Challenges of weed control in large scale organic horticultural crops production in Nigeria: Observatory notes from Ogbomoso agricultural zone

Adesina, G.O., Olabode O. S. and G. O. Kolawole

Department of Agronomy, Faculty of Agricultural Sciences, Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Oyo State.

ABSTRACT

Effective weed control is a panacea to bounty harvest in any crop production. The advent of organic agriculture which deemphasize the use synthetic agro-chemicals in crop production has posed a challenge for effective weed control in large scale organic agriculture production in the tropics. Several weed control options had been employed in the developed country. However, no rigorous attempt had been made to tackle the problem of weed control in large scale organic horticultural crop production in Nigeria. A visit to two large scale horticultural farms in Ogbomoso agricultural zone recently comfirm the challenges facing the farmers adopting organic farming methods. This is a task for all scientist involved in crop production business.

Corresponding author: lakinsina@yahoo.com

INTRODUCTION

Organic farming refers to ecologically-based production systems used to produce food and fiber (Treadwell *et al.,* 2009). It can be further defined by the proactive, ecological management strategies that maintain and enhance soil fertility, prevent soil erosion, promote and enhance biological diversity, and minimize risk to human and animal health and natural resources. Many kinds of farm products are produced organically including vegetables, fruit, herbs, grains, meat, dairy, eggs, fibers, and flowers (Treadwell *et al*., 2009).

According to Heckman, (2006), Organic agriculture gained significant recognition and attention in 1980, marked by the USDA publication Report and Recommendations on Organic Farming. The passage of the Federal Organic Foods Production Act in 1990 began the era of accommodation for organic farming in the USA, followed by another milestone with official labeling as USDA Certified Organic in 2002. In Europe, similar trend was observed. In Nigeria of recent, there is persistent advocacy for renewed attention being paid to organic farming.

In the western world where organic farming is gaining momentum, very small percentage of their population engage in farming and they receive heavy subsidy from their governments. Also, the governments are creating good enabling market environment for organic products.

Organic farming practice is gaining acceptance in the developing countries around the world most especially African nations because there is the made believe on the import of organically produced food stuff. Food product from organic field sells double the price when compared to food from conventional field in the developed world where there is an organized market. Based on the perceived higher income which is expected to accrue to the farmers producing organic foodstuff, many of the elites are in the fore front popularizing organic farming in Africa.

The proponent of organic farming conscientiously emphasize the advantages of this farming practice in terms of environmental consideration which include an aspect of soil, water and air pollution; soil fertility and nutrient renewal, climate change with respect to reduction in ozone layer depletion through avoidance of inorganic chemicals inputs in conventional agriculture, carbon dioxide level on the farmers' field; on health, food produced through organic farming minimizes risk to human and animal health and natural resources when compared with food produced through conventional agriculture.

Despite all the advantages associated with organic farming which by default or otherwise are still found in the practices of local farmers in Nigeria and other developing countries all over the world, the major limiting factor to the production of most field crops is weed interference on farmers' field. Weed control becomes more than an issue as we plan to make food available on common mans' table despite the population explosions being experienced in many of the third world nations. It is important to note that many of the food aid project embarked upon by many of the developed world are produced through conventional agriculture. The pertinent question then arose on the methods used in weed control in organic food production as it excludes the use herbicides or any other in organic chemicals.

Weed control

"Weeds happen" according to Mary-Howell and Matens (2002) and weeds have been a problem since man first began to cultivate a few chosen plant species as crops. Whenever a crop is seeded, weeds also appeared (Zoschke and Quadranti, 2002). Crop losses due to weeds are still very large, and they can result in significant financial burdens for farmers. For example, Zoschke and Quadranti (2002) reported that world-wide, a 13.2% loss of agricultural production is attributed to the competitive effects of weeds. Therefore, the control of weeds is an essential component of productive agriculture. It has been reported that "Organic growers' biggest problem is weeds, because they can't use herbicides," (Barbercheck, 2009).

In other parts of the world, many methods are being devised to combat weeds in organic fields. Grubinger (2008) listed Ten Steps toward Organic Weed Control. According to him many of the tactics below are commonly used by the organic growers in New England, and may have application to other regions and larger scale of production. Here are 10 steps toward successful non chemical weed control:

Lower weed pressure by managing your weed seed bank to reduce the need for cultivation and hand hoeing.

- Thoroughly compost animal manures to kill off weed seeds, or avoid using manure altogether.
- Keep weeds from going to seed: cultivate solely for that purpose, or handful, if necessary.
- Reduce weed influx by keeping alleys and field edges mowed or harrowed.
- Power wash tillage equipment after use in fields with a noxious weed problem.

Diversify rotations to keep a particular weed from proliferating.

- Try to alternate crops with different tillage requirements or time of planting.
- Include small grains or sod crops in the rotation if possible, to vary the habitat for weeds.

Use cover crops because they compete with weeds while providing other benefits.

