Inspiring4Biodiversity

Integrating biodiversity in agricultural supply chains

Six methods for managing biodiversity in agricultural supply chains

Dr. Thomas Schaefer

Erasmus+

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Introduction: Managing Biodiversity in Business

Corporate activities can have impacts on biodiversity along the entire value chain. This particularly affects agricultural supply chains. 70% of terrestrial biodiversity is directly or indirectly threatened by agriculture. At the same time, there is a very large leverage effect and direct starting points for the protection of biodiversity especially in agricultural production. Inspiring4Biodiversity will therefore present various methods for managing biodiversity in agricultural supply chains.

The greater part of the impact is in the hands of the company itself. For example, cleaning agents can be biodegradable (product formula), production can be energy and resource-saving (e.g. by recovering process heat). The sales department can draw up application guidelines for the use of products that avoid environmental impacts. Positive effects can be achieved by a reflected product selection, if necessary even within the product selection of the same manufacturer. An example would be the switch from classic insecticides to pheromone active ingredients. In the area of services, a financial product can be mentioned that guarantees investors full biodiversity protection. After-use and disposal concerns the reusability or recyclability of products after their use, such as the use of multiple containers in industry.

If a company builds a modern image through this, biodiversity management can play a role in human resource development. For strategy and management, topics such as raw material availability, prices, quality and risk management are relevant, e.g. if only one country of origin can be considered for a raw material. Biodiversity issues are also relevant for sustainability reporting. It is not uncommon for companies to have to work with what is available on the market and develop the necessary specifications themselves. Environmental aspects in supply chain management have been anchored in EMAS (European Management and Assessment System) and ISO 14001 (Environmental Management System) for many years. Biodiversity aspects have been added to the criteria for some years.

Biodiversity issues are also relevant for sustainability reporting. This document offers a methodology for getting started with corporate biodiversity management.

What this tool can do

This tool intends to support sustainability managers and buyers of agricultural products in choosing the appropriate method for biodiversity management of their own agricultural supply chains.

Who this tool is for

Products from agricultural production must meet various requirements and criteria such as quality, price and availability. A company that is committed to preserving biodiversity and the livelihoods of people must engage in the management of biodiversity in its agricultural supply chains.

What this tool cannot do

This tool is not a one-fits-all approach that can be implemented simply and directly. The subject is too complex and customised solutions are required. In individual cases, external or additional internal expertise will be necessary for implementation.

Six practices for managing biodiversity in agricultural supply chains

Six ways in which companies can incorporate biodiversity into their management are outlined below. These increase in complexity and are suitable for different types of companies.

- I Implementation of a sustainability strategy with own criteria
- II Implementation of a sustainability strategy with external criteria
- III Certification with existing sustainability standards
- IV Biodiversity check agriculture
- V Biodiversity Action Plan
- VI Application of biodiversity scorecard

For each of these procedures, a brief introduction is given below, strengths, weaknesses, opportunities and risks are explained and a practical implementation example is described.

I . Implementation of a sustainability strategy with own criteria

A company creates a sustainability strategy that defines the important goals and how to achieve them. The strategy can be very broad or focus on biodiversity. A catalogue of requirements and measures concretises the strategy. For example, measures for biodiversity can be switching to integrated pest management, establishing riparian strips and flower strips in the productive landscape. Suppliers are motivated to support and help implement these measures.

This requires an extensive process involving different groups of stakeholders to make the concept sound and implementable. Requirements from the procurement criteria must be implementable with suppliers and at the same time withstand critical dialogue with civil society. Such a strategy can be structured in very different ways. With regard to biodiversity, a breakdown according to the main causes of biodiversity loss, other important criteria such as freedom from deforestation and water management is just as obvious as a breakdown according to the sphere of influence of an agricultural operation, e.g:

- General management.
- Cultivation and core business.
- Biodiversity and ecosystems on the farm.
- Biodiversity and ecosystems around the farm.
- Other aspects such as further processing.

For which companies is this procedure suitable?

The process is suitable for companies with a limited portfolio of different raw products and resilient, direct, ideally long-standing supplier relationships.

