CERES Policy

Organic Micro-Algae Certification under Regulation (EC) 889/2008 and NOP

1	**Background**	Production rules for seaweeds are established in Regulation (EC) 834/07 and 889/2008. According to recent changes, these rules also apply to micro-algae such as *Spirulina* and *Chlorella*. Under NOP, CERES considers micro-algae to be covered under hydroponic crops. However, production rules for micro-algae are not very specific in these two standards and are therefore spelled out in more detail in the present policy.
2	**Normative framework**	Rules in Reg. (EC) 834/07 are established in Articles 13(2) and (3), and in Reg. (EC) 889/08, Art. 6a through 6e. For NOP, the crop production rules apply.
3.1	**Scope**	The present policy applies only to micro-algae cultivated in closed systems, not to wild harvest nor to open cultivation systems.
3.2	**Terms**	Air Quality Index (AQI): This is a complex index based on several indicators. It was initially developed by the US Environmental Protection Agency EPA and has since been adopted by most countries in the world. These indices, even if they use slightly different ways of calculation, are comparable (see https://en.wikipedia.org/wiki/Air_quality_index). For China, where most of our micro-algae clients are located, the AQI can be tracked in real time at http://aqicn.org/map/ Europe has developed a different system that is not easy to compare to the AQI. If in the future we should have microalgae clients in Europe, we will establish the corresponding limits using European parameters.
4	**Environmental Management**	

		Requirement EC 834/07 & 889/08	**Requirement NOP**	**CERES Policy**
4.1	**Parallel and mixed production**	834, Art. 11: Parallel production for aquaculture is allowed, provided there is adequate separation between production sites	§205.202: Organic operations must have boundaries to prevent the unintended application of prohibited substances	Our experience shows that effective separation is not possible, when organic and conventional production exist inside the same operation. We therefore do not allow parallel production of organic and conventional micro-algae inside the same unit.
4.2	**Environmental Assessment Plan, Sustainability Management Plan**	Shall be provided by the operator, based on Directive 2011/92/EU	§205.200: Organic operations must maintain and improve the natural resources	The Regulation allows for an "equivalent" environmental assessment. By thoroughly completing the CERES Organic Management Plan (OMP), the operator complies with this requirement. If the operator already has an environmental assessment and sustainability management plan, then the OMP can refer to that document.
4.3	**Location**	834, Art. 13(2): Must meet the water quality requirements defined in different other EU legal texts 889, Art. 6b(1): Shall be situated	§205.201(5): The operation must prevent contamination by prohibited substances	Provisions on water quality defined in the EU Regulation and related legislation, refer to wild harvesting or open cultivation systems. They are therefore not applicable to the present policy. To ensure that organic micro-algae production is not affected by

		Requirement EC 834/07 & 889/08	Requirement NOP	CERES Policy
		in locations that are not subject to contamination or pollution; clearly separated from conventional operations		general pollution, also air pollution must be considered. Operations in locations with a general high level of air pollution are not eligible for certification. An Air Quality Index of up to 100 is acceptable.
4.4	**Water supply**	No clear provisions, except for separation from conventional operations		Considering that water bodies in many countries are subject to a high level of pollution, and that micro-algae grown in basins may absorb all kinds of organic and non-organic pollutants, CERES requires fresh water to comply with national or WHO drinking water criteria, except for nitrate parameters (since anyhow fertilizers are added, putting a limit to nitrate does not make sense).
4.5	**Water recycling**	Art. 3 of Reg. 834/07 requires organic operators to make "responsible use of natural resources, such as water"	§205.200: Organic operations must maintain and improve natural resources including water	Water must be re-cycled to reduce fresh water consumption to a minimum. Operators must demonstrate that their water consumption does not affect local communities nor the local environment.
4.6	**Waste water**	Art. 6(d): Nutrient levels in effluent water shall be the same or lower than in inflowing water.		Requirements established by CERES for fresh water inflow are higher than the EU Regulation requirements (see Section 4.3). Therefore, it is difficult to apply the equation "quality of effluent ≥ quality of inflow". For this reason, we have established that the wastewater should either comply with Category II of the German waterbody classification system,[1] or, have the same water quality as the receiving water body – whichever of the two criteria is higher. This applies also to pH.
4.7	**Energy**	Art. 6(b): Preferably use of renewable energy	No provisions	Where water basins are heated, renewable energy must be used. A period of 3 years can be granted until meeting this requirement. This provision does apply neither to NOP, nor to energy used for other purposes. For these cases, "must" is to be replaced by "should".
4.8	**Waste**	Art. 6(b): The operator shall draw	§205.200 (see above)	Solid organic waste must be returned to local farms for use as soil amendment, or similar purposes. If organic farms exist in

