CHAPTER 1

INTRODUCTION

1.1 The Underlying Reason: Industrial Agriculture and Its Impacts

In order to approach the concept of sustainable agriculture and organic farming, it is very important to understand the reason for its existence. Understanding the reason will give us a clearer view on the concept and guide us to implement the concept effectively. Agriculture is one of the major human economic activities in the global landscape. Unlike the other economic sectors, agriculture is multifunctional (Pretty, 2006); it does more than contributing food and fiber. It plays a fundamental significance in creating food security, poverty alleviation, community empowerment and environmental conservation. Agriculture is dependent at natural, social and human capital assets (Pretty, 2006**).** These assets are directly affected by the agriculture systems, as the agriculture systems consume inputs from the assets. Therefore an agriculture system that functions effectively for a long time period must work in a way that accumulates these assets, rather than deplete the assets. This system is often referred as "sustainable" (Pretty, 2006).

Since 1960, the world population has grown from 3 billion to more than 6 billion, imposing an increasing impact of the human footprint on the earth (Kitzes*et al*., 2008), therefore putting the pressure on humans to improve agriculture systems to cope with increasing demand for food. As a response, Industrial agriculture has become the promising agriculture system to produce enough food for the growing population.However, it has contributed significant environmental harms (Tilman, 1999; MEA, 2003), which depletes natural resources, where agriculture is depend most. In addition to that, industrial agriculture also affects the social and human capital of agriculture. Industrial agriculture promotes monoculture crops, agrochemical based, export oriented, corporate controlled, technology driven and consumes non-renewable energy intensively.

Monocrops are expanded by deforestation and intense use of pesticides and synthetic fertilizers. Deforestation destroys natural habitat, adding to the extinction of non-agriculture plants and animal species. Scialabba(2003) mentions that according to the International Union for Conservation of Nature (IUCN),year 2000 red list of threatened species, agriculture activities contributes to 70 percent of all threatened bird species and 49 percent of all plant species. Homogeneous monocultures are susceptible to pest, and farmers use pesticides to control the outbreak of pest (Norberg-Hodge *et al.*, 2002). Besides killing the target pests, pesticides also eliminate the natural predators. This disrupts the ecological balance between predator and prey (Pesticide Action Network North America Regional Center, 1999). The agrochemical runoff can poison soil, rivers and streams and often endanger wildlife and humans. The fall of honeybee colonies in U.S and China widely attributed to the pesticides applications and destruction of habitats (Winston, 1997).

Inorganic fertilizers can gradually raise the acidity of the soil until it impedes the plant growth. Nitrate and phosphate runoff from inorganic fertilizers, contributes to the severe algal blooms in water, leading to eutrophication (Horrigan*et al.*, 2002). Intense use of agrochemicals and machineries have killed the soils living substance therefore reduces the productivity of the soil. Furthermore, mechanical methods, clean weeding practices, overgrazing, overuse of water in industrial agriculture have affected the soil consistency, making the soil more prone to water and wind erosion, resulting high rate of topsoil lost.

In Industrial agriculture, subsequent amount of machines in farms and processing factories uses the fossil fuel as an energy source. Increasing domestic and international trade in agricultural product stimulates demand for transport. More products transported more kilometers, resulted in additional burning of fossil fuels

(Hora and Tick, 2001). Extensive burning of fuel contributes to air pollution and global warming. In terms of natural resource consumption, industrial agriculture system can be symbolized in a linear arrow as in figure (2.1) (Larsson, 2008). The starting point of the arrow represents the natural resources (i.e. top soil and water) and the end point is the product (i.e. crop, meat, processed food). The natural resources are utilized extensively without returning it back to the starting point of the arrow. Since, the resources are limited, if the system continue in a similar way, it will collapse. All these environmental consequences and extensive natural resource utilization, have limited the productivity of agroecosystems all around the world.

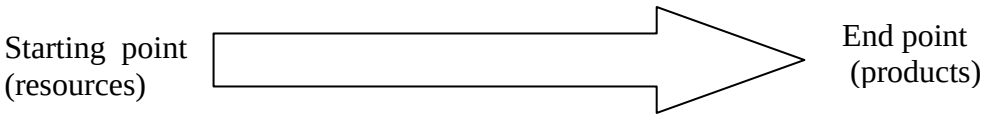

Figure 1.1: Linear arrow representing the consumption pattern of natural resources in industrial agriculture systems (Larsson, 2008).

Furthermore, industrialization and globalization have changed the multifunctional of agriculture into just producing food. In this system food is treated as commodity and the farm as a factory that producing it, while the farmers as the laborers working around the clock to full fill the market demand. This market oriented system, has contributed tothe social - economic marginalization of farmers community, especially small holders, and also effected health of consumers. Transformation towards industrial agriculture made farmers extensively dependent to agrochemicals, seeds, machineries for production and export market to sell their product. This has opened the doors for agribusiness companies to take control of the many aspects of the agrifood system. The agrifood system rapidly becoming more concentrated (Busch, 2003). Very few companies are starting to dominate their

respective sections in the agrifood system. For example, the seed industry once the province of small entrepreneurs and only marginally profitable, is now largely in the hands of multinational corporations (Kloppenburg, 1988), as well as the world's agrochemicals industry (Hendrickson *et al.*, 2001). The same situation is happening in farm machineries and the supermarket sector (Smith, 2002).

Increasingly, agribusiness companies have grown into huge corporations, vertically integrating into all aspects of the agrifood system, with owning farms, supplying farm equipment, fossil fuels, pesticides, seeds, fertilizers, marketing and distribution services (Hendrickson and James, 2005). Agribusiness companies indirectly control all the farmers needs.Farmers have no control on the increasing cost of inputs, nor over the price of their products. Farmers get less money for their products, because when the product moves along the supply chain, their value continuously captured by manufacturers, processors and retailers (Pretty, 2001). Agribusiness companies also control farmers freedom and erode their indigenous knowledge, creativity and innovation capabilities (Hinrichs and Welsh, 2003). Farmers are introduced to new technology and farming practices that concentrates only on increasing the yield volume. The agribusiness companies restrict farmers from practicing their own farming methods. For example in the case of hybrid seeds farmers are not allowed to save their seeds as they were doing before this with traditional farming (Eshwara, 2007). In a sense farmers becomes less participate in agrifood system and merely just act as passive producers for profit driven agribusiness companies.

Industrialization of agriculture has separated consumers from the producers. Consumers are not aware how their food is grown, how it is processed, and how it was treated during transportation. Agribusiness companies and retailers have

manipulated consumers' preference towards their production characteristics. Foods for the global system are chosen for the monoculture growing conditions and the ability to stay fresh during long distance transportation, rather than for its nutrition levels. Food processing removes the natural color and flavor of food, resulting high usage of artificial coloring and taste to replace the natural lust. Morgan (cited in Norberg-Hodge *et al.,* 2002) mentions that chemical preservatives are used to extend shelf lives. Accumulation of these chemicals in the body can cause cancer, birth defects, immune system breakdown and neurologicaldamage.Pesticides pose serious health problems for farm workers and consumers. Pesticide residues enter our bodies through air, water and food raise risk for various diseases such cancers as well as reproductive and endocrine system disorders (Horrigan *et al.,* 2002).

It is well understood that, the industrial agriculture system fails to accumulate the essential capital assets of agriculture, and further deplete them, which will make the system to lose its functions effectively and become unproductive and collapse. In other word it is not sustainable. This will be a serious concern, since there is an urgent need to feed the increasing global population and as well as agriculture is a primary livelihood of 40 percent of the human population. Therefore, an alternative system, which addresses the loopholein the current system, is vital to prevent any serious consequence in the near future.

1.2 Sustainable Agriculture A Brief Overview

As a response to the world development that depletes natural resources on a mass scale and its consequences to environment, economy and social status of human, in 1987, World Commission on Environment and Development (WCED), also referred as Bruntdland Commission, introduced the concept of "sustainable

development". According to the commission's report, sustainable development is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In 1992, Rio Summit was held as the extension to Bruntdland Commission. Agenda 21was one of the reports came out from the summit. Agenda 21 suggested various areas that need to be addressed by sustainable development, including agriculture.

Responding to the drawbacks of industrial agriculture, sustainable agriculture was proposed as an alternative to the industrial agriculture system. Sustainable development is based on "three pillars" model (Serageldin, 1995). These three pillars are namely environment, economics and social. Based on this model, sustainable agriculture can be represented as in figure (1.2)

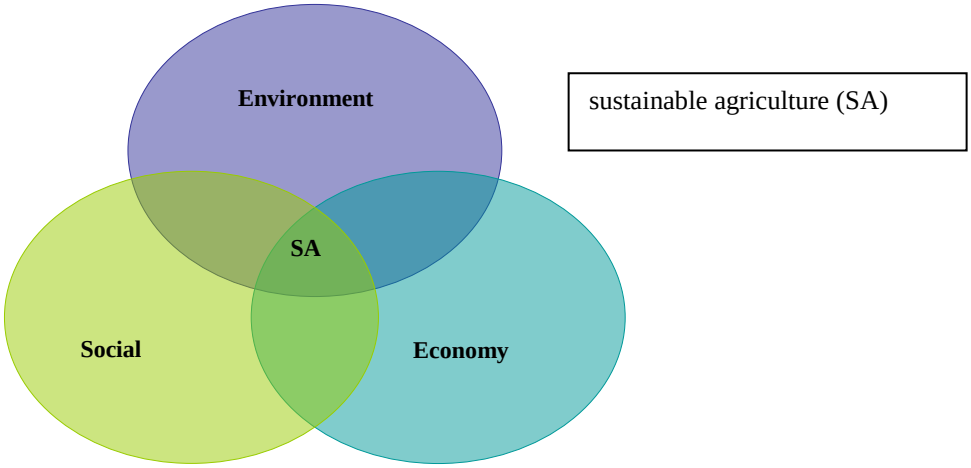

Figure 1.2: Sustainable agriculture model.

According to this model, sustainable agriculture is a farming system that produces food without destructing the environment, providing a fair economic return for farmers and other workers in the system and wide range of social benefits in terms of health, knowledge acquisition, farmers participation and etc. (Earles, 2005; Pretty, 2006). The farming system also must show resilience (the ability to buffer shock and

stresses) and persistence (the ability to continue for a long period). Sustainable agriculture system is alsosite specific. For example, agriculture system which is sustainable in the semi - arid regionis not sustainable in a high rainfall area (Horrigan *et al.,* 2002). Sustainable agriculture system is primarily based on building an agroecosystem, which promotes biodiversity, conserves and protects water, uses minimum tillage, integrates crop and livestock enterprises on the farm, reduces external non-renewable inputs by utilizing as much on farm inputs (Earles, 2005).

Sustainable agriculture tends to promote local food systems. In a sustainable agriculture system food is traded in local markets, unnecessary food trade is avoided, food economic value recycles in a closed system, protecting it from profit oriented agribusiness companies, in return, giving back farmers higher profit margin. Exclusion of expensive external non-renewable inputs also reduces agriculture cost of production. Sustainable agriculture system also opens the door for farmers to learn new knowledge, become more innovative, manage, negotiate and decide. Around the world farmers practices number of sustainable agriculture systems, such as, agroecology, biodynamic, organic, low-input agriculture (LEISA), regenerative and natural farming. I choose organic farming as the subject of my study, because organic farming is the major sustainable agriculture system being practiced in Malaysia.

1.3 Historical Development of Organic Farming

Since human learned to cultivate and domesticate animals, the only form they were doing it by practicingorganic methods and it was sustainable. In the late 18th century, progress in science has led to a number of innovations that moved agriculture away from organic methods. Large number of subsistence agriculture system around the world, which was practicing organic farming, has been converted into commercial

ventures using new agricultural innovations. After the First World War, development of chemical industries has made fertilizers and pesticides widely available for agriculture around the world.

Paull (2007) describes that,in 1909, American agronomist F.H. King**,**wrote a book entitled *"*Farmers of Forty Centuries, Permanent Agriculture in China, Korea, and Japan". King wrote this book after travelling to China, Korea, and Japan to study the traditional fertilization, tillage, and general farming practices. King was the pioneer in bringing up the fact that providing chemical nutrients will not solve the problem in crop production; indeed it is the building up of soil fertility which is important for crop production.In 1920, Austrian Rudolf Steiner introduced biodynamic agriculture, which is the first organic farming system. In his series of lecture Steiner emphasized on the farmer's role in guiding and balancing the interaction of the animals, plants and soil.

Respectively, it was Lord Walter Northbournewhowas the first person to use the term organic farming. In 1940, through his"Look to the Land" book, Northbourne, put forward the idea of the farm as an "organic whole", where the word organic refers as having a "complex but necessary inter relationship of parts, similar to that in living things". Northbourne described a holistic and ecologically balanced farming system. It is important for us to understand the definition of the "organic", to avoid the common misunderstanding, where the "organic" term referred to carbon based fertilizers that often used in organic farming.

However, Conford (2001) explains that, it was Sir Albert Howard , who is regarded by most, as father of the organic farming movement. He worked as agriculture adviser, from 1905-1924 at Pusa, Bengal (India) directing various agricultural research centers. Inspired by King's work, he documented traditional

Indian farming practices, and regarded them as superior to conventional agricultural science. After returning to England, drawing from his Indian experience, he conducted further research and exposed his concepts and theories of composting, soil fertility, and health and disease. In 1943, Howard published a book entitled “An Agricultural Testament”, which influenced many scientists and farmers of his time. In this book he put forward the concept of “The Law of Return”**,**that later become central to organic farming. In this concept he mentions that, when land is converted for agricultural purpose, crops and livestock are harvested in the fields, the nutrients are removed from the soil. When we failed to return the agricultural waste products back into the land, it results in nutrient depletion of soil and soil humus is not built. This was a great concern of Howard, who strongly advocated “The Law of Return”, where he urges to utilize available waste materials to build and maintain soil fertility and humus content. In his book he introduced the composting method that he learned from India (Fitzpatrick *et al*., 2005).

Beyond composting and soil fertility, Howard made a wide range of discoveries including in the area of plant breeding, irrigation, mycorrhizae root systems, soil aeration, fruit tree cultivation, post-harvest produce transport, weed management, and diseases of plants and humans (Howard, 1972 and Hershey 1992). For all these contributions, Howard was knighted in England. In 1946, Howard wrote another book entitled “The War in the Soil”. This book strongly criticized the companies that make profit from fertilizers and pesticides that are destructing the environment. Howard also loudly criticizedthe credibility of the classical research methodology at the Rothamsted Agricultural Experiment Stationthat compared synthetic fertilizers and manures. Howard adopted Northbourne's terminology in his book "The Soil and Health: A Study of Organic Agriculture" in 1947. In this book,

Howard was suggesting a holistic and at least period of 10 years of organic and non-organic comparison study. Such a study was attempted from 1939 to 1969 in England by Lady Eve Balfour. Her observations from this comparison of whole farms were described in her widely read book *"*The Living Soil and The Haughley Experiment*"* first published in 1943 and republished in 1974 (Balfour, 1976). Her work led to the formation of the Soil Association, which is now the UK based key international organic advocacy group.

Another person that must be appreciated for his contribution in developing organic farming is Jerome Rodale. Rodale is an American businessman and publisher. Influenced by Howard's work, Rodale started to involve in organic farming (Kelly, 1992). He began experimenting with composting and organic farming techniques at the farm he bought near Allentown, Pennsylvania. In 1942, Rodale started publishing"Organic Farming and Gardening"magazine, with Howard as his sub-editor. Through this magazine and other publications such as *"*Pay Dirt*"* in 1945 and "Organic Front" in 1948, Rodale was able to popularize the concept and methods of organic farming among consumers in the USA. The publication of "Silent Spring" by Rachel Carson in 1962 is worth mentioned, as the most influential ever writing that ignited environmental movements around the world, while raising the concerns over the excessive use of pesticides, especially Dichlorodiphenyltrichloroethane (DDT) (Paull, 2007). Silent spring has been widely known as being a key factor in the US government's 1972 banning of DDT.