Example: Unilever Sustainable Agricultural Code USAC

The Unilever Code of Sustainable Agriculture is a set of best practices to embed critical aspects of sustainability in agriculture with criteria and apply them to supply chains. The USAC's objectives pay into the Unilever Sustainable Living Plan programme, which is seen as fundamental to the business. Cf. Unilever Strategy for the Protection and Regeneration of Nature.

Strength

- The process and all criteria are fully in the control of the company.
- Own focus, e.g. along customer enquiries or supplier structure.
- Criteria apply uniformly to all raw products.
- External certifications for suppliers are no longer required.
- Incentives can be controlled on the part of the company.

Challenge

- Increased initial outlay for the company.
- No independent control as by external certifiers.
- Possible lack of acceptance by suppliers.
- Not suitable for complex/multi-layered international supply chains.

Opportunities

- Reaction to new topics self-controllable and possible at short notice.
- Good communicability, high credibility.
- Continuously expandable.

Risks

- Additional burden on suppliers due to further criteria structure.
- No sufficient update frequency (e.g. every three years).
- No sufficient resources in the company for implementation.

The IPBES Global Assessment Report on Biodiversity and Ecosystem Services of 2019 shows that up to 70% of terrestrial biodiversity loss is due to livestock and crop production.

II. Implementing an own sustainability strategy by means of external sustainability standards with additional criteria for biodiversity

As above, a company creates its own overarching sustainability strategy, which identifies the important goals and how to achieve them. This again requires an extensive process involving various groups of stakeholders. A simplification to the previous concept is that the implementation is not completely self-managed, but the company relies on a set of existing sustainability certifications. In addition, individual, transversally significant requirements and measures for certain raw products are implemented across the board.

In complex supply chains with many products from many regions of the world, it is very challenging to ensure long-term supplier relationships and traceability. Sustainability standards in the food industry have a global network of advisors and certifiers who can ensure this. Additional criteria can then be implemented for supply chains that are well known by the company.

For which companies is this procedure suitable?

The method is suitable for companies with a diverse portfolio of raw products and supply chains that cannot be directly traced throughout or direct, long-standing supplier relationships.

Example: Nestle Responsible Sourcing Standard

The food company Nestle decided to start sourcing a set of critical raw materials with sustainable certification in 2013 and has been continuously expanding this set ever since. In overarching strategies, such as on biodiversity and water in agriculture, Nestlé named and implemented goals in their own projects in addition to the certifications. See Nestle Sustainably Sourced Raw Materials.

Strength

- External and independent assurance of the implementation of the biodiversity criteria.
- Applicable worldwide in complex supply chains.
- Own focus possible, e.g. along customer enquiries or supplier structure.
- Overriding criteria apply uniformly to all raw products.
- The suppliers in the supply chain know certifications.

Challenge

- Certifiers set criteria.
- Control of the company via criteria only possible to a limited extent.
- Traceability of supply chains only indirectly possible.
- No own control of implemented measures.
- Costs for certification at the suppliers or producers' premises.

Opportunities

- New raw products can be added with reasonable effort.
- Good communicability, high credibility.
- Flexibility through change of certifications and own criteria.
- Entry into traceability possible through cooperation with certifiers.
- Continuously expandable.

Risks

- Limited influence on revisions of certifications.
- Lack of availability of certified products.
- No sufficient resources in the company for implementation.

III. Certification with existing sustainability standards

Independent of developing its own autonomous biodiversity strategy, a company relies on biodiversity criteria in existing sustainability standards in the food industry.

In complex supply chains with many products from many regions of the world, it is very challenging to ensure long-term supplier relationships and traceability. Further processing companies and importers may have to respond to customer demands. Sustainability standards in the food industry have a global network of consultants and certifiers who can ensure this. Besides quality, availability and price, these can also be other criteria, increasingly sustainability standards in the food industry. Such standards increasingly take into account criteria and measures for the protection of biodiversity. Relying on these can therefore be a good strategy. However, it remains important to understand which criteria the respective standards require. Finally, an overarching policy for the protection of biodiversity can be derived from this.