		Requirement EC 834/07 & 889/08	Requirement NOP	CERES Policy
		up a waste reduction plan		close proximity, waste / compost should preferably be returned to these farms.
5	**Cultivation**			
5.1	**Conversion period**	Art. 36(a) of 889: The conversion period for a seaweed cultivation unit shall be the longer of six months or one full production cycle.	No specific provisions for hydroponics	Six months conversion period under our equivalent standard, no conversion under NOP
5.2	**Juvenile algae**	834, Art. 13(2)(b): to ensure that a wide gene-pool is maintained, the collection of juvenile seaweed in the wild should take place on a regular basis to supplement indoor culture stock	Since we consider micro-algae under the crop production scope, organic breeding stock must be used where available	a. We expect regular refreshment of the gene-pool b. Organic juvenile algae must be used where available. Organic operations should keep their own stock if possible. c. Before using conventional juveniles, the operator must make significant efforts to obtain organic material. These efforts must be recorded.
5.3	**Nutrition / Fertilisation**	Only according to Annex I	Only according to §205.203; 205.601 and 205.602	In addition to the requirements established by the two standards, CERES does not allow use of fresh livestock manure. If compost, residues from biogas plants, guano or residues from food industry are used, limits in Annex A to this document apply.
5.4	**PH-Adjustment**	No clear provisions	Only according to §205.105(b) 205.206(e)	Annex II (Reg. 889/08) list sodium hydrogen carbonate (a.k.a. potassium /sodium bicarbonate) as plant protection product for use in organic production, without any restrictions. Considering that by adjusting the pH (medium-high), the growth of other algae in the culture medium is effectively inhibited, CERES accepts the use of sodium carbonate and sodium bicarbonate to adjust the PH.
5.5	**Antifouling measures, cleaning**	Art. 6e: Mechanical cleaning. Where this is not satisfactory, only substances from Annex VII(2) can be used	§205.601: Ethanol, isopropanol, chlorine materials (residual water must not exceed 4 ppm Cl_2!)	No additional provisions
6	**Processing of products made from micro-algae**			
6.1	**General**	No specific provisions, the general rules for organic food processing apply		No additional provisions

		Requirement EC 834/07 & 889/08	Requirement NOP	CERES Policy
6.2	**Additives, processing aids**	According to Annex VIII and IX	According to §205.605 and 205.606	No additional provisions
6.3	**Preventing contamination**	Art. 26(4)(a): Operators shall (…) take precautionary measures to avoid the risk of contamination by unauthorised substances or products;	§205.272: Must implement measures necessary to (…) protect organic products from contact with prohibited substances	There are two particularly critical areas for micro-algae: a. Cultivation in polluted water (see 4.3 above) b. Contamination with Polycyclic aromatic hydrocarbons (PAH) during drying of the final products. For this reason, in close co-operation with the competent authorities in Germany, CERES has established the maximum residue levels according to Annex B to this document.

7	**SO_2 in microalgae**	SO_2 levels between 10 and >100 mg/kg are often found in dried *Spirulina* and *Chlorella* products (Food Safety Authority of Ireland, 2019). According to inofficial information from our contract laboratory, out of 50 Chlorella samples tested (organic and conventional), all had SO_2 concentrations between 11 and 90 mg/kg, while 150 out of 180 Spirulina samples yielded positive results for SO_2. This may be a threat for consumers with sulphite allergy. According to EU food law, when food items contain >10 mg/kg SO_2, the label must include a "contains sulphites" statement. This is, however, a food safety issue, not necessarily linked to compliance / noncompliance with organic production rules. Potential origin of increased SO2 levels in microalgae:		
		Source		**Link to organic production rules**
		a. According to Ashworth (2018), SO_2 in commercially produced microalgae may originate from any sulphur compounds in the water, often derived from general environmental pollution, but sometimes also of natural origin. Since *Spirulina* and *Chlorella* need sulphur for their growth, they tend to "scavenge" the water for any available sulphur.		If the water quality, as defined in 4.3 and 4.4 above, is not met, this would be a breach of the organic standard.
		b. Adding sulphur fertilizers to the water.		Elemental sulphur and several sulphates are allowed in Reg. EC 889/08, Annex II, and also NOP §205.203. Therefore, using such fertiliziers may not be the best practice for reducing SO_2 levels in the final product, but is **not** considered a non-compliance (NC).
		c. Contact with exhaust gases during the drying process.		See Section 6.3 above: NC if direct drying is used

