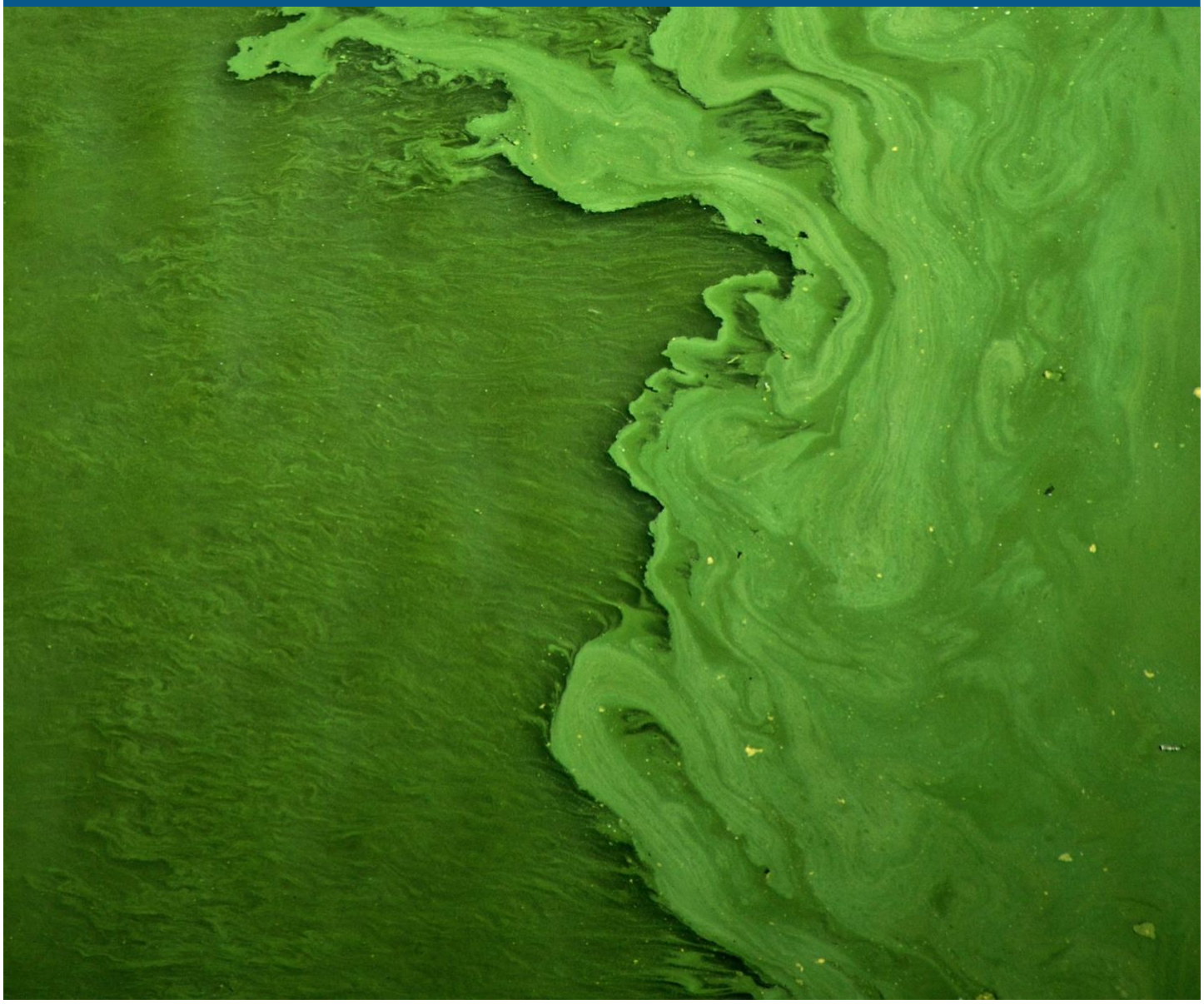
ISCC 202-9

GUIDANCE FOR ALGAE CULTIVATION

Version 2.0



Document Title: ISCC 202-9 Guidance for Algae Cultivation

Version: 2.0

Valid from: 06 April 2022

Content

1 Introduction

Peculiarities of algae cultivation

Compared to agricultural production, biomass production from algae shows some specific aspects. In contrast to agricultural crops, algae are cultivated in aquacultures, e.g. ponds or tanks and bioreactors on land. Further, algae are growing and can also be cultivated in the sea in exposed areas of the sea coasts, from the splash zone through the intertidal zone. Traditionally, algae are harvested in these coastal areas and used as a high-quality and low-fat food. For algae cultivation on land, species are used according to their specific properties like fast biomass production or the synthesis of desirable ingredients (e.g. protein, fats).

This guidance document focuses on algae cultivation on land in ponds (including tanks) and bioreactors. Algae production systems can be established outside of arable land due to low land use and reliance on only a few, readily available input factors (e.g. electricity, water, seeding material, nutrients). In terms of land consumption, such a production system usually does not compete with (fertile) agricultural land or forests and thus represents an attractive alternative to these traditional biomass production systems. Algae production systems demonstrate competitive yields per cultivation area while benefitting from fast production periods and relatively low resource consumption per ton of algae biomass produced. Thus, algae cultivation can be an efficient option for biomass production in industrially dominated locations as well as sites not suited for agriculture or forestry.