Starting from the 1970s organic farming has been actively promoted by environmental movements and received wide public attention particularly in the USA and Europe. In 1972,International Federation of Organic Movements (IFOAM) was founded in Versailles, France. During 1980's, organic farming advocates started to

promote organic farming under the banner of sustainable agriculture. This move was done in order to attract some respect to organic farming. One such advocate was Garth Youngberg. He established Henry A. Wallace Institute for Alternative Agriculture, for supporting sustainable agriculture. This institute was a strong supporter in developing organic agriculture.

1.4 Principles of Organic Farming

Since the development of organic farming based on works of a number of individuals and organizations, therefore the principles that underlies organic farming also varies according to respected individuals and organizations. However, all these principles is reflective of each other.

In this thesis, principles that I refer to were from Lord Northbourne and International Federation of Organic Movement (IFOAM). Lord Northbourne, as the first person who coined the word organic farming, in his Look to the land (1940) book, introduced much of the founding ideas for the development of organic farming principles (Paull, 2007) and IFOAM as an international organization, have introduced organic farming principles based on worldwide stakeholder participatory process(IFOAM, 2007).

1.4.1 Holistic

This principle explains that, farm must not approach based on isolated ideas. A farm must be treated as a living entity. A farm has a complex interaction between its biological and non- living components. This complex interdependence interaction is vital for the productivity of the farm. For example, “the soil and the microorganisms

in it together build up the soil fertility and provide nutrients which are important factor for plant growth. For Northbourne “Farming cannot be treated as a mixture of chemistry and cost accountancy, nor can it be pulled into conformity with the exigencies of modern business, in which speed, cheapness, and standardizing count most. Nature will not be driven. If you try, she hit backs slowly, but very hard”.

1.4.2 Ecological

Following IFOAM (2007) organic farming practice should be based on living ecological systems. Production based upon ecological process, recycling and site specific. For an example, in cultivating crops is the living soil; for animals is the farm ecosystem: for aquatic organisms, the aquatic environment. Organic farming, pastoral and wild harvest system should fit into the cycles and ecological balances in nature. The cycles are universal but their operation is site-specific. Input reduction by reusing, recycling and efficient management of materials and energy is emphasized, in objective to improve environmental quality and conserve resources. Ecological balance in organic farming is achieved through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Therefore, all those who produce, process, trade, or consume organic products should give priority to protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

1.4.3 Localism

Localism was proposed to counter the impacts of profit oriented agribusiness. Northboune mentions “it is ludicrous to cart stuff about all over the world, so

someone can make a profit out of doing so, when that stuff could much better be produced where it is wanted". Local based farming cuts off involvement of middleman and emphasis on reduction of external farm inputs (i.e. fertilizers, pesticides, machines). These increase profit margins for farmers. In addition, local systems also add more income generation options by encouraging the formation of rural enterprises. Beside economic purposes, localism also serves for environmental purposes. In this system, in order to reduce usage of non-renewable energy farmers must utilize as much as on farm resources as farm inputs and avoid long distance trade.

1.4.4 Fairness

All the persons involved in organic farming systems including farmers, workers, processors, distributors, traders, and consumers, must conduct fair relations at all levels. Fairness is characterized by equity, respect, justice and stewardship of the shared world, both among people and in their relations to other living beings. This principle requires sufficient production of good quality food and contributes to food sovereignty as well as poverty reduction. It also insists animals that used in agriculture must be provided with an environment that accord with their physiology, natural behavior and well-being. Furthermore, natural and environmental resources utilized for production and consumption should be managed in a socially and ecologically friendly way and available for future generations. The principle proposes a system of production, distribution and trade that are open and equitable and account for real environmental and social costs.

1.4.5 Precautionary

Both agriculture and ecosystem that agriculture depends very much are dynamic. They respond to internal and external demands and conditions. Since humans do not have a full understanding of agriculture and ecosystem, precaution will be appropriate concern in management, development and technology choices in organic agriculture. Any new technology in agriculture needs to be assessed and methods in practice reviewed. Science will be a vital tool in order to ensure that organic farming is healthy, safe and ecologically sound; however, science alone will not be sufficient enough.Practical knowledge, accumulated wisdom, traditional and indigenous knowledge also must be taken into consideration in the assessment of new technology. The assessment process of new technology must be participatory and transparent. The precautionary principle explains that known and well-functioning technologies are better than risky technologies. It is better to prevent the damage rather than depending on our ability to cure the damage.

1.5 Organic Standards, Regulations and Certifications

There are certain standards that have been framed to govern every step in organic agriculture including seed selection, cultivation methods, harvest and marketing. IFOAM has set the international framework for organic farming. Based on the framework set by IFOAM, many countries have formulated their own standards and regulations for organic agriculture, as according to their local condition. Organic certification is a certification issued for the agricultural produce by the accredited certifying agencies indicating that only organic methods followed at every step of its production and processing. It provides a guarantee to the customers that no any other

inputs (i.e. Chemical and Genetically Modified) are used in production or processing. Organic certification assures quality and prevents fraud. Therefore it will be easy for farmers to export their products out of the country. Organic certificates also ensure better price for the organic products in the local market. However, getting the products organically certified involves high cost; therefore it is essential for those who are interested in expanding their market inside and outside country. If the consumers had direct contact with the farmers or had confidence in the retailer who purchased directly from the farmer, this certification is not essential.

1.6 Brief Overview of Organic Farming in Malaysia

1.6.1 History of Organic Farming Development in Malaysia

In Malaysia, parallel to the mainstream commercial agriculture development, alternative agriculture also was growing positively on a smaller scale. The model for sustainable agriculture most preferred or practiced by local proponents of sustainable agriculture was organic farming.Early sign of certain organic farming methods in Malaysia can be traced back to the early 60's, when Integrated Pest Management (IPM) was first introduced in palm oil plantation, and gradually extended into cocoa, coconut and paddy farming following years till to date (Othman and Palasubramaniam, 2001). Only during the late 80's organic farming started to be practiced comprehensively in an organized manner. This early initiatives were led by NGO's and private sector. According to Ong (2001), in 1987 Centre for Environment, Technology and Development, Malaysia (CETDEM) initiated first organic farm at one acre land at Sungai Buloh. This farm served as an experimental plot and public advocacy base. Starting 1990's, the number of organic farms were started up, such as Penang Organic Farm, Ecofarm and NakimFarm in Negeri

Sembilan, Kuantan Organic Farm and Lifestyle Farmhouse in Melaka.Starting 1990's consumer demand for organic food started to increase, following the cancer patients' requirements for healthy food.During that time most of the organic products was not available in the market, it was imported, by local marketing organizations such as Reldex, DC organics, and FMC. The organic foods were distributed through home based dealers, mostly advocates of natural health systems and diets. A Major breakthrough for Malaysian organic farming, was led by the private sector. This can be associated with the contribution of Steven Leong.

In 1995, Steven Leong established first organic fertilizer and compost production facility to cater the input demand which enabled a number of organic farming conversion in Cameron Highland areas. In the same year, Steven Leong initiated Primer Organic Produce, which is the first organic marketing organization, covers growing market demand inthe west and east part of the country. Primer Organic Produce that was able to get wide attention from the public, and signified the ability to produce quality organic vegetable produce, highlighted the potential market opportunity, private- sector investment and the conversion of market produce. A number of local organic farms increased as well. To date, early NGO and private sector initiatives have been taken over by more market-orientated small scale, producers.

1.6.2 Land under Organic Cultivation

According to Sivapragasam and Mohamed Roff (2005) in 2001 there were 27 organic farms with 131 hectares of land. After the introduction of the Malaysian Organic scheme in 2005, there were 22 farms under the scheme and covering about 464-ha, where it surpassed the target of 250-ha set by the Malaysian government in

the 8th Malaysian plan. The latest number,according to the Ministry of Agriculture'sMalaysian Organic scheme (SOM), in May 2010, there are 28 organic farms covering 1243.52 hectares of land. However, the exact hectares may differ, since the statistics only include the SOM certified farms, excluding private certified and non-certified farms. Referring to the table (1.1) among these 28 farms, 5 of them cultivating vegetables and fruits; 9 farms growing only fruits; 6 growing only vegetables; 3 farms dedicated for mushroom growing; 1 for Aloe Vera, 1 for spices, 1 for herbs; 1 for fruits with herb; 1 farm contains rice, herbs, spice, fruits and flower. The size of these farms ranges from 0.8 to 600 hectares.

Table 1.1: Farms accredited under Skim Organik Malaysia (SOM) until May 2010 (Department of Agriculture, 2010)

No	**Participant**	**Type of crops**	**Acreage (ha)**
1	Titi Eco Farm Resort Sdn. Bhd	Vegetables & fruits	11.2
2	DD Pitaya Marketing & Distributors Sdn. Bhd	Vegetables & fruits	2.02
3	EM Bioorganic Sdn. Bhd	Vegetables & fruits	40
4	Kenko Real Organic Sdn. Bhd	Vegetables & fruits	40
5	GK Organic Farm	Vegetables & fruits	
6	DQ Farm Products Sdn. Bhd	Fruits	20
7	Ishak bin Din	Fruits	2.4
8	DD Pitaya Marketing & Distributors	Fruits	2.02
9	Golden Meridian Sdn. Bhd	Fruits	12.8
10	Syarikat Gamatani Trading Sdn. Bhd	Fruits	76
11	Tan Ah Fatt	Fruits	1.62
12	NilaiSelesa Enterprise	Fruits	20
13	PermatangCabaranSdn. Bhd	Fruits	20
14	Noble Ag Plantation	Fruits	6.485
15	Ponak Plantation SdnBhd	Vegetables	600
16	ZenxinAgri-Organic Food Sdn.Bhd	Vegetables	5.98
17	Norizanbt Othman	Vegetables	0.8
18	HatikuAgrikultur	Vegetables	1
19	N&N Farm Sdn. Bhd	Vegetables	0.8
20	Yu Hao Enterprise	Vegetables	0.6
21	C & C Mushroom Cultivation Farm Sdn. Bhd	Mushroom	2.6
22	DXN Pharmaceutical Sdn. Bhd	Mushroom	1.6

Table 1.1 continued

23	Jin Teik Health Food Sdn. Bhd	Mushroom	3.83
24	Target Challengers Sdn. Bhd	Aloevera	202.34
25	Nasuha Enterprise Sdn. Bhd	Spices	10.2
26	AgripearlSdn. Bhd	Herbs	8.9
27	TengkuZanariahbtTengkuMohdSalleh	Fruits & herbs	0.8
28	Kahang Organic Rice Eco Farm	Rice, herbs, spice, fruits & flower	105

1.6.3 Organic Market in Malaysia

Sivapragasam and Mohamed Roff (2005) have mentioned that, inthe year 2000 the local market for organic products was RM20 million and increased to RM50 million by 2004. During the pioneering period, organic subscription scheme was famous distribution mode, however, the current emergence of wholesalers and hypermarkets have overwhelmed the pioneering distribution mode. The current prevailing market distribution mode is producers (farmers) -wholesaler- retailer-consumer, where it includes more than 60 dealers ranging from home-based distributors, organic and health food shops and hypermarkets such Tesco, Carrefour and Giant. The majority of these organic distributions is concentrated only in major cities; this indicates the existence of uneven organic consumer demand in the country. Farmers are also keen to venture into value added activities, such as small scale production of organic soya, tofu, tempeh, fruit jam, juice, bread, organic restaurants and educational eco-tourism activities.

1.6.4 Policy Initiatives for Organic Farming in Malaysia*

The Third National Agriculture planincludes programs that contribute tohigher productivity, while conserving and utilizing natural resources in a sustainable manner. Government addresses organic farming as a part of a strategy to increase farmers income, overcome environmental effects of conventional agriculture, reduce food import and increase export of high quality food. In the 8th Malaysian plan (2001-2005) government set a target to increase the organic farming area up to 250 hectares. Under this initiative, RM5000 per hectare together with eligibility to existing credit facilities was allocated as an incentive for farmers converting into organic farming. In the 9th Malaysian plan (2006-2010), the government sets its target to increase the land area under organic farming up to 20,000 hectares, with a market value of RM800 million and promises higher allocation for the sector development.

1.6.5 Regulation, Standardization and Certification in Malaysia†

Most of the organic products in the early years were not regulated and certified. Only a few were certified by foreign certifiers. Retailers buy from producers they trust and consumers buy from retailers they trust. The whole market was based on trust. Initial efforts at local based regulation, standardization and certification of organic products were developed by Department of Standard, Malaysia. It was called, The Malaysian Standard, MS 1529:2001 and covers the production, processing, labeling and marketing of plant-based organically produced foods. In December 2003, the Department of Agriculture Malaysia, has introduced voluntary based organic

* This section was wrote according to Sivapragasam and Mohamed Roff (2005)
† This section was wrote according to Ong (2008)

certification system, called National Organic Scheme (SOM). The certified products will be labeled with the SOM label. The label is recognized in the local market.

1.7 Research Objective

This introductory chapter highlighted the historical development, principles and significance of organic farming as a sustainable agriculture system to replace unsustainable industrial agriculture. Around the world significant number of countries are taking various efforts in mainstreaming sustainable agriculture, particularly organic farming. This includes Malaysia as well. However, understanding of organic farming practices on the ground as a sustainable agriculture model; understanding the principles of organic farming on the ground; addressing issues in the farms; and including farmers perspectives are important requirements to assess and propose initiatives for developing organic agriculture as a sustainable agriculture system.

Taking these into consideration this research is aimed:-

1. To observe and record organic farming practices at selected sites.
2. To analyse whether recorded practices are feasible into the sustainable agriculture model and comply with the principles of organic farming.
3. To put forward recommendations based on the farmers perspectives and real situations in farms to support the development of organic agriculture towards achieving sustainable agriculture system in Malaysia.

The research takes farms and Non-Governmental Organizations (NGO) in Malaysia and India as case study locations.In order to address these objectives, I chose qualitative case study method, which includes semi- structured interviews, participatory observation, secondary data collection and farm tours.Observed

practices are presented, analysed and discussed according to the objectives. In the end, the conclusion is drawn and recommendations are offered to develop organic farming towards achieving sustainable agriculture system in Malaysia.

CHAPTER 2

RESEARCH METHODOLOGY

2.1 The Choice of Method: Qualitative Case Study Approach

The objective of the research is exploratory in nature. Exploratory study is conducted to provide a better understanding of a subject. It is not designed to come up with final answers or decisions. This study is conducted to understand the organic farming practices as a sustainable agriculture model, to explore the application of principles of organic farming in farms andto address issues in the farms to propose policy recommendations toward achieving sustainable agriculture system in Malaysia. Furthermore organic farming itself is complex, dynamic, adapted to locally diverse conditions, and it is extensively interdependence with various factors (i.e. economy, culture, politics, social and history). These characteristics require more flexible and comprehensive method of investigation (Midmore *e tal.,* 2009) and a method that enables research to be conducted in language and space of the individual (Neuman, 2000). Case study suits these requirements.

According to Pauline (cited in Saravanavel, 2008) case study is a "comprehensive study of a social unit, be that unit a person, a group, a social institution, a district or community". It allows the researcher to understand a given research problem or topic from the perspectives of the local population. In addition, case study especially effective in obtaining culturally specific information about the values, opinions, behaviors, and social contexts of particular populations. Furthermore, it exposes the inter relationship of various complex forces operating directly or indirectly upon the subject of the study.

2.2 Data Collection and Analysis

Case study does not require higher number of samples (farms). Only a sample (that is, a subset) of a population is selected for any given study. Furthermore, goals of case-based study, is to understand the reasons and concepts rather than causal inferences (Perecman and Curran, 2006). I decided to focus my case study in sustainable agriculture practices, rather than expand the investigation to include both sustainable agriculture and conventional, as I felt that a wider approach would sacrifice richness in data gathering and analysis.