For which companies is this procedure suitable?

The process is suitable for companies that have to react significantly to customer wishes and need a high degree of flexibility.

Example: Sustainability standards with criteria for biodiversity

The requirements for importers regarding sustainability certifications of tropical fruits vary from country to country and from fruit to fruit. In Germany, about 90 % of bananas are certified by sustainability standards. Slightly more than 10 % of these are organic bananas, and about 80 % are specially qualified with the Demeter, Naturland, Rainforest Alliance and Fairtrade standards. Pineapples are certified to much lower percentages. In addition to those mentioned, there are other certifications such as Sustainably Grown, which work with individual companies.

Strength

- External and independent assurance of the implementation of the biodiversity criteria.
- Applicable worldwide in complex supply chains.
- The suppliers in the supply chain know certifications.
- Good communicability to customers.

Challenge

- Certifiers set criteria.
- Control of the company via criteria only possible to a limited extent.
- Traceability of supply chains only indirectly possible.
- No own control of implemented measures.
- Costs for certification at the suppliers or producers' premises.

Opportunities

- New raw products can be added with reasonable effort.
- Good communicability, high credibility.
- Entry into traceability possible through cooperation with certifiers.
- Continuously expandable.

Risks

- Limited influence on revisions of certifications.
- Lack of availability of certified products.
- Little room for manoeuvre for the company.

Important sustainability standards in the food industry with criteria for the protection of biodiversity

Organic standards: Demeter, Naturland, Bioland, Ecovin

In addition to somewhat more demanding criteria in organic agriculture according to the EU Organic Regulation, these standards also decisively demand measures for biodiversity, such as biodiversity action plans (Demeter). Demeter has also required at least 10% biodiversity areas on certified farms for many years. Ecovin farms must draw up and implement a BAP in order to obtain certification.

Conventional standards: Global Gap, Rainforest Alliance and Fairtrade

With different emphases on social and ecological criteria as well as on farm management, these standards call for effective and ambitious measures to protect biodiversity. This includes, for example, BAP in Fairtrade as well as many other measures in cultivation, on farms and beyond. Rainforest Alliance has been demanding 10% biodiversity areas since 2020. GlobalGap has been offering a Biodiversity Add On to farms since 2022.

IV. Biodiversity Check Agriculture "BCA"

The Biodiversity Check Agriculture BCA provides the basis for a structured dialogue with farms and thus the entry into biodiversity management. The check can be applied to both large and small farms, and for cooperatives there is a convoy variant with which several small farms can be involved at the same time. The BCA analyses the direct and indirect impacts of a farm on biodiversity and uncovers further links. At the same time, it is a process for raising awareness of the issue among producers. The BCA is voluntary, flexible and confidential, and suitable for any crop. It is divided into four sections:

1. Biodiversity in operational management.
2. Biodiversity in cultivation.
3. Biodiversity on the farm and on the agricultural land.
4. Biodiversity in the surrounding landscape.

A trained person along established questionnaires implements the check. The aim of the counselling is a practical report with a catalogue of concrete recommendations for measures that the company can implement.

For which companies is this procedure suitable?

Agricultural enterprises that want to start with integrated biodiversity management can use the BCA. Companies in the food sector can motivate supplying companies to implement a BCA.

Example: Pineapple plantations of Upala Agricola in Costa Rica

The Costa Rican company Upala Agricola uses the BCA as a supplement to mandatory sustainability certification. The biodiversity check has identified a number of possible measures that are now being successively implemented. These include an inventory of flora and fauna, potential for soil improvement through organic matter and the valorisation of natural and semi-natural habitats on the site.

Further information: www.delcampoalplato.com.

Del Campo al plato

Strength

- Individual and adaptive tool with tailored recommendations.
- Applicable on farms worldwide.
- Process-oriented, successive implementation possible.
- Riding past the requirements of sustainability standards.

Challenge

- Implementation of the measures not necessarily part of the process.
- No mandatory external control of implemented measures.
- Advisor not yet available worldwide.

