Carbon credit market in agriculture – a comparison between Germany, France and Switzerland

Agriculture can contribute to storing CO_2 in soils and plants in the long term. This is referred to as carbon farming. Agricultural businesses can sell carbon certificates for this service in climate protection. To do so, the CO_2 storage achieved through agricultural activities, e.g., humus formation, planting trees, the use of rock flour (enhanced weathering) or biochar, must be determined and certified by an independent certification body. The carbon credits are traded on the voluntary carbon market and serve as an incentive to implement climate protection measures/activities in agriculture.

How are carbon credits generated?

If interested in carbon farming, agricultural businesses contact certification providers. These providers document the initial conditions, for example, using management data, soil samples, or satellite data. In some cases, a baseline is also determined (what would have happened without measures). The certification provider advises the farmer on suitable measures, which the farmer then implements and documents. Depending on the provider, the CO_2 reduction is assessed several times or at the end of the specified project duration. Certification is then carried out by an independent certifying body. The certificates generated are usually sold by the certification provider to companies or private individuals who want to offset their emissions (Fig. 1). How much money the agricultural business receives from the sale of carbon certificates depends on the provider. In some cases, farmers are also offered the opportunity to sell their carbon certificates directly.

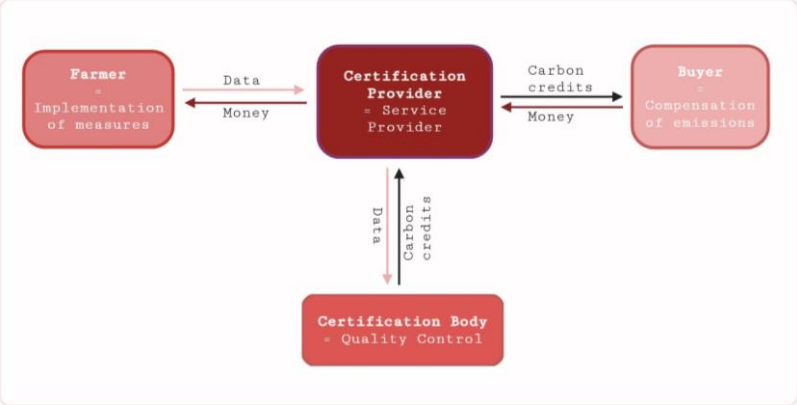

Fig. 1: General Certification Process with the involved parties.

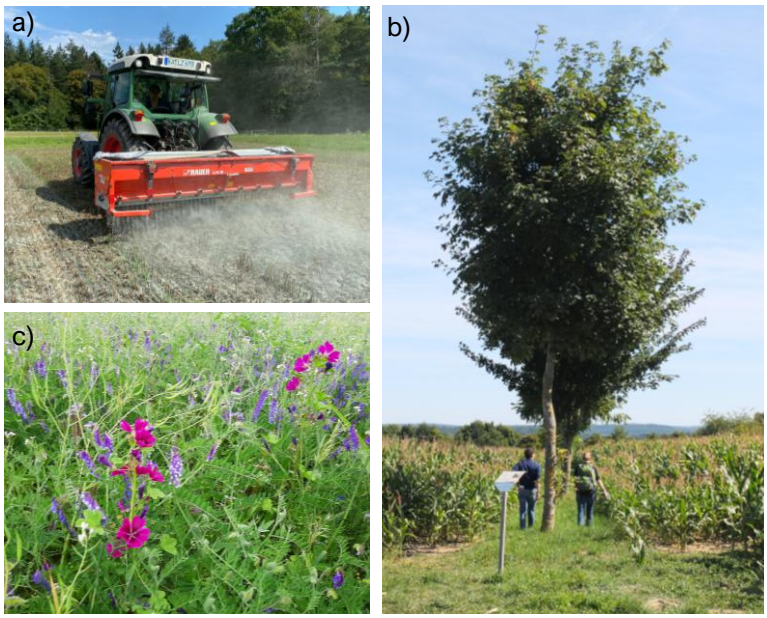

Fig. 2: Possible measures for carbon sequestration: a) Enhanced weathering, b) Agroforestry, c) Catch crops. Source: LTZ Augustenberg

There are various international certification standards for certification, e.g., Gold Standard (GS), Verified Carbon Standard (VCS), Carbon Standard International (CSI). These are intended to ensure that climate protection measures are legitimate as well as measurable and serve as a basis for issuing carbon certificates.

