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The Organic Hydroponics Dichotomy

Can a Soil-less Growing System be "Organic"?

A White Paper
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Introduction

Hydroponics is a technology for growing terrestrial plants with their roots in nutrient solutions, i.e., water with dissolved fertilizers, rather than soil. Although interest in hydroponics first began in the early 1900s, it was not widely adopted until fairly recently.[1]

Hydroponic production is not mentioned in the Organic Foods Production Act (OFPA) of 1990. When the National Organic Standards Board (NOSB) first sought to define the term *organic*, they did not consider the concept of growing organic crops without soil.

In 1995, the NOSB defined organic agriculture as "*an ecological production management system that promotes and enhances biodiversity, biological cycles, and* ***soil biological activity****. It is based on* ***minimal use of off-farm inputs*** *and on management practices that restore, maintain, and enhance ecological harmony"* [emphases added].

Given this definition, can the term *organic* be applied to soil-less systems, such as hydroponic crop production? On its website, the USDA National Organic Program (NOP) states that "*Organic hydroponic production is allowed*." However, this statement is in direct contradiction to recommendations issued by the NOSB.

In this paper we review the history of NOSB and NOP actions with regards to hydroponics, summarize the organic community's concerns with soil-less organic production, and recommend actions the NOP should take.

Definition of *Organic*

Strictly speaking, the 1995 definition of organic would not only prohibit hydroponics, it would prohibit organic aquaculture as well. The NOSB has addressed that question, with the development of recommendations for organic aquaculture for aquatic animals (fish and shellfish) and plants (algae). Aquaculture involves the production of plants and animals in their natural environment – water. In contrast, hydroponics involves the production of plants in an unnatural environment, i.e., a nutrient solution rather than soil.

Later definitions of *organic* removed the reference to soil. In 2002, the NOP defined organic agriculture in CFR §205.2: "*Organic production [is] a production system that…respond[s] to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biological diversity."*

The home page of the National Organic Program (NOP) posts the following answer to the question *What is organic?*

[1] Growing Tomatoes Hydroponically, web page downloaded from http://ag.arizona.edu/hydroponictomatoes/propagat.htm.

Organic is a labeling term that indicates that the food or other agricultural product has been produced through approved methods that integrate cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity.[2]

Whether organic agriculture is considered a production system or merely a labeling term, it is clear that organic agriculture is more than a substitution of approved "organic" materials for synthetic chemicals. The later definitions do not require that organic systems be soil-based, but they do require that organic methods include use of biological practices that foster cycling of resources.

Overview of Hydroponics

Types of hydroponic systems

The term *hydroponics* encompasses a diversity of production systems used to raise terrestrial plants, plants that evolved to obtain nutrients through their roots in the soil. In a hydroponic system, terrestrial plants have their roots in air, water, or an inert medium, rather than soil. The roots are immersed in water or periodically bathed with a nutrient solution. Since hydroponic production often occurs in a greenhouse, cold frame, or hoop house, it is sometimes called ***controlled environment agriculture*** (CEA). The production of aquatic plants, such as the freshwater alga *Spirulina*, is not considered hydroponic production, but rather *aquaculture*.

There are several types of this relatively new technology. Various terms describe whether plant roots are in a solid substrate, whether the nutrient solution is recycled, and whether fish are part of the system.

Aggregate systems, also called *medium culture*, allow plants to be rooted in sand, gravel, vermiculite, rock wool, or other solid substances.

Liquid systems, also called *solution culture*, allow the plant roots to be immersed in the nutrient solution. Plants may be grown on floating rafts with roots suspended in the nutrient solution, or roots may be encased in plastic channels, in the *nutrient film technique* (NFT). Instead of being immersed in water, roots can be suspended in air and misted with water, a technique called ***aeroponics***.

Hydroponic systems are further categorized as **open**, where the nutrient solution is not reused, or **closed**, where surplus solution is recovered, replenished and recycled.