Opportunities

- Uncover linkages with biodiversity in different supply chains can be analysed.
- Entry into traceability possible through cooperation with certifiers.
- Continuously expandable with more farms and products.
- Blueprint for biodiversity management e.g. of a supermarket chain.

Risks

- Agricultural enterprises rise.
- Implemented measures not sufficiently ambitious.

Only a small part of agricultural production is for direct human consumption. Up to 75% of global agricultural production is not for direct human consumption, but for the **production of meat and dairy products.** Soy, maize, wheat, rapeseed etc. are used as feed for cattle, pigs or poultry.

In addition, **energy crops** are cultivated for use as fuel or for biogas plants. These are sugar cane in the subtropics and tropics, and sugar beet, wheat and maize in temperate latitudes. In Germany, around 20 % of agricultural land is used for the production of energy crops.

Agricultural supply chains can also be found in the **clothing industry, especially** cotton cultivation, wool production, silk, leather and, in smaller quantities, down, linen or hemp. Rubber for car tyres or fragrances in cosmetics also have an agricultural origin.

V. Biodiversity Action Plan "BAP"

A Biodiversity Action Plan (BAP) assesses the initial situation of a farm and recommends specific biodiversity measures to support biodiversity on site in the long term. This plan is accompanied by a monitoring approach that illustrates both the quantitative development of biodiversity measures on the farm and the qualitative development of individual indicator species. A BAP can be the result of an individual Biodiversity Check, but can also be developed as part of another process, e.g. with the farm staff.

BAPs can be tailor-made for a farm and scaled to the farm size, and the level of ambition can be adjusted accordingly. Measures can be very diverse and cover the four areas mentioned in the previous chapter: biodiversity in farm management, biodiversity in cultivation, biodiversity on the farm and farmland, and biodiversity in the surrounding landscape. Farms where further processing of their own products takes place (e.g. in viticulture or for farm shops) can extend the catalogue accordingly. The measures should address the five main causes of biodiversity loss (see above).

For which companies is this procedure suitable?

Every farm can set up and implement a BAP. Companies in the food sector can demand BAPs from supplying farms or motivate them to develop them. However, BAPs can also be developed on an aggregated level for several farms, usually at the level of the supplying company.

Example: National Sustainable Spice Programme (NSSP) India

The National Sustainable Spice Programme (NSSP) brings together stakeholders from the public and private sectors as well as smallholder groups on one platform to address social, economic and environmental issues in the Indian spice industry. The main objective of the programme is to promote 'food security and sustainability' by bringing together key stakeholders in the sector who are committed to sustainable spice production. The NSSP uses BAP as a measure to protect biodiversity among Indian spice producers.

Further information: www.nssp-india.org.

Strength

- Individual and adaptive tool with tailor-made measures.
- Applicable on farms worldwide.
- Process-oriented, successive implementation possible.
- Passing/fulfilling the requirements of sustainability standards.
- Tool for support and development of BAPs available and partly freely available.

Challenge

- No established benchmarks for the ambition of a BAP.
- No mandatory external control of implemented measures.
- BAP advisor not available worldwide.

Opportunities

- Adaptable in the long term and expandable through new measures.
- Entry into traceability possible through cooperation with certifiers.
- Continuously expandable with more farms and products.
- Blueprint for biodiversity management e.g. of a supermarket chain.

Risks

- Implemented measures not sufficiently ambitious.
- BAP will not be implemented in the long term.

VI. Application of Biodiversity Scorecards

Biodiversity scorecards consist of a defined catalogue of biodiversity measures for which different degrees of target achievement are set. Each of these measures is linked to a maximum value, the degrees to intermediate values. If all measures are fully implemented, the sum of all maximum values is 100 %. The values for partial achievement can be used to easily determine which measures are implemented on the farm. A regular check enables reliable progress monitoring.

The creation of the scorecard requires the definition of the measures and a weighing of the assigned values (scores). Then the scorecard can be applied to any number of farms. If the farms are very heterogeneous, a scorecard can be created from several modules (e.g. arable farming, dairy farming, fruit growing). In this case, the comparability of the scores must also be guaranteed between the modules.