In Malaysia there were a total of four farms and one NGOchosen as case study location. In India there were three organic farming areas and one NGO chosen as case study location.Two of the Malaysian farms, which are GK Organic Farm and Bandar Harapan Enterprise, were identified as the case study locations through internet search. These two farms were selected because of their pioneering effort in establishing organic farms.Consumer Association of Penang (CAP) was chosen because it is the only NGO that extensively promotes organic farming with farmers in Malaysia.The remaining two of the Malaysian farms, which are the Sanmarkam Jasmine Garden and Somasundram Vermicomposting Housewere chosen by CAP. These two sites were established with the support of CAP. Visit to Center for Indian Knowledge Systems (CIKS) was arranged by CAP. CIKS is the international partner to CAP in promoting organic farming. My visit to case study locations in India was arranged by CIKS. All the Indian sites were farms that have been established through the support of CIKS. The details of the case study locations are explained further in chapter three and four. Data collection was done during field visits to selected farms and organizations. The method employed were semi structured interviews, participant observation, farm tours and secondary data collection. The data's are presented in

chapter three and four. Recorded practices analysed for the feasibility intothe sustainable agriculture model and whether the practices comply withthe principles of organic farming.Recorded practices also used to categorize case study locations into certain groups. Data analysis is further explained in chapter five. The collected data's are also used as a basis to propose recommendations to develop organic farming as a sustainable agriculture system in Malaysia. These is recommendations are in chapter six.

2.3 Semi- Structured Interview

I chose to use semi-structured interview as a prime method of collecting data in my case study. According to Neuman (2000) unlike the other more rigid forms of data collections such as questionnaires, where detailed questions have to be prepared ahead of time, in this method I tend to maintain an open framework by asking general questions and probed into further information as according to the responds of the farmers during the interview. This allows the farmers to respond in a way they normally behave, rather than forcing them into giving information in a more formal way, thus allowing me to gather data that reflects personal knowledge and experience of the farmer. Furthermore semi-structured interview also allows me to conduct further interviews when the initial responses suggest the need for additional detail, or a change of research focus. This method also creates a dynamic situation between me and the farmer, where two way communication exits to give and take information.

In the semi-structured interviews, thethemes were personal information, factors to involve in organic farming, farm details, farming practices, farm management, impacts from practicing organic farming, support from extension services, awareness of sustainable agriculture and organic principles, challenges

faced, solutions practiced and policy recommendation to develop organic farming toward achieving sustainable agriculture system.

2.4 Participant Observation

According to the Campbell *et al*., (2004), participant observation helps me to deeply understand the subject of my research by immersing me fully into it. During the field visits to the farms,I was able to observewhether farmers are really practicing principles of organic farming. Furthermore, during my research period I had the opportunity to attend a number of seminars and workshop organized by local NGO, where I was able to observe the interactions between farmers and community members. This contributed very much to the studies of social impacts among organic farmers.

2.5 Farm Tours

The farmers brought me for walking toursaround their farm highlighting its various productive and non-productive elements as well as management practices (Campbell et al., 2004). While walking around the farm, the farmer and I talked about the farm, its history, the farmer's family and all other possible themes that emerge. This allowed me to get farmers view of the farm from a spatial perspective. Besides that, I also was able to observe and record the actual established practices on the farm and compare it to the sustainable agriculture model and the principles of organic farming from literature. The entire tour was documented through photographs of specific sites and recording of the accompanying dialogue of participants (Campbell *et al*., 2004).

CHAPTER 3

SEEKING ORGANIC FARMING KNOWLEDGE: THE MALAYSIAN EXPERIENCE

3.1 Introduction

There were a total of five case study locations I visited in peninsular Malaysia to explore the organic farming practices and the development of organic farming. In this chapter I will share the background of each locations and organic farming practices that I observed. Each background covers short history, reason of involving in organic farming, type of farm produce, other services offered, and the current status of the farm. The observed practices are categorized under six main practices, namely polyculture, organic soil management, weed management, integrated pest and disease management, integrated farming and selling to local markets.

Figure 3.1:Map of Peninsular Malaysia showing case study locations.

3.2 GK Organic Farm

The farm is located at Dengkil, Selangor, about 50 km south of Kuala Lumpur. The farm is owned by Gan.He is 45 years old and married. He has 3 children, 2 of them are pursuing higher education and the last child is in secondary school. Gan was born in farmers' family.He graduated in Agriculture from University of Putra Malaysia (UPM) and worked as an agrochemical dealer. While working in the agrochemical field he realized that conventional farming method is not sustainable.

In 1994, Ganobtained 10 acre land from private owners. Since then, with the basic principles of organic farming, Gan had been extensively worked hard to transform the land from secondary forest to a farm with 70 varieties of low land vegetables, fruits and herbs. The crops are produced organically using methods suchas polyculture, inter-cropping, multi-level cropping, mulching, composting and integrated pest control. No livestock is kept in the farm,except pets and some regular visit of wild animals from nearby secondary forests. Beside the vegetables, fruits and herbs, the farm also produces products like jams, herbs teas, sauces, enzyme syrups etc. The farm also offers agro-tourism for the public. Gan employs 10 workers to maintain the operation and production of the farm. The farm products and services cater only for local markets.

3.3 Bandar Harapan Enterprise

"City of Hope" is what its means when translate the Bandar Harapan (in Malay language) into English. The enterprise as what itmeans brings hope for the disadvantaged community of physically disabled persons and single mothers. The sole objective of Bandar Harapan Enterprise is to enable the disadvantaged to be self-

sustaining, self-sufficient and independent by providing them training and exposure on organic farming and farm management and eventually set up and run their own business. The enterprise is made of an organic farm and a retail outlet. The farm is located at AraDamansara, sub-urban housing area and the retail outlet in anurbanhousing area at Petaling Jaya. The enterprise was founded by Ivon Ho WengCheong (Ivon). Ivon in his early 30's, is an agriculture consultant, herbalist and acupressurist. Currently he runs the daily operation of the farm helped by volunteers, disabled and single parents. He is very enthusiastic in helping the disables and single parents to be self-sufficient and independent through organic farming.

According to Ivon, his father was a building contractor, and when Ivonwas 12 his father had lost in business during recession, and he had to shift the whole family from their home to a five acres of uncultivated land at Kota Damansara. It was the time when Kota Damasara was still undeveloped, and his family had to live among the hardcorepoor in the squatter area. Their family of 7 members, survived by cultivating vegetables and rearing fish on the land.Ivon was just 13 then, but already started farming with his family member. Sakti is Ivon'sneighbor and close friend. Saktibecame disabled due toan occupational accident and was unable to continue his normal occupation and ended up helping Ivon in the farm. However, after 5 years, their land was taken over by certain private developers to build a golf course at Kota Damansara. Ivon and Sakti, respectively, went on seeking for another piece of land to cultivate. They found an old-man living alone on an acre of land, in Ara Damansara. Considering their strong interest, the old man allowed them to cultivate in his land. Together with Sakti, and with the assistance of the Welfare Department of Petaling Jaya, and volunteers, Ivon started to cultivate on the donated land with Jasmine flower and later diversified into 15 acres of land with herbs, fruits, and vegetables. All the

collected harvest of the farm is sent to the retail outlet. At the retail outlet the harvest is packaged and marketed to the public with the help of disadvantage community. With this, the disadvantage community was able to become independent through self-employment and earns a meaningful life in the mainstream of the community. Currently the farm runs a farm adoption program. Under this initiative, certain part of the farm land is rented to the public. Public are given consultancy and training on how to cultivate their own organic garden on the rented land. Collected rent is used to operate retail outlet run by the disadvantage community. Furthermore, through this program Ivon is able to educate people about organic farming, environmental sustainability and social responsibility of helping the disadvantage community.

3.4 Sanmarkam Jasmine Garden

Sanmarkam Jasmine garden is located at the outskirts of Kulim, a fast developing city atthe north of peninsular Malaysia. Sanmarkan is the owner of the garden. Sanmarkam in his early 40's have been cultivating Jasmine flowers for about 3 years. Sanmarkam is a manufacturing technician by profession. He and his wife started to cultivate few Jasmine flowers in his house backyard, as a hobby. However due to high demand for the flower from nearby residents, he cleared more land in his house compound and cultivatedmore Jasmine flowers. He expanded his Jasmine flower market to nearby towns as well. Cultivation of Jasmine flowers which started off as a hobby had turned into Sanmarkam's part time job and contributed additional income for him. However, according to Sanmarkam, after about one year his flowers were attacked by pest, which reduced his production. He tried to control the pest using all kinds of pesticides, but nothing was successful. Finally, some of his friends, after watching a promotional television programme on organic farming by Consumers

Association of Penang (CAP), advised Sanmarkam to try organic methods. Following his friends advice, Sanmarkam took an effort to meet Somasundram, who was a pioneer organic farmer of CAP organic farming training program. After getting some initial training from Somasundram, Sanmarkam made his own natural plant growth promoter, neemoilandvermicompost and used them in his farm.After about one year he managed to overcome the pest problem. His Jasmine farm became free from pest attacks and more productive.

Now other than Jasmine flowers, Sanmarkam rents another half-acre of land, and started to rear goats, and cultivate organic sugar cane. Furthermore, Sanmarkam also had joined CAP's organic farming training program, and improved his organic farming knowledge and skills, and became a model farmer. He provides consultancy and training on organic farming. His clients ranges from government officials, academicians to new farmers. Beside these, Sanmarkam participates in CAP's organic farming campaigns as well, by sharing his experience and expertise with new organic farmers.

3.5 Somasundram Vermicomposting House

Somasundram runs a vermicomposting house, rears cattle and cultivates vegetables in an 1 acre of land at Seberang Jaya, a well-developed city at North of Peninsular Malaysia. Somasundram in his late 50's is a retiree and has been running his organic operations for five years. In his working days Somasundram was a very active social activist and participates in CAP's campaigns. He was exposed to organic farming methods by attending organic farming training organized by CAP. Somasundram started his vermicomposting house on a rented land behind his house. Besides selling his own made vermicompost, he also sells own made organic natural

plant growth promoters and natural insect repellents. In addition to these, he rearscows, sells cow milk, and also utilizes cow dung and urine to make organic farm inputs. Along these, he cultivates organic vegetables as well. He uses his own made vermicompost and farm inputs to cultivate the vegetables.He marketshis product to local consumers with the help of his children.Somasundram was the pioneer organic farmer succeeded under CAP's organic campaign. He became as a role modelforother new farmers. He shares his experience and knowledge to new farmers as well.

3.6 Consumer Association of Penang

During my case study period I had the opportunity to visit Consumer Association of Penang (CAP) headquarters and travel together with their staff members to observe their effort in promoting organic farming in Malaysia. I felt that it is very important to write about CAPin this chapter, becauseamong the very few NGO's that promotes organic farming in Malaysia, CAP works in a participatory manner with farmers in developing organic farming in Malaysia.

CAP is based in the state of Penang. It was established in 1970 and advocates mainly on consumerism, healthy living and sustainable environment. Since early 2000, CAP has started to promote organic farming among consumers as one of the tools to achieve healthy living and sustainable environment. Under this initiative CAP conducts various training programmes on organic farming methods to farmers. CAP trained farmers in proper preparation and application of various natural plant growth promoters, natural insect repellents, liquid fertilizers, vermicompost and compost. The introduction training programmes were conducted by organic farming experts from overseas, especially India. After a while the trainings were conducted by the local organic farmers. Sanmarkan and Somosundram, whom were in my case study are

participants of CAP organic farming training programmes. CAP also brings experts from overseas to conduct field trips to local organic farms and provide consultancy. Furthermore CAP also sponsors educational trips for local farmers to experience and learn development of organic farming in other countries. However, these two activities are not conducted often due to financial constraints. Currently local organic farmers brought in as consultants to conduct field trips to help new organic farmers. Beside these, CAP works together with farmers to produce various publications, audio and video materials on organic farming awareness to consumers and on organic farming techniques to farmers. All their publications and promotional material will be in four languages, mainly in Bahasa Melayu, English, Chinese and Tamil. This enables CAP outreach efforts reach many consumers. CAP with the help of local organic farmers, also conducts road shows and mini exhibition to promote organic farming and organic product consumption to consumers.

3.7 Observed Practices

3.7.1 Polyculture

Polyculture practices such as mixed-cropping and inter-cropping, is one of the innovative farming practice that I came across in our study. At GK Organic Farm I noticed, that water spinach *(Ipomoea aquatica*) isinter-cropped with sweet potato *(Ipomoea batatas)*. There is also three dimensional cropping system in the farm, where pumpkins (*Cucurbita sp.)*arecultivated on top of the roofs, Sawi (*Brassica rapa)* and Yam (*Dioscorea sp.)* on the ground, herbs at the hedge. Meanwhile, at Bandar Harapan, I saw herb shrubs grown at the hedge of vegetable beds. This shrub contains herbs such as cat whiskers (*Orthosiphon stamineus),* which attracts many beneficial insects such as bees, butterflies, assassin bugs,syrphid flies and wasps.

These insects prey on insect pests such as aphids, mites, thrips, mealybugs and insect eggs.

3.7.2 Organic Soil Management

All the farmers are not using any kind of synthetic fertilizer in their farms. One of the common soil fertility management methods isthe regular addition of organic matter such as compost, vermicompost, liquid fertilizers and compost tea, which are made through recycling resources within the farm, and also resources found near their farm. Composting is the method of converting the organically available, non-decayed plant and organic waste into a dark brown texture, fluffy organic material rich in humus and low in density called as compost. According to what I observed at GK Organic Farm more than 80 % of total materials used in the compost is obtained from the farm such as plant residue, cut grass, pulled weeds, aquatic plant from the pond, soil from the farm ground and the rest from nearby village such as sugar cane pulp, tapioca peel, banana peel, plantation waste such as oil palm fiber and a small percentage of chicken manure, which is needed as a 'starter', or kindling, to heat upthe heap. All the materials turned into compost by undergoing 6 months (or longer) aerobic& anaerobic fermentation in the compost heap.

Vermicomposting is another process used by the farmers, where earth worms are used to convert organic materials (i.e. cow dung, paddy straw, kitchen waste) into a humus-like material known as vermicompost. According to Sanmarkam, as a fertilizer, vermicompost contains nutrients in a form that are readily taken up by plants, such as nitrates, exchangeable phosphorous, soluble potassium, calcium and magnesium. Vermicompost contains a far more diverse microbial population than other composts. Farmers culture earthworms such as, Red Wigglers (*Eisenia foetida*)

or Red Earthworms (*Lumbricus rubellus*) in their own made tank. This tanks varies in size and shape according to the farmer needs. Organic wastes such as cow dung from the farm as well as nearby farm were used as beds for the worms to grow. Under a controlled environment (temperature, moisture, pH, oxygen) worms grow in the tank by feeding the waste and producing their cast known as vermicompost.

Furthermore, liquid fertilizers and compost tea, are also used to fertile the soil. In Bandar Harapan, Ivon makes liquid fertilizer by fermenting fruit and vegetable wastes. At GK Organic Farm, compost tea, which is the liquid residue of the composting process is collected and applied into the soil before planting. Other than application of organic fertilizer, there are also other practices implemented by the farmers to build up the fertility of the soil. Biological nitrogen fixing is one of it. For example, at Bandar Harapan, Okra (*Abelmoschus esculent***)** is cultivated to fix nitrogen to the soil.Besides that, at Bandar Harapan, I also picked up the idea of microhabitat management. In this method porous pots are used to disseminate moisture into the soil by filling up the pots with water and leaving them on the vegetable beds on hot days. When turned over, they create natural habitat for insects and microorganisms which fertile the soil. In addition, farmers also are using practices of mulching, cover cropping, green manuring, addition of cocoa pit and mixed-cropping to retain and enrich nutrients in the farm soil.

3.7.3 Weed Management

Weeds were managed by hand plugging, machines, cover cropping, mulching and inter-cropping.

