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Experiential Learning's in Climate Resiliency through Organic and Ecological Farming in the Philippines

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In the VOHO Farms, water from the former fish pond, when it becomes murky, was pumped out and used to fertigate the crops and other trees. The recycled water is rich in bio-nutrients for enriching the already fertile volcanic soils. The farm also maintains plant biodiversity. More than 80 species of plants and weeds are found in the farm. The farm boundaries are planted to medicinal and culinary herbal plants. Those with known pesticidal properties: neem tree, jatropha, *makabuhay*, lemon grass, citronella, marigold, *kakawate*, spring onions, lagundi, banaba and oregano as well as hot chillies, garlic and onions – are made into bio-pesticides and used as deterrent or repellents (bio-crop protection) for the control of insect pests and plant diseases. When fermented with molasses or brown sugar, it is also used as biofertilizers since the whole concoction is rich in macro and micro nutrients that serve as food for beneficial microbes to fix nitrogen from the air, synthesize and mobilize fixed macro and micro nutrients from the soils and make it available for plant nutrition and growth. In return, the host plant provides glucose or sugar food to the microbes through symbiosis relationship. The use of *rhizobia*, *azospirillum*, *mycorrhiza* and *trichoderma* as well as effective and indigenous micro-organisms (E/IMOs) technologies from the University of the Philippines at Los Banos and elsewhere are also being commercially adopted in the nucleus and satellite farm clusters. The benefits of organic farming and its contributions to climate resiliency are undeniable. That is why many people, not only farmers, are getting interested and motivated to support or go into organic food production. Its expected benefits transcend human health and wellness considerations with greater impact on climate resiliency and environmental security (soil, water, air, animals, plants or fauna and flora protection and conservation) as well as in economically assuring food security. The detail information will be discussed.

Key words: Organic and Ecological Agriculture; Climate Change and Resiliency; Food Security and Poverty Reduction; Organic Farm Clusters; Value Chain

Introduction

In the Philippines, despite efforts to reduce rural poverty, rural and agricultural communities remained poor. According to previous national estimates, 35% of households (17.5 Million) in rural communities are poor

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(Dy, R.T. Agribusiness and Inclusive Growth: An Expert's Advocacy: 2015). However, such rural poverty level went down to 30 % in 2015 involving 16.8 Million Filipinos vis-à-vis national poverty incidence of 21.6 %. In contrast, the national poverty line for Indonesia stood at 11.3 % with rural poverty at 14.2 % covering 20 Million Indonesians in 2014. From 2001 to 2013, the total agricultural productivity growth or total factor productivity (growth in outputs and inputs) in the Philippines was only 1.87 % per year vis-à-vis Indonesia's 2.65 % per annum. Total agricultural exports for Indonesia were valued at 33.1 Billion USA Dollars in 2015 versus only 4.7 Billion for the Philippines (Dy R. T. as published in October 2017 Monthly Agriculture Magazine, Manila Bulletin, Philippines).

To add to the poverty and total factor productivity problems, the country is highly vulnerable to the harsh impacts of climate change (heavy rains and floods, drought and severe to erratic changes in temperature, humidity and wind velocity including earthquakes) since a huge proportion of the rural population and its labor force (>30%) is heavily dependent on agriculture (on-farm and off-farm) and micro-enterprises. The country, in general, has a very large and dominant rural and agriculture cum agribusiness sector.

Typhoons with heavy rains, ocean surges, earthquakes as well as droughts cause serious damage to the country's farmlands. In 2013 alone, the Department of Agriculture estimated that damages caused by the devastation and damages of Typhoon Haiyan (local name is Typhoon Yolanda), to agriculture, forestry and fisheries amounted to hundred Billions of USA Dollars with no less than 6,300 dead people. Thus, such disasters inflict adverse effects and impacts on the livelihood, well-being and socio-economic condition of farmers and fisher folks and rural/coastal communities in Leyte and three major Visayan Regions. The Philippine Government has developed a master plan budget under a build back better scheme amounting to almost 171 Billion Pesos (USA$ 3.75 Billion). In fact, the Philippines has been identified to be the third most vulnerable countries globally in climate change effects and impacts.

Therefore, the contribution of the agriculture sector to the total factor productivity and economy is challenged by its vulnerability to climate change. Filipino smallholders are at the forefront where the climate change impacts apparently and directly affect their agriculture-related livelihoods, rural employment and sources of household income.

