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Chapter 3

Organic agricultural practices among small holder farmers in South Western Nigeria

Sijuwade Adebayo and Idowu O Oladele

Additional information is available at the end of the chapter

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1. Introduction

Organic agriculture and biotechnology are two key innovations that are considered to have beneficial impacts on the future sustainability of agriculture (Wheeler, 2005). Conventional farming has played an important role in improving food and fibre productivity to meet human demands but has been largely dependent on intensive inputs of synthetic fertilizers and pesticides (Tu, Louws, Creamer, Mueller, Brownie, Fager, Bell and Shuijin, 2006). Moreover, the conventional intensive agricultural systems have side–effects which compromise food production in terms of quality and safety. Therefore, problems arising from conventional practices have led to the development and promotion of organic farming system that account of the environment and public health as main concerns (Melero, Ruiz Porras, Herencia and Madejon, 2005). Besides, traditional subsistence smallholding farming can no longer meet the needs and expectation of ever-increasing population of Nigeria (Adomi, Monday-Ogbomo and Inoni, 2003). Increasing agricultural productivity, self-sufficiency and poverty alleviation depend on the acceptance and full utilization of modern inputs, as long been recognized and policy formulation and implementation have been done (Aina 2007). The-Research-Extension-Farmers-Linkage-System (REFILS) has been able to ensure some awareness about the use of modern agro-inputs (Oladele, Sakagomi and Kazunobu 2006).

Organic farming represents a deliberate attempt to make the best use of local natural resources and is an environmental friendly system of farming. It relies much on ecosystem management which excludes external input, especially the synthetic ones. Ander son, Jolly and Green (2005) stated that organic farming is a production system that excludes the use of synthetically manufactured fertilizer, pesticides, growth regulators and livestock feed additives. The system relies on crop rotation, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation and aspects of biological pest control to maintain soil

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productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests. According to Agbamu (2002), organic farming technology is frequently regarded as the solution to environmental problems that are related to agriculture as well as food safety. Furthermore, Conor (2004) pointed out that organic farming developed as a response to what was perceived to be polluting food supply by modern farming methods and the ensuing degradation of the environment with chemical and other by-products of the industry.

Soil quality is a necessary indicator of sustainability land. The two farming systems (organic and conventional) studied at farm level in Central Italy has emphasized interesting differences on soil quality. It became obvious that organic management affects soil microbiological and chemical properties by increasing soil nutrient availability, microbial biomass and microbial activity, which represent a set of sensitive indicators of soil quality. (Marinari, Mancinelli, Campiglia, Grego, 2006). The bacterial biomass that perform soil functions and resist environmental stress occurring under organic farms scores higher than in other farming systems (Mulder, De Zwart, Van Wijnen, Schouten, Breure, 2003). Furthermore, the results confirm the positive effects of organic manures and diversified crop rotations on soil quality aspects. Rigby and Ca'ceres (2001) and Defoer (2002) reported that organic agriculture tends to conserve soil fertility and system stability better than conventional farming systems. The Food and Agriculture Organization of the United Nations regards organic agriculture as an effective strategy for mitigating climate change and building robust soils that are better adapted to extreme weather conditions associated with climate changes (IFOAM, 2009; Pretty, 1999).

Organic agriculture promotes food safety and quality. The past decade has been characterized by escalating public concern towards nutrition and health and food safety issues (Crutchfield & Roberts, 2000). As a result, at present, consumers perceive relatively high risks associated with the consumption of conventionally grown produce compared with other public health hazards (Williams & Hammitt, 2000, 2001). Mitchell, Hong, Koli, Barrett, Bryant, Denison and Kaffka (2007) discovered that fruits and vegetables produced organically have increased levels of flavonoids which are reported to protect against cardiovascular disease (Hertog and Hollman, 1996) and to a lesser extent, against cancer (Knekt, Kumpulainen, Jarvinen, Rissanen, Heliovaara, Reunanen, Hakulinen and Aromaa, 2002) and other age-related diseases such as dementia (Commenges, Scotet, Renaud, Jacqmin-Gadda, Barberger-Gateau and Dartigues, 2000) whereas the levels of flavonoids did not vary significantly in conventional treatment. Furthermore, Lumpkin (2005), and Zug (2006) noted that the use of chemicals in vegetable production has been identified as a major source of health risk and a cause of extensive environmental damage.

