National Organic Standards Board
Materials Subcommittee Discussion Document
Marine Materials in Organic Crop Production
June 12, 2018

SUMMARY:

This discussion document explores the issue of environmental impact of harvesting marine vegetation[1] for organic crop production inputs through a proposed requirement that aquatic plants under §205.601 (j)(1) and other nonsynthetic uses of marine vegetation be certified organic to the wild crop standard §205.207. Guidance is needed to elaborate how the wild crop standard is applied in a marine environment and how certifiers and producers can meet the condition that harvesting "will not be destructive to the environment".

INTRODUCTION:

Seaweeds have been commonly used throughout human history. They comprise a seemingly unlimited renewable resource; however, they are subject to the usual depletion through unintended over-harvesting and pollution. The laws that control harvesting, establish conservation zones, and seek to ensure sustainable seaweed harvest worldwide are highly variable, typically poorly articulated, and not easy to enforce. Some seaweed species grow back very quickly following harvest, while others take many years. Because of high demand, harvesting does not necessarily protect biomass and rarely involves ecosystem management. Little is understood about the multi-trophic impact of seaweed harvesting or cultivation.

There are nine separate listings for marine materials on the National List; however, only one is the subject of this discussion document: §205.601 (j)(1) Aquatic Plant Extracts. Aquatic Plant Extracts incorporating *Ascophyllum nodosum*, *Sargassum* spp., and *Laminaria* spp. are used as fertilizers for organic farming (TR lines 514-16). Marine materials are also used in nonsynthetic form as soil conditioners.

Approximately 50,000 metric tons of wet seaweed is harvested annually, yielding 10,000 metric tons of seaweed meal (TR lines 238-39). The Food and Agriculture Organization's 2004 Report, "The State of World Fisheries and Aquaculture" noted:

> In 1991, it was estimated that about 10,000 tonnes of wet seaweed were used annually to make 1,000 tonnes of seaweed extracts with a value of US$5 million. However, since that time the market has probably doubled as the usefulness of these products has become more widely recognized and organic farming has increased in popularity[2].

As this report is fourteen years old and the organic industry larger, the current figures is surely considerably higher. The high fiber content of the seaweed acts as a soil conditioner and assists moisture retention, while the mineral content is a useful fertilizer and source of trace elements (TR lines 241-42). An area of growth in seaweed fertilizers is in the production of liquid seaweed extracts that can be produced in concentrated form for dilution by the user. Seaweed fertilizers can be applied directly onto plants or watered in around the root areas. Organic farming provides a market for liquid

[1] This Discussion Document looks only at marine vegetation and does not address freshwater vegetation or fish.
[2] Food and Agriculture Organization (FAO). 2014. The State of World Fisheries and Aquaculture. FAO of the United Nations. Rome, Italy. 154 pp.

seaweed fertilizers as a result of wider recognition of the usefulness of the products and their effectiveness in growing of vegetables and some fruits (FAO 2004) (TR lines 247-51).

BACKGROUND:

During the 2015 sunset review of almost 200 materials, the NOSB and public comment noted concern that in the years since these materials were added to the National List, global harvesting has increased, overharvesting of many marine macro-algae has occurred, and the potential for contamination and destruction of marine ecosystems has accelerated.

In order to more fully examine marine materials in organic production, a Technical Report (TR) was obtained in 2016. The NOSB submitted brief information on each of the nine materials on the National List and posed seven questions regarding nomenclature, overharvesting, selective harvesting, contamination, certified organic wild crafting, cultivation, and CO2 sequestration.

Based on the issues raised in the TR, a Discussion Document was posted in Fall 2016, and the following three questions were posed:

1. Should the naming conventions of the marine plant/algae listings on the National List be consolidated and/or clarified to avoid redundancies and duplication, using Latin binomials?
2. Should annotations be written to clarify specific uses or harvesting guidelines for any of the marine algae listings, such as "no machine harvesting of *Ascophyllum*" and "Not harvested from a conservation area identified by State, Federal, or International bodies"?
3. Is there a need for further NOP Guidance on marine plants/algae?

Considerable public comment, both written and oral, was provided for the Fall 2016 NOSB meeting and was extensive and substantive in nature.

