow Food International and hope to start by the end of March 2023. This will give our small farmers a chance to display what they produce and for consumers and cooks to appreciate these and interact with the farmers to learn more about these food items.

The Presidia are Slow Food Communities that work every day to save native livestock breeds, local fruit and vegetable varieties, bread, cheeses, cured meats, sweets, and more. They are committed to passing on traditional production techniques and crafts, they care for the environment, and they add value to landscapes, places, and cultures.

The community will comprise the producers first and foremost but can also involve other subjects closely linked to the project (experts, chefs, journalists, institutional representatives, etc.) if they share the same objectives.

In this regard, Slow Food Community of Negros together with Slow Food International are eyeing the Tultul making activities in Barangay Hoskyn in the island of Guimaras. We hope to launch this by 2024 at the Terra Madre Salone Del Gusto Food Festival in Turin, Italy.

The Cooks Alliance project was started in 2009, and so far, has spread to more than 20 countries. The participating cooks all have very diverse backgrounds and cooking styles, but they all share a commitment to protecting agricultural biodiversity and to safeguarding gastronomic knowledge and local cultures. They cook in a huge range of different kitchens: in restaurants, inns and B&Bs, [CR1] or more informal places like markets and street food stands. The Alliance welcomes cooks with all kinds of cooking styles, whether ethnic, fusion, or creative.

They always source quality ingredients (local, sustainable, and seasonal), communicate the origin of their products and they know the producers who supply them. The Slow Food Cooks 'Alliance project cannot exist without quality ingredients. The cooks must commit to using as many good, clean, and fair foods as possible, products which could be linked to Slow Food projects (such as the Presidia, the Ark of Taste, food communities or Earth Markets) or come from virtuous producers who respect the environment and animal welfare.

We are currently applying for authority to have an official Cooks Alliance organization for Western Visayas. Target date to be accomplished is within the first quarter of 2023.

Slow Food Coffee Coalition

This is another project of Slow Food International where the whole supply chain from farmers and consumers can network and support each other. "The group promotes transparency and traceability, thus promoting good, clean and fair coffee for all. What is highlighted here is the work of each farmer in how he works hard to produce the best coffee for his community.
https://coffeecoalition.slowfood.com/manifesto/

We are proud to say we do have an existing Slow Food Coffee Coalition organization in Minoyan, Murcia, Negros Occidental. The farmers are now completing their standards of controlling the quality of their coffee using the participatory guarantee system where they themselves decide what is good, clean and fair coffee under Slow Food principles.

As a Slow Food Community of Negros, particularly registered as Negros Island Community Promoting and Preserving Traditional Food, we believe that everyone deserves to have good, clean, and fair food and we work on ensuring that this happens particularly in our community. We believe that food plays a central role not only in defining the quality of life of individuals and peoples, but also in the history, construction and evolution of their culture and identity.

We believe that safeguarding the environment is important and that promoting the biodiversity of the land and sea and a more sustainable food system are key actions against climate change. We aim to spread the advocacy of Slow Food by disseminating correct information, raising awareness on good, clean, and fair food and sustainable production and consumption choices.

The latest program of Slow Food International is the *Slow Food Travel Program*. We believe that this will help our farmers increase their income and at the same time show the rest of the world what we have to offer is based on our culinary history, our biodiversity and what is traditionally ours.

This is the priority project we now have with the Department of Tourism Region 6. Our initial itinerary to be launched this year is the Coffee Trail as we have the complete supply chain in Negros Occidental. The message of this tour for the guest to realize that we must protect our food sources which are endemic to our biodiversity so that we can practice what is Good (good for everyone), Clean (clean for the environment) and Fair (fair to the farmer and to the consumer). This is our dream, to have good, clean, and fair food for ALL.

REENA GAMBOA

Educational Background:

LLB Law Juris Doctor/ University of St. La Salle, Bacolod, Bacolod City; 2007-2011

AB Social Science/Ateneo de Manila University, Loyola Heights, Quezon City;1981-1985

Positions held and Work Experience:

1. Aguinaldo Alicia Agricultural Corporation, Chief Executive Officer and President since 2012

Products: Naturally farmed fruits and vegetables, free range chicken, carabao's milk, sugarcane

2. Managing Director of CASA A. GAMBOA (under Aguinaldo Alicia Agricultural Corporation)

Bed and Breakfast and Events Venue

3. Negros Island Community Promoting and Preserving Traditional Food Inc., President and Spokesperson since 2019 / Non-Government Organization which focuses in GOOD, CLEAN and FAIR FOOD

4. Independent Accredited Tour Guide for Negros Occidental

5. Silay Export, Inc. / Marketing Director/Chief Executive Officer

Product Line: Handmade paper, novelty items, laminated items, home accessories

6. Visayan Center for Hotel and Restaurant Services, Inc. / President

7. Association of Negros Producers Foundation for Enterprise Development, Inc. / President

AAVARTANSHEEL FARMING

BY PREM KUMAR SINGH (INDIA)

Aavartansheel farming is based on the philosophy of Shree A. Nagraj. He introduced his Worldview of Harmonious Co-existence in a set of twelve books. One of the key elements of this philosophy is the finding that the earth, the plants, and the animals can only be understood out of a system analysis. They are interconnected and keep each other in balance. Aavartansheel farming can be translated as Periodic Proportionate Farming. According to the Aavaransheel concept, farming is an activity which aims to fulfil the necessities in life by making available nature-derived products while maintaining the fertility of the land, abiding by the natural laws, and fulfilling the social obligations.