Aquaponics

When fish are added to the hydroponic system, it is called ***aquaponics***—the integration of aquaculture with hydroponics. An aquaponic system fosters the cycling of nutrients because the nutrient-rich water from fish tanks is used to fertilize (or "fertigate") the plants. Fertility is generated from biological

[2] http://www.ams.usda.gov/AMSv1.0/nop

cycles, rather than from off-farm inputs. Plants act as biological filters, so that the water can be recirculated and reused. It is considered a highly sustainable system.[3]

History of NOSB Deliberation and Recommendation

In 2001, the NOSB wrote a recommendation on greenhouse production but they did not specifically mention hydroponics.

By 2003 the NOSB prepared a guidance document for hydroponics and other soil-less growing systems. The Crops Subcommittee was scheduled to present its recommended guidance document for hydroponic production at the Spring 2003 NOSB meeting. The background material[4] considered various growing systems and posed questions to consider in regards to organic hydroponics, but did not present any firm recommendations. This document included both hydroponics and soil-less growing systems, which covers a broad range of production methods—perhaps too broad. There was a need to distinguish between hydroponics and other systems, such as mushrooms on wood substrate, or greenhouse plants in peat moss substrates.

In 2008, the Crops Subcommittee again began gathering information about hydroponics, and again used the term "soil-less growing systems," presenting a discussion document at the Spring meeting.[5] The discussion requested public comment relative to limiting hydroponic systems to naturally aquatic plant species, but there was never a recommendation voted on by the full NOSB.

In 2009, the NOSB presented a discussion item at the Spring meeting.[6] The document noted, "*Hydroponics … certainly cannot be classified as certified organic growing methods due to their exclusion of* ***the soil-plant ecology*** *intrinsic to organic farming systems….*"

The NOSB referenced OFPA's requirement for an organic system plan designed to foster soil fertility (§6513b), and the following regulations:

§205.203(a) The producer ***must*** *select and implement tillage and cultivation practices that maintain or improve the physical, chemical, and biological condition of the soil.*
§205.203(b) The producer ***must*** *manage crop nutrients and soil fertility through rotations, cover crops, and the application of plant and animal materials.*
§205.203(c) The producer ***must*** *manage plant and animal materials to* ***maintain or improve soil organic matter*** *content in a manner that does not contribute to contamination…* [emphases added]

At the Fall 2009 meeting, the NOSB presented a recommendation for rulemaking, the addition of §205.209 Greenhouse Production Systems.[7] *The recommendation again stated a prohibition of hydroponic systems.*

[3] Rinehart, L., and Diver, S. 2010. Aquaponics – Integration of Hydroponics with Aquaculture. ATTRA/NCAT. 28 pp.
[4] Bandele, Owusu. 2003. Crops Committee Recommendations for a Guidance Document Relative to Hydroponics and Other Soil-less Growing Systems.
[5] Crops Committee Discussions on Guidance Statements Relative to Soil-less Growing Systems, April 2008.
[6] NOSB Crops Committee: Soil-less Growing Systems Discussion Item. May 2009 Meeting.

After public comment was received, the Crops Subcommittee wrote a recommendation, *Production Standards for Terrestrial Plants in Containers and Enclosures*. The full NOSB approved the document and made a formal recommendation, which was submitted to the NOP on April 29, 2010.[8] This document is a result of years of work by the volunteers on the NOSB and public comment by organic stakeholders. The document recommended rulemaking action by the NOP.

The recommended regulations state, in part:

§205.209(b) ***Growing media shall contain sufficient organic matter capable of supporting natural and diverse soil ecology. For this reason, hydroponic and aeroponic systems are prohibited***. [emphasis added]

The discussion section of the recommendation states:

Observing the framework of organic farming based on its foundation of sound management of soil biology and ecology, it becomes clear that systems of crop production that eliminate soil from the system, such as hydroponics or aeroponics, cannot be considered as examples of acceptable organic farming practices.

It's clear that the NOSB and the organic community still intend organic farming to be based on ecological principles, as stated in the 2002 definition of organic.