Organic agriculture improves ecological health because farmers maintain nutrient balances in soil through locally available organic materials or recycled farm wastes (Park, Stabler and Jones, 2008; Hynes, 2009). Stolze, Piorr, Harring and Dabbert (2000) and Olsson et al (2001) concluded that nutrient balances on organic farms are often close to zero and that energy efficiency is found to be higher in organic farming than in conventional farming. It also encourages ecosystem service which sustains agricultural productivity and resilience and advocates production intensification through ecosystem management. Fertility management in organic farming relies on a long-term integrated approach rather than the more short-term

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much targeted solutions common in conventional agriculture (Watson et al., 2002). The practice of organic agriculture has been associated with returns on investment because it offers farmers a much more secure income than when they rely on only one or two inputs (Osborne, 2009; Mcguirk, 1990). Besides, organic farm precludes purchases of organic inputs, loans and thus the profit margin made by farmers increases and farmers are better off financially (Sanchez and Swaiminathan, 2005; Mei, Jewison and Greene, 2006).

Unlike organic agriculture, which emphasizes effective soil management and biodiversity, conventional agriculture (also referred to as intensive agriculture) relies on farming a single crop year after year. To overcome the imbalance imposed upon a conventional farm's ecosystem, harmful agents, such as pesticides and synthetic nitrogen fertilizers are used. Unfortunately, conventional agricultural practices exacerbate rather than alleviate the effects of climate change. The consequence of conventional farming's ecological imbalance is a decline in soil organic matter, soil structure, fertility, microbial and faunal biodiversity. Combine these impacts with the nutrient overload that ultimately ends up in waterways, deforestation, and overgrazing that occurs due to changes in land use, and it's not difficult to see why many are now stating that conventional agriculture represents an unsustainable long-term option.

The description of organic agriculture in the preceding section has led to the generation of research output recommended by Agricultural Knowledge and Information Systems (AKIS) in order to enhance organic agriculture and make it more sustainable and profitable. The information generated on organic agriculture by various AKIS has created the need for vegetable farmers to fill the information needs and bridge the gap in their production activities. The way in which information is sought is information seeking behaviour. The study attempts to analyse the information seeking behaviour and adoption of organic farming practices among vegetable farmers in South Western Nigeria.

2. Organic agriculture

Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system (FAO, 1999). The FAO/WHO Codex Alimentarius guidelines defined organic agriculture as "a holistic production management [whose] primary goal is to optimize the health and productivity of interdependent communities of soil life, plants, animals and people".

Similarly, the International Federation of Organic Agricultural Movements, with over 750 member organizations in 108 countries, defined it as "a whole system approach based upon sustainable ecosystems, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs (IFOAM, 2006; IFOAM, 2002). The aim of organic farming is to create integrated,

humane, environmentally and economically viable agriculture systems in which maximum reliance is put on local or on-farm renewable resources, and the management of ecological and biological processes. The use of external inputs, whether inorganic or organic, is reduced as far as possible.

Certified organic food and fiber products are those that have been produced according to documented standards. They are foods that are guaranteed to have been produced and processed in a manner that avoids the use of synthetic fertilizers, pesticides, hormones, genetically modified organisms and irradiation, and which strives to enhance natural biological cycles and to meet minimum animal welfare standards.