For which companies is this procedure suitable?

Biodiversity scorecards are particularly suitable for similar crops in comparable regions. It is not easy to weigh up the scores between different climatic zones, very different types of cultivation, etc. The scores can be used for different crops.

Example: ProPlanet apple project of the Lake Constance Foundation

The Lake Constance Foundation has developed a scorecard with precisely tailored measures for biodiversity to control measures in apple cultivation at Lake Constance. The fruit growers create flowering areas, plant hedges and woody plants and install nesting aids for wild bees and birds. Each year, well over 100 fruit growers participate. The balance of measures since 2010 (as of 2017): 246 hectares of flowering areas, 8800 woody plants, 550 insect nesting aids, 1740 bird boxes and 120 bat boxes. A success control carried out in 2017 shows that even intensively used low-trunk orchards can be habitats for many wild bees. Thus, 117 wild bee species were identified in the cultivation areas and promotion measures.

Further information:

www.bodensee-stiftung.org/pro_planet_apfelprojekt

PRO-PLANET.INFO
Für mehr Artenvielfalt

Strength

- Good comparability within the project.
- Individual tool with tailor-made measures.
- Reliably applicable on farms.
- Process-oriented, successive implementation possible.

Challenge

- No mandatory external control of implemented measures.
- Not easily applicable to a wide diversity of cropping types and climates.
- Adjustments during the process change the scores and thus the comparability.
- Comparability between crops and farming systems limited.

Opportunities

- Entry into traceability possible through adaptation to criteria of certifiers.
- Expandable with more farms.
- Concept can be expanded through modules for other forms of culture.
- Concept for biodiversity management e.g. of a food producers.

Risks

- Long-term monitoring and implementation not given.
- Only works with long-term supply relationships.

Conclusion

The impact of the production of agricultural products on biodiversity can be analysed using the methods available today and appropriate mitigation measures identified. Companies in the food sector can choose appropriate approaches and adapt them to their needs in order to manage the impacts they cause and are therefore responsible for, ideally inspiring themselves, their employees, business partners and customers to conserve biodiversity.

Background information

Different types of cultivation and their influence on biodiversity

Organic farming

Organic production focuses on the development of a biodiverse, resilient system in cultivation, in which natural processes make the use of chemicals unnecessary. This is legally regulated in the European Union by Regulation (EC) No. 834/2007 (Organic Regulation). Monocultures and the use of synthetic chemical products such as fungicides, herbicides and insecticides, artificial fertilisers, growth regulators and antibiotics, as well as genetically modified agents and products are avoided. Instead, manure or slurry applications and green manure are used to add nutrients to the soil and promote the build-up of organic matter in the soil. Organic methods are used to control pests and weeds. To avoid diseases and pests, proven and robust varieties are preferably planted. If necessary and if possible, biological pest control methods are used. The use of plant protection products is severely limited. Besides plant preparations or oil emulsion, inorganic protective agents are permitted to a limited extent, mainly as fungicides.

What does this mean for biodiversity: Doing without agrochemicals significantly reduces the negative impacts of agriculture. Many studies show significantly higher biodiversity on organically farmed land.

Integrated farming

Integrated production (IP) strives for agriculture that is close to nature and animal-friendly. All farming techniques should strike a balance between environmental protection, economic efficiency and social needs. In concrete terms, this means, for example, fertilising only when the crop needs it and applying pesticides only when no natural methods are available. The level of consideration is a trade-off between the potential economic crop loss and the cost of control. In IP, methods are to be used that have the lowest possible impact on the environment without adopting all the restrictions from organic farming. There are no restrictions on the use of agrochemical products.

IP is not specifically regulated by law in the EU. In fact, the EU Pesticides Directive, the EU Nitrates Directive and other EU directives required IP to be implemented in all EU member states. In Germany, this has largely been implemented, and in some EU countries and Switzerland there is the possibility of having IP certified.