Public Comments to the NOSB

The NOSB received very few comments that addressed hydroponic crop production, because the Crops Subcommittee Recommendation focused primarily on greenhouse production. Comments on hydroponic and aquaponic production were included in the recommendation because they involve growing crops in greenhouses without soil for the entire life of the crop.

Pennsylvania Certified Organic and Oregon Tilth Certified Organic (OTCO) both supported the recommendation to prohibit hydroponics, citing the organic foundation of soil in organic agriculture. The Organic Trade Association (OTA) supported the prohibition, because Canada prohibits hydroponic production from being certified organic. The OTA elaborated that the Canadian definition of hydroponics is more detailed than the U.S. definition, in that Canada only includes plants grown on an inert medium fed by a nutrient solution.

California Certified Organic Farmers (CCOF) strongly disagreed with the NOSB's recommendation. CCOF stated that they have certified organic hydroponic operations and that they support both hydroponic and aeroponic systems as eligible for organic certification.

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[7] NOSB – Crops Committee Recommendation: Greenhouse Production Systems. September, 2009.

[8] Production Standards for Terrestrial Plants in Containers and Enclosures, April 29, 2010. Formal Recommendation by the NOSB to the NOP.

Current NOP Status of Hydroponics (as of March 2015)

Although the full NOSB developed a recommendation to prohibit organic hydroponics in 2010, the NOP still has not adopted this formal recommendation, despite the fact that it was developed with input from many organic stakeholders and much volunteer time from members of the Board.

Because the NOP did not issue guidance or regulations, some accredited certifying agents (ACAs) have therefore determined by default that hydroponic systems can be certified organic. The ACAs that certify hydroponic/aquaponic systems, or have done so in the past, include OTCO, CCOF, QAI (Quality Assurance International), Indiana Certified Organic, MOSA (Midwest Organic Services Association), and Organic Certifiers, Inc. There may be others, but it is impossible to determine if an ACA certifies hydroponic farms because they are not required to state whether an organic farm is producing crops hydroponically. The List of Certified USDA Organic Operations on the NOP website typically does not state if the production is hydroponic. Only one operation on the NOP site states "hydroponic production" although there are several other farms that use hydroponic methods.

In response to this confusing state of affairs, Dave Chapman, an organic farmer in Vermont, drafted a petition to the NOP asking them to formally accept the NOSB recommendation. Over a year later, the "Keep the Soil in Organic" petition has nearly 1,200 signatures, roughly half of which are farmers.[9] On January 29, 2014, producers certified by Vermont Organic Farmers (VOF) voted to approve the following resolution: "Vermont Organic Farmers demand that the National Organic Program accept the 2010 NOSB recommendation to prohibit soil-less hydroponic vegetable production as certified organic." VOF continues not to certify hydroponic operations and publicly supports the petition.

On February 7, 2014, the National Organic Coalition (NOC) released their Position on Hydroponic Production.[10] They agree with the NOSB recommendation from 2010 that stressed "*organic farmers are not just tillers of the soil, but also stewards of soil ecology on the farm.*" NOC stated, "*Until a clear definition has been provided by the NOP, certifiers should not be allowed to certify hydroponic systems.*"

After the petition from Dave Chapman and the comments from the National Organic Coalition, the NOP clarified its stance. On February 21, 2014, the NOP posted information on their webpage under "Organic Topics of Interest." The information was also included in the Organic Integrity Quarterly.[11] (The full text is in appendix 2.)

The NOP stated that "*Organic hydroponic production is allowed.*" This statement on the NOP website does not constitute a regulation or even guidance, but it does provide support for certifiers who wish to

[9] Keep the Soil in Organic consumer and grower petition. 2014. http://www.keepthesoilinorganic.org/
[10] NOC Position on Hydroponic Production. 2014. Downloaded from http://www.nationalorganiccoalition.org/nosb.
[11] Organic Integrity Quarterly, May 2014 Newsletter, page 13, downloaded from http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5107710

certify hydroponic crop production systems. It indicates that crop production can be considered organic even when terrestrial plants are grown in pure nutrient solution or in an inert medium.