In the Spring of 2017, the Handling Subcommittee brought forth a proposal recommending that the marine algae materials be annotated with Latin binomials where possible, or by Class, and that the NOP develop Guidance to clarify the term "kelp" as used in organic production and wild harvesting. An identical proposal was brought forth in the Crops Subcommittee with a motion to amend the listing for Aquatic Plant Extracts to read (proposed changes are underlined):

> Aquatic plant extracts (other than hydrolyzed) <u>derived from brown seaweeds, class *Phaeophyceae*.</u> –Extraction process is limited to the use of potassium hydroxide or sodium hydroxide; solvent amount use is limited to that amount necessary for extraction.

Upon receipt of public comments stating that the annotations needed further justification and support and that stakeholders required more time to reflect upon the potential impacts of the proposals, both the Handling and Crop proposals were sent back to subcommittee for additional work. For the Fall 2017 meeting, the Handling Subcommittee reissued their proposal in the form of a discussion document to solicit additional input.

With respect to the Crops proposal to annotate §205.601 (j)(1) Aquatic Plant Extracts, public comment revealed that there are a number of aquatic plant products containing more than the brown class of seaweed. OMRI conducted a search of OMRI-listed crop input products that contain aquatic plant extracts and found:

"Of the 75 OMRI Listed products that contain aquatic plants as an ingredients:

· 48 contain **brown** algae (*Ascophyllum Nodosum, Sargassum, Durvillaea Potatorum, Egregia menziesii, Laminaria spp., Pelagophycus sp.* and/or Macrocystis *integrifolia)*

- 5 contain **red** (*Gelidium* sp.) and/or **green (***Ulva sp.)*
- 22 products do not have information about seaweed species".

Additionally, Table 5 of the 2016 TR lists the following species used for agricultural production and their country of origin:

- **Chlorophyta (Green)-** *Dictyosphaeria cavernosa* Kenya; *Enteromorpha spp.* Portugal; *Ulva spp.* Italy, Portugal
- **Rhodophyta (Red)-** *Ahnfeltia plicata* Chile*; Gracilaria spp.* Portugal; *Gracilaria chilensis* New Zealand; *Halymenia venusta* Kenya; *Laurencia papillosa* Kenya, Philippines; *Lithothamnion corallioides* France, Ireland, UK; *Phymatolithon calcareum* France, Ireland, UK
- **Phaeophyta (Brown)-** *Ascophyllum nodosum* France, Canada, China, Iceland, US; *Ecklonia maxima* South Africa; *Fucus spp.* France; *Fucus gardneri* Canada; *Hydroclathrus clathratus* Philippines; *Laminaria schinzii* South Africa; *Macrocystis pyrifera* Australia; *Nereocystis luetkaena* Alaska, Canada; *Sargassum spp.* Brazil, Vietman; *Turbinaria spp.* Vietnam

Given that there are aquatic plant input products using green, red, and brown algae, the Crops Subcommittee determined to re-examine its approach to this issue.

While the Spring 2017 proposal focused on nomenclature, questions over the environmental impact of marine material harvesting for organic production are of concern. The TR explores the issue of "sustainable harvesting", but a lack of an agreed-upon means of defining, measuring, and enforcing such practices makes the term problematic. Consequently, this Discussion Document instead looks at ways of addressing the environmental impact of harvesting marine materials for organic crop production. It poses the idea of requiring that all marine materials used in crop input products be certified organic. As most of these materials would be certified to the wild crop standard, we explore the issue of better defining, measuring, and enforcing the requirement under §205.207 (b) that wild harvesting "will not be destructive to the environment".

Note: Much of the research, text, and goals of this Discussion Document are the effort of former NOSB member, Dr. Jean Richardson, and were completed prior to the end of her term in January 2017. Thank you to Dr. Richardson for spearheading this within the NOSB and for providing a framework from which to continue the important work on this topic.

RELEVANT AREAS OF THE RULE, NOP GUIDANCE, NOP POLICY MEMO, and OMRI:

§205.601 Synthetic substances allowed for use in organic crop production

In accordance with restrictions specified in this section, the following synthetic substances may be used in organic crop production: Provided that, use of such substances does not contribute to contamination of crops, soil, or water...

(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 use is limited to that amount necessary for extraction.

§205.207 Wild-crop harvesting practice standard.