What does this mean for biodiversity? The use of pesticides and emissions to air, soil and water are lower than in unregulated conventional agriculture. However, pollution of groundwater, soil and surface water remains high. Against the background of the fact that in Germany, for example, IP has been used for decades, positive effects on biodiversity can hardly be argued. Studies show that biodiversity has declined by 70% since 1995, even with IP as practised in Germany. Effects have also been documented in protected areas.

Integrated Pest Management IPM

In conventional agriculture, integrated pest management is regarded as the guiding principle of modern plant protection. Economically, ecologically and toxicologically suitable methods are to be coordinated in order to keep harmful organisms below the economic damage threshold. In Integrated Pest Management, biological, biotechnological, plant breeding, cultivation and cultural measures are to be optimised in such a way that the use of pesticides is kept to a necessary minimum. The EU member states have committed themselves to allow only integrated pest management from 2014 at the latest, giving priority to non-chemical measures (Art. 55 Regulation 1107/2009/EC and Art. 14 Directive 2009/128/EC).

The measures include a suitable location for the crop, proper soil cultivation, crop rotation, a suitable sowing or planting date, the use of healthy seeds or seedlings of a variety that is as resistant as possible to the prevailing pests, and a balanced organic or mineral fertilisation. Wherever possible, targeted chemical plant protection measures should be carried out in compliance with appropriate control thresholds or damage thresholds and relevant forecasting methods. There are no restrictions on the use of pesticides.

What does this mean for biodiversity? Critically, plant protection can be understood as a euphemism, because the use of herbicides is by no means a measure to protect plants. IPM is a component of IP and, as described above, IPM leads to less pesticide use, while the pollution of soils, groundwater and surface water remains too high. The use of substances hazardous to bees has been halved since 2015; no other positive effects on biodiversity are known.

Conventional agriculture

For the sake of understanding, conventional farming that operates without IPM or IP will also be described here. Conventional agriculture aims to achieve the highest possible yield per area. To achieve this, fertiliser and crop protection are applied in such a way that maximum growth and as few losses as possible occur. The methods described above, such as crop rotation, variety selection, etc., are subordinate to the yield goal. The emergence of agrochemicals in the first half of the 20th century represented a step forward, as the yield and thus the economic basis of farms became less dependent on external factors such as the weather.

Farmers purchase "technology packages" from agrochemical manufacturers, which provide for application according to fixed schedules. Pesticide applications are made at such close intervals that plant diseases are excluded. This leads to enormous quantities of pesticides and fertilisers and considerable emissions. The expensive use of agrochemicals does not necessarily lead to higher incomes for the farms. Nevertheless, this cultivation philosophy is still the most common in Europe.

What does this mean for biodiversity: Rachel Carlson warned of the silent spring as early as 1962 against the backdrop of rampant pesticide use in the USA. For 60 years now, each new spring has been somewhat more silent than the previous one. Besides the direct destruction of habitats for new cropland, the change in trophic status, i.e. the natural supply of nutrients to a habitat, through fertilisation and the direct and indirect destruction of animals, plants and fungi are the greatest known impacts on terrestrial biodiversity, with declines averaging 70% worldwide.

Intensity of the production system

The intensity of the production system and the associated influence on biodiversity can be derived from the tillage, the use of fertilisers and pesticides, the extent of possible irrigation in relation to water availability and other factors.

Soil cultivation

Intensive tillage includes, for example, turning ploughing, deep ploughing and intensive drainage. Low-intensity tillage remains superficial and interferes little with soil properties. This protects the natural processes in the soil. A decisive factor in tillage is the erosion it may cause. This is closely related to the irrigation system and precipitation, especially heavy rainfall events. The US Department of Agriculture has developed the Erodability Index for this purpose, which is used in the USA and Central America to produce maps of erosion susceptibility; something similar is planned for Europe. Another aspect is the improvement of soils in terms of structure, humus content and water capacity. For practicability, we recommend obtaining information on whether erosion risks are known and whether soil improvement measures are in place on specific farms.