The NOP issued this statement in direct contradiction to the NOSB recommendation that organic hydroponic production should not be allowed. The NOSB recommendation was issued after public discussion and input from the organic community. The NOP statement was issued without public input, and without regard for the accepted process of standards development.

Organic Certifier Response to NOP Position on Hydroponics

As of March 2015, the NOP has not issued a proposed rule or established regulations based on this NOSB recommendation, nor has the NOP issued guidance to certifiers. This means that certifiers must interpret the regulations on their own. This leads to a lack of uniformity, with some ACAs choosing not to certify hydroponic systems as organic, while others accept organic hydroponic systems.

One certifier, Oregon Tilth Certified Organic (OTCO), has posted on their website some FAQs (attached in appendix 1). We applaud OTCO's efforts to provide transparency by posting information about their interpretation of organic standards on their website. The FAQs do provide information about the types of hydroponic systems that are being certified. Since these systems may be based on sterile water, rather than fertile soil, hydroponic farmers are concerned about obtaining a source of plant nutrients. OTCO addressed the problem as follows:

Can synthetic micronutrients be applied? What is required to document deficiency?
Synthetic micronutrients can be used in a hydroponic system. Most hydroponic systems are obviously deficient of micronutrients, however deficiency must still be documented (205.601(j)(6)). Documentation of deficiency could include water or tissue tests, notes of visual observations, extension or advisor recommendations, etc.

According to this interpretation, farmers can simply grow plants in water plus micronutrients in a system that does not integrate biological practices, foster cycling of nutrients, or promote ecological balance. In other words, hydroponic farmers can grow certified organic crops in a system that does not meet the NOP's own definition of *organic*.

These concerns about organic **hydroponic systems** are shared by other countries. The U.S.-Canada Equivalency agreement states that *"Agricultural products produced by hydroponic or aeroponic production methods **shall not be sold or marketed as organic in Canada**"* [emphasis added]. *Hydroponic production is also prohibited by EU regulations.*

It's not clear how these standards are being enforced when crops are exported to Canada or Europe. Organic certificates issued by ACAs are not required to specify which crops are grown hydroponically. A search of the NOP 2013 List of Certified USDA Organic Operations resulted in only three listings for

hydroponics,[12] one by Oregon Tilth (OTCO) and two by Midwest Organic Services Association (MOSA). It is likely there are far more than three hydroponic operations certified as organic, but they are not registered as hydroponic producers.

Mexico, Canada, Japan, New Zealand, and 24 European countries (including Holland, England, Germany, Italy, France, and Spain) all prohibit hydroponic vegetable production to be sold as organic in their own countries, although it may be exported as "organic" to the U.S. Since the United States is one of the few countries that allow hydroponic production systems to be labeled organic, "organic" hydroponic producers in other countries are often growing exclusively for a U.S. market. Currently "hydroponic organic" produce sold in this country is primarily grown in Mexico, Canada, or Holland exclusively for the U.S. organic premium market.[13]

Hydroponic Production as an Ecological System

From an organic perspective, hydroponic production uses less water than soil-based production, which is a wise use of resources in arid areas. However, hydroponic production minimizes biodiversity. By definition, crops are isolated from the soil, so that the soil microbes and invertebrates are not part of the hydroponic farm. Because hydroponic production is typically done indoors in a greenhouse, the crops are also isolated from the entire terrestrial ecosystem—soil flora and fauna, as well as all insects, birds, and other plant life. Typical hydroponic greenhouses do not "*promote ecological balance, and conserve biological diversity*," both of which are part of the definition of organic production systems.

Organic production is not merely input-substitution; it is an ecological system that fosters cycling of nutrients. Crop production systems that require all nutrients to be brought in from the outside do not represent an ecological system; therefore, they should not be labeled organic. The NOP statement on hydroponics presents a simplified view of organic crop production:

These producers use the same fertilizers and pest control practices as other organic farmers – primarily natural fertilizers and pest control methods.