Since it is apparent that vulnerability to climate change is related to poverty incidence levels, as the poor are the least able to respond to climate-related stress and shocks, the resource-poor farmers in the Philippines will surely be severely affected by the effects of climate change. These include erratic rainfall patterns or increased intensity as well as occurrence of drought and prolonged dry season as well as sea surges during devastating typhoons and damages caused by earthquakes and landslides.

These phenomena, with interchanging La Nina and El Nino episodes, has further worsen the already highly handicapped position of small farmers while suffering from the exploitative supply chain where farmers are in a devastating "cost-price squeeze" where he is a price taker in both input (sellers' market) involving unscrupulous money lenders or usurers and farm input suppliers, as well as in th product markets (buyers' market) that are dominated by merciless chain of traders, middlemen, processors and supermarkets.

This paper presents the on-farm adaptive research trials and best practices as well as consulting, management and advisory services being done by the Villegas Organic and Hobby Farms and Sustainable Agriculture and Organic Farmers' Cooperative- KASAMA KA Organik Kooperatib (Kalipunan ng Sustenableng Agrikultura at Magsasakang Kooperatiba or KKOK) and the now registered with the Cooperative Development Authority (CDA) Malvar Organic Farmers' Agriculture Cooperative (MOFAC) in Malvar, Batangas Province. Focusing on climate change effects and impacts in agriculture, the issues being addressed include 1) food security and access to safe, affordable and health promoting foods; 2) water sufficiency and resilience to drought and prolonged dry season; 3) environmental and ecological stability of an agro-ecosystem; 4) human health and healthy lifestyle; and 5) climate change impacts and its resiliency for increasing and sustaining agricultural productivity and enhancing farm income.

Methods

The Villegas Organic and Hobby Farms and its partner Cooperatives employ good to best organic agriculture practices, as advocated and promoted by the International Federation of Organic Agriculture Movements (IFOAM: Organics International) and the Department of Agriculture under the Organic Agriculture Act of 2010 (Republic Act 10068). These include: a.) improving soil nutrition by recycling organic matter (i.e., carbon capture); b.) producing bio-organic fertilizer (BOF) via enhanced composting using beneficial microbes and adopting vermi-culture; c.) producing vermi-tea, fermented fruits and plant juices, fish amino acid and calcium cum potassium concoctions; d.) maintaining mineral and micro-nutrients balance; e.) improving pest and disease management and control; f.) adopting better water use efficiency; g.) increasing soil organic matter content; h.) using better weed control methods; and, h.) adapting and adopting eco-functional intensification and multi-storey crop-livestock diversification.

For environmental sustainability and climate change mitigation and adaptation, the 3-hectare Villegas Organic and Hobby (VOHO) Farms, managed jointly with the Cooperatives, is an integrated crop-poultry-fish

farming system that practices zero wastes management. Resources in the farm are recycled and nothing is wasted or thrown away. Free ranged poultry and livestock wastes (chicken and turkey dung, brooding materials and chicken feathers as well as cattle and carabao manure) along with garden weeds, vegetable trimmings, twigs as well as kitchen and food wastes and other bio-degradable materials are composted to produce bio-organic fertilizer for crops, and/or pre-composted and fed to cultured earthworms (African night crawlers).

The vermi-culture produces vermi-cast and vermi-compost, which is used as soil medium for raising vegetable seedlings and fertilizing or enriching the soil with organic matter and humus. Vermi castings are prepared into vermi tea and used as bio-nutrient foliar spray or soil drench for the growing of vegetables, herbs and other crops.

Fermented plant, fruit and medicinal herbal juices, including bio-pesticidal plants, are also being prepared and concocted to serve as bio nutrient boosters or bio-crop protection concoctions.

Recently, the farm has expanded to another 3.2-hectare Villegas Organic Orchard (ORO) Farm under the diversified and integrated coconut farming systems that incorporate multi-storey plantings of bananas, graviola or guyabano, calamansi, dragon fruits, durian, rambutan, coffee, cacao or cocoa, mangoes, papayas or pawpaw, pili, asuete and moringa (malunggay) as well as mixed vegetables of the pakbet, green leafy salad and chopsuey types. Also being produced are feed crops and legumes for feeding cattle, carabaos or buffalos, turkeys and chickens.