(a) A wild crop that is intended to be sold, labeled, or represented as organic must be harvested from a designated area that has had no prohibited substance as set forth in §205.105, applied to it for a period of 3 years immediately preceding the harvest of the wild crop.

(b) A wild crop must be harvested in a manner that ensures that such harvesting or gathering will not be destructive to the environment and will sustain the growth and production of the wild crop.

§205.200 General.
Production practices … must maintain or improve the natural resources of the operation, including soil and water quality.

NOP 5022, effective July 22, 2011, Guidance: Wild Crop Harvesting provides details to clarify §205.207, including:

> Section 205.200 states that production practices must maintain or improve the natural resources of an operation under organic certification. This applies to all types of organic certification, including wild crops. Unmanaged, untrained and uninformed harvesting of wild products from a wild habitat without maintaining or improving the natural resources can disqualify the wild products from organic certification.

Additionally, the Guidance states:

4. A description of the proposed ecosystem management and harvesting practices, the impact of their proposed harvesting on the long-term viability of the wild species and on the area's ecosystem, and information on any equipment planned for use or being used to harvest and manage the wild-crop and ecosystem.
    a. This should include a description of the monitoring system that will be used to ensure that the crop is harvested in a sustainable manner that does not damage the environment, including soil and water quality.
5. A list of any rare, threatened, or endangered terrestrial or aquatic plants or animals that occur in the harvest area.
    a. The presence of rare, threatened, or endangered species in a wild harvest area does not automatically disqualify an operation from organic certification, but any potential or actual impacts need to be described and addressed.
    b. If there are potential or actual negative impacts resulting from the wild crop management and harvesting, actions that address and correct these impacts need to be described, implemented, and monitored.
6. The procedures employed that prevent contamination from adjoining land use or other point or non-point sources contamination.
7. The training provided and the procedures employed to ensure that all collectors harvest crops in accordance with the OSP and in a manner that does not damage the environment.

NOP 5020, effective 1/15/16, Guidance: Natural Resources and Biodiversity Conservation clarifies organic regulations at 7 CFR 205.200 that states, "to maintain or improve the natural resources of the operation….".

NOP Policy Memo 12-1, Production and Certification of Aquatic Plants, issued September 12, 2012 provides further clarification as follows:

> This policy memorandum is issued as a reminder that aquatic plants and their products may be certified under the current USDA organic regulations. Certifiers and their clients may use the USDA organic regulations, including the National List of Allowed and Prohibited Substances at 7 Code of Federal Regulations (CFR) 205.601-205.602, as the basis for the production and certification of cultured and wild crop harvested aquatic plants.

While current USDA organic regulations specifically exclude aquatic animals from organic certification, no such exclusion exists for aquatic plants. Further, some parts of the USDA organic regulations specifically address aquatic plant production. For example, some aquatic plants, such as kelps and seaweeds, are listed in 7 CFR 205.606 of the USDA organic regulations, allowing their use in non-organic form when certified organic forms are not commercially available. Producers and certifiers are required to comply with the USDA organic regulations when producing or certifying cultured and wild crop harvested aquatic plants.

The use of ground and surface waters, ponds, streams, or other waterways for aquatic plant production may be regulated by Federal, State, or local authorities. Aquatic plant producers should consult with Federal, State, and local authorities to ensure compliance with all applicable laws, in addition to the USDA organic regulations, regarding the use of synthetic substances and other materials in ponds and waterways. Also, under 7 CFR 205.200, aquatic plant producers must ensure, and certifying agents must verify, that production practices maintain or improve the natural resources of the operation, including soil and water quality.

OMRI definition of Kelp in Crop Production:
The dried marine algae of the botanical divisions of Rhodophyta (red algae), Phaeophyta (brown algae), and Chlorophyta (green algae) (AAPFCO).

PREVIOUS PUBLIC COMMENT AND TECHNICAL REPORT:

Following the receipt of the 2016 limited scope TR, the NOSB presented questions to the public in a November 2016 Discussion Document. Thousands of pages of public comment and peer-reviewed scientific research articles were received in Fall 2016, providing the NOSB with a substantive body of documented research from a number of perspectives which helped form this Discussion Document.