"Certified organic agriculture" is defined as a certified system of agricultural production that seeks to promote and enhance ecosystem health while minimizing adverse effects on natural resources. It is seen not just as a modification of existing conventional practices, but as a restructuring of whole farm systems. However, "organic agriculture" is not limited to certified organic farms and products but can include all productive agricultural systems that use sustainable, natural processes, rather than external inputs, to enhance agricultural productivity (Scialabba and Hattam, 2002).

Organic farmers adopt practices to conserve resources, enhance biodiversity, and maintain the ecosystem for sustainable production and can lead to increased food production, in many cases we have seen a doubling of yields, which makes an important contribution to increasing the food security of a region (Park et al, 2008). Therefore, Non-certified organic agriculture' is defined as local, often traditional agriculture that is managed more or less in accordance with the principles of organic agriculture, but is not based on certification, trade and premium prices and it promises an alternative development path in rural areas of low-income countries (Halberg et al., 2006).

The principles of organic agriculture according to IFOAM are principle of Health-Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one indivisible; principle of ecology-organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them; principle of Fairness-Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities and principle of care-organic agriculture should be managed in a precautionary and responsible manner to protect health and the well-being of current and future generations and the environment. Literature suggest that the farm, farmer and institutional factors drive farmers to adopt new technologies (De Francesco, Gatto, Runge and Tretini, 2008; Rehman, Mckemey,Yates, Cooke, Garforth, Tranter, Park and Dorward, 2007; Hattam, 2006). Factors such as the financial and social-economic impacts of new technologies, effects of new technologies on the risk of the farm, available resources and technology transfer programme also have an effect on the decision of the farmer to adopt new technologies.

Organic agriculture is fast emerging as the only sustainable long-term approach to food production. Its emphasis on recycling techniques, biodiversity, low external input and high level output strategies make it an ideal replacement for the petroleum intensive agricultural

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methods that are currently contributing to global warming (IFOAM, 2008; Swift et al, 2004). There are a number of factors indicating that organic agriculture is far more future proof than conventional agriculture. These include ecosystem services (Pimentel et al, 2005 and Stolze et al, 2000); Ecological health (Backer et al, 2009, D'Agostino and Sovacool, 2011); Soil fertility and system stability (Reddy, 2010, Mader et al, 2002); mitigating climate change (FiBL, 2007, Lee, 2005); food safety and quality (Gallagher et al, 2005, Makatouni, 2002; Magnusson et al, 2001 and Torjusen et al, 2001); return on investment and poverty alleviation (Rigby and Caceres, 2001); consumer preferences (Willer and Youssefi, 2007, Chen, 2007 and Mondelaers et al, 2009); value addition (Ohmart, 2003, Mitchell et al, 2007); market niche (Alroe and Noe, 2008) and indigenous knowledge (Tengo and Belfrage, 2004, IFOAM, 2003).

3. Methodology

The area of study is southwestern Nigeria which comprises of six states namely: Oyo, Osun, Ogun, Ondo, Ekiti and Lagos States. Southwest is situated mainly in the Tropical Rainforest Zone, though with swamp forest in the coastal regions in Lagos, Ogun, Ondo and Delta States. The agricultural sector forms the base of the overall development thrust of the zone. The zone covers an area ranging from swamp forest to western up lands, in between are rain forest and the northern parts of Oyo and Ogun states having derived Guinea savannah vegetation. The areas lie between latitude 5 degrees and 9 degrees North and longitude 2 degrees and 8 degrees East. It is bounded by the Atlantic Ocean in the south, Kwara and Kogi states in the north, Eastern Nigeria in the east and Republic of Benin in the west. It has a land area of about 114,271km square representing 12% of the country's total land areas. The high concentration of agricultural activities justifies the choice of the study area (NARP, 1996).