In collaboration with the Bahay Kubo Global Systems, Inc., the three agri-preneur farmer partners of the Villegas ORO Farm is currently in the process of setting up and institutionalizing the growing of Bahay Kubo (Bamboo House) cropping of 18 vegetables that were cited in the famous Bahay Kubo Culture Song of the Philippines. There will also be an addition of indigenous and introduced vegetables expanding into 28, 36 and up to 48 mixed fruits and vegetables farming that will support household food security and livelihood systems not only in the rural areas but also in schools as well as barangays or village eco-farms.

Moreover, the VOHO farms is now on its expansion towards a modest 3 to 5 bed and breakfast eco-farm tourism business to complement its existing organic agriculture and agri-based entrepreneurship learning businesses.

Results and Conclusion

In the VOHO Farms, water from the former fish pond, when it becomes murky, was pumped out and used to fertigate the crops and other trees. The recycled water is rich in bio-nutrients for enriching the already fertile volcanic soils.

The farm also maintains plant biodiversity. More than 80 species of plants and weeds are found in the farm. The farm boundaries are planted to medicinal and culinary herbal plants. Those with known pesticidal properties: neem tree, jatropha, makabuhay, lemon grass, citronella, marigold, kakawate, spring onions, lagundi, banaba and oregano as well as hot chillies, garlic and onions – are made into bio-pesticides and used as deterrent or repellents (bio-crop protection) for the control of insect pests and plant diseases. When fermented with molasses or brown sugar, it is also used as bio-fertilizers since the whole concoction is rich in macro and micro nutrients that serve as food for beneficial microbes to fix nitrogen from the air, synthesize and mobilize fixed macro and micro nutrients from the soils and make it available for plant nutrition and growth. In return, the host plant provides glucose or sugar food to the microbes through symbiosis relationship. The use of rhizobia, azospirillum, mycorrhiza and trichoderma as well as effective and indigenous micro-organisms (E/IMOs) technologies from the University of the Philippines at Los Banos and elsewhere are also being commercially adopted in the nucleus and satellite farm clusters.

Nitrogen-rich plants, such as kakawate (gliricidia), malungay (moringa), trichantera (madre de agua), mulberry and ipil-ipil (leucaena) leaves as well as colapogonium, rensonii, stylosanthes legumes, are harvested, chopped, and used as feed supplement to the free range chicken and turkey growing for meat and egg production. Oregano, mint, basil, tarragon, and other herbs like lagundi, yerba buena, oregano and malungay leaves are crushed for its juices and/or fermented and mixed with feeds and used as organic feed and medicine to free-range poultry.

Except for some purchased seeds, the farm produces nearly its entire farm inputs from the resources found in the farm, hence making it sustainable and rich in biodiversity. The farm maintains its commercial on-farm applied R and D trials, through an in-house scientist and some organic technologists and scientists on call, where the production technology and practices are continually validated in the farm, thus making these technological innovations and best practices more situation- and location-specific. For example, the use of natural predators (parasitoids) and glericidia-based cum virgin coconut oil and deumataceus concoctions has been efficaceously proven to be very cost-effective in controlling the highly virulent and menacing coconut scale insects (CSI). Its applications plus the wind blowing and water saturation effects of Typhoon Glenda in 2014 saved our additional 2-hectare coconut farm (now the emerging Villegas Organic Orchard or ORO Farm) under organic-in-conversion in adjacent village from CSI total damage with minimal cutting of dead trees.

In 2011 to 2012, the Cooperative and Sustainable Agriculture and Entrepreneurship Learning Center, with the technical and financial assistance from the Department of Agriculture, has embarked in a community-based organic seed production project, mainly vegetables, food

crops and staple crops as well as in integrated upland rice production followed by field crops such as soybeans, sorghum, cassava and corn, including two urban organic gardening projects in Quezon City and Marikina City, Metro Manila.

All these technological advances and practices have been transferred to, and adopted by, a network of at least 30 satellite farms that are members of the KKOK network and more than 100 associate small farmers' members and trainees of the cooperative. These are being institutionalized through the KKOK's Nucleus and Satellite Organic Farm Clustering (NuSOFaC) scheme and Value Chain Optimization modalities (Villegas *et al.,* 2012).