Algae can be produced in short production cycles or, in some cases, harvested daily. After harvesting, algae are further processed. Algae can be used as, for example, food and feed. Further, algae oil can be extracted and processed into biofuel. Algae-based carbon fibres and textiles produced from algae are further examples of the many possible uses of algae.

Advanced biofuels

The use of algae as biomass feedstock to produce biofuels is an innovative process and an alternative to traditional feedstocks from agriculture. According to the Renewable Energy Directive (EU) 2018/2001 (often referred to as RED II), biofuels from algae, if cultivated on land in ponds or photobioreactors, are classified as advanced biofuels (Annex IX, Part A, lit (a) of RED II).

Production systems for algae cultivation

The cultivation of algae can be conducted using different technologies and production systems such as open ponds or tanks, photobioreactors or heterotrophic fermentation, among others. These technologies differ mostly in their cultivation process and input factors. Also, their locational requirements deviate. This guidance document is solely referring to algae cultivation on land as those aquacultural systems are eligible for Annex IX classification.

Feedstock of algae production

Usually, the energy source for the algae growth is (sun)light – autotrophic growth. In this case, the feedstock is algae. In other production processes, the energy source is organic carbon from surroundings – heterotrophic growth. Here the feedstock is organic carbon. For a mixed scenario, the feedstock could be partially algae and the organic carbon source – mixotrophic growth

(see Table 1). This guidance document refers to autotrophic growth. For the other growth types, ISCC must be contacted prior to certification.

Table 1: Algae growth type and feedstock classification. Source: RTFO: Compliance Guidance 2022

Growth type	Energy source	Carbon source	Feedstock
Autotrophic	Light	CO_2	Algae
Heterotrophic	Organic carbon	Organic carbon	The organic carbon source
Mixotrophic	Part light, part organic carbon	Part CO_2, part organic carbon	Mixed

Necessity of a guidance document

Due to the nature of algae cultivation in contrast to agriculture and forestry, additional guidance for applying ISCC certification is necessary. This document provides guidance on the certification of the production of algae biomass under ISCC. This guidance complements the existing requirements under ISCC EU.

2 Scope and Normative References

This document comprises guidance for the certification of sustainable cultivation of algae biomass on land. The specific criteria described in this document complement the system basics described in ISCC document 202-1 and 202-2 and apply to all relevant elements in the value chain. As a basic principle, all relevant ISCC documents are valid for the scope and ISCC EU system documents in their valid version must be applied.

3 Special Provisions for Algae Cultivation

3.1 Supply Chain Elements

Algae supply chains

For biofuels produced from algae, the supply chain starts at the algae cultivation unit. With regard to its role in the supply chain, this unit is comparable with farms or plantations in agricultural supply chains. Therefore, the certification scope is farm/plantation. A unit converting the algae biomass into algae oil is considered as a processing unit (oil extraction). Therefore, the certification scope for this unit is oil mill. Further information about supply chain elements is included in ISCC system document 201 – System Basics.

3.2 Calculation of GHG Emissions

GHG emissions for extraction or cultivation

GHG must be calculated according to ISCC EU System Document 205 “Greenhouse Gas Emissions”. Emissions for algae cultivation shall be calculated based on the calculation formula for extraction or cultivation of raw materials (e_{ec}). Especially, the following factors must be considered:

> Fertiliser
> Plant protection products
> Water consumption
> Wastewater treatment and waste management
> Electricity consumption
> Fuel consumption
> CO_2 consumption
> Seedlings

Emissions from carbon stock changes caused by land-use change (e_l) and emission savings from soil carbon accumulation via improved agricultural management (e_{sca}) are not applicable for algae cultivation.

3.3 Sustainability Requirements

Sustainability requirements for algae cultivation

The ISCC EU System Documents "ISCC EU 202-01 Agricultural Biomass: ISCC Principle 1" and "ISCC EU 202-02 Agricultural Biomass: ISCC Principles 2-6" provide information on the sustainability requirements for sustainable biomass production in agriculture on farm or plantation level. In general, these sustainability requirements also apply to algae cultivation and the production of algae biomass. Thus, the sustainability requirements must be "transposed" from sustainable biomass production on agricultural land and as part of an agricultural management system to aquacultural biomass production on land. The land-based sustainability requirements according to Art. 29(3)-(5) of the RED II must be fulfilled for the land on which the aquacultural production system is located. The requirement for the monitoring of impacts on soil quality and carbon is not applicable. Algae grow in aquaculture (in water) and not in soil. Sustainability requirements focussing on soil quality and the carbon content of the soil cannot be applied for these kinds of cultivation systems. Furthermore, specific requirements on Good Agricultural Practices (GAP), e.g. focussing on the protection and conservation of soil fertility and quality or the implementation of ecological focus areas, are not applicable for aquacultural biomass production.

The following sustainability requirements from ISCC EU System Document 202-1 and 202-2 **do not apply** to algae cultivation as those are solely referring to sustainable soil management and cannot be transposed to algae production on land:

> 1.4 Monitoring of impacts on soil quality and carbon
> 2.1.3 Implementation of ecological focus areas for the protection of pollinators and biodiversity
> 2.1.4 A biodiversity action plan is in place

> 2.1.5 Natural vegetation areas around springs and natural watercourses are to be maintained or re-established

> 2.1.7 Restriction on burning

> 2.2 Maintain and improve soil fertility

> 2.3.7 Soil organic matter balance is compiled

> 2.5 Avoiding plant protection products with integrated pest management