3.7.4 Integrated Pest and Disease Management

No chemical is used to control disease or pest in all the farms. According to Gan, Pest is definedas insects, which associated with the natural environment. The idea of killing the insects is strongly opposed; rather it'sbetter to control them by understanding their interaction with the crops.At GK Organic Farm, Gan showed me red- ants in sour soup fruit as protecting the fruit from fruit flies. He also explained that, the sweet corn attracts aphids, which also will attract their own predators which is lady bug. Therefore any bug will have their own predators. In a farm with the balanced eco-system, undisturbed by chemicals, plants are protected naturally by friendly predators, microorganisms, and by their own immune mechanisms.

Besides these ecological management options, crop protection methods are also used in the farms. At GK Organic Farm, Mulberry trees are netted to keep away birds from the ripen fruits. Bagging fruits with old plastic bags is another simple and effective method utilized in the farm to control pest and diseases. Other than these, all the farms are utilizing on farm and off farm resources to make natural pest repellent, Biopesticide, natural foliar sprays, effective microorganism culture and natural plant growth promoter such as *Pancakavya*. Farmers claim that, these own made natural inputs are effective in protecting crops from pests and diseases.

3.7.5 Integrated Farming

There were three models of integrated farming practices that I identified from my field visits. One of it was the integration of farming system with aqua-ecology. At GK Organic Farm, water from the pond is pumped up to a small reservoir in the farm to irrigate vegetable beds, as well as to supply household taps. Some ornamental lotus

and other water plants also grow in the pond. Some of these water plants are used for compost and mulching. Gan explained to us that, the irrigation pond also plays its role as a wildlife sanctuary, as he noted wild tortoises stretching out from his pond. On the other hand, there is Somasudram who integrates livestock with cultivating vegetables, fruits and flowers. In addition to providing milk and meat, the dung and urine of the cow used by Somasundaram to make compost, natural plant growth promoter, and natural pest repellent and foliar sprays. The cows are fed with crop residues and weeds. This helps to turn unusable biomass into animal proteins.

Meanwhile, at Bandar Harapan, farming, aqua-ecology and livestock are integrated. Ivon made his own pond, where he started to cultivate plants suitable for biological nitrogen fixing. The water from the pond is also used for irrigation purposes. He also rears free range chickens at his farm. He hopes that integration of plant, animals and aqua-ecology will create a balance farm ecosystem

3.7.6 Selling To Local Market

All the farms that I visited operate to caterlocal market. GK Organic Farm sells their productat organic shops nearby the farm, such as at Kajang, Bandar BaruBangi and around the Kuala Lumpur area. Bandar Harapanmarkets their products through organic shops at the nearby housing areas. Somasundaram and Sanmarkamdo the same; they sell their products to the local consumers around their farm. All the farmers have their own brands and own packaging. All the packaging is done in house. The most established marketing method is selling to local organic shops. The other methods are onfarm selling, direct marketing and participating in organic markets fairs. None of the farmer exports their products to overseas.

3.8 Conclusion

I can conclude that all the observed practices in Malaysia are based on building up soil fertility, sustainable use of available natural resources, excluding use of non-renewable resources and promoting fair economic benefits for the farmers. All the observed practices areanalysed on the impact to the environment, economy and social and existence of resilience and persistence. This is done to assess whether the observed practices fit into the sustainable agriculture model. Plus the observed practices also explored whether they comply with the principles of organic farming principles. The farms are characterized into two groups of constructive and reconstructive farmers. All these analysis are explained further in the chapter five.

CHAPTER 4

SEEKING ORGANIC FARMING KNOWLEDGE: THE INDIAN EXPERIENCE

4.1 Introduction

During my research period I was fortunate to join an educational trip to Tamil Nadu, India. The trip was sponsored by CAP and its Indian NGO partner, Center of Indian Knowledge System (CIKS).Except me and CAP's staffs, participants of this trip were organic farmers under CAP's outreach programme. Objective of this trip was to provide the Malaysian organic farmers an exposure and understanding of the Indian organic farming system. For me this trip gave me an opportunity to observe the organic farming practices in another country and analysis whether the practices fit into the proposed sustainable agriculture model and comply with the principles of organic farming. This trip also allowed me to observe the issues faced by organic farmers in the case study location in India and the initiatives taken to overcome the issues. Some of these initiatives areused as a reference,in proposing recommendations to develop organic farming in Malaysia.

I began my journey at CIKS headquarters in Chennai and continued to Sukkonkolai, Vandavasi, Irulas, Sirkazhi, Banglore and ended back at Chennai. However, only my visits to CIKS headquarters, Sukkonkolai, Vandavasi and Sirkazhi are explained in this chapter. This is because; only these locations were relevant to objective of my research. In this chapter I have written background of each locations followed by the observed practices.

Each background covers a short profile of the location, reason of involving in organic farming, type of farm produce, other services offered, current issues,and discussion with farmers. The observed practices are grouped into five main categories as organic soil fertility management, integrated pest management, in-situ seed conservation, small holder group certification and selling to local markets.

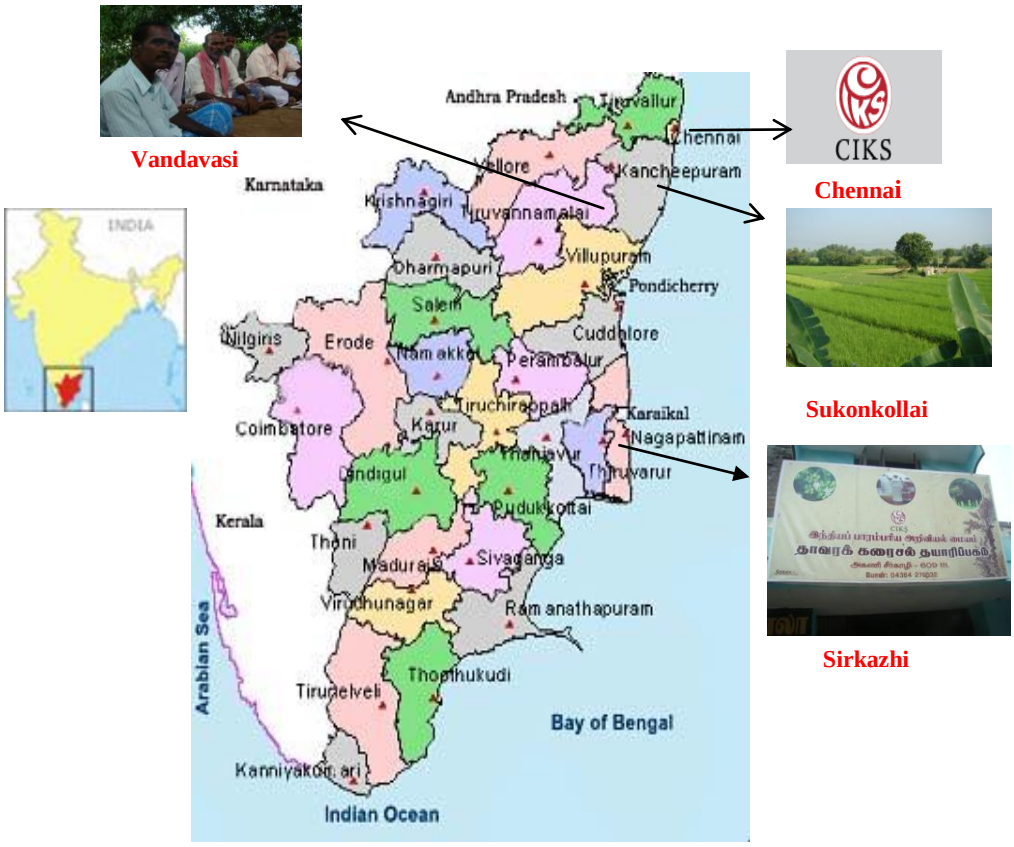

Figure 4.1: Case study locations in Tamil Nadu, India

4.2 Practical Solutions from Traditional Indian Knowledge Systems: Silent Revolution of Center for Indian Knowledge Systems (CIKS)

My first case study location was Centre for Indian Knowledge systems (CIKS) headquarters at Chennai. Chennai is the capital city of the Tamil Nadu. According to CIKS director Bala in his introduction speech, India is a magnificent land that is rich in various knowledge systems such as in agriculture, architecture, healthcare systems, textiles, astronomy, math, logic and linguistics. These knowledge systems are not merely serving a decorative role or reminders of a past glory. In order to evolve into a strong and a self-reliant nation it is essential to identify and build upon the strength of these inherent knowledge systems and potential in varied areas. The long term goal of CIKS is to establisha programme for the strengthening and revitalization of varied

aspects of Indian knowledge systems. CIKS tries to achieve this goal through looking deep into the heart of these ancient knowledge systems to gain a strong understanding of their workings and rationale. The understanding and knowledge gained is then leveraged to develop solutions that are practical and feasible in today's context. CIKS concern areas are biodiversity conservation, organic agriculture and Vrkshayurveda (plant science originated from an ancient text in India).

4.2.1 Green Revolution as the Precursor of Organic Farming Development in India

Bala also mentioned in his introduction speech that, Green revolution took place in India from 1967-1978. During this period farming area continuously expanded. Existing farmlands practiced double- cropping intensively and use of genetically improve seeds (hybrid seed), chemical fertilizers and pesticides were widespread. As a result yield per unit of farmland improved by more than 30 per cent. In year 1978 and 1979 the grain output was 131 milliontons. However, in 1979 and 1987, India faced severe drought conditions due to poor monsoon and the yield decreased. Furthermore, starvation still exists in India, due to lack of good distribution in the industrial agriculture system, of Green Revolution. Other long term effects were lost of biodiversity (i.e. loss of traditional seeds), drop in soil fertility, yield reduces due to pest attack and disease, increase in production cost, domination of agribusiness, marginalization of small farmers, loss of traditional and indigenous knowledge. All these raise questions about whether the Green Revolution was really a long-term solution? Was it designed to be sustainable? Addressing these set backs, CIKS using traditional Indian knowledge systems, conducts various research and outreach activities to develop organic agriculture in Tamil Nadu as a solution to

overcome the negative impacts of industrial agriculture promoted by Green Revolution.

4.2.2 Chennai to Sukkonkolai: The Changing Landscape of Tamil Nadu

My next destination was to CIKS organic farm in Sukkonkolai village. The village is approximately 2 hours drive towards south of Chennai. While traveling from the metropolitan city of Chennai to the research farm, I have noticed lands being cleared off for new housing projects and new factories. This clearly indicates the reduction in agricultural land in Tamil Nadu as informed by a CIKS staff in my travel to Sukkonkolai. According to CIKS staff, increasing number of factories contributes to power scarcity. Power cut occurs often and it affects the agriculture activities as well. In addition creation of new jobs at factories increases migration of farm workers from agriculture into industry sector.

4.3 Sukkankolai Organic Farm: Research and Outreach Centre

Area of the organic farm is 11 acres. The land previously was cultivated conventionally. Conversion to organic farming started from 2002 and to date the entire land is cultivated organically. The farm is purely used for research and outreach purposes only. It has seed storage facilities; laboratories, biofertilizer production unit, composting facilities, Azolla cultivation pond, hostel facilities and training rooms.

During my stay at Sukkonkolai farm, I had the opportunity to participate in a group discussion with the farmers from nearby areas. These farmers converted into organic farming practice as a result of CIKS outreach activities at Sukkonkolai farm. The farmers mentioned that the primary reason for them to convert into organic

farming was based on economic reasons and frequent pest and disease attack on their crops. They pointed out that using expensive agriculture inputs (i.e. pesticides and chemical fertilizer) in the industrial agricultural system have increased the cost of agricultural production. However, the plants have been frequently attacked by pests and diseases, but the expensive agricultural inputs could not contain the pest and disease attack, which reduces the crop production and farmers profit. Therefore the farmers tried organic farming as an alternative method to overcome the problems of industrial agriculture.

With the guidance of CIKS, the farmers have successfully converted their farm into organic farms. According to them, after converting into organic farming, they have stable production and no need to spend for expensive agriculture inputs and even so they enjoy a stable profit. The farmers also have formed their own organic farmers society called “Sangam” (it refers to society in local language of Tamil) and applied for small holders group certification to widen their market into big cities such as Chennai. In my next case study location I found out more about the operation of this “Sangam’ and the marketing strategy of organic farmers. From my discussions with farmers, I found that, Sukkonkolai organic farmers are facing similar challenges as the conventional farmers in the region. The challenges are such as reeducation in the agricultural land area, agricultural labor migration into industrial sector and frequent electricity cut out at the farms due to the high demand of electricity from increasing factories. The farmers hope that, considering at the current increase of agricultural input cost, organic farming will be preferred by most of the farmers as the suitable alternative and sustainable farming method to increase the local food production.

4.4 The Vandavasi Organic Farmers: Success Story of "Arogyam" And Organic "Sangam"

My next destination was to Vandavasi at Trivanamalai District. Since 1993, CIKS worked with farmers in the Vandavasi area promoting organic farming. CIKS started off with establishing network of farmers with the objectives to exchange seeds and information. Several meetings with the local farmers were held regarding the importance of practicing organic farming and cultivating local varieties. Farmers were provided with the initial supply of seeds from the seed bank, which has been procured by CIKS from farmers who already growing it in other areas. And so the farmers were instructed on the technical know-how of cultivating their farm organically. They were trained to control pests using natural control methods and fertile the soil using organic methods such as compost, vermicompost, "Amirathakaraisal",Azolla and biofertilizers. One of the farmers told me that, most of the farmers at harvest return twice the quantity of seeds that they have removed from the seed bank.

Now, Vandavasi contains about 52 acres of organic farms cultivating Paddy, Ground nut, Sugarcane, pulses and vegetables. One of the constraints that the farmers were facing was to market their produce. It was depressing for the farmers that they did not get a reasonable profit in the regular market. To overcome this CIKS introduced a programme to link up the consumers with the farmers. This programme was named as "Arogyam" (it means as 'healthy' in the local language of Tamil). "Arogyam"is a programme which has registered consumers. These consumers will purchase organically grown crops from the Vandavasi farmers.

"Arogyam" was successful. This marketing programme has shown that it would be possible to sell organic products to the consumers at rates on par with the existing inorganic products and also provide farmers with reasonable returns. Under

this "Arogyam" programme, other plans were also have been established to strengthen the organic market, such as getting farmers products certified as organics and engaging farmers in downstream processing. CIKS has come up with certain models, to ensure the maintenance and sustainability of their organic farming programme. CIKS has formed organic farmers "Sangam". This "Sangam" is made for members who are farmers came together for the common cause of organic farming.

Until now CIKS have established 37 organic farmers "Sangams", including the one that I visited at Vandavasi. The "Sangam" members pay a monthly membership fee which is saved in a bank account. Elected office bearers manage the "Sangam" operations. The "Sangam" maintains the village community seed bank. The seed bank storage structure is initially provided by CIKS and later it is maintained by the "Sangam". The borrowing and returning is controlled by the "Sangam". The "Sangam" also provides certain agriculture inputs such as sprayers, tarpaulin sheets for drying grain and etc. All these are rented out for nominal rate. Besides that The "Sangam" is also provides a soft loan scheme for the farmers. The "Sangam" buys farmers products and sells it through "Argoyam" and pays dividend from the profit obtained from the sale. Some "Sangams" also runs biopesticide units as an additional income generating activity.

After visiting the "Sangam" office, processing factory and farms, I had similar opportunity at the Sukkonkolai, to join a short group discussion with the Vandavasi organic farmers. The answer to the inquiry of reasons to involve in organic farming was the similar as from the Sukkankolai farmers. Most of the answers were due to economic reasons and frequent pest and disease attack on their crops. The farmers told that, after converting to organic farming, they gained stable yield and no need to spend for expensive agriculture inputs and enjoy stable income. According to them,

marketing organic products was an obstacle they were facing. They managed to overcome the problem through the establishment of “Sangam” and “Arogyam”. It is interesting to note that, the Vandavasi organic farmers also face similar problems as the Sukkankolai farmers, such as loosing of agriculture land, shortage of agricultural labor and power cut. According to the farmers, these problems are caused by rapid industrialization taking place in Tamil Nadu.