The cooperative has also been provided with small grant by the Korean Federation of Sustainable Agriculture (KFSA) and IFOAM in 2011 for the improvement of its learning and training facilities for organic agriculture technology development and promotion. Through the VOHO Farms' Sustainable Agriculture and Entrepreneurship (SAGE) Learning Center, we have hosted numerous training and capacity building initiatives for various international and national non-government organizations, Local Government Units (LGUs) and farmers' cooperatives, school children, high school and university students on study tours as well as extension workers, researchers, policy makers and organic agriculture enthusiasts as well as agribusiness entrepreneurs. We undertake one-day study tours on organic, ecological and natural farming as well as 2 to 3 days live-in and hands-on training on organic and agro-ecological farming systems.

In addition, a small grant has been granted by the Saemaul Undong Forum of Korea and the Cheongdo-Gun in 2015 for the propagation of guyabano (graviola) in Malvar, Batangas. An ongoing project on the Resettlement of Informal Settlers with Employment and Upliftment (RISE UP Project) with the Aboitiz Group of Companies through the Lima Land Inc is now under implementation with the setting up of an organic farm village with the 30,000 employees of the Lima Land Industrial Technology Park as the envisaged market outlet of organic produce. The ABS-CBN Kawad Kapamilya Foundation, Inc. also benefited from the VOHO Farms and cooperative's consulting, advisory and management services through the completion of the feasibility study and start-up implementation on the revival of their Iba (Zambales) Organic Farm and commercialization of the Eco-Tourism business.

The Cooperative was also instrumental in preparing a consortium-based Feasibility Study and Business Plan for establishment of Coconut Processing Plant for Non-traditional Coconut Products like Virgin Coconut Oil using at least 20,000 nuts per day from the naturally and organically grown coconuts of very poor farmers and laborers in Eastern Batangas, especially the towns of Rosario, San Juan and Ibaan.

For climate change resiliency, the promotion and adoption of multi-storey farming systems under coconut groves have been simultaneously implemented along with the setting up of more composting and water/soil conservation technologies and facilities. The integration or planting under coconuts of cardava and lakatan/latundan bananas, dragon fruits, graviola or guyabano, pomelos, cacao and coffee, pili, durian, mangoes, avocados, jackfruits, rambutan, durian and leguminous plants and trees for soil conservation and feeds for poultry and livestock. Piggery, native chicken and turkey farming as well as cattle and carabao raising are also integrated in the other 3.2 hectare organic in transition or organic-in-conversion farm known as the Villegas Organic Orchard (ORO) Farmville located in the adjacent Barangay of San Pioquinto, Malvar, Batangas.

Additionally, in a concluded organic agriculture value chain study in 2009-2010 (Villegas, P. M. *et al.* 2012), the farmers identified a number of factors on how organic agriculture can contribute to environmental sustainability and climate change mitigation. The well-informed farmers stated that organic inputs nourish the living components of the soil, wherein the microbial inhabitants release, transform, and transfer nutrients to the host plants. These beneficial microbes also contribute to the reduction of nitrate leaching to the groundwater caused by the continuous use of toxic chemical fertilizers. Organic inputs and materials also improve soil fertility, help ensure environmental sustainability and maintain food safety and health for the well-being of people. Organic farming practices with minimum tillage effectively lock in more carbon into the soil rather than releasing it into the atmosphere, which contribute immensely to the reduction of greenhouse gases.

The benefits of organic farming and its contributions to climate resiliency are undeniable. That is why many people, not only farmers, are getting interested and motivated to support or go into organic food production. Its expected benefits transcend human health and wellness considerations with greater impact on climate resiliency and environmental security (soil, water, air, animals, plants or fauna and flora protection and conservation) as well as in economically assuring food security.

The farmers were also asked if they observed any changes in their health conditions after shifting to organic products. Most mentioned that they felt healthier and that there was a significant drop in the incidence of illnesses and diseases in their households. Additionally, the countryside farmers' remoteness from commercial districts encouraged them to use herbal medicine like lagundi, oregano, sambong, to mention a few as well as culinary herbs like lemon grass and turmeric, that are readily available within their localities as substitute for expensive and un-affordable commercial drugs.

Lessons Learned and Recommendations

The major lessons learned or key barriers to organic technology transfer and sustainability that KKOK and VOHO have encountered in project execution as well as major recommendations, are as follows:

While farm supervisors and laborers have been equipped with knowledge and skills in organic agriculture and farming systems, the major setback concerns the negative attitude and unsatisfactory working habits of some lowly educated farmhands. Generally, some farmhands do not have the passion for sustainable and ecological agriculture and thus, are not committed to the principles of care, health, ecology and fairness (CHEF), thus exhibiting lack of or inadequacy of concern for sustainable and ecological agriculture technologies and farming systems. Thus, the labor-intensiveness of organic farming versus lack of passion on, and commitment to, organic agriculture, is further constrained by additional labor costs resulting in lower labor-output ratio (lower labor efficiency) and generally higher labor costs attributable to relatively inefficient labor inputs.