Why We Need It

Loss of biodiversity, suicide rates among farmers, water-, soil- and air-pollution, climate change, global warming are just a few of the headlines which should be a wake-up call to realise something is going wrong in our society. We have to re-think how we live together, how we produce our food and how we use our natural resources.

The Philosophy of Aavartansheel Farming

The entire existence is in the form of co-existence.

Co-existence means that in the immeasurable void infinite nature is unified in each and every form. In other words, air, water, soil, animals, and human beings along with all the units and components of the earth are in a state of co-existence with one another. Present day agriculture is based on a materialistic and profit-focused concept. Therefore, a re-evaluation and analysis of the entire agricultural system has become essential.

In nature you will find rules, controls, and balances.

Since ages humankind has learned and lived with the laws of nature. We have gained knowledge about the seasons, the circle of life, the use of animals and metals. On this basis we have learned to plough the fields, sow seeds and how to live with nature. Now, due to greed, we are interfering win the laws of nature, trying to control seeds and species of animals. This attitude has disturbed and polluted nature. We urgently have to accept and live by the rules, controls and balances of nature again. This will cure our planet and bring happiness and peace to our planet.

All things and matter are in a definite proportion.

Nature in its diversified infinite forms is proportionate in its distribution. Soil, metals, air, water, human beings, fauna, and flora are all in a definite proportion. That is why they are all periodically regenerative, proportionate, and eternal. Any upsetting in mutual ratio causes imbalance of seasons, illness and want.

Qualitative growth is eternal. Nature gives more than what it takes.

Plants and trees take minerals from the soil for their growth, flourishing, fruit and seed production. They also take air, water and sunlight for their nutrition and development. They return to the earth more developed forms. In the same way all living beings receive their nutrition from vegetation and return micro bio-manure, which helps in the growth of vegetation.

In nature all sides are satisfied. There is no profit, loss, or greed.

In nature there are no such things like profit or loss. Nature is not greedy. It is humankind who takes more than it needs. This is the reason for the exploitation of our natural resources.

Farming is a responsibility of the family and village, not of an individual.

Farming is a multi-methodical, multi-dimensional and multi-angular function. Every age, capacity and skill is required. The family and all the people of the village cooperate with one another. Then farming becomes a festival and prosperity is realized.

The value of natural splendor is infinite, incalculable, spontaneous, and subtle. Agricultural production is determinable and within human power.

Since the beginning of humanity, we have been living by utilizing the free gifts of nature like fruits, grains, vegetables, herbs, milk, honey, wool and so on. We have had no role or contribution in the making of these things. We got these products easily, free of cost and without much effort. In the same way the germinating, growing and reproducing of seeds happened and happens without our involvement. The products made out of these resources are within human power.

Self-sufficiency of Soil Fertility, Seed, Water, Energy and Thought

A farmer should be free to make his own decisions, based on the confidence that he, in all modesty, is the manager and guardian of life processes.

Soil fertility can most often be built without external inputs.

For centuries farmers have selected and improved seeds in the living context of healthy, fertile soil, a specific landscape, variable climate circumstances and resistance against diseases and pests.

It is every farmer's task to guard the water quality of his farm.

Agriculture in close collaboration with nature needs little energy input.

The principles of farming and farm designing:

- The principle of self-sufficiency
- The principle of fertility
- The principle of balance
- The principle of quality and safety of food
- The principle of employment
- The principle of prosperity

How to Implement Aavartansheel Farming

One-third of your farmland should be used for fruit trees, forest, or jungle.

One-third of your farmland should be used for animals and pasture farming.

One-third of your farmland should be used for the necessities of your family.

The surplus production should be processed and value-added.

A part of the net income should be devoted to those deprived of education, health, employment and justice in the neighborhood or village.

The Results of Aavartansheel Farming

It is of utmost importance to create a resilient agro system in order not to become the slave of chemical aids, which are recommended by the industry to the farmer nowadays as the indispensable standard recipe. The artificial means have no place in vital farming.

It is often forgotten that agriculture is the primary sector in society. This sector secures the essential needs of man. Without healthy food and water nobody would be able to develop any industry or service.

Aavartansheel farming aims at providing nutrition and health to the body and achieving prosperity through nature by maintaining its equilibrium and continuity intact.

The positive results of Aavartansheel farming are food-security, physical and psychological health care, climate balance and strong peaceful communities. These are not just necessary for yourself, your family, and your community but also for future generations.

PREM KUMAR SINGH

Secretary of the Organic Farmers Association of India (OFAI)

Since 1987, I have been passionate about organic farming. In 2010 I founded the "Humane Agrarian Centre" to propagate Aavartansheel farming. This deals with co-existential and sustainable methods of agriculture, the preserving of seeds and maintaining the balance between humans, plants, animals and air, water and soil fertility. For the same purpose I established an agricultural museum on my farm. The past, the present and a possible, peaceful future of the planet is presented.

As the author of three books about organic farming, I have tried to make my experiences available to a wide public. My first book "Aavartansheel farming" deals with the co-existential way of farming. "What farmers really need"**,** my second book, I wrote with a Belgian organic farmer, Johan D`hulster. It expresses my thoughts about the way farmers are looked upon by society. The third book is a letter from Indian farmers addressed to the Indian Parliament. It contains a number of suggestions on how policies can be made in favor of organic farmers.

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