Public comment included concerns for the following:

- Conservation of wild marine algae species, and marine ecosystems.
- Lack of clarity as to which species are allowed on the National list and confusion over names used.
- Overharvesting of some species in some geographic areas.
- Need for clarification of which species are used, and from which geographic areas.
- Desire to encourage organic cultivation and wild harvesting of marine materials.
- Need for clarification of which species can or are being cultivated.
- Clarification of wild harvesting techniques.
- Feasibility of harvesting by individual species selection as opposed to multi-species harvesting by littoral or marine zone
- Extraction methods.
- Sequestration of metals or other contaminants in some wild and cultivated algal species.

Of the seven questions posed in the limited scope TR in 2016, three are most relevant to this discussion document:

<u>1. Overharvesting:</u> The nine listings include thousands of species of algae from many different geographic locations, the marine intertidal zone, deeper ocean areas, and wild harvested beds. Which species, genera, classes are being overharvested? Which geographic regions indicate overharvesting

impact? What is the trend in harvesting marine algae? What is the present status and trends in harvesting and overharvesting of Ascophyllum nodosum?

Public comment received from producers of seaweed materials provided statements that overharvesting is not an issue, or if it was that there are regulations in place to control harvesting. By contrast, other public comment by marine biologists and the international research community indicates that overharvesting and harvesting in such a manner that ecosystem structures are destroyed is relatively widespread and inadequately monitored or regulated.

The TR provides examples of the following seaweeds being overharvested: Irish Moss (*Chondrus crispus*), Rockweed (*Ascophyllum nodosum*) and giant Kelp (*Macrocustis pyrifera*) (TR lines 523-24).

> "Kelp and rockweed, are foundational species forming large expansive marine habitats supporting a diverse range of wildlife, including other algal species, marine animals and many species of protozoans and bacteria (Seeley and Schlesinger, 2012). Without a good accounting of all of the species present it is hard to predict the effects of harvesting rockweed and kelp on each ecological niche. Thus, it has been important to recognize that sustainable seaweed production perceived as reproducible harvest capacity, may not guarantee the sustained subsistence of each resident species. Although not part of any agricultural waste stream, extracts from wild-harvested kelp and rockweed are allowed for use in organic production as soil amendments (§205.601(j)(1)). (TR lines 528-35)
>
> Rockweed has an important role as habitat, as food and as a nutrient source supporting a community of organisms that inhabit its "forests." Any cutting of rockweed can produce an effect on the supported eco-communities. Furthermore, many aspects of this ecosystem have not been elucidated, encouraging more precaution as the brown algae "forestry" industry grows into the future (Seeley and Schlesinger, 2012)." (TR lines 356-60)

It must also be noted that ocean warming and other environmental factors probably contribute to depletion of these species (see also: Halat et al. 2015[3], Kay et al. 2016[4], and TR lines 579-83). Overharvesting impacts not only the specific plant species or genus but all the associated plant and animal species which form the marine ecosystem in a given location (see also: Keats et al. 1987[5], Kelly 2005[6], and TR lines 597-611).

Seaweeds, particularly those that form canopy structures, such as rockweed, are bioengineers and contribute to a highly productive habitat. Their presence helps to reduce the physical stresses of the intertidal habitat. Some of their key ecological functions include nutrient cycling and maintaining water quality. Seaweeds provide a habitat and food source for numerous invertebrates and fish, grazers and feeders, and maintain water quality. They also provide a physical barrier against waves, protecting the shore and inhabiting species. As such, certain species that are slow to regenerate from moderate harvesting or have substantial benthic repercussions from their removal, may not be compatible with

[3]Halat L, Galway ME, Gitto S, Garbary D. 2015. Epidermal shedding in *Ascophyllum nodosum* (*Phaeophycea*): seasonality, productivity and relationship to harvesting. Phycology. 54(6):599-608.

[4] Kay LM, Schmidt AL, Wilson KL, Lotze HK. 2016. Interactive effects of increasing temperature and nutrient loading on the habitat-forming rockweed Ascophyllum nodosum. Aquatic Botany. 133:70-78.

[5] Keats DW, Steele DH, South GR. 1987. The role of fleshy macroalgae in the ecology of juvenile cod (Gadus morhua) in inshore waters off eastern Newfoundland. Journal of Zoology. 65:49-53.