The research design of the study is descriptive and quantitative which is defined by Bless and Higson-Smith (2000), as a study concerned with the condition that exist, practices that prevail, beliefs and attitudes that are held, processes that are on-going and trends that are developing. The study profile organic farming practices in southwestern Nigeria. The population of the study is the entire population of vegetable farmers in the South Western Nigeria. Cluster sampling technique was adopted for selecting the required sample of urban vegetable producers. From literature and preliminary surveys, vegetable production in urban areas that is market oriented is mostly carried out along perennial sources of water or lowlands. This constrains farmers to clusters around these sources of water. Therefore, cluster sampling is considered appropriate. The sampling technique involves random selection of three states in the southwestern Nigeria which were Oyo, Ogun and Ondo. Three local government areas in the urban were selected from each state to give a total number of nine local government areas used for the study. The choice of these Local government areas is based on the dominance of vegetable producers in the different areas. The three local government areas chosen in Oyo state were Akinyele, Egbeda and Ogbomoso south. The three local government areas chosen in Ogun state were Odeda, Obafemi Owode and Abeokuta north. The three local government areas selected in Ondo state were Akure south, Akure north and Ifedore. A cluster of vegetable producers was selected from each of the local government areas to give total of nine clusters.

Fifty producers were randomly selected from each of the nine clusters to give a total sample size of four hundred and fifty respondents for the study.

Data for this study was generated from primary sources based on the objective of the study. Interview schedule was used to elicit information from the respondents. The questionnaire consisted of 14 organic farming practices in southwestern Nigeria from which the respondents indicated use and non-use. These practices are crop rotation, application of compost, mulching of crops, inter cropping, mixed cropping, crop residues, cover crop, animal manure, organic fertilizer, bio control, natural insect predator. A split half technique was used to determine the reliability coefficient with a reliability coefficient of 0.85. The questionnaire was face validated by panel of experts on agricultural extension, agronomist and organic agricultural researcher. The panel consisted of lecturers in agricultural extension and Agronomy. The study took into account the ethical consideration which was addressed through, voluntary participation. Data were analyzed with the Statistical Package for Social Sciences (SPSS) 18.0 using means and standard deviation.

4. Results and discussions

Table 1 shows a list of 14 organic agriculture practices from which the respondents were asked to indicate their use or otherwise using a 2 ponit scale of Yes (2) and No(1). The actual mean is 1.5 due to the rating scale and a mean of greater than 1.5 denoted a use while a mean less than 1.5 denoted non-use. The mean scores of 11 out of 14 practices were above the actual mean which implies the use of these organic agriculture practices. These technologies are: minimum tillage, crop rotation, sanitation, intercropping, green manure, cover crop, fire, compositing, organic fertilizer, animal manure, and mulching. The results revealed the most prominent organic agriculture practices were minimum tillage (1.81, SD=0.9); crop rotation (1.80, SD=0.7) and mulching (1.79, SD=0.6). With respect to the use of minimum tillage, it is the practice that minimises the disturbance of the soil. The soil is not tilled intensively thereby improving the soil structure. It is a cultivation operation whereby soil is disturbed as little as possible to produce crop. Mulch residue from the previous crop is left on the soil surface which aids in retarding weed growth, conserving moisture, and controlling erosion. Therefore, the practice of minimum tillage is a common operation among the farmers that is usually carried out in order to prepare the soil before planting exercise. Baldwin (2006) noted that many organic farmers typically manage weeds mechanically and, therefore, cannot focus on building soil structure in the same way as conservational tillage practitioners which often relies on herbicides for weed control. Instead, organic farmers use innovative practices such as crop rotations, green manuring, and biological pest control to improve the soil structure and conserve soil organic carbon.