4.5 SirkazhiOrganic Farmers: BiopesticideProduction Unit and Women Self Help Group

My next destination was to Sirkazhi which located south of Vandavasi. Sirkazhi is another location where CIKS promotes organic farming. CIKS established biopesticidepreparation units in some of the organic farmer’s villages. Plants contain many compounds with pest control properties. Biopesticide refers to the extract made from the plants to be used as pest control. I visited abiopesticidepreparation unit in Agani Village, Sirkazhi established by CIKS. At this unit CIKS conducts training for the farmers to prepare plant based extracts. Beside production the unit also conducts small scale research to improve the preparation, application and effectiveness of biopesticide. Examples of the biopesticides prepared at this unit are 3 compound extract (made from ginger, garlic, and chili), neem extract and sweet flag extract.

Biopesticides are prepared by women who have been trained by CIKS. These women are also farmers. They work on a part time basisat this production unit. They are also involved in outreach activities (i.e. training fellow farmers on preparing and applying the Biopesticide). According to Subashini, who is the CIKS program director for Sirkazhi, the production has been standardized, published as a guide and

disseminated to the farmers for their reference. The farmers who have been convinced of the effectiveness of these extracts, prepares these extracts on their own to use in their farm. She also mentioned that, the insects (pest) also will develop immunity to biopesticides as to the chemical pesticides.So to overcome this, CIKS advises the farmer to apply various types of biopesticides rather than one type.

After visiting the biopesticide preparation unit, I headed to other organic farms around Sirkazhi. There are about twenty farms cultivating paddy and vegetables organically. Of the three farms I visited, I observed the farmers were practicing similar organic practices as at Sukkonkolai and Vandavasi. They were practicing integrated pest and disease control methods (i.e. natural pest and disease control methods and pest traps), seed saving and organic soil fertility management (i.e. vermicomposting, composting, use of biofertilizers, application of Azolla, and "Amirthakaraisal". With the help of CIKS, the farmers have applied to small holders certification. The farmers also have formed Organic "Sangam" as in the other places that I visited earlier.

Another interesting project by CIKS at Sirkazhiwas Information Technology (IT) training for farmers. CIKS started a program to establish a communication center at the "Sangam" office. This Centre is equipped with computer, internet and video conferencing (VC) facilities. Farmers are trained to use VC to communicate between farmers and CIKS staffs for consultations and also exchange of ideas. This programme was funded by TATA group and supported by Indian Institute of Technology (IIT), Chennai. At Sirkazhi CIKS funds and consults formation of Women Self Help Group (SHG). This Women SHG is located at Allivilagam, a village placed at the outskirts of Sirkazhi and operates a vermicomposting production

unit. This Women SHG functions as a cottage industry, providing additional income for the local women and improving rural economy.

During my discussion session, the Sirkazhi organic farmers responded similarly as to other farmers to most of my questions. Basically the reason for the conversion was to overcome the pest and disease problems and to reduce increasing expenses on purchasing conventional agriculture inputs. After the conversion the farmers have achieved a stable yield, reduced expenses and happy with their responsibility in conserving the farm environment. The farmers mention that, the organic awareness is poorer in rural areas compared to larger cities.Consequently, rural areas have little market for organic products.Farmers are looking forward for their farms certified, in order to sell their products to larger cities. Sirkazhi organic farmers face the similar problem faced by other farmers as well, such as loosing of agriculture land, shortage of agricultural labor and power cut.

4.6 Observed Practices

4.6.1 Organic Soil Fertility Management Methods

Recognizing the negative effects of chemical fertilizers the Indian farmers have turned into organic alternatives to enhance the soil fertility. CIKS has introduced various organic soil fertility management practices to these farmers. One method I noticed was using of “Amirthakaraisal”. It is an organic growth promoter. It is made from cow dung, cow urine, molasses and water. This growth promoter is mixed into irrigation channel and used as direct spraying or foliar spray. Green manuring was another practice that I observed. Farmers cultivate certain crops in the field before cultivating the main crop and plough them back into the soil. Such crops are called as green manure crops. These crops help to improve soil fertility. Some of the commonly

used green manure plants are such as Sun hemp (*Crotalaria juncea*), Sesbania (*Sesbania speciosa*), Wild indigo (*Tephrosia purpurea*) and Indian indigo (*Indigo feratinctoria*).

CIKS is promoting composting to enhance soil fertility. There are two main types of composting that I noted namely vermicomposting and Biodung composting. Vermicomposting is a method where earthworms are used to turn the cow dung into compost. Biodung composting refers to a method turning agriculture wastes together with cow dung and cow urine into compost. Converting the waste into compost and applying them to plants, helps the plants to utilize the nutrients easily.

Another interesting method I discovered was the application of Biofetilizer. Some of the microorganisms found in the soil fix atmospheric nitrogen and convert it into a form that can be assimilated by the plants.The manure containing such microorganisms is named as Biofertilizer. CIKS established its own mini laboratory and production unit at the farm to produce this Biofetilizer. Some of the microbes that are commonly used include Acetobacter, Azospirillum and Phosphobacteria. According to CIKS staffs, these Biofertilizer do not only reduce expenditure but also increase the yield and the fertility of the soil. Biofetilizer is applied to the plants in four different ways as follows; direct mixing with seeds, use in nursery, direct mixing with soil and root immersion and planting.

Azolla is a fern that grows in the stagnant water in rice fields. This plant contains algae called *Anabaena azollae*. The fern provides the necessary nutrients and space required for the algae. In turn, the algae provide the fern with the fixed atmospheric nitrogen and other nutrients essential for its growth. Under CIKS guidance farmers grow this Azolla and use it paddy fields. The advantages of using Azolla are such as, providing nitrogen to the crops; yield increases; the crops grow

well; weed can be eliminated and growing Azolla is equivalent to the use of Ammonium sulphate fertilizer.

4.6.2 Integrated Pest Management

I noticed that farmers were using natural and mechanical method to control pest attack in the farms. The mechanical methods were such as using hormone based insect traps, light trap and yellow stick and box traps. The natural methods were soaking neem cake along the irrigation channel and using organic insect repellent made from five leaf extract. This five leaf extract is made of plants with milky latex; plants which are bitter; plants that are generally avoided by cattle; aromatic plants; plants that are not affected by pest and diseases.

4.6.3 In-Situ Seed Conservation

Farmers have deep knowledge of their local seed varieties, of their environmental and nutritional requirements and their properties and peculiarities. This has made them to harvest even under the most severe stress situations.Local seed varieties and their diversity play an important role in organic farming. However, over the year's strong growth of industrial agriculture systems have made hybrid seeds high in usage. Introduction of these hybrid seeds have caused local varieties to become extinct at an alarming stage. Understanding this, CIKS engaged in In-situ seed conservation project, in order to conserve and promote the use of local seed varieties in organic farming. Through this project CIKS has been involved in setting up farmers seed banks in villages in different parts of Tamil Nadu. More than 130 varieties of paddy and 50 vegetable varieties are conserved in farmers fields and

experimental farms.At the Sukkonkolai research farm, I observed collection of rice seeds. Rice seeds from 3 seasons namely Samba (July-January), Navarai (December-March) and Sornavalai (April-August) were collected. Examples of the collected seed are “Vadan Samba”, “KadaiKaluthan”, “Sembalai”, “KattuKuttalam” and “Sandikar”. These seeds names are in the local language of Tamil. These rice seeds are packed in gunny sack. Vegetable seeds are kept in aluminum box to prevent moisture. Seeds are labeled with a tag containing information such as type, date, source and weight. The seeds then placed in a special room. Light trap, need leaves and herb fumigation are used to protect the seeds from insect and rat attack.

4.6.4 Small Holders Group Certification

Another practice by the Indian farmers was applying for Small Holder Group certification. CIKS encourages the farmers to get their farms certified as organic farm. However, in individual certification, the farmer has direct contact with the certifying agency. The individual certification system does not have any internal inspection. Therefore at the end of each season, the certifying agency undertakes external inspection. The certifying agency works more. Hence, the cost of the certification process is likewise high.This is not a viable option for small and marginal farmers. As an alternative, CIKS adheres small holders’ group certification. The standards and regulations observed in both certification methods are the same.

In the small holder group certification system, CIKS acts as a bridge between the certification agency and the farmer. CIKS undertakes internal certification of the organic farm and hence the mistakes are rectified now and then. The work of certifying agency is made short using this internal certification. External certification by the certifying agency is carried out randomly in some of the farmers fields. In this

field external certifying agency will confirm that the internal inspection have been carried out completely. Thus the cost is significantly reduced in this small holder group certification compared to the individual certification.

4.6.5 Selling to Local Market

All the farmers at the case study locations were selling their farm products to the local consumers. Their consumers are mainly from nearby cities. The farmers sell their products through collective marketing strategy such as "Arogyam". In this system "Sangam" buys the farmers products and package it under "Arogyam" and sell it to the registered customers at "Arogyam". This system gives better opportunities for the marketing of organic products into cities. This system helps farmers to have a continuous market for their products. Besides this collective marketing strategy, there are also farmers whom sell their products directly to the consumers. Most will be through local daily market.

4.7 Conclusion

I can observe that practices in India have similarities withMalaysia. As in Malaysia, the Indian practices arebasedon building up soil fertility, sustainable use of available natural resources, excluding use of non-renewable resources and promoting fair economic benefits for the farmers. However the involvement of NGO in promoting organic farming was better established compare to Malaysia. Other than that, the in term of gender, female participation in farming is higher in India. The Indian farmers are also more socially inclusive through active participation in farmers association and self-help groups.I also noticed that, with the trend of moving towards

industrialization, Indian farmers are facing problems such as loosing of agricultural labor and land, plus energy shortage.

As what I did with the Malaysian practices, in order to assess whether the observed practices fits into the sustainable agriculture model, all the practices areanalysed on the impact to the environment, economy and social and explored for the existence of resilience and persistence. Besides that, the observed practices areexplored whether they comply with the principles of organic farming. The observed farmsarecharacterized in two groups as constructive and reconstructive farmers. All theses analysis of the observed practices are shared in the following chapter.

CHAPTER 5

DISCUSSION

5.1 Introduction

In this chapter, observed organic farming practices are analysed for the feasibility to fit into the sustainable agriculture model. This is doneaccording to the three pillars model of sustainable agriculture as in figure 1.2, in which observed practices are analysedon the impacts to the environment, economics and social aspects. The practices are also explored for the existence of elements of resilience and persistence. In addition to that,analysis is also done to study whether organic farming practices in the case study location complies with the principlesof organic farming from the literature.The principles are holistic, ecological, localism, fairness and precautionary.Lastly, all the case study farms are characterized in two distinctive groups as constructive and reconstructive farmers.

5.2 Feasibility into Sustainable Agriculture Model

5.2.1 Environmental Impacts [*]

In terms of biodiversity, I noted that practices such as polyculture, cover-cropping, mulching, addition of organic fertilizers and the use of integrated natural pest management practice enhance species diversity at the farms. For example, polyculture increases the number of crops at the farm as well as the insects associated with the crops, and soil management practices such as mulching, cover-cropping and the addition of compost, builds up the soil carbon that increases soil biota (i.e. earthworms and microorganisms). Exclusion of pesticides also can be regarded as on of the factors for the presence of higher species diversity at the farms. Beside these, organic soil management practices have also restored soil nutrients. According to

[*] This discussion point was referred to Alföldi*et al.,*(2002)

farmers this can be indicated by high earthworm population in the farm and diverse plants that grows healthilyin the farm. Furthermore, conserving energy is another essential environmental service of organic farming. All the non- renewable inputs such as chemical fertilizers, plastics and fuel were excluded or minimized. Only renewable resources were used as energy input into the farming system. The capturing of solar energy is enhanced by increasing the leaf area available for photosynthesis, through practice of polyculture and cover-cropping. Farm wastes (plant residues, leaves, cut grass, pulled weeds, cow dung) and off-farm wastes (oil palm fiber, kitchen wastes, paddy straw) are recycled into compost and added back into the farm as renewable energy input. Furthermore, selling at local markets, consumes less time and distance, thus reduces fuel burning as well.

5.2.2 Economic Impacts

In term of economics aspect, the farmers strongly expressed that, the overall production cost is reduced because they don't have to depend on expensive agriculture inputs. Furthermore, farmers also mentioned that diversity in cultivated crops significantly contributes to the increase of their income. Harvestable products in per unit area are higher than under sole cropping with the same level of management. Besides that, farmers also are able to obtain high quality yield and the stable volume of productionthroughout the year because of less pest and disease attack andpost-harvest losses. In addition to that, diverse produce also opens the opportunity for farmer to involve in downstream activities such as production of processed food and beverages, compost and providing tourism and educational services. These provide additional income and contributing to rural development. All the visited farms economically survives not because of the big volume of production but the mass variety of produce

or products and value added services that meets more consumers preference. Adding to the economic benefits is the selling to the local food market through methods such as direct selling, farmers market, organic shops and farmers' society which cuts off much of the possible involvement of middlemen, thus increasing farmers profit. Further economic benefit, was selling the certified organic products inthe organic premium market.

> *"My jasmine garden was facing pest problem. The jasmine flowers had very short shelf life and my harvest was reduced. After adapting to natural farming, and going through conversion period, the entire previous problem were solved.* ***I don't have to spend on chemicals now****. I also now consult other on natural farming. I started to get* ***stable income****"* – Sanmarkam from Sanmarkam Jasmine Garden
>
> *"Besides selling vegetables with* ***premium price****, we also selling our own made Mulberry jam, fruit enzymes and herbs. Furthermore we provide to local market by our self, so we can a better profit margin"* – Gan from GK Organic Farm.
>
> *"I am now able to gain better income after conversion to organic farming because now I can have stable production and avoid using expensive pesticides and fertilizer*" – Vandavasi Farmer

Figure 5.1: Box quoting farmers taking on economic benefit of organic farming

5.2.3 Social Impacts

One of the social impacts was in terms of knowledge acquisition. Farmers were able to gain in depth knowledge of their farm ecosystems and learn new techniquessuchas composting, vermicomposting, making natural plant growth promoter and use it in their farms. Farmers were able to manipulate and improve the organic practices according to their needs. Thus the room for innovation and creativity exists. Beside the farming techniques farmers were also gained skills in management, marketing and public relations, as a result of direct participation in the local food system (i.e.direct selling, farmers market) and sustainable agriculture advocacy (i.e.campaigns, exhibition, trainings, and consultancy). Furthermore,

farmers also felt more freedom, since there is no pressure from input providers and middlemen. They were able to make their own decision regarding their farming system. Farmers also felt that, besides providing food to consumers, they are also contributing to the creation of sustainable environments, educating public and improving disadvantage communities. All these have helped to build farmers self-esteem and confidence. Organic farming empowers farmers.

From the health perspective, farmers told that, they are free from chemical exposure (pesticides and synthetic fertilizers) and their health is improved. In addition to that, more nutritious and safe food, was available for consumers from the organic farming practices. Beside these, numbers of other social benefits are associated with the consumers as well. For example through the Bandar Harapan the consumers were aware that their consumption was aiding the improvement of disadvantages life. They become more socially responsible. Furthermore, all the eco-tourism and educational activities at the organic farms also have enlightened the consumers on the concepts and issues of sustainable environment. The organic consumers merely not functioning as the end user but they realize that their consumption contributes to the development of a sustainable environment and empowerment of farm communities for a better life.

Knowledge acquisition

" I searched additional information by surfing the internet and applied to make my ***own Panchakavya****, which has better smell compare to the original mixture, now it's more user friendly"* – Mr.Sanmarkam , CAP National Sustainable Agriculture conference , 2008

"I use local wastes to make ***my own compost****, I don't have to buy from outside "* – Mr.Gan, Gk Organic farm.