- Select species for rapid growth that can starve weeds of light and nutrients. Also species that can provide ground cover and erosion control.
- Sow at high rates, drill the seed and even irrigate if necessary to assure thick stands and rapid establishment of cover crops.
- Regular incorporation of cover crops (green manuring) enhances soil tilth, making cultivation easier. Since frequent cultivation can harm soil structure, it is important to compensate by adding clean organic residues whenever practicable.

Feed the crop, not the weeds by manipulating fertilizer placement and timing.

- Avoid pre-plant broadcasting of soluble nutrients that may be more readily utilized by fast-growing weeds than slow-growing crops, and may even stimulate weed germination.
- Apply fertilizer near the rows where it is more likely to be captured by the crop.
- When using expensive bagged organic fertilizers, band at low rates at planting or side dress; rely on mid-season release of nutrients from compost and/or green manures for primary fertility.

Pick the right tool for the job. Cultivation is critical to weed control on organic farms, and doing it right requires a variety of tools that can be matched to the weed, crop and soil situation. Over the season, different tools are needed as the crops and/or weeds get larger.

- Blind, "over-the top" cultivation controls very small weeds, just germinated or emerged, before and sometimes after planting. The entire surface of the field is worked very shallow using flex-tine cultivators (e.g. Lely weeder), or rotary hoes.
- Shallow between-row cultivators such as basket-weeders, beet-hoes, or small sharp sweeps are used to cut off and uproot small weeds after the crop is up. These can get very close to the crop when it's small, without moving much soil into the row, and may be the only tools used on delicate crops like leafy greens.
- As vigorous crops grow, soil can be thrown into the row to bury in-row weeds using rolling cultivators (e.g. Lilliston), spyder wheels (e.g. Bezzerides), large sweeps or hilling disks. Some of these tools can be angled to pull soil away from the row when plants are small and later turned around to throw soil back on the row during subsequent cultivations.

Combine tools to cover the different zones in the field.

- Between-row, in-row, and wheel-track weeds must all be attacked.
- Watch out for narrow strips that are missed because they pass between too-few tools.
- Front-mounted or belly-mounted tools plus rear-mounted toolbars facilitate combinations that can assure complete coverage.

Set up for speed to minimize cultivation time and expense.

- Perfectly straight rows and alert tractor drivers are essential
- Uniform row spacing across comparable crops enhances the utility of a cultivation set-up.
- Consider multiple-row units; gauge wheels are helpful on wide units or if fields aren't level.
- With frequently-used tractor-mounted cultivators, get them set just right and leave them on all season to avoid repeated mounting and adjustment.

Timing is everything: get the weeds while they are small, before the field looks weedy.

- Very shallow cultivation of "white thread" weeds can minimize bringing up more weed seeds.
- Keep an eye on the weather and try not to get beat by the rain; if you do, be ready with the heavy artillery - more aggressive tools for bigger weeds, when you can get in.

Consider stale seed beds or stale rows using flame-weeders.

- Prepare soil for planting, and then use a flamer to kill very small weeds without disturbing the soil.
- One or two flamings are used, just before and/or after planting, but prior to crop emergence.
- Single burners flame just the crop row, multiple burner units cover a whole bed.
- Backpack, push-type and tractor-mount units are in use.

Experiment to fine-tune your weed management tactics.

- Start on a small scale with tools and techniques that are new to your farm.
- Identify your problem weeds and compare different combinations of rotations, cover crops, and cultivation tools for their effectiveness in providing control.
- Keep an eye on for new tools, or new ways to use old tools.
- Leave a "control" row or section untreated, so you can see the effectiveness of your tactics.

Organic by default

It pertinent to state here that majority of the peasant farmers in Nigeria are organic farming

practitioner by defaut in the production of vegetables and fruits. They produce without chemical inputs like mineral fertilizers and herbicides applied to their fields. This group of farmers are referred to as organic farmers by default.

Due to the scale of production of this group of farmers in term of farm size, they control weeds manually with the use of hoe and cutlasses.

Increasing the food basket

There is no doubt that increasing the food basket of Nigeria is a necessity if we will move ahead in all other facet of our national life. Based on the fact staring us on the face, the proponents of organic farming need to come to term with the devastative effect of weed in the tropical environments can reduce yield to zone.

In the western world where the organic farm produce is on their market, many factors favor the production and among these is the rapid advancement in technology which allows farmers to choose between alternatives in combating weed menace. Many of these new technologies are not available in our country and the thought of importing such technology may by out of reach to majority of our farmers. The few commercial big intensive farms that may have access to fund to procure many of these modern equipments will eventually produce at cost that will be uneconomical and thereby find it difficult to sell their product even in the international market.

Case Studies in Nigeria

Methods employed in the established farms in Nigeria (Case study of 4 hectares Organic Tumeric farm and 40 hectares Pineapple farm around Ogbomoso

Manual weeding: On these farms, casual workers comprising women, men, and children are employed in large number to either use hoes and cutlasses or hand to remove weeds from the farms. The labourers work tirelessly to reduce weed pressure on the farms. Due to the large sizes of these farms, before they complete the removal of weeds from all the sections of the farms others weeds would have emerged from where the labourers started. So, it was a vicious cycle of weed control until harvest.