Crop rotation as one of the practices can be attributed to the use of indigenous knowledge, where farmers' belief that soil needs rest and some measure should be put in place to ensure soil maintenance and fertility. One of such measures is bush fallowing whereby a farmland that have been cultivated for some number of years is left uncultivated for few years in order

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to fallow and regain its lost nutrients. Crop rotation is another measure that is used by the farmers for this purpose. In this case, the farm land is not abandoned but crops that are cultivated on the farm are planted in sequence in order to maintain the soil fertility. Crop rotation is a practice that is as old as farming practice itself. Subba Rao (1999) and Stockdale, et al (2000) observed that crop rotations and varieties are selected to suit local conditions having the potential to sufficiently balance the nitrogen demand of crops. Furthermore, Bending and Lincoln, (1999) in their work among the US farmers noted that organic growers commonly plant rapeseed, mustard, and other brassicas as rotation crops to 'clean up' soil during the winter months. Besides, Crop rotations comprising both grass-clover fields and arable crops have shown to be relatively robust in relation to most problems with weeds, pests and diseases (Dubois et al, 1999).

Mulching ranks highly as a cost-effective means of crop residue usage against soil erosion in annual row-cropping systems on sloping lands; and is at the centre of a resurgent soil conservation ethic in much of North America (Shelton et al., 1995). However, it is not commonly used among the vegetable farmers who reported that mulching is predominantly used by yam producers. The findings of Junge et al, (2009) showed that mulching and cover cropping were mostly regarded as not labour-intensive, highly cost-effective, compatible and easy and cheap to adopt. The farmers had a positive impression of the effectiveness as erosion control measures and also mentioned additional advantages, such as the increased soil fertility from the decomposition of organic material and the release of nutrients however disadvantage of mulching was seen in the amount of grass required, the main material used as mulch in the area.

Other organic agricultural practices used by farmers include practices. Farm sanitation (1.69, SD=0.8), intercropping (1.66, SD=0.2), green manure (1.60, SD=0.9) and cover crop (1.55, SD=0.8). Farm Sanitation is keeping the field clean which help in preventing the growth and multiplication of weed, pest and diseases. The reason may be because farmers are also aware of those things that can prevent them from having good yield or output. Farmers go to farm everyday even after the planting period to weed at interval, remove any form of crop residue or decay of dead animal on their farm that can attract pests and diseases to the crop planted and can cause pollution in the environment. Farmers are aware that if weed are left to grow on their plot, it will compete with the crop planted for the available nutrients and will reduce their yield during harvest. Besides, some weeds affect the crop leaving a residual effect on the crop which can affect the taste or the appearance of the crop. Whenever this happened, the farmer will run at a loss because such crop will not attract buyers and may have to be sold at a ridiculous price.

Baumann et al., (2000) showed that intercropping as a cultural method can be used to suppress weeds and reduces pest population because of the diversity of crops grown. According to Sullivan (2003), if susceptible plants are separated by non-host plants that can act as a physical barrier to the pest, the susceptible plant will suffer less damage. Furthermore, intercropping reduced the nitrate content in the soil profile as intercropping uses soil nutrients more efficiently than sole cropping (Zhang and Long Li, 2003).

Organic agriculture practices	Mean	SD
Minimum tillage	1.81	0.9
Crop rotation	1.80	0.7
Farm Sanitation	1.69	0.8
Intercropping	1.66	0.2
Green manure	1.60	0.9
Cover crop	1.55	0.8
Fire	1.53	0.6
Composting	1.60	0.4
Organic fertilizer	1.68	0.9
Animal manure	1.71	0.3
Mulching	1.79	0.6
Natural pesticides	0.36	0.6
Farm scaping	0.16	0.6
Bio control	0.13	0.3

Table 1. Distribution of the respondents by use of organic agricultural practices

Katyal (2000) reported the application of organic manure as the only option to improve the soil organic carbon for sustenance of soil quality and future agricultural productivity. Wambani et al. (2006) compared the effect of farmyard manure application with recommended rate of inorganic fertilizer and it was discovered that the recommended rate of organic manure was the most profitable and preferred by the farmers because of their low cost, availability of organic manure and longer persistence of kales under these treatments.