" I cultivate Jatropha tree to ***rehabilitate the hard soil*** *in my farm. I can sell the Jatropha seed and the tree is easy to be managed"* – Mr.Ivon, Bandar Harapan Enterprise

Figure 5.2: Box quoting farmersconversation which shows their knowledge acquisition

Building up self-esteem and confidence

"Local scientists often visit our farm, we ***subsidizing the scientist*** *to carry out their research in the farm. The* ***time*** *we spent and the* ***knowledge we spent with them is all free*** *without any charge"* – Mr.Gan, GK organic farm

"I don't use Effective microorganisms (EM) to speed up the composting process. The EM sold in Malaysia is from Japan, so it's not suitable for the local farm conditions. IFOM also says farmers should not use foreign microorganisms in our farm. ***I want recommend*** *to our scientist to conduct research to make products from local microorganisms to improve the productivity local farmers"*- Gan, GK organic farm.

"A lot of ***school children*** *visit my farm and I feel that it is* ***my responsibility to educate them*** *on organic farming"* – Mr.Ivon, Bandar Harapan Enterprise.

" I believe I cultivate ***not just for providing healthy food****, but* ***beyond that*** *the farm builds healthy environment, give opportunity for the disadvantage to improve their life and educate public to protect environment and help the disadvantage"* - Mr. Ivon, Bandar Harapan Enterprise

"I'm ***not that well educated****, but now I'm giving a* ***speech in front of all of you****, I feel myself now* ***like a lecturer****" – Mr.Kaniapan at CAP National sustainable conference, 2008 .*

" Last time I have to dependent on the chemical dealer each time my plants got diseases, and he normally will give less convincing solutions, now after adopting natural farming, not only my farm become better but ***I can teach others on natural farming****, even agriculture department officers" – Mr.Sanmarkam at CAP National Sustainable conference, 2008 .*

Figure 5.3: Box quoting farmers' conversation that shows the building of their self esteem and confidence

5.3 Resilience and Persistence

Elements of resilience and persistence of organic farming were seen during the reason hike in global fuel price, which increased fertilizer price, resulting in high agriculture cost of production and low profit margin, thus burdening the farmers. But, organic farmers were not badly affected since most of them were excluded from fuel derived agriculture inputs. They were able to continue farming with fewer burdens. In addition, there are more, such element can be identified during pest attacks, environmental stress and economic downturn.

5.4 From Principles to Practice

According to the literatures organic farming promotes principles of holistic, ecological, localism, fairness and precautionary. Throughout my research I looked for practical application of these principles at the visited farms. The principle of holistic was clearly noted when farmers were emphasizing on creating an integrated farm system, building up soil fertility using organic methods and promoting biodiversity in the farm. They believed that creating a diverse farm ecosystem is essential in increasing farm productivity, and totally rejected the idea of managing farm in an isolated manner. Next principle of ecological was practiced by all the farms I visited. Practices such as composting, polyculture and biological pest control were all emphasizing on improving the farm environment, conserving resources and achieving ecological balance. The observed farms were practicing the principle of localism as well. They were selling their products to only local markets either straight to customers or through local organic shops. There is no involvement of middle man.

The principle of fairness was not practiced to extend of other principles. Only a few aspects of the principle, such as managing the natural and environmental resource utilization for production and consumption in socially and environmentally friendly way were noted among the farmers. Farmers were producing good quality food, however they were not contributing much for achieving food sovereignty of the country, because they are few in numbers, and the organic food is a new, niche and a small market, compared to conventional food produced through industrial agriculture system. The concept of production, distribution and trade that is open and equitable and account for real environmental and social costs, promoted by organic farming is not seen. This is because the industrial agriculture is a major food production system in the country. As for the precautionary principle, farmers were aware that, their farms

aredynamic;therefore any techniques they practice in their farm should be suited to their farms. They tend to innovate and adopt the techniques according to their farm ecosystems and avoid if they doubt the techniques.

5.5 Characterization of Case Study Farms

In general, all the organic farms that I visited were small holders, catering local demands, with farm size ranging from 2 acres to 15 acres. From my field visits, I noted that, there were two distinct groups of farmersin practicing organic farming. One group of farmers can be classified as “idealistic pioneers” (Ulmer*et al.*, 2005). For them, organic farming is part of a holistic lifestyle where the environment, the farm and the farmer are an interdependent community. Sustainability was a core philosophy of life. Organic farming was their initial way of farming, there was no conversion involved. Money was not their only goal in farming; there were other objective such as environmental services, public education and health awareness. These farmers havehigh levels of organic farming knowledge. The other type of farmers was, “reconstructive farmers”, who converted to organic farming, to overcome high agriculture production cost and less production of conventional farming. Tendency towards other objectives than financial benefits was very low. Element of sustainability beyond the farm activities was not seen among them. They are still beginners in organic practices, with about 3 years of experience, thus their knowledge level is still not as depth as the “idealistic pioneers”, but they demonstrated an active learning process.

Table 4.1: Characterization of case study farms

Idealistic Pioneers	**Reconstructive farmers**
Mr. Gan of GK Organic Farm	Mr. Sanmarkam
Mr. Ivon of Bandar Harapan	Mr. Somasundram
	Sukkonkolai Farmers (India)
	Vandavasi Farmers (India)
	Sikazhi Farmers (India)

5.6 Conclusion

The analysis shows that observed practices do not bring negative impacts to the environment. The practices are based on sustainable use of natural resources. Farmers also enjoy better profit by excluding expensive farming inputs, stable produce and additional income through downstream activities. Furthermore, in terms of social improvement, farmers had shown greater social inclusion and building up of innovation and knowledge. Furthermore organic farms showed persistence and resilience as well. All these clearly show that organic farming fits into the sustainable agriculture model. The observed practices also comply with the principles of organic farming. Principle of holistic, ecological, localism, fairness and precautionary were demonstrated at visited farms. From the field visits I can characterize the organic farmers into two groups. One group is “idealistic pioneers” and another one is “reconstructive farmers”. In the next chapter recommendation to develop organic farming towards achieving sustainable agriculture is shared. The overall conclusion is drawn on the possibilityof mainstreaming organic farming towards developing sustainable agriculture system in Malaysia.

CHAPTER 6

CONCLUSION

6.1 Recommendationsfor Developing Organic Farming in Malaysia:

Farmers Voice

Throughout my field visits, I had the opportunity to mingle and discuss with farmers on the issues that they are facing on the ground, how they overcome it and what is their hope and suggestions to develop organic farming towards achieving sustainable agriculture system in Malaysia. Taking all that into account, I am putting forward some recommendations below, for the development of organic farming in Malaysia toward achieving sustainable agriculture system in Malaysia.

6.1.1 Supporting Conversion to Organic Farming

Currently not much assistance is given to farmers to venture into organic farming. There is only credit given up to RM5,000 per ha as an incentive for conversion, which is not enough, compared to the high cost involved in the conversion.Despite this credit incentive there is much more support is needed in term of technical advice (i.e. soil fertility management, pest and disease control, cultivation methods, energy management, marketing). The initial stage of organic farming is very crucial. Normally the yield will be low, because the reconstruction of farm toa new system. This will normally be atrial and error period. This is the time where,technical advice is very important to support the farmers to address the errors and overcome themuntil the farmers and farmadapt to organic farming system. This type of support is very much lacking in Malaysia.

From my studies, I have noted that, in India, farmers have received strong support (i.e. financial and technical) from local NGO's such as CIKS to assistthem through the initial years of organic farming successfully. In Malaysia, farmers that I

met, pass through the conversion period with their own efforts, and only a few are being assisted by local NGO's. However, due to lack of financial and technical capacity, these local NGO's are only efficient in introducing the techniques to farmer initially but not effective in providing continuing support to the farmers. Therefore serious concern must be given to assist new organic farmers in terms of technical and initial financial support.

6.1.2 Building Organic Farming Knowledge

In order to provide technical supports to new farmers, it is very important that, those who are providing the support is well equipped with necessary organic farming knowledge. Organic farming in Malaysia is very new (about 30 years) and it is still growing.Organic farming knowledge varies among farmers. As characterized in our studies"idealistic pioneer" are more experienced compared to "constructive farmers". The majority of organic farmers in the country are constructive farmers. There are very few experienced farmers and experts in this field.Therefore, a mechanism must be created to share the expertiseof experienced farmers with new farmers and agricultural extension workers. Efforts in India by CIKS such as forming farmers groupand knowledge sharing via Information Technology (IT) is worth to be considered to be developed in Malaysia.

Currently Malaysian Agriculture Research and Development Institute (MARDI) and few NGO's such as CETDEM and CAP are providing trainingprograms for new farmers. However, the programs are insufficient and occasional. NGO's and relevant government bodies should find ways to work together to come up with a well-organized trainers training programs for the extension workers and training programs for new farmers. Besides these, more fundamental and

applied research and development activities needed to develop technologies that will benefit farmers. Research and development activities should be participatory, interdisciplinary and farmer centric. Knowledge building should not just stay in laboratories and among scientist; it must involve people from the ground, basically farmers. Farmers based biopesticide production and research unit, seed saving facilities and microbiology research laboratories by CIKS at India can be a good example to be replicated accordingly to our local needs.

6.1.3 Enabling Production of Organicfarming Inputs

Organic farming encourages farmers to produce their own production inputs, such as fertilizers and pest control materials. Most of these are made by utilizing in and off farm resources. The farms that I visited were all small holders and strategically located, with access to off farm resource, therefore, they are able to produce enough agriculture inputs for their farms. For an example at GK Organic Farm, all the required resources were collected from nearby villages and at Bandar Harapan, kitchen wastes were collected from nearby housing area. However, farmers indicate that, problem may arise, if the farm is located in area with less access to off farm resources and also if the farm size is big until the volume of available resources are not enough to produce required agricultureinputs.To overcome this, it is suggested that, a system for collecting the required resources and storing at a central facility, is established at all the strategic locations. This central facility should be easily accessed by farmers. Alternatively, organic inputs also can be produced in mass volume, at a central facility, and provided to the farmers. Thus the farmers will purchase organic production inputs from the central facility. Althoughsuch practices definitely will overcome the shortage of organic production inputs, butit will deviate the farmers

from the principles of localism and ecological. Furthermore, social benefits such as knowledge acquisition will not be effectively achieved.

6.1.4 Overcoming Shortage of Man Power

Organic agriculture involves more manpower. It proposes the use of fewer machines in order to reduce energy consumption. For an example, weeding is done by hand, or using weeding machines that useman power to move around. Packing is also manually done by farm workers. This is possible because the farm size is small and the workers are sufficient. However, production will face problems if the farm size is bigger and there is less manpower. Furthermore in Malaysia, we are facing of manpower shortage in agriculture sector. This for sure will be a challenge forthe growth of organic farming as well.

To overcome this challenge, it is proposed to practice use of solar powered, electric based or any other environmental friendly machines and tools in the organic farming. This will be an effective method to overcome the manpower shortage issue. Incentives and training should be provided for organic farmers to purchase and use such items in their farms.

6.1.5 Simplifying the Certification Process

The effort of coming up with a local certification system is worthy to be praised. The certification scheme known as Skim Organik Malaysia (SOM) is voluntary based. However, SOM has not attracted much participation from local organic farmers. Of the farms I visited only GK organic farm participated in the scheme an obtained the certification. According to farmers the organic scheme

involves various form inspection and accreditation; therefore it complicates farmers especially the new farmers that have less knowledge and experience. In addition, the scheme is only for the local market and not applicable for export purpose. Besides that, the scheme is not well known by the local consumers.

Following this, it is proposed that, the certification process is simplified and farmers are provided with good supervision from extension workers throughout the certification process. Furthermore, taking examples from CIKS effort, group certification is also can be considered an option in the local regulatory system. Beside, current efforts such as advertising on the highway billboards, participating in exhibitions and publishing in websites, more efforts also should be taken to create awareness of the existence of SOM among consumers.

6.1.6 Assisting Market Development

The organic market is unevenly dispersed in the country. According to the organic farmers, their products mainly bought by consumers that are concerned for healthy lifestyle and environment. They normally have higher purchasing power, and based at city areas.On the other hand, the majority of consumers prefers less expensive food and widely distributed at all the other part of the country. Therefore, the organic products marketwill only remain in city areas.

Initiatives should be taken to assist in widespread marketing of organic products. Current farmers market program by the Federal Agriculture Marketing Association (FAMA) could provide booths specially dedicated for organic products, and also monthly organic farmers market could be established at suitable locations all around the country especially out of the major city areas. Help also should be provided to establish organic cold chain facilities for transportation of organic

vegetables and fruits. The current local certification system should be upgraded to meet international standard, enabling local organic products for export purpose. Financial and technical assistance also must be provided for farmers who would like to export products to overseas. Furthermore, as seen in India, farmers associations could be established for the marketing purpose. My observation also shows, organic farming encourages downstream activities. Therefore financial and technical assistance can also be established to promote downstream activities among organic farmers.

6.1.7 Spreading the Organic Awareness

As mentioned earlier, the organic market is comparatively young market in this country and only concentrated in city areas. The majority of local consumers are not aware about organic farming. Therefore it is recommended that, proper survey should be conducted to find the status of organic awareness in the country. Following that, organic awareness campaign should be initiated nationwide, according tothe appropriate sector of the community. Integrating organic farming education into schools and higher education institutes also should be given priority. This can be done as part of the environmental education activities that are taking place nationwide in schools and higher learning education institutes. This will create future generations of consumers that are aware of organic farming and products. Furthermore, advocacy activities of farmers to community also should be supported and encouraged. Spreading the awarenessof organic farming is essential to increase the demand for organic products at all parts of the country.

6.2 Mainstreaming Organic Agriculture In Malaysia: Is It Possible?

Although the Third National Agriculture Policy has mentioned the need for conservation of natural resources, but at the same time, the main priority of the policy was to increase the productivity and competitiveness of the agriculture system of the country. The other part of the policy also encourages commodity based and technology driven agriculture, which indirectly supports the industrial agriculture system.Besides this, the major agricultural activity of the country, oil palm cultivation is driven by the industrial agriculture system. Oil palm cultivation is one of the major contributors to the country's economy. Therefore any major changes that under promote industrial agriculture in the country will affect the oil palm plantations and this might affect to country's economy as well.Beside these, current incentives and schemes to support farmers in rural areas, such as giving of subsidies tochemical fertilizers, isindirectly encourages, farmers participation inthe industrial agriculture system.

Considering at the strong industrial agriculture system, in the country, mainstreaming organic agriculture in Malaysia, will not be possible, if the current situation persists.Therefore, indeed of going for mainstreaming efforts, the way forward should be concentrating on the development of organic farming among the small holders, who are cultivating non-commodity crops (i.e. fruits, vegetable, herbs, and etc.). Besides that, flexibility in practice should be tolerated, such as allowing environmentally friendly machines, organic monoculture, and purchase of organic inputs and export of product to attract more new farmers.

As the current world population isincreasing enormously and our natural resources are becoming limited, the need to feed people without depleting the available natural resources becomes crucial. Although concentrated in a small region

of the globe and despite the complexity of this issue cannot be easily solved, this thesis highlights that, there are alternatives to industrial agriculture practice that depletes the natural resources, such as organic farming.