[6] Kelly E (editor). 2005. The role of Kelp in marine environment. Irish Wildlife Manuals No. 17, National Parks and Wildlife Service. Dept. Environment, Heritage, and Local Govt. Dublin.

organic principles.[7]

For example, maerl harvesting off the northeast Atlantic has long-term repercussions. "Maerl beds represent a non-renewable resource as extraction and disruption far out-strips their slow rate of accumulation"[8]. The authors of a review of branch growth rates noted, "although rapid on a geological time-scale these accumulation rates are far too low for the maerl to be regarded as a sustainable resource for extraction for agricultural and industrial use"[9]. A study of the same region concluded that maerl dredging was a major threat to the habitat and that there is more to be gained from protecting rather than exploiting these habitats[10].

Some species have relatively rapid growth rates and reproductive techniques that allow for replenishment with intentional harvesting rates. Seaweed harvesting must ensure the proper stem length is left attached to the underlying substrate. Reproduction will then occur from this stem, promoting a second generation of seaweed growth from both the intact stem and the recruitment of new plants. The species replenishment rate and frequency of harvest are, therefore, critical factors impacting future seaweed generations and the marine habitat. Failing to take species and harvest rate into account can result in seaweed plots that are quickly exploited and, over time, lead to long-lasting damage to the benthic and trophic communities. Frequent harvests may also have impacts on the heterogeneity of age classes within a seaweed population. This means the population will eventually only consist of young seaweed that are not only smaller than older seaweeds, but may then be harvested before their full life cycle is completed. This could have recruitment and reproductive impacts on future generations in terms of sustainability.[11]

In the case of rockweed, even studies that indicate environmental resilience to commercial harvesting note that though extraction may, in some cases, represent a low percentage of annual biomass production, but "the lack of knowledge of energy pathways prevents us from concluding that this is a low level of ecological impact"[12]. Some research has shown that fallow periods are necessary for sustainable harvesting. Fallow periods also prevent the encroachment of faster growing species. The

[7] Maine Department of Marine Resources. 2014. Fishery Management Plan for Rockweed (Ascophyllum Nodosum). Maine Department of Marine Resources & Rockweed Plan Development Team. 51 pp.; Werner A, Kraan S. 2004. Review of the potential mechanization of kelp harvesting in Ireland. Marine Environment and Health Series 17; McCook LJ, Chapman ARO. 1991. Community succession following massive ice scour on an exposed rocky shore: effects of Fucus canopy algae and of mussels during late succession. Journal of Experimental Marine Biology and Ecology. 154:137-169; Lamote M, Johnson LE. 2008. Temporal and spatial variation in the early recruitment of fucoid algae: the role of microhabitats and temporal scales. Marine Ecology Progress Series. 368:93-102; Watt CA, Scrosati RA. 2013. Bioengineer effects on understory species richness, diversity, and composition change along an environmental stress gradient: Experimental and mensurative evidence. Estuarine, Coastal and Shelf Science. 123:10-18; McCook LJ, Chapman ARO. 1997. Patterns and variations in natural succession following massive ice-scour of a rocky intertidal seashore. Journal of Experimental Marine Biology and Ecology. 214:121-147.

[8] Barbera C, Bordehore C, Borg JA, et al. 2003. Conservation and management of northeast Atlantic and Mediterranean maerl beds. Aquatic Conservation: Marine and Freshwater Ecosystems. 13:S65-S76.
[9] Bosence D, Wilson J. 2003. Maelr growth, carbonate production rates, and accumulation rates in the northeast Atlantic. Aquatic Conservation: Marine and Freshwater Ecosystems. 13:S21-S31.
[10] Hall-Spencer JM, Grall J, Moore PG, Atkinson RJA. 2003. Bivalve Fishing and maerl-bed conservation in France and the UK—retrospect and prospect. Aquatic Conservation: Marine and Freshwater Ecosystems. 13:S33-S41.
[11] Jenkins SR, Norton T, Hawkins SJ. 2004. Long term effects of Ascophyllum nodosum canopy removal on mid shore community structure. Journal of the Marine Biological Association of the UK. 84(02):327-329.