		Requirement EC 834/07 & 889/08	Requirement NOP	CERES Policy
		d. Exposing final product to SO_2 with the purpose of sterilisation and extension of shelf life.		This would clearly not be allowed; the respective lot would automatically lose its organic condition. However, we do not have any evidence that this might be a common practice in *Spirulina* or *Chlorella* production.
		How does CERES react in case of complaints concerning SO_2 in organic microalgae? • If the annual inspection has not yielded any NCs related to 7(a) through (d), we will only inform the involved stakeholders, through the present policy, and will typically not conduct an additional investigation concerning the origin of the problem. Possible reasons of the contamination will be discussed during the next onsite inspection. • Only if the SO_2 levels are very high (> 70 mg/kg), an additional onsite inspection may become necessary. Typically, this should be unannounced.		
8	**Related documents**	3.2.35 Brief Info Micro-Algae (Inf) 4.2.3.11 Micro-Algae Inspection (WI) 4.3.13 OMP Microalgae (F) Ashworth, Gideon (2018). Sulphur dioxide in commercially produced microalgae. https://fstjournal.org/features/sulphur-dioxide-commercially-produced-microalgae Food Safety Authority of Ireland (2019). https://www.fsai.ie/news_centre/allergen_alerts/chlorella_spirulina.html		

Annex A

Requirements for substrates used for micro algae nutrition (for NOP, these values are to be seen as a general guideline, not binding limits)	
Faecal coliform bacteria	Max. 1,000 MPN / 4 g substrate
Salmonella	Max. 3 MPN / 4 g substrate

Annex B

Maximum residue levels for final micro-algae products (ready for consumption) (for NOP, these values are to be seen as a general guideline, not binding limits)		
	Unit	**Limit Value**
Microbiological Parameters		
Total microbial counts	CFU[2]/g	1.0×10^5
Moulds	CFU/g	1.0×10^4
Enterobacteriaceae	CFU/g	1.0×10^3
Coliform germs	CFU/g	1.0×10^2
E. coli	CFU/g	negative
Staphylococcus aureus	CFU/g	<10
Salmonellae	CFU/g	negative
Chemical Parameters		
Heavy metals[3]		
Pb	mg/kg	1.2
Cd	mg/kg	0.3
Hg	mg/kg	0.1
As[4] (total arsenic content - sum of inorganic and organic arsenic)	mg/kg	20.0
PAHs[5] (Polycyclic aromatic hydrocarbons)		
Benzo(a)pyren	µg/kg	5
Sum of Benz(a)anthracen, Chrysen, Benzo(a)pyren, Benzo(b)fluoranthen	µg/kg	25

[1] The system consists of four categories (I being the best, IV the worst). Water of category II must meet, as a minimum, the following parameters: Biological Oxygen Demand $(BOD)_5$ maximum 2-6 mg/l; NH_4-N maximum 0.3 mg/l.

[2] Colony forming units

[3] Values derived from provisionally tolerable weekly intake (PTWI) for these substances, by WHO

[4] There are currently maximum levels for arsenic in rice/rice products in the Contaminants Ordinance 1881/2006, not for algae. In addition, the maximum levels relate only to inorganic arsenic, since organic arsenic is considered to be of little concern.

[5] Basically PAH-values should be “as low as reasonably achievable” (ALARA principle); The values mentioned above are based on Regulation (EC) 1881/2006, last updated through Reg. (EU) 2015/1993, where MRLs of 10 respectively 50 µg/kg are established. CERES fixes the MRL for organic products at 50% of these values.