While the same fertilizers may be used by all organic crop producers, the source of fertility for the crops is vastly different. When plants are grown in soil, the breakdown of organic matter by microbes and invertebrates releases most of the nutrients plant need, particularly the micronutrients. Organic farmers build fertile soil by adding organic matter from crop residues, animal manure, and cover crops, then providing the conditions that allow the organic matter to decompose and form humus. From the book, *Building Soils for Better Crops*[14]:

It's true that you can grow plants on soils with little organic matter…. However, as soil organic matter decreases, it becomes increasingly difficult to grow plants… But if attention is paid to proper organic matter management, the soil can support a good crop without the need for expensive fixes.

[12] Searched http://apps.ams.usda.gov/nop/ on June 12, 2014.
[13] http://www.washingtonpost.com/lifestyle/home/hydroponics-organic-label-is-all-wet/2014/02/18/e5d174f6-91f2-11e3-b3f7-f5107432ca45_story.html
[14] Magdoff, F. and Van Es, H. 2009. Building Soils for Better Crops. SARE, p. 12.

Soil, even sandy or poor soil, is an ecological system. Soils are not sterile; they have bacteria, fungi, and soil-dwelling invertebrates that increase availability of nutrients by breaking down organic matter. More important, the ecological approach of organic farming can improve poor soils. The use of cover crops, compost, natural sources of minerals, or grazing animals can improve the organic matter content and biodiversity in the soil. This is the fundamental process of regeneration that makes organic agriculture truly sustainable, able to grow food over the long term. Soil-less systems such as hydroponics seek to diminish the ecological complexity of the system.

Although some hydroponic systems are input-dependent, others do foster cycling of nutrients. Aquaponic systems are one example of an ecological system. An aquaponic system fosters the cycling of nutrients because the nutrient-rich water from fish tanks is used to fertilize (or "fertigate") the plants. Fertility is generated from fish wastes, rather than from off-farm inputs. Plants act as biological filters, so that the water can be recirculated, and reused. It is considered a highly sustainable system.[15]

These aquaponic systems are an example of hydroponic production that could very well be labeled organic. Before that is possible, though, the NOP must establish regulations for hydroponic production. Hydroponic systems, just like terrestrial systems, must be ecological systems if they are to be labeled organic.

Hydroponic systems may also have benefits in terms of sustainability, under certain circumstances. For example, crops grown in a closed hydroponic system (that recirculates water) in an arid climate may require less water than field-grown irrigated crops. Hydroponic vegetables grown in the winter for local consumption can reduce the need for vegetables transported long distances from warmer climates. Crops grown in the intensively managed greenhouse environment can require less acreage, therefore may be more suitable near urban environments. Despite the fact that certain systems may offer benefits, regulations are needed to ensure that all hydroponic systems are held to uniform requirements.

Commercial Status of Hydroponics

Hydroponic production allows crops to be grown at high densities in a controlled environment, for example, optimum temperatures. Hydroponic systems, particularly aquaponics, can be attractive to a small-scale grower to increase profitability. Hydroponic systems are increasingly being used on a large scale as well, especially to grow out-of-season crops.

There was significant commercial interest in hydroponic production as early as a decade ago, and certifiers were approving hydroponic systems as meeting organic regulations.

The organic community is not alone in its interest in a marketing label for hydroponic crops. Certified Naturally Grown (CNG) is developing a new certification for aquaponic operations. CNG is a peer-reviewed (alternative) certification program that is based on the USDA organic regulations.

[15] Rinehart, L., and Diver, S. 2010. Aquaponics – Integration of Hydroponics with Aquaculture. ATTRA/NCAT. 28 pp.

They state on their website:

A meaningful certification program would require a new set of standards specific to aquaponic production. And developing standards is about more than simply saying "no chemicals". CNG's certification programs must also take into account the materials used in production, energy use, and impacts on natural resources, among other things.[16]

As CNG considered the issues, they determined:

[H]ydroponic operations are not a good fit for CNG certification because there are currently few sources of natural fertility well-suited to hydroponic operations. Commercial hydroponic operations typically rely on synthetic fertilizers.