Cremer et al; (1996) showed that cover crop residues interfere with the emergence of weed through the allelopathic effect. In addition, Langdale et al. (1991) concluded that cover crops reduced soil erosion by 62 per cent based on a comparison of bare soil and soil planted with a cover crop in the south eastern United States. Results presented for the use of Tithonia and legume cover crops shows increase grain yields significantly in Eastern Uganda (Delve and Jama, 2002). Moreover, Cover crops can improve soil quality (Dabney et al. 2001), and when planted at the beginning of the transition phase, may provide essential soil-building properties and improve weed suppression (Barberi 2002; Martini et al. 2004); however, soil quality effects and ability of cover crops to suppress weed species varies among cover crop species (Melander et al, 2005; Snapp et al, 2005).

The results further shows that the use of organic agricultural practice covered fire (1.53, SD=0.6), composting (1.60, SD=0.4), organic fertilizer (1.68, SD=0.9) and animal manure (1.71, SD=0.3). Wilson (2007) found that flame weeding also called flame cultivation or flaming, is a thermal physical control method that is part of the National Organic Program (NOP) under

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the organic foods production act of 1990. Flame weeding delays the presence of weeds in crop beds by killing the weeds present before the crop has breached the soil. This can significantly reduce hand-weeding labor costs. Farmers see the use of fire as an easy and faster method of clearing the weeds, trees and bushes particularly at the on-set of planting season when the land is prepared. Besides, some farmers believe that when the land is prepared with fire, the ash of the weeds, trees or residues that were burnt will make the soil to be fertile. Farmers see the use of fire for clearing as cost-effective compared to the use of hired labour. Anon (1999) reported that in Iowa, farmer feedback on flame weeding has been positive however burning as labour-saving tool to clear land and to prevent weed infestation is now being brought into question and many development agencies now advocate no-burning. In the communities, however, it is less a question of burning or no-burning but rather when, where, and how to reduce its negative impact (Aalangdong et al., 1999). Some northern farmers have made a conscious decision to cease bush burning with the aim of regenerating organic material (Millar et al 1996). Singh (2003) noted that organic farmers in India reported the capacity of manure (compost) to fulfil nutrient demand of crops adequately and promote the activity of beneficial macro-and micro-flora in the soil. Also, Ouédraogo et al (2001) showed that farmer was aware of the role of compost in sustaining yield and improving soil quality. However, lack of equipment and adequate organic material for making compost, land tenure and the intensive labour required for making compost are major constraints for the adoption of compost technology. Olayide et al (2011) assessing farm-level limitations and potentials for organic agriculture in northern Nigeria, discovered that the current levels of organic fertilizer use as share of the minimum requirements for take-off for organic agriculture in Nigeria was low despite its potentials.

Vanlauwe, (2004) noted that livestock manure is important in maintaining soil organic matter levels, a critical factor in soil health. Additionally, Omiti et al, (1999) noted that animal manure compost is the most common source of soil amendment in organic agriculture in Nigeria and indeed Africa. Farmers are fully aware of the fertilizing value of animal manure as well as the differences, for example, in nutrient release between the manures as also reported by Dittoh (1999) and Karbo et al. (1999). However, Mafongoya et al (2006) reported that in Africa, though, animal manure is one of the mostly used organic inputs, but as the need for increased agricultural production rises; it has been found to be limited in quality and quantity. Williams (1999) reported similar result among farmers in semi-arid West Africa.

However the use of natural pesticides (0.36, SD=0.6), farm scaping (0.16, SD=0.6) and Bio control (0.13, SD=0.3) were below the actual mean which indicate non-use by the farmers. This may be because these practices do not fit in to the farming system in the study areas. It can also be attributed to the technicality of the use of these practices usch that the application of the practices and the associated legislation and the process of securing permission for the use of these practices.

5. Conclusions

The paper has shown the nature and trend of the use organic agricultural practices among smallholder farmers in South Western Nigeria by highlighting organic agricultural practices that are prominent and those that were less prominent as well as practices that are not in use. Due to the prevailing opportunities and benefits associated with the use of these practices, this paper recommend that farmers should increase their awareness and use of organic agricultural practices.

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