Mulching: Mulching involves the use of organic plant materials, living mulch, and synthetic materials to smoother weeds on the field and reduce the negative impact of the weed on the crop plant. In the organic farm visited, grass mulch was employed to control weeds. The operation involves mass harvesting of tall grasses such as *Hypperrhenia rufa, Calopogonium spp, and*

Impereta cylindrica. These grasses were spread evenly on the field where organic plants are been cultivated. The overall objective was to suppress the growth of diverse weeds to enable the choice crop maximize the nutrients in the soil.

Challenges

- Availability of mulching materials

  On the commencement of farm operations, the continuous availability of organic mulching materials is a challenge which must be surmounted by the farm operator. At the initial stage, the grasses were available but later, the quantity of grass mulch required covering a 4 ha farm size become increasingly difficult. Trailer attached to a tractor was thereby used to transport mulch from whatever location to the field. The tonnage to cover a large hectarage farm will be enormous.

- Drudgery

  The methods of weed control required a lot of energy and drudgery and in no time may discourage few farmers who may be showing interest in organic farming. High labour was required for hand weeding and likewise for mulching.

- Cost / Transportation

  The over all cost of organic farm product will increase geometrically when consideration is given to the number of man-day that will be employed on the farm if the farming enterprise will be beyond subsistence level.

- Time

  During the farm operations, it was evident that complete weed control was unattainable because of the slow rate of covering enough ground on the field. As one end of the field was been hoed, weeds population increased in the part of the field earlier hoed.

- Nutrient mining from another location

  The grasses for mulching will mine nutrients from the locations where they are harvested and deposit same in the organic field, this may create some imbalance ecologically.

- Ineffective weed control

  Overall assessment of the weed control strategy did not yield appropriate result as such optimum yield expected from the cultivated crop may be unrealisable. Weed is one single pest that farmers spend approximately 70% of their time on. Invariably, in organic field, the problem of weed will be so enormous and this could frustrate any intending farmers out of this laudable enterprise.

Possible Solution for weed control in Nigeria

Planting of cover crop

One of the main panaceas to weed problem in organic field is the introduction of cover crops. These cover crops will serve as live mulch and will be of double advantage to the farmers. Amongst advantages of cover is their ability to smoother weed and addition of nutrients to the soil through nutrient recycling process and fixation of atmospheric nitrogen. Many of the crops used as cover crops belong to leguminous class which has potential to fix atmospheric nitrogen through nodulation processes.

Breeding of fast growing and hardy species

Breeding of crops that are fast growing and possesses traits that can easily suppress weed are to

developed. This work will involve a multi-disciplinary research team who will work on the major crops cultivated by farmers and incorporate weed resistance in the genome of these crops. Furthermore, in breeding work, hardy crops and species allelopathic characteristic should be selected for development and subsequent release to farmers for propagation.

Development of organo-herbicides

Organic herbicides that are ecologically save should be developed and tried for efficiency and adoption. The developments of these types of herbicicdes require good collaboration between herbicides manufacturing firms and scientists from the universities and other research institutes. Already in the market some of these types of herbicides have been released but the specificity must be ascertained

CONCLUSION

In the developed world, many of the incentives such as modern tools for mechanical weeding which can be used in place of applying synthetic herbicides are available. In other to have profitable organic farming practices in Nigeria, there is a need for more research efforts to put in place appropriate tools which will be adaptable to tropical environments. Moreover, if adoption will be done through importation of technology, serious field trials should be carried out to ascertain the workability of the likely tools that will be imported so that scarce resources will not be wasted on equipments which may not be useful in our local environment.

REFERENCES

Barbercheck Mary (2009). Research project to study weed-control methods for organic farming *http://live.psu.edu/story/40402/rss69*

Grubinger Vern (2008). Ten Steps Toward Organic Weed Control. http://www.uvm.edu/vtvegandberry/factsheets/orgweedconrtol.html Retrieved August, 2009.

*Heckman J. (2006)*A history of organic farming: Transitions from Sir Albert Howard's is Organic Farming: A*n eOrganic article and was reviewed for compliance with National Organic Program regulations by members of the eOrganic community.* http://www.extension.org/article/18655.

Mary-Howell & Klaas Martens 2002. Organic wed control: Cultural and Mechanical Methods. *Reprinted from ACRES. A voice for Eco Agriculture Vol. 32: 8*

Treadwell D., Jim Riddle, M. Barbercheck, D. Cavanaugh and Ed Zaborski (2009). What War in the Soil to USDA National Organic Program. Renewable Agriculture and Food Systems (2006), 21:143-150.

Zoschke and Quadranti, 2002Zoschke, A. and M. Quadranti. 2002. Integrated weed management: Quo vadis. *Weed Biology and Management 2:1–10.*