This reasoning by CNG is relevant to the NOP, as it decides whether to continue to allow organic hydroponic operations. If no action is taken by the NOP, it allows other programs, such as CNG, to be viewed as the gold standard for consumers.

Recommendations

At the present time (March 2015), hydroponic growers are achieving organic certification without clear regulations that are specific to their ecological system. This situation needs to be remedied.

Regulations specific to hydroponic systems are needed

At this time, hydroponic systems are allowed, even if the organic production method is merely input-substitution. For example, commercial hydroponic operations rely completely on synthetic fertilizers. Replacing those synthetic fertilizers with natural materials is a form of input-substitution; it does not create an ecological system. The NOSB, and in fact the entire organic community, needs to come to agreement on what type of hydroponic system are acceptable for organic production.

In addition, since there is some disagreement over whether hydroponics should be certified organic, the organic certificate should clearly indicate which crops are hydroponically grown.

A new section of the National List is needed for hydroponic crops.

It is particularly important to develop guidelines on sources and types of fertilizers that are allowed for organic crop production. The synthetic micronutrients that have been approved by the NOSB for terrestrial crop production, including boron, zinc, copper, iron, manganese, molybdenum, selenium, and cobalt, are to be used only if a soil deficiency is documented. These micronutrients, and indeed all the synthetic fertilizers on the National List, were reviewed by the NOSB for use in terrestrial systems. When the NOP declared that hydroponic production was allowed, that decision allowed all the synthetic nutrients that were never reviewed for use in a hydroponic system.

[16] Downloaded from http://community.naturallygrown.org/aquaponics_certification_in_development

As part of the development of standards for hydroponic production, there needs to be some requirement for evidence that synthetic micronutrients are needed. If organic certifiers simply replace the requirement for soil testing with a requirement for water testing, all the synthetic micronutrients will be allowed.

Synthetic materials on §205.601 should be evaluated for hydroponic production
When materials are petitioned to be added to §205.601 of the National List, the evaluation focuses only on terrestrial crops. Some materials may be appropriate only for terrestrial, but not for hydroponic, ecosystems. An example of this is aqueous potassium silicate (APS), a highly soluble synthetic fertilizer that is scheduled to sunset in 2015.

The initial petition requested use of APS as a source of potassium fertilizer for hydroponic crops. Although APS is on the National List for use as an insecticide or plant disease control, clearly it can also be used as a source of synthetic macronutrients in hydroponic production. When materials are reviewed for inclusion on the National List, they should be reviewed for appropriateness in a hydroponic system. This has not been done in the past, perhaps because NOSB members assumed that hydroponic systems were not allowed to be certified organic.

The NOSB and the organic community should address questions specific to soil-less growing systems
The regulations for hydroponic systems must clarify specific requirements for crop producers, including:

- What types of growing media are allowed?
- What sources of fertility are allowed?

In addition, there should be recognition of the ways in which the hydroponic operation is part of the larger ecological system. Otherwise, there will be little to differentiate organic hydroponic systems from conventional systems. Organic regulations require farmers to use practices that build or maintain soil health, such as cover cropping and crop rotations. Hydroponic systems should also address practices that regenerate the ecosystem. This may include the effects on the soil, water, and solid waste systems that the farm is part of. Questions to consider include the following:

- What is the role of off-farm inputs? Hydroponic production often has a high reliance on off-farm non-biodegradable materials.
- Is the growing medium composted, reused, or recycled?
- Are the non-harvested portions of the plants composted, or discarded as trash (i.e., sent to a landfill)?
- What methods are used to dispose of plastic and other non-biodegradable materials, such as plant supports?
- How is water disposed of after crops are harvested? Is the nutrient water added to plants outdoors, or is it added to a municipal waste system?

- Are there any practices that preserve biodiversity within the system, such as symbiotic culture of aquatic animals and plants?
- If the operation is limited to crop production, does the grower take steps to increase biodiversity of the outdoor environment to offset the decrease in biodiversity seen in hydroponic culture?

Conclusion

In 2010, the NOSB made a clear recommendation: hydroponic systems should not be eligible for organic certification. We urge the NOP to respect that decision and enforce it.