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Generally, certification is based on the following basic criteria:

Durability: Carbon storage or reduction in greenhouse gas (GHG) emissions must be permanent. For CO_2-certificates that are based on irreversible processes (e.g. enhanced weathering) or with a high mean residence time (e.g. biochar) this is guaranteed per se (ZeroEx, Circular Carbon). For reversible processes (e.g. humus formation) durability can be addressed by long term contracts with the farmers including financial buffer (TGO AG, CarboCert) in case carbon storage is not maintained permanently.

Additionality: Carbon storage or reduction of GHG-emissions must go beyond the legal framework and must not already be part of a subsidy program. The differentiation between "business as usual" and additional is often difficult. Catch crops for example increase humus formation, but are also part of state subsidy programmes.

Leakage: Carbon certificates should not be based on carbon storage or reduction of GHG-emissions in one place, while the activities increase emissions elsewhere. For example, applying additional organic fertilizer on certified fields to increase humus formation while it is depleted on other fields where no or less organic fertilizer is used. This is addressed by monitoring the entire farm and accounting for external inputs.

Comparison between countries

In Germany, France, and Switzerland, the system of carbon certification in agriculture differs in structure and scope. While there are a large number of private providers in Germany, the carbon market in France is organized nationally. In Switzerland, trading of carbon certificates in the agricultural sector is still not well established.

France The market for agricultural carbon certificates is based mainly on the Low Carbon Label (CARBON AGRI), an official framework launched in 2018 by the Ministry for the Ecological Transition. This label certifies projects that reduce emissions or sequester carbon within the national territory, according to approved methodologies (permanent grasslands, arable crops, hedgerows, etc.). The credits generated can be sold to companies, local authorities, or individuals wishing to voluntarily offset their emissions, thus providing farmers with additional income. The process is transparent: calculation methods, eligibility criteria, and results are published, and certification involves verification by an independent third party.

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Germany Various certification providers are active on the market in Germany. However, it is difficult to find available providers and to compare them using the information available online. Only a few explain in detail the basis for determining and calculating carbon sequestration or disclose the generated revenue for farmers. Agricultural businesses usually participate in the certification program with some or all of their agricultural land. Greenhouse gas savings outside of agricultural land, for example through measures in animal husbandry, are not taken into account in the certification process. Carbon credits are often based on increasing humus, however the quantification is intricate as humus is often inhomogenously distributed and a change in the amount only measurable after many years.

Switzerland There are a number of actors and initiatives, that offer carbon certificates on the voluntary market. There is only little coordination between the initiatives, and the government does not play a central role as opposed to mandatory compensation. The detailed process of calculation and certification is rarely disclosed. An important actor for carbon certificates is myclimate, a foundation supporting projects for CO2 compensation in the voluntary and mandatory market, in agriculture and other sectors. There are a number of projects supporting projects such as agroforestry, without emitting a certificate for their greenhouse gas reduction.

A relatively new actor in Switzerland, AgroImpact, was created in 2023 to accelerate farm's resilience to climate change in Switzerland, without emitting carbon certificates (insetting). It supports farms to adopt adaptation practices, reduce GHG emissions and to store carbon in soil. The participation is voluntary and once the farmers agree to carry out the assessment, they commit for six years. The buyers (food industry, distributors) compensate the farmers with a premium.

Carbon Removal Certification Framework (CRCF)

In order to standardize trading in carbon credits, the EU has adopted a common regulatory framework (CRCF Regulation (EU) 2024/3012). The detailed design with methodological specifications is expected to be finalized in 2026. However, it will take several years until full implementation (recognition of the certification programs by the EU Commission and creation of an EU-wide registry). The regulatory framework is voluntary, but it can be assumed that it will become the standard. The aim of the regulation is to strengthen confidence in carbon credits trading and, in particular, to prevent greenwashing. The regulatory framework is intended to cover both technical solutions (e.g., biochar, BECCS – bioenergy with carbon capture and storage) and natural sinks (e.g., humus formation, peatland rewetting).