From the observations and discussion, it demonstrates that organic farming recycles the resources its uses and it does not use them extensively.It can be interpreted in a cycle arrow diagram as in figure (7.2).Furthermore, organic farming also fits the sustainable agriculture model derived from Serageldin (1995). The observations have also shown; organic farming is effective in maintaining the farm environment, providing a fair economic return and contributing social benefits, as in the figure (7.1). In addition, from the discussion with the farmers it is observed that organic farms demonstrate "resistance" and "persistence". All these shows that organic farming is suitableto be developedto achieve sustainable agriculture system in Malaysia, promised that all the proposed recommendations are taken into consideration for further implementation

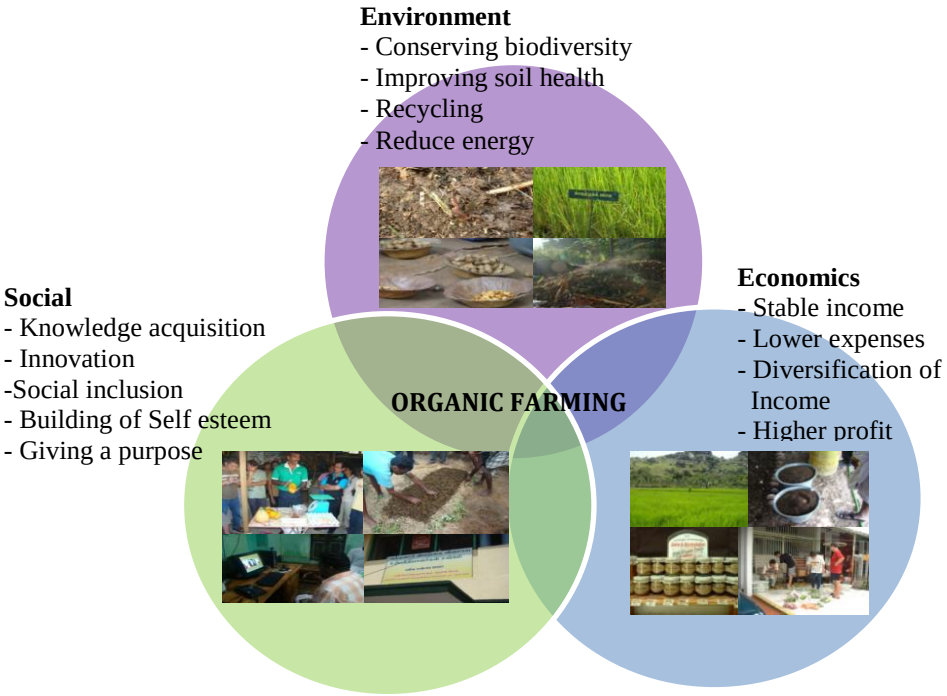

Figure 6.1: Observed organic farming practices presented in sustainable agriculture model.

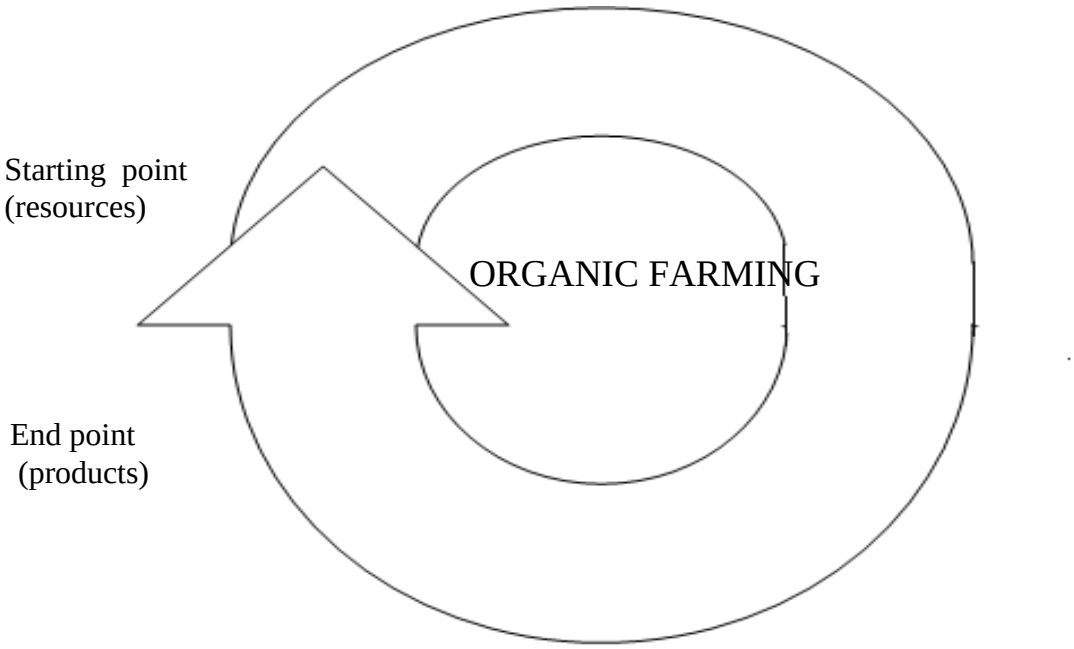

Figure 6.2: Observed practice presented a circular arrow diagram(Larson, 2008)

6.3 Future Research Possibilities

This exploratory study managed to highlight the practical application of organic farming principles and the feasibility organic farming into the sustainable agriculture model. Through this exploratory study the challenges and issues faced by farmers and potential solutions were identified as well. These were used to propose recommendations to develop organic farming towards achieving sustainable agriculture system in Malaysia. Following this exploratory study, I would like to recommend two possible future research.

First is a quantitative analysis of financial, environmental and social impacts of organic farming. The other one will be quantitative comparative study on the financial,

environmental and social impact between organic and non- organic farms. Both of these researches will provide quantitative data's that will give stronger validity to my exploratory findings and firmer support the development of organic farming toward achieving sustainable agriculture system in Malaysia.

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Appendix A:Pictures from field visits in Malaysia and India

Pictures for chapter 3

Figure 3.2: Welcome board at GK Organic Farm entrance

Figure 3.3: Gan (in round neck red t-shirt) discussing with fellow researcher.

Figure 3.4: View of certain section of GK Organic Farm.

Figure 3.5: Bandar Harapan sign board

Figure 3.6: Ivon explaining about the improved soil at his farm.

Figure 3.7: Vegetables growing at Bandar Harapan.

Figure 3.8:Sanmarkam showing sugar canes in his farm.

Figure 3.9:Sanmarkam mixing own made vermicompost.

Figure 3.10: Sanmarkam Jasmine Garden.

Figure 3.11: Somasundamworm house.

Figure 3.12: Somasundram (holding the basket) in discussion with me.

Figure 3.13: Vegetable cultivation near Somasundramworm house.

Figure 3.14:Three dimensional cropping systems, where pumpkins (*Cucurbita sp.* on top, sawi (*Brassica rapa*)and yam (*Dioscorea sp.)* on the ground, herbsand at the hedge.

Figure 3.15: Water spinach*(Ipomoea aquatica*) inter-cropped with sweet potato *(Ipomoea batatas)* at GK Organic Farm.

Figure 3.16: Cat whisker (*Orthosiphon Stamineus)* shrubs grown at hedge of vegetablebeds at Bandar Harapan.

Figure 3.17: On-farm and off-farm resources utilized for making compost at GK Organic Farm.

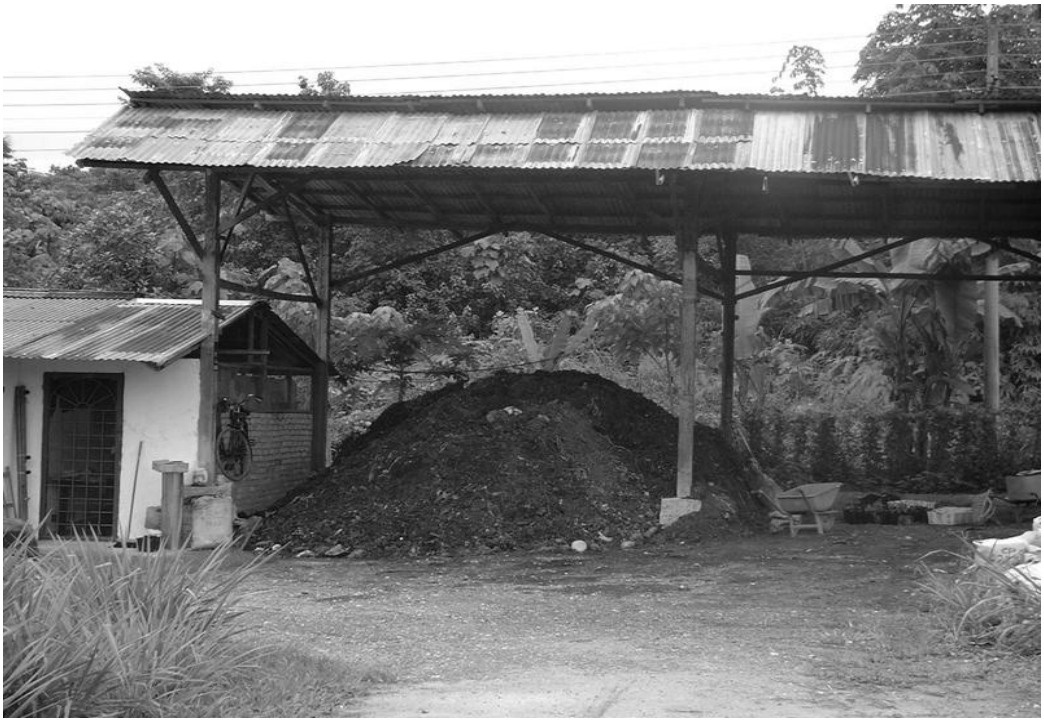


Figure 3.18: Well matured own made compost at GK Organic Farm.

Figure 3.19: Somasundram mixing the dried cow dung to be used as bed for vermicomposting.

Figure 3.20: Vermitanks at Sanmarkam Jasmine Garden.

Figure 3.21: Sanmarkam showing the worms used for composting.

Figure 3.22: Fermentation of fruit and vegetable wastes to produce liquid fertilizer at Bandar Harapan.

Figure 3.23: Fermentation of wastes in plastic tanks to produce liquid fertilizer At BandarHarapan.

Figure 3.24: Liquid fertilizer made at Bandar Harapan.

Figure 3.25: Biological nitrogen fixing through cultivation of Okra (*Abelmoschus esculentus*) at Bandar Harapan

Figure 3.26: Porous pots used as soil fertility management practice at Bandar Harapan.

Figure 3.27: Cut grasses are used for mulching the beds at GK Organic Farm.

Figure 3.28: Addition of cocoa pit on the soil to enhance soil fertility at GK Organic Farm.

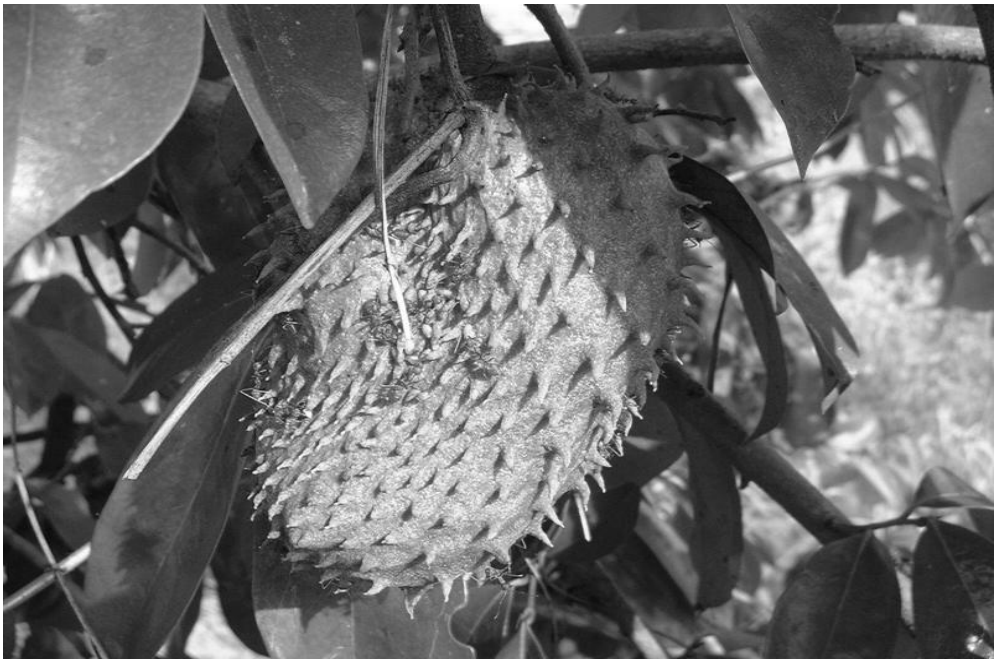


Figure 3.29: Sour soup fruit in the farm is well protected from fruit flies by red ants at GKOrganic Farm.

Figure 3.30: Herb shrubs grown at hedge of vegetable beds to attract beneficial insects at Bandar Harapan.

Figure 3.31: Bagging using old plastic bags is a simple but effective way to control insect and disease attack at GK Organic Farm.

Figure 3.32: Mulberry trees are netted to keep birds away from ripen fruits at GK Organic Farm.

Figure 3.33: Somasundram showing his own made natural insect repellent

Figure 3.34: Ornamental lotus and other water plants in the pond used as compost ormulching material at GK Organic Farm.

Figure 3.35: Livestock integrated with vegetable cultivation near Somasundramvermicomposting house

Figure 3.36: Own made irrigation pond cultivated with *Mimosa sp* for Biological Nitrogen fixing at Bandar Harapan

Figure 3.37: In house packing unit at GK Organic Farm.

Figure 3.38: Gan and his workers are packaging their harvest.

Figure 3.39: A local organic shop that sells GK Organic Farm products.

Figure 3.40: Organic vegetables from various organic farms, including from GKOrganic farm sold in a local organic shop.

Figure 3.41: Direct selling to local customers by GK Organic Farm.

Figure 3.42: In house packing at Bandar Harapan.

Figure 3.43: Selling of vermicompost to local customers by Somasundram

Figure 3.44: Small scale packing unit at Somasundram house.

Pictures for chapter 4

Figure 4.2: Sukkonkollai Organic Agriculture Research Farm.

Figure 4.3: Organic paddy field at Sukkonkollai.

Figure 4.4: “Vadan Samba”, a type of indigenous rice cultivated at the Sukkonkolai farm.

Figure 4.5: “KadaiKalutan”, a type of indigenous rice cultivated at the Sukkonkolaifarm.

Figure 4.6: Seeds of indigenous rice varieties are kept in seed storage room and properly labeled.

Figure 4.7: Vegetable seeds are kept inside aluminum box to protect from high moisture.

Figure 4.8: a) Yellow color tins attract insects. They are covered with gam to trap the insects. b) Cross sticks are placed to allow birds to sit on it and catch insects as prey.

Figure 4.9: Yellow box trap.

Figure 4.10: Five leaf extract prepared and put into pots, and covered white cloth. Cloth is opened in the evening and it will repel the insects.

Figure 4.11: Light traps are placed around the farm.

Figure 4.12: Hormone traps at the farm.

Figure 4.13: Vermicomposting used to recycle cow dung into nutrient rich compost.

Figure 4.14: Biodung composting where cow urine added as part of composting of farm wastes.

Figure 4.15: Nutrient rich compost made from composting the farm wastes.

Figure 4.16: “Amirthakaraisal” an organic growth promoter is mixed into irrigation channel.

Figure 4.17: Azolla cultured in a pond.