Use of pesticides

For pesticides, toxicity and frequency of application are relevant parameters. Today's pesticides are extremely efficient; some neonicotinoids, for example, are 10,000 times more potent than the long-banned DDT. 2 litres of the herbicide glyphosate are enough to prevent the growth of wild weeds on one hectare of field for six weeks, that is 0.2 ml per m². This suggests to the user that only a small amount of poison is used and that the treatment is gentle. In fact, the lower application frequency is due to the high toxicity. Less toxic and well degradable agents, such as those permitted in organic farming, require larger quantities and more frequent applications. In order to assess the intensity of spray treatment, these aspects - quantity, frequency of application and toxicity - should be considered in an integrated way.

The German Federal Environment Agency uses the simplified Treatment Index, which indicates how often a crop has been treated with the prescribed amount for a pesticide. This enables a comparison of the intensity of crops (cf. Pesticide Atlas 2022, www.boell.de/pestizidatlas). It is highly recommended to avoid particularly toxic substances that are listed on the PAN International List of Highly Hazardous Pesticides.


Fertilisation

Improper, i.e. too intensive, fertilisation can damage soils, groundwater, surface waters and the adjacent natural landscape through leaching. Natural, biodiverse habitats are often rather poor in nutrients. Inputs of fertilisers from agriculture lead to significant changes in the trophic status of biodiverse habitats and to the loss of biodiversity. Active soil life, high humus contents and intelligent green manure management, as is common in organic farming, can in the best case make fertiliser unnecessary altogether. Until that happens, precisely balanced fertiliser applications according to soil or leaf samples at the relevant growth periods can ensure complete uptake by the crop and avoid the aforementioned. Apart from that, too much fertiliser is also a cost factor.

Irrigation

More than 70 % of the water abstracted from groundwater, rivers and lakes worldwide is used to irrigate agricultural crops. In countries with sufficient rainfall, this is not critical. However, water-intensive crops in particular are also cultivated in arid regions, which is only possible there with intensive irrigation. In such areas, water reserves cannot be compensated for in the long term by precipitation or inflows. The Aral Sea in the border region between Kazakhstan and Uzbekistan is a well-known example. Once the fourth largest inland lake in the world with 68,000 km², it has lost almost 90% of its surface area and over 98% of its water volume due to water extraction for irrigation-intensive cotton cultivation. The water crisis in many countries of the world is thus not caused by the abstraction of drinking water, but by agriculture. The consequences are as catastrophic for biodiversity as they are for people when wetlands are lost as habitats and drinking water reservoirs in arid regions.

In general, crops that require a lot of water should not be grown in dry areas. Water withdrawals must also be balanced independently with the locally available hydrological conditions. In general, the best available technology should be used for irrigation, ideally drip irrigation, which can be partially buried.

Genetic engineering

Genetically modified crops, i.e. varieties into which genes from other species have been inserted using laboratory methods, have been discussed since the 1980s as a possible step out of the global food crisis. Varieties that need less water and fertiliser and are more resistant to diseases seemed a solution for people in developing countries to increase yields and bring people out of hunger. So far, only a few crops have been established, but they often have little relevance for local nutrition, such as soybean cultivation in Brazil or cotton in India, which are traded internationally on the world market. Experts see considerable dangers in genetic engineering for biodiversity, as possible effects through outcrossing and release are hardly predictable.

The food crisis is primarily a distribution problem. Up to 70% of agricultural land is used for grazing and growing fodder rather than for producing food for humans. In many developing countries, of all places, large areas are used for the production of biofuels. Many foodstuffs are exported from developing countries and are initially no longer available to the local population. Either way, the risks of genetic engineering can be dispensed with.

Land consumption

There are many factors that determine the impact of agropastoral systems on biodiversity. One of many factors is land use. In the following, we want to demonstrate by way of example how a company can assess its own influence through the procurement of raw products with regard to land use. There are different levels of complexity to consider in different farming systems. Some examples with increasing complexity are presented below:

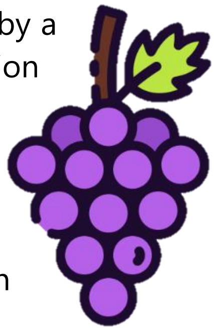
Example 1: Bananas for baby food manufacturers

Bananas for the western markets grow in permanent monoculture in Latin American countries. This means that the same crop grows on the same area for decades. The yield per hectare and year in these countries is about 40 (30 - 50) tonnes. Differences between the individual cultivation countries have converged in recent years. I.e. one kilogram of bananas requires about 0.25 m^2. A manufacturer of baby food can thus calculate quite well how much area is required for its own purchase.