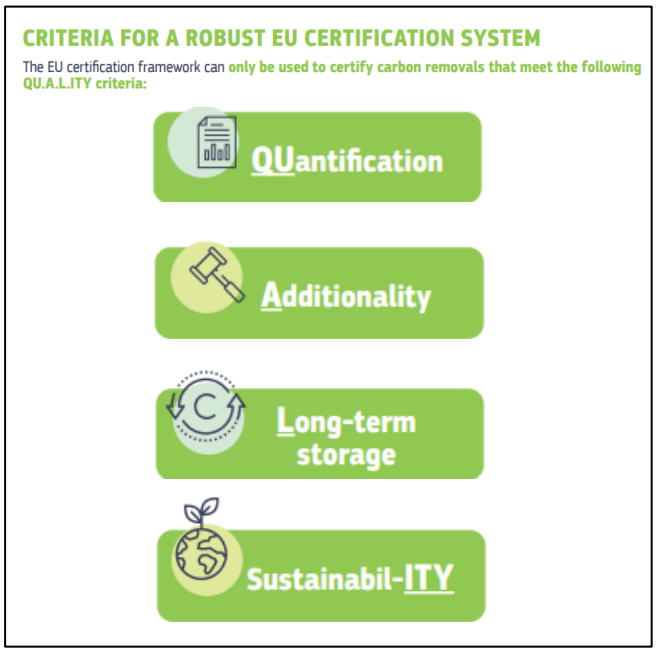

Fig. 3: Criteria of the CRCF for the certification process. Source: Factsheet of the CRCF proposal, European Commission, 2022

Comparison between countries – Certification Providers

Certification provider	TGO Ag	CarboCert	AgreenaCarbon Project	Zero Ex	Okostrom (biogas)	dairy cooperative mooh	CARBON AGRI
Country	Germany	Germany, Switzerland	20 countries in Europe (Austria, France, Germany, Poland, Spain, UK et al.)	Germany	Switzerland	Switzerland	France
Standard	ACS2030-Standard	DIN ISO 14064-2	DIN ISO 14064-2 Verified Carbon Standard (VCS)	n/a	Goldstandard, ISO	VCS, feed additive methodology VM0041	French Label Bas Carbone / Ministry of Ecological Transition
System boundary	Farm and landscape level (LCA Scopes 1-3)	Agricultural land	Agricultural land	Agricultural land	Biogas Plant	Dairy Farm	Farm Level
Quantification method	• Soil carbon fractions analysis (BC LOCK method) • remote sensing • management data • LCA integration	• Soil samples	• Soil measurements • Modelling based on RothC model • Satellite assessments	• Soil samples • Water samples using a self-developed instrument	• Quantity of manure digested/processed (production is not a relevant parameter in ISO/GS)	• Measure agolin (feed additive) added to mineral feed via feed mills	• Greenhouse gas accounting CAP'2ER Level 2
Duration	> 35 years	8-20 years	40 years	5-10 years	20 years	minimum 6 months	5 years
Measures	• humus formation • agroforestry • catch crops • flower strips • reduced tillage • biochar • rock powder • rewetting of peatland	• humus formation • agroforestry	• reduced tillage • crop residues on field • cover crop • catch crops • reducing nitrogen fertilizer • nitrification inhibitor	• rock powder n/a	• anaerobic digestion of farmyard manure in biogas plant	• feed additive	• herd management • herd feeding • manure management • fertiliser consumption • energy consumption • cultivated land management • agro-ecological infrastructure management
Financial benefit for the farmer	Guaranteed annual payment + variable bonus based on verified CO_2 removal (€/t CO_2e) – aligned with UBA social cost of carbon (880 €/t)	At least 30 €/t CO_2eq (Risk buffer: Payout of 80 % of generated t CO_2, remaining 20 %, paid out after 20 years)	85 % of the revenue from their sales (Risk buffer: 24 % of carbon credits + additional 10% as further safeguard)	-	The farmer is remunerated per t of CO2 reduced	60 CHF per t CO_2eq plus share in surplus distribution	32 €/t CO_2eq
Price of certificates for	30–380 €/t CO_2eq	Minimum of 55 €/t CO_2eq	30-50 €/ t CO_2eq	200-300 €/ t CO_2eq	100 CHF per t CO2eq	Varying prices, on average 100 CHF per t CO_2eq	40 €/t CO_2eq
Costs for Farmer	Initial cost: Soil samples, modelling, certification Ongoing cost: From 60 €/ha/year or annual contract depending on farm size	Soil samples: 110 € per unit (1 to 9 hectare), *The smaller the structure, the higher the costs per hectare (average 3-5 hectare)* Travel expenses per farm: 200 €	Investment in new euqipment	None (rock powder is provided for free)	Investment for biogas plant	Feed additive is paid by farmer but compensated by provider	The costs can be estimated at the €2,500 per farmer (initial assessment – action plan – mid-term review – final assessment). All these actions will be carried out by a trained CAP2ER agricultural advisor. The cost is mainly financed by public or private entities.
Transparency	+++	+++	++	++	++	++	+++
Additionality	++	++	++	+++	+++	++	+++
Leakage	++	++	n/a	++	+	+	++
Durability	++	++	++	+++	++	+	++
Effect on climate protection	++	++	++	+++	+++	++	+++

Table 1: Comparison of different certification providers from Germany, Switzerland and France (based on information that was found online). Rating of the providers: n/a = not applicable/no information, + = unsatisfying, ++ = moderate, +++ = good