The Organic Foods Production Act (OFPA) established the NOSB "*to assist in the development of standards for substances to be used in organic production and to advise the Secretary on any other aspects of the implementation of this title.*"

The recommendation of the NOSB represents a major investment in both time and money, by the federal government, non-profits, industry, organic certifiers, and other organic stakeholders. The NOP has stated that they are not legally required to follow NOSB recommendations, and a lawyer might uphold that interpretation. We suggest a common-sense interpretation: When a board is created to advise the federal government, the intention is that the government will follow that expert advice. The intention of OFPA was to involve a volunteer citizen board (the NOSB), along with the entire organic community, in creating organic regulations based on consensus. If the original writers of OFPA wished to have the federal government draft regulations without input from citizens, they would not have established the volunteer board with representations from diverse representation from the organic community. Instead, they chose a democratic approach, believing that federal regulators would honor their intentions.

In the long term, if the NOP is to continue to allow organic hydroponic certification, the NOP should request that the NOSB review again the possibility of organic hydroponic production. With carefully drafted standards, organic hydroponic production could become more accepted by the organic community. Until then, there is a need for additional scrutiny of crop production materials, recognizing that they may be used in hydroponic production under the current NOP policy.

Appendix 1. Oregon Tilth Certified Organic (OTCO) Hydroponic FAQs[17]

Questions and Answers Regarding Organic Hydroponic Operations

Does the land on which a hydroponic system is constructed need to be free of prohibited materials for 36 months (205.202(b))?
No. A soil-less system is not required to meet the land history requirements.

What type of growing media can I use?
Only non-synthetic growing media is allowed. Any substance which supports the root system must be non-synthetic. Note that rock wool is a prohibited synthetic due to its chemical methods of production (see OMRI, and definition of "Synthetic" in 205.2).

Are synthetic rafts, floats, tables, containers, gutters, etc. allowed?
Yes. Any structure that merely surrounds or supports the plant, and is not a media for the root system, can be synthetic. This is analogous to a plastic pot or seedling tray in a greenhouse.

What is allowed for pH adjustment?
Only non-synthetic (natural, mined) or National List synthetic materials are allowed for pH adjustment. Examples of allowed materials for pH adjustment: citric acid (produced by a non-GMO organism), vinegar, calcium carbonate (oyster shells, etc.). Examples of prohibited materials: nitric acid, phosphoric acid, potassium hydroxide, calcium hydroxide.

Is regular water testing required?
No, but the water must not contaminate the organic crop with prohibited substances.

What needs to be in place for an inspection to occur?
The system must be complete with all equipment and ready to begin production, but plants do not need to be growing to be inspected.

Am I allowed to paint the inside of my galvanized tank or other equipment in the growing system?
Yes, but you must show that the paint is not contaminating the organic crop (i.e., leaching or peeling).

Can I use pressure-treated lumber for construction of my building or beds?
Yes, but pressure-treated wood must not contact the water the plant is grown in or the organic crop (205.206(f)).

Can the operation be indoors (i.e., in a house or garage)?
Yes. There is no requirement in the organic standards that plants be grown outdoors.

Are Fill & Drain (Ebb & Flow) systems allowed?
Yes. Fill and Drain is a method of water management and is allowed.

[17] Downloaded from http://tilth.org/farmers/otco-hydroponic-faqs, May 28, 2014

Can manure be used in a growing media mix?
Yes, the restriction on manure is the same as applied to any other cropping system (205.203(c)). If the water or manure touches the organic crop then a 120-day pre-harvest interval is required.

Can synthetic micronutrients be applied? What is required to document deficiency?
Synthetic micronutrients can be used in a hydroponic system. Most hydroponic systems are obviously deficient of micronutrients, however deficiency must still be documented (205.601(j)(6)). Documentation of deficiency could include water or tissue tests, notes of visual observations, extension or advisor recommendations, etc.

Can I operate a split production system?
Yes, but they must be physically separate and there can be no commingling of water or inputs. Records must be maintained to confirm that contamination and commingling has not occurred.