By the way: About 1 million tonnes of bananas are imported and consumed in Germany every year, which requires about 250 km^2 of cultivation area. This is roughly equivalent to three-fourth of the area used for apple cultivation in Germany (336 km^2).

Example 2: Wine growing for a large winery

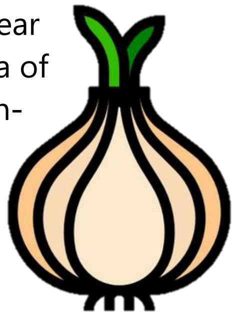
Wine is also grown as a permanent crop. The average yield per hectare in Germany, for example, is about 8,500 l/ha. However, this varies greatly by a factor of 10 (2,000-20,000 l) depending on the grape variety, cultivation strategy and growing region. The average yield in growing regions in southern France, Spain and Portugal is about 3,000 l/ha due to the drier climate. In order to calculate the area impact of a batch of e.g. 50,000 l, a large winery here must therefore know the average yield of the regions of origin or the winery. Italian wine would require about 2 ha of cultivation area, German less than 1 ha.



Example 3: Fresh onions for the fresh produce section of a supermarket chain

Crop rotations are positive for sustainable cultivation and biodiversity. At the same time, the area required for production in the crop rotation cycle is increasing. Farmers and their customers can find ways to create space for biodiversity together.

Conventional onions have an average yield of 44 t/ha in Germany, organic onions approx. 33 t/ha, i.e. 2.7 or 3 ha for 100t. Onions are grown in 7-year crop rotation to avoid soil-borne diseases. This means that a total of 16 ha of cultivation area is needed for 100 t over the crop rotation. For organic onions, the corresponding figure is approx. 21 ha for 100 t. For the other components of the crop rotation, such as wheat, maize and other cereals as well as catch crops, this must also be taken into account.

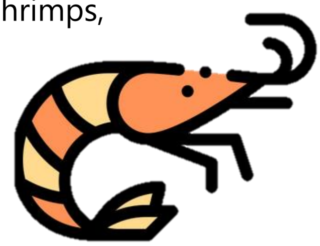


Example 4: Parsley for manufacturers of ready-made soups

Conventional flat-leaf parsley has an annual yield of about 60 t/ha total fresh mass yield. Like onions, parsley is usually grown in perennial rotation to avoid costly control of soil-borne diseases. Usually 5, more rarely 7 years of crop rotation are chosen, in which other umbellifers (e.g. carrot) are not grown. This would have to be clarified to determine the exact area impact. Parsley is dried for further processing after harvesting, losing up to 90 % of its weight. The dry leaf mass yield for flat leaf parsley is 6.1 t/ha, for curly leaf parsley 6.7 t/ha. A delivery of 10 t of curly dry parsley is therefore the harvest of 6 ha! However, parsley can be mown, i.e. harvested, up to 4 times a year. If this is taken into account and the 10 t are calculated on the basis of an annual harvest, the result is 1.5 h/10 t.

Example 5: Shrimps for speciality fish and seafood markets

For all animal products, the complexity is significantly higher. Here, the information on the area on which they are produced and additionally all feed used must be taken into account. If the feed is also of animal origin, as in the case of shrimps, for example, the feed of the fodder must also be included in the land consumption. Here, an individual consideration is necessary. For more common products such as beef, pork or chicken, meaningful information can be found on the internet.



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Global Nature Fund (GNF)
International Foundation for Environment and Nature
Fritz-Reichle-Ring 4 - 78315 Radolfzell, Germany
Phone: +49 7732 9995-80
www.globalnature.org

Author:
Thomas Schaefer (GNF)

Partner organisations:
MITTETULUNDUSUHING PEIPSI KOOSTOO KESKUS (Estonia)
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