[12] Sharp GJ, Pringle JD. 1990. Ecological impact of marine plant harvesting in the northwest Atlantic: a review. Hydrobiologia. 204/205:17-24.

undisturbed seaweed population can therefore sustain other dependent populations for longer periods of time, establishing the trophic benefits of a stable ecosystem. Additionally, fallow periods allow seaweed to gain biomass overtime. Many species reach peak size after two or three years[13].

2. Selective harvesting: There are about 6,500 species of red algae (Rhodophyta) such as Chondrus species, Palmiria, Delessaria; about 2,000 species of brown algae (Phaeophyta) such as Laminaria species, Ascophyllum species, Sacharina, Fucus, Sargassum muticum; and about 1,500 green algae (Chlorophyta) such as Dunaliella, of which many are not marine. How many species of each class are being wild harvested? Can one species be harvested without impacting other species in the same location?

The TR indicates that there is limited research on algal species harvested for economic purposes. An additional literature search shows some work has been done on multi-tropic consequences of kelp harvest on the coast of Norway, indicating negative impacts of kelp harvesting on fish abundance and diminishment of coastal seabird foraging efficiency (Lorentsen et al, 2010[14]). Lorentsen points out that kelp fisheries are currently managed in order to maximize net harvest of kelp biomass, and the underlying effects on the ecosystem are partly ignored.

A Literature review did not turn up any scientific research comparing certified organic kelp harvesting with non-certified wild harvesting.

There is peer-reviewed research on the habitat impact of seaweed on common eider ducks (such as Blinn et al. 2008[15]), fish impact in Nova Scotia (such as Black 1991[16]), and impact of mechanical harvesting on Ascophyllum (such as Ang 1993[17], Ang 1996[18], and Arzel 1998[19]). There is considerable research on Ascophyllum harvesting impacts, including findings in the 2016 TR. "As with other areas where *Ascophyllum nodosum* and *Laminaria digitata* are harvested commercially, ecological concerns about changes in species diversity resulting from harvesting have been noted (Ingolfsson 2010) (TR lines 892-96).

3. Cultivation: Which species are being cultivated, and in which geographic locations? What are the environmental issues associated with farming marine algae?

Not all marine algal species are easily or economically cultivated. For example, *Ascophyllum nodosum* (Rockweed), a species widely harvested and overharvested for aquatic plant extracts and alginic acid, is

[13] Maine Department of Marine Resources. 2014, *supra* note 6; Werner A, Kraan S. 2004, *supra* note 6; Wippelhauser GS. 1996. Ecology and Management of Maine's Eelgrass, Rockweeds, and Kelps. Maine Natural Areas Program, Department of Conservation. Maine.

[14] Lorentsen SH, Sjotun K, Gremillet D. 2010. Multi-tropic consequences of kelp harvest. Biological Conservation. 143:2054-2062.

[15] Blinn BM, Diamond AW, Hamilton DJ. 2008. Factors affecting selection of brood-rearing habitat by common eiders (Somateria mollissima) in the Bay of Fundy, New Brunswick, Canada. Waterbirds. 31:520-529.

[16] Black R, Miller RJ. 1991. Use of intertidal zone by fish in Nova Scotia. Environmental Biology of Fishes. 31:109-121.

[17] Ang PO, Sharp GJ, Semple RE. 1993. Change in the population's structure of Ascophyllum nodosum due to mechanical harvesting. Hydrobiologia. 260/261:321-326.

[18] Ang PO, Sharp GJ, Semple RE. 1996. Comparison of the structure of populations of Ascophyllum nodosu, (Fucales, Phaeophyta) with different harvest histories. Hydrobiologoa 326/237 179-184.

[19] Arzel P. Les luminaires sure les cotes bretonnes. Evolotion de l'exploitation et de la flottille de peche, actuel et perspectives. Editions IFREMER BP 70-29280. Plouzane, France. 139 pp.

a brown seaweed which is not economic to cultivate. By contrast, Laminaria saccharina is easy to cultivate. The TR provides considerable detail on seaweed farming of many species worldwide.