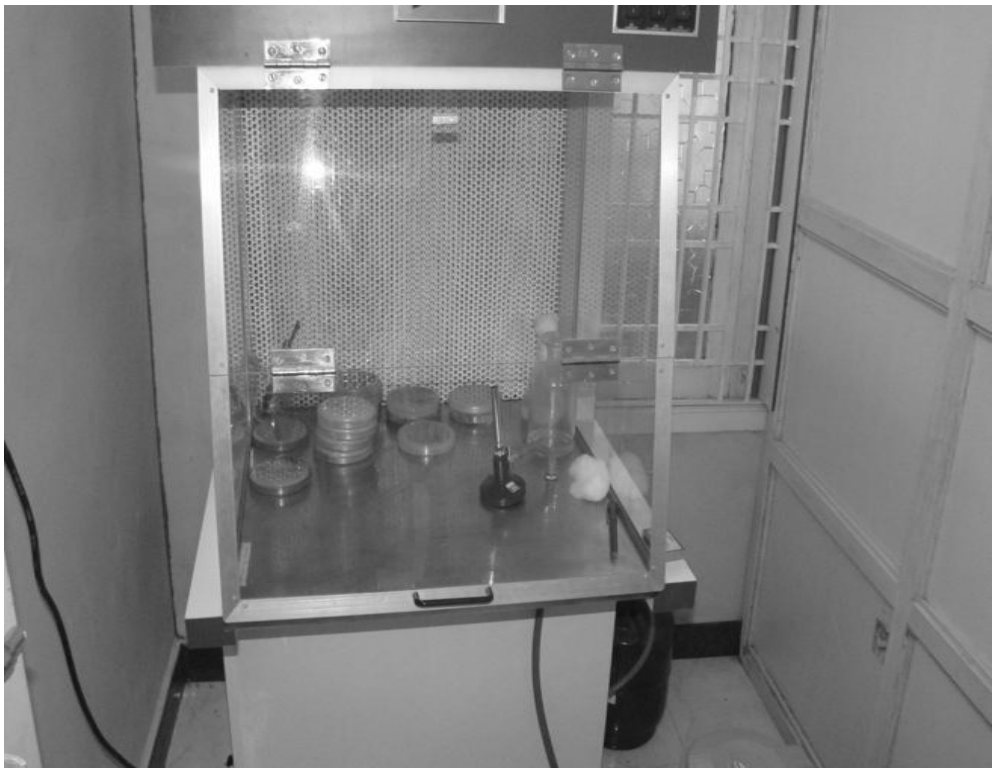


Figure 4.18: Equipment used to isolate microorganisms for the preparation of biofertilizers.

Figure 4.19: Isolated microorganisms cultured and kept in cold storage.

Figure 4.20: Biofertilizer production machine.

Figure 4.21: "Pancakavya" a natural plant growth promoter.

Figure 4.22: Vandavasi organic "Sangam" office

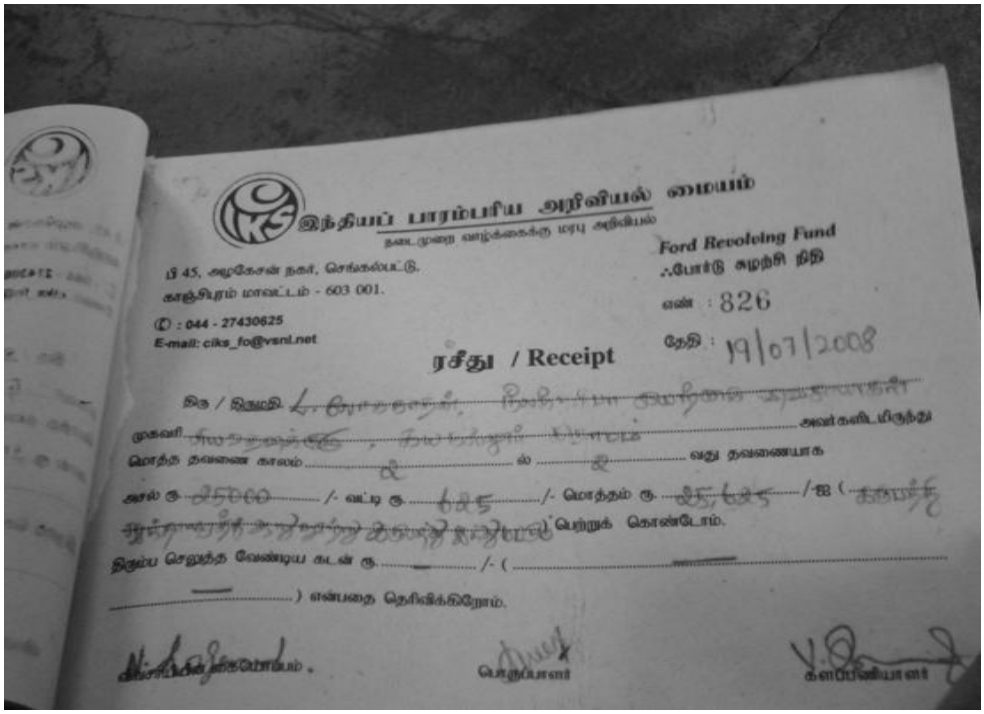


Figure 4.23: Receipt issued for repayment of soft loan for farmers.

Figure 4.24: Organic paddy field at Vandavasi.

Figure 4.25: Vermicompost is used to fertilize organic paddy field at Vandavasi .

Figure 4.26: Green manuringpractice in an organic farm at Vandavasi.

Figure 4.27: Machine used for oil processing as on of the downstream activities at Vandavasi.

Figure 4.28: Coconut leaves are recycled to be used as plates.

Figure 4.29: Vandavasi organic farmers.

Figure 4.30: Sirkazhibiopesticide production and CIKS organic service center.

Figure 4.31: Posters at the biopesticide production unit.

Figure 4.32: Biopesticide storage.

Figure 4.33: Herbs garden at the biopesticide unit.

Figure 4.34: Small hut to produce organic compost and growth promoters in one of organic farms at Sirkazhi.

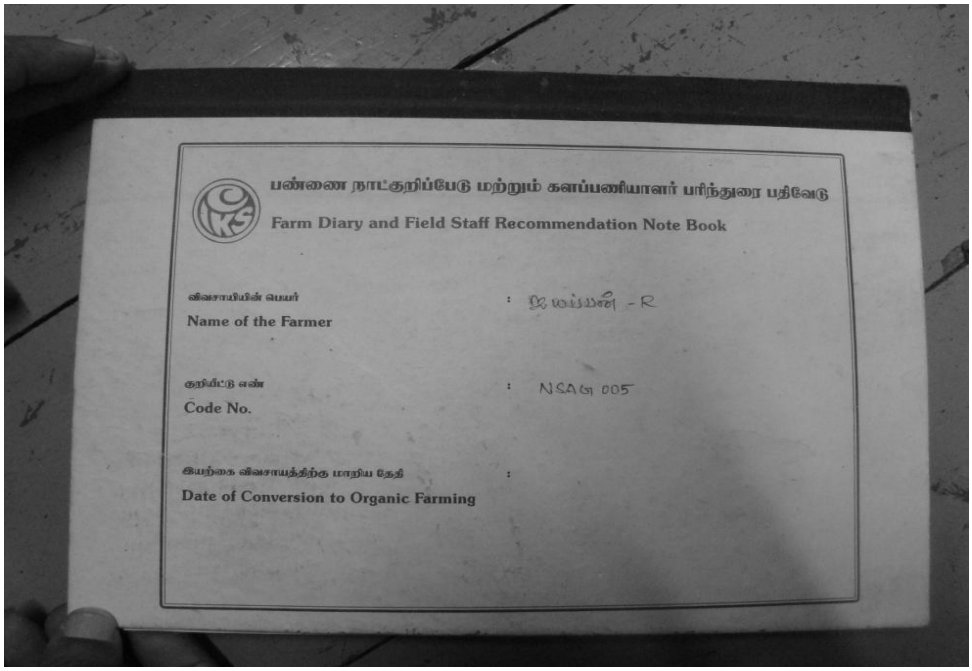
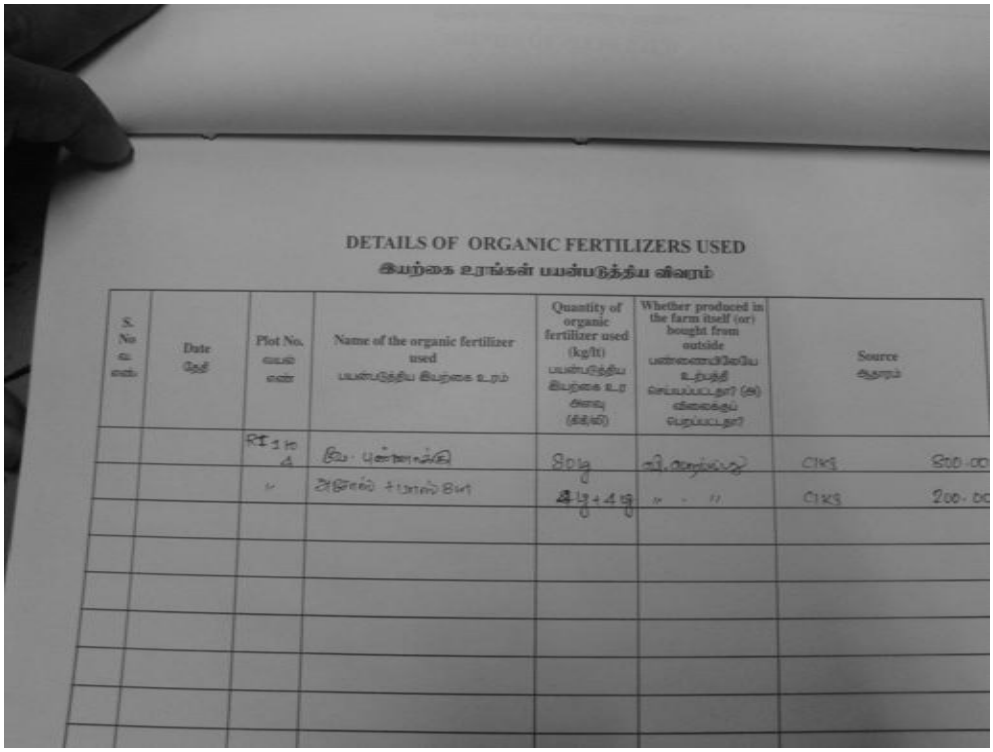


Figure 4.35: Organic practices and relevant management practices are recorded in a note book to apply for organic certification



DETAILS OF ORGANIC FERTILIZERS USED

இயற்கை உரங்கள் பயன்படுத்திய விவரம்

S. No. வ. எண்.	Date தேதி	Plot No. மடை எண்	Name of the organic fertilizer used பயன்படுத்திய இயற்கை உரம்	Quantity of organic fertilizer used (kg/lt) பயன்படுத்திய இயற்கை உரங்களது (கி.கி/லி)	Whether produced in the farm itself (or) bought from outside பண்ணையிலேயே உற்பத்தி செய்யப்பட்டதா? (அ) விலைக்கு வாங்கப்பட்டதா?	Source ஆதாரம்	
		RI 1 to 4	இலை பஞ்சகவ்யா	50lg	சி.வாங்கப்பட்டது	CIKS	800.00
		"	அசோஸ் + பாஸ்போ பேக்	4kg+4kg	" - "	CIKS	200.00

Figure 4.36: Recording of organic fertilizer consumption at one of the farm.

Figure 4.37: Capacity building of farmers by teaching them to use internet facilities for better communication, exchange of knowledge and information at Sirkazhi.

Figure 4.38: Empowerment of women through vermicomposting activity at Sirkazhi.

Picture for chapter 5

Figure 5.1: Earth worms beneath the soil at Bandar Harapan as an indicator of healthy soil.

Figure 5.2: Earthworms under the soil at GK Organic Farm as an indicator for healthy soil.

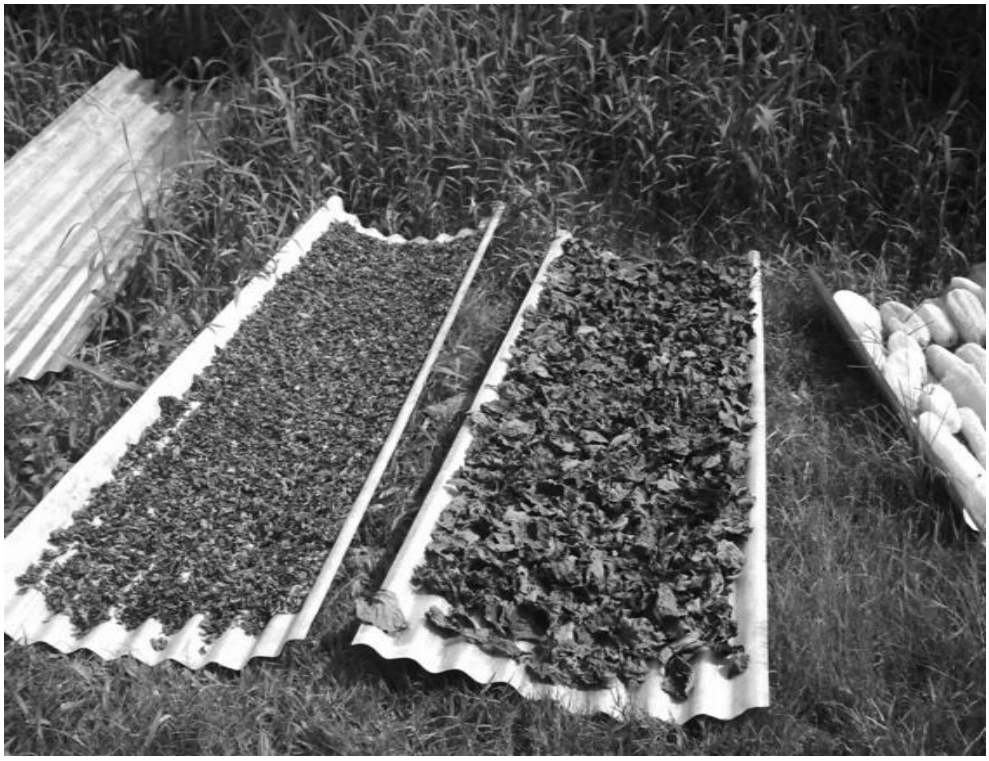


Figure 5.3: Various herbs at GK Organic Farm are dried up for packaging.

Figure 5.4: Various fruits from the farm enable GK Organic Farm to produce different jams and marmalades as one of the downstream activities.

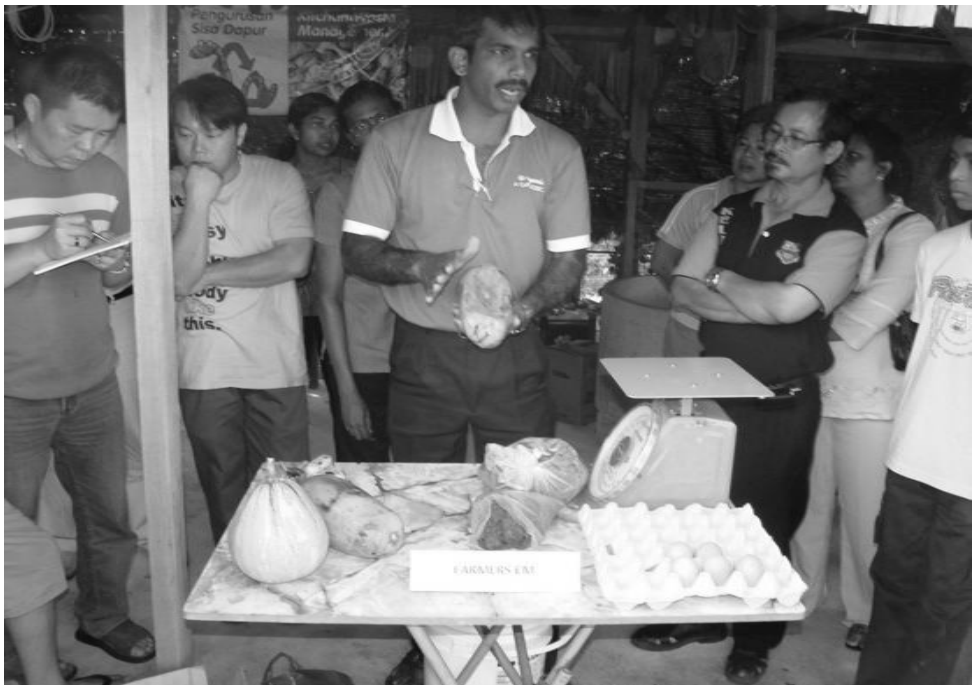


Figure 5.5: Sanmarkam is demonstrating the process of producing Farmers Effective Microorganisms(FEM) solution to the public.

Figure 5.6: Sanmarkam as an organic farmer is lecturing on organic farming practices to the public during national level conference.

Figure 5.7: Ganat GK Organic Farm is conducting educational tour for school students.