Does fish food or medicine need to be organic?
No. OTCO considers that fish feed is consumed by the fish and not used by the plants. All fish feed and medicine inputs are allowed. However, chemicals which modify the pH of the water, or which can be taken up directly as plant nutrients (potassium hydroxide, phosphoric acid, etc.), are not considered fish food and are therefore not allowed.

Can fish food contain antibiotics?
Yes, provided that antibiotics will not contaminate the organic crop. Antibiotics may not be administered in the same solution used by the organic crop. Antibiotics which are solely used for fish production are allowed, as long as it is not intended as a crop production input.

Does an aquaponic system require a pre-harvest interval for fish manure, or testing of water that includes fish excrement?
No. The NOP definitions in 205.2 states that "Manure" is produced by livestock, and the definition of "Livestock" excludes aquatic animals. No pre-harvest interval or testing of water is required. However, the water used for organic production must not contain chemicals (nitrates, etc.), which could contaminate the organic crop.

For effluent, what are the requirements for the prevention of leaching and/or disposal of excess nutrients?
The operation must manage effluent in a way that does not contribute to the contamination of crops, soil, or water. This must be included within the operation's Organic System Plan.

Appendix 2. NOP statement on Organic Certification of Hydroponic Crops

The following text was downloaded from
http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateJ&page=NOPTopics.

The text was also published in the Organic Integrity Quarterly, May 2014 Newsletter, page 13, downloaded from http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5107710

Organic hydroponics is a method of growing plants using mineral nutrient solutions, in water, without soil. Terrestrial plants may be grown with their roots in the mineral nutrient solution only or in an inert medium, such as perlite, gravel, biochar, or coconut husk. Some organic farms are utilizing hydroponic growing methods to produce organic crops under the USDA organic regulations. These producers use the same fertilizers and pest control practices as other organic farmers—primarily natural fertilizers and pest control methods. Organic hydroponic production is allowed as long as the producer can demonstrate compliance with the USDA organic regulations.

Accredited certifying agents are certifying organic hydroponic operations based on the current organic regulations and the operation's Organic System Plan. In the future, the NOP may provide additional guidance regarding organic hydroponic production and how the regulations apply to such methods.

The National Organic Advisory Board (NOSB) completed their final recommendations on crop production in containers and enclosures (e.g. greenhouses) greenhouses in 2010. The NOSB's 2010 recommendation included a provision for not allowing organic hydroponic production. The NOP continues to work on evaluating and implementing a backlog of older NOSB recommendations including the greenhouse recommendation. Any proposed changes based on the NOSB's greenhouse recommendation that would affect organic hydroponic operations would involve opportunities for public comment.

Appendix 3. USDA Organic Regulations – Micronutrients

§ 205.601 Synthetic substances allowed for use in organic crop production

(j) As plant or soil amendments.

(1) Aquatic plant extracts (other than hydrolyzed)—Extraction process is limited to the use of potassium hydroxide or sodium hydroxide; solvent amount used is limited to that amount necessary for extraction.

(2) Elemental sulfur.

(3) Humic acids—naturally occurring deposits, water and alkali extracts only.

(4) Lignin sulfonate—chelating agent, dust suppressant.

(5) Magnesium sulfate—allowed with a documented soil deficiency.

(6) Micronutrients—not to be used as a defoliant, herbicide, or desiccant. Those made from nitrates or chlorides are not allowed. Soil deficiency must be documented by testing.

(i) Soluble boron products.

(ii) Sulfates, carbonates, oxides, or silicates of zinc, copper, iron, manganese, molybdenum, selenium, and cobalt.

(7) Liquid fish products—can be pH adjusted with sulfuric, citric or phosphoric acid. The amount of acid used shall not exceed the minimum needed to lower the pH to 3.5.

(8) Vitamins, B_1, C, and E.

(9) Sulfurous acid (CAS # 7782-99-2) for on-farm generation of substance utilizing 99% purity elemental sulfur per paragraph (j)(2) of this section.