As with terrestrial agriculture, focusing on the production of any few select species could lead to monoculture plots of those species. While this makes harvesting species of interest easier, these plots are then susceptible to diseases and may limit the resources available to other organisms in the ecosystem. Additionally, some native seaweed beds are wiped out to make room for the more profitable species. Various studies have elaborated on the detrimental effects of invasive seaweed cultivation. Without competition or predators, invasive seaweeds can colonize on thriving corals eventually causing death. There is also the potential for epiphyte outbreaks or species diversity declines.[20]

DISCUSSION:

This discussion document proposes a new way of looking at the sourcing of materials for organic production. Currently, there is inconsistency in the review and use of inputs for organic production. Synthetic materials are closely evaluated through the material petition and sunset review processes while natural materials allowed under the regulations receive relatively little scrutiny. Nonsynthetic inputs deserve equal assessment for their impact on the environment, including contamination during manufacture or extraction and adverse impacts on biodiversity. While it could be said that organic areas of use of marine materials are of least concern in terms of the quantity of the overall harvest, it does not prevent the organic community from examining the impact the industry is having on marine ecosystems. It is similar in many respects to the requirement that organic livestock be fed organic feed, as in the case of NOP 5027 Guidance: The Use of Kelp in Organic Livestock Feed that clarifies that marine materials used as a livestock feed must be certified organic to the wild crop standard.

The use of seaweed as a fertilizer presents a comparatively unique situation in organic certification: materials are largely harvested from wild native ecosystems as inputs for organic crop production products—both synthetic (aquatic plant extracts) and natural (soil conditioners). The review above illustrates the importance of addressing the effects of seaweed harvesting on wild native ecosystems, both in terms of cultivated and wild seaweed.

In the absence of a universal standard for "sustainable harvest" within marine environments, and given the goal of limiting ecological harm from seaweed harvesting, this discussion document explores a means of addressing the environmental impact of harvesting seaweed for use in organic crop production through existing organic certification tools. In addition to addressing environmental impact, requiring organic certification to the wild crop standard would also help mitigate potential contamination issues which are also dealt with in terrestrial farming systems, particularly in relation to drift. Delineated no-cut buffer zones could also serve as conservation areas.

Nevertheless, the wild crop standard is quite general in its language when it requires that "a wild crop must be harvested in a manner that ensures that such harvesting or gathering will not be

[20] Cottier-Cook EJ et al. 2016. Safeguarding the future of the global seaweed aquaculture industry. United Nations University (INWEH) and Scottish Association for Marine Science Policy Brief. ISBN 978-92-808-6080-1. 12pp.; Werner & Kraan, 2004, *supra* note 5; Zemke-White WL, Smith JE. 2006. Environmental Impacts of Eucheuma spp. Farming. In: Critchley AT, Ohno M, Largo DB, editors. World Seaweed Resources. Degussa, Amsterdam; Lindeberg MR, Lindstrom SC. 2010. Field guide to seaweeds of Alaska. University of Alaska Fairbanks, Alaska: Sea Grant College Program; Aquenal Pty Ltd. 2008. National Control Plan for Japanese Seaweed or Wakame Undaria Pinnatifia. Rep. Australian Government.

destructive to the environment and will sustain the growth and production of the wild crop." This standard encompasses both terrestrial and aquatic systems of production and therefore includes a broad range of crops, from herbs to mushrooms to kelp, for example. NOP 5022 Guidance: Wild Crop Harvesting addresses some of this; however, there remains much in the wild crop standard that is subjective in interpretation. Each certifying agency is left to develop its own guidelines for enforcing these standards.

Some certifiers who currently certify both wild harvested and cultivated seaweed to the wild crop standard have expressed a strong desire for more explicit standards for marine ecosystems, stating that it is challenging to try to adopt terrestrial criteria to an aquatic system. Further NOP guidance on applying both the wild crop standard, NOP 5022 Guidance: Wild Crop Harvesting, and NOP 5020 Guidance: Natural Resources and Biodiversity Conservation could help elucidate questions of avoiding prohibited substances, prohibitions of harvesting in conservations areas, safeguarding biodiversity conservation, and evaluating long-term harvest impacts, among other concerns. Organic wild crop harvesting should aim at not changing the natural environment. While this may be difficult to predict and will vary significantly by location and species, it is important for maintaining the complicated interactions that take place within the local ecosystem. Clear demarcations of harvesting areas, ecosystem health assessments, detailed species identifications and population figures, and exposure to potential contaminants would be base appraisals. Some specific evaluation questions could include:

- How does structural change from harvest benefit/detract from habitat?
- How does architecture of the harvested species affect associated species?
- How much loss/change is too much?
- Assess the long-term effects of harvesting on a large spatial scale.
- What is the difference between the commercial harvest rate and natural mortality in a given year in different areas of the harvest zone?
- Will cumulative effects of successive harvest restructure habitat and/or ecosystems?[21]

The topic of marine materials is vast and complicated, and the proposed recommendations below are a first step in approaching the issue. Future work to safeguard against negative environmental impact might include specifying which species, geographic regions, and/or methods of harvest are allowed or prohibited. Currently, there are no plans to prohibit the harvest of any specific species, as that would require a case-by-case review with sufficient data that is beyond the preview of this present effort.

RECOMMENDED PROPOSAL:

1) This discussion document suggests an annotation to §205.601 (j)(1) requiring (proposed changes are underlined and in red):

§205.601 Synthetic substances allowed for use in organic crop production

In accordance with restrictions specified in this section, the following synthetic substances may be used in organic crop production: Provided that, use of such substances does not contribute to contamination of crops, soil, or water...

(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 use is limited to that amount necessary for extraction. Must be made with certified organic aquatic plants, including, but not restricted to, algae.

[21] Maine Department of Marine Resouces. 2014, *supra* note 6.

2) An additional listing is proposed at §205.602 prohibiting seaweeds unless organically produced to address seaweeds used in non-synthetic products and therefore not covered by the annotation under Aquatic Plant Extracts. This prohibition, unless certified organic, would help safeguard that seaweeds harvested for and used in organic crop production do not harm the environment (proposed changes are underlined and in red):

§205.602 Nonsynthetic substances prohibited for use in organic crop production.

The following nonsynthetic substances may not be used in organic crop production:

(e) Marine algae (seaweeds)--unless organically produced.

3) Recommendation that the NOP develop Guidance on applying §205.207 "Wild-crop harvesting practice standard" to the production and harvesting of marine algae. Guidance is needed to clarify how marine algae can "be harvested in a manner that ensures that such harvesting or gathering will not be destructive to the environment and will sustain the growth and production of the wild crop". In particular, "will not be destructive to the environment" involves a wide range of impacts on the marine ecosystem, while "will sustain the growth and production of the wild crop" refers to the ability to sustain production of biomass of the crop.

CONCLUSION:

As one public commenter succinctly stated: "A central tenet of organic food production is the conservation of biodiversity and natural resources. As such, it is imperative that materials allowed for use in organic food and farming be sourced and/or manufactured in a manner that does not contribute to ecological damage via resource depletion, species endangerment or extinction, pollution, or significant habitat alteration."

Each marine material grows in a complex and not fully understood ecological context subject to internal and external stressors and never in homeostasis. In order to fully review a material against the required OFPA criteria, each marine material must be assessed in the context of where it is growing with an understanding of verifiable assurances against environmental harm. The harvest of marine materials for organic production must be based on the maintenance of the biodiversity of natural aquatic ecosystems and the continuing health of the surrounding aquatic and terrestrial ecosystems in a period of rapid commercial expansion of both wild and cultivated seaweeds and limited international regulation.

DISCUSSION QUESTIONS:

We are seeking comments from the public on the following questions:

1. Please discuss the feasibility of requiring all seaweed harvested for use in organic crop production to be certified to the wild crop standards.
2. For certifiers currently certifying marine materials to the wild crop standard, please describe how you verify that biodiversity is conserved and how wildlife are maintained in the harvest areas.
3. Could species be comprehensively listed on aquatic plant extract product ingredients?
4. Would the establishment of a working group be useful in providing additional guidance on wild cropped and farmed marine algae and to clarify the definition and measurement of "not destructive to the environment" stipulated in the wild-crop harvesting practice standard §205.207 (b)?

5. Is there a potential to replace marine materials with freshwater materials for crop production inputs? Many of these freshwater materials are invasive species and are already removed as part of restoration efforts.

Vote in Subcommittee

Motion to accept the marine materials in organic crop production discussion document
Motion by: Emily Oakley
Seconded by: Lisa de Lima
Yes: 5 No: 0 Abstain: 0 Absent: 2 Recuse: 0

Approved by Harriet Behar, Subcommittee Chair, to transmit to NOSB, June 12, 2018