To counteract such constraint, a family-farming based profit sharing scheme is now being adopted by VOHO Farms. A family farm labor force (husband and wife and children team) is now being hired wherein the Social Entrepreneur provides the capital expenditures that will be amortized over its lifespan and working capital which shall be deducted from the farm produce proceeds and/or sales revenues. The resulting net revenues are shared equally by the enterprise capitalist and owner operator and the concerned family-based laborer-agripreneur. To diversify income sources, cattle, pig and poultry production is also being done on a livestock dispersal and profit sharing scheme. The emerging farm agri-preneurs have also been provided with modest housing, farm implements, transport vehicles and basic amenities for wholesome family life in the farm. They have also free access to the land where they can produce short term vegetables, fruits or organic herbs and cash crops without any rental fee to the owner-social entrepreneur.

Concerning the overall issue of sustainability of the VOHO Farm Complex and its Sustainable Agriculture and Entrepreneurship Learning Center, plans are underway to transform the integrated organic farming and capacity building enterprise into a legacy project. Business plans are now being developed to enter into an investment and management consortium agreement with the Countryside Builders Multi-Purpose Cooperative of LandBank Alumni Retirees and Employees and the Malvar Organic Farmers Agriculture Cooperative. It is envisaged that the two cooperative entities will have equity and management participation in the VOHO integrated organic cum farm eco-tourism enterprise with the CBMPC as the lead investor that will use the business model as the template for nationwide project implementation for greater results and impacts.

Organic farm yields tended to be much lower than conventional or chemical farming at the onset, particularly in organic-in-conversion or in-transition farms, since the build-up of humus and organic matter takes considerable time. However, yields tend to increase over 2 to 4 cropping seasons with progressive build-up in organic matter and humu with the utilization of science and technology-based plant nutrition and crop protection technologies. In reality, the initial reduction in yield is more than compensated by the premium prices received from organic produce (due to shortage in supply vis-a-vis demand and recognition of food safety and health considerations). The overall lower cost of production associated with low-cost organic farm inputs that the farmers could practically produce on-farm rather than purchasing from input dealers or private suppliers optimizes or enhances the generation of higher farm income.

In reality, however, the alleged cheaper food prices under chemical agriculture are basically market and price distortions as they account only for the financial or accounting prices (which are further distorted by agriculture and food subsidies in developed countries and dumping prices of their food surpluses to food importing countries). Existing food prices do not include the environmental or ecological costs nor the health and wellness costs and other social costs of chemically-based industrial agricultural systems (Mendoza T.C. and P.M. Villegas 2014).

Due to lack of economies of scale and lack of easy access to organic markets, farmers find it difficult to overproduce due to problems in handling perishable organic produce like vegetables, herbs and fruits.

There is therefore an urgent need to promote and institutionalize the community-supported agriculture (CSA) where the consumers and end-users could directly link with the organic farm producers who must be organized at the community level. Direct Producers Linkage with Users Scheme (PLUS) is a strategy that will enhance the value chain in favor of the farmers and end-users like the processors and the ultimate consumers.

Alternatively, farmers must be given the access to post-harvest handling and village-based processing. However, there is very limited support for community-based food processing industries as well as basic harvest and post-harvest handling particularly access to cold chain technology of the Philippine Center for Post-Harvest and Agricultural Mechanization Systems (PhilMech) of the Department of Agriculture.

Finally, as a matter of recommendation, given the ill-effects of chemical or brown agriculture to environment, ecology and human and animal health, there is an urgent need to shift the gear from chemical agriculture to consumer- and demand-led promotion of green, organic and ecological agriculture and fair trade. To promote cooperative-based consolidatorship and value chain enhancement in green agriculture production and trade, it is imperative to adopt the organic farm cluster development approaches and methodology of the KKOK/MOFAC to

achieve economies of scale and facilitate access to fair trade through the establishment of Nucleus and Satellite Organic Farm Clusters (NuSOFaCs) and its supply and value added chain (value chains and links) optimization modalities (Villegas, P. M *et al*., 2012).

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