



Research paper

Food security criteria for voluntary biomass sustainability standards and certifications

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ABSTRACT

With the shift from petroleum-based to biomass-based economies, global biomass demand and trade is growing. This trend could become a threat to food security. Though rising concerns about sustainability aspects have led to the development of voluntary certification standards to ensure that biomass is sustainably produced, food security aspects are hardly addressed as practical criteria and indicators lack. The research objective is to identify how the Human Right to adequate Food (RtaF), which is applicable in over 100 countries, can be ensured in local biomass production and in certification systems in food insecure regions. We aim to first develop a suitable conceptual framework to integrate the RtaF in biomass production, processing and trade and derive guidance for the choice the criteria. Second, we identify appropriate criteria to ensure that the RtaF is not violated by certified biomass operators based on a comprehensive literature review, stakeholder workshops and expert interviews with certification bodies, standard initiatives, NGOs, ministries, scientists and enterprises. The conceptual framework is based on the UN “Voluntary Guidelines to Support the Progressive Realization of the RtaF in the Context of National Food Security” and the four dimensions of food security. Based on this framework, we developed the rights-based food security principle. We selected 45 criteria that ensure that the RtaF is not adversely affected by certified biomass production of companies and farmers. The suggested criteria are applicable to all biomass types and uses and serve as a best-practice set to complement existing sustainability standards for biomass.

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1. Introduction

International demand and trade for agricultural commodities is growing while governments have started to shift from petroleum-based to bio-based economies. Hence, the rising demand for biomass is leading to a rising competition between the different biomass uses in the context of limited availability of arable land,

water and energy [1]. This trend can have adverse impacts on food security at two levels: At the international level through rising food prices and lower supply of food, and at the local level through the direct competition between biomass production for non-food purposes and available land and water resources for food production [1–4]. In the past years, the increasing use of bioenergy in the industrialized countries has led to more biomass imports and large-scale land acquisitions, which are associated with many, often negative, effects on the local population of the exporting countries [5–7]. These new markets for biomass attract national and international investors. Although international organizations such as World Bank and UNCTAD [8] promote foreign direct investment in agriculture in the expectation of positive effects on the development of the agricultural sector, most of these investments fail to include environmental and social aspects in a responsible way [9].

Sustainability concerns and climate change led to the development of voluntary certification schemes in the past decades [10,11]. As an answer to sustainability requirements for biomass, various initiatives for sustainability standards and certification schemes

Abbreviations: FPIC, Free, Prior and Informed Consent; FSC, Forest Stewardship Council; ISCC, International Sustainability & Carbon Certification Standard; RAI, Principles for Responsible Investment in Agriculture and Food Systems of the Committee on World Food Security; RSB, Roundtable on Sustainable Biomaterials; RSPO, Roundtable for Sustainable Palm Oil; RtaF, Human Right to adequate Food; RTRS, Round Table on Responsible Soy; VGGT, Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security.

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have emerged as new private governance mechanisms [11–14]. It is assumed that adverse environmental and social impacts of large-scale biomass production, export and trade can be solved through private engagement and cooperative mechanisms involving civil society actors, business and state authorities [13,15,16]. In the last two decades, voluntary sustainability standards proliferated [17] yet with great differences in the scope of sustainability and feedstock types. The main standards were mostly developed in multi-stakeholder processes referring to one specific feedstock such as the Forest Stewardship Council (FSC) for wood, the Round Table on Responsible Soy (RTRS), and the Roundtable for Sustainable Palm Oil (RSPO). Others refer to multiple feedstock such as the Roundtable on Sustainable Biomaterials (RSB) or the International Sustainability & Carbon Certification Standard (ISCC). These initiatives gained support with the introduction of the Renewable Energy Directive of the European Union, which includes a set of mandatory sustainability criteria for bioenergy [18]. Voluntary certification systems which fulfil these criteria can be used to prove compliance with the directive.

In addition, different guidelines emerged at the international level targeting the responsibility of investors in the agricultural sector such as the 'Principles for Responsible Investment in Agriculture and Food Systems' (RAI) defined by the Committee on World Food Security in 2014 and the 'Principles for Responsible Agricultural Investment that Respects Rights, Livelihoods and Resources' [8] developed by the World Bank, the Food and Agriculture Organization (FAO), the International Fund for Agricultural Development, and the United Nations Conference on Trade and Development (2011). Two guidelines of special importance to food security were released by the FAO: (i) the 'Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security' (hereafter Right to Food guidelines) providing recommendations, mainly for governments, for the implementation of the Human Right to Adequate Food in 2004 [20], and (ii) the 'Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security' (VGGT) in 2012 [21]. The VGGT build upon the Right to Food guidelines and complement these with technical instructions specifically on land rights. The FAO also developed the 'Bioenergy and Food Security' approach to assist countries in their design and implementation of sustainable bioenergy policies and strategies that support also food security and rural development. A broader focus on human rights in business practices led to the development of the UN Guiding Principles on Business and Human Rights, which were endorsed by the UN Human Rights Council in 2011 [19].

Both, the private sustainability standards and the international guidelines, intend to guide and voluntarily regulate sustainability aspects of biomass production. Certification systems monitor the sustainability practices of individuals through a third-party verification of the implemented criteria of a voluntary or obligatory standard. This requires exactly defined and measurable criteria that can be controlled during on-site audits [22,23]. The primacy of food and nutrition security within the production of biomass is widely discussed at the international level and stipulated along the civil society landscape [24]. Yet only few proposals have been made for assessing food security aspects in voluntary, private certification standards for biomass [25]. Among the various biomass sustainability standards and certification schemes, only the RSB defined a comprehensive guideline to assess food security [26]. However, their assessment method is complex and seems hardly applicable in the context of voluntary certifications due to the required extensive data collection and analysis. A study assessing the sustainability performance of different biomass certification schemes revealed a lack of methodologies to assess and avoid negative

impacts on local food security through certification standards [27].

The objective of this research is to identify how food security and the Human Right to adequate Food, which is applicable in over 100 countries, can be ensured in local biomass production in food insecure regions through certification systems. Two research questions are therefore addressed:

1. What is a suitable conceptual framework to integrate the Right to adequate Food in biomass production, processing and trade and which can guide the choice of criteria and indicators?
2. Which criteria are appropriate to ensure that the Right to adequate Food is protected by certified biomass operators?

This paper is structured into seven sections presenting the introduction, methodology, the conceptual framework, the developed rights-based food security principle with the selected criteria and their description, discussion and recommendations, and finally conclusions.

2. Methodology

We decided on a stepwise process for the development of the rights-based food security principle based on intensive stakeholder interaction. We started with a comprehensive review of available literature on the Human Right to Adequate Food (hereafter Right to Food) and on the various methods for measuring food and nutrition security. The aim was to identify a suitable assessment tool to measure impacts of biomass production on the food and nutrition security situation at the local level [40,49–54]. In a workshop with food security scientists we discussed how a valid assessment of the food and nutrition situation at local level could be done and how causality with the biomass production could be established given the typical situation of limited resources available for an audit, i.e. it is done at relatively low costs, within short time and without specific expert knowledge. This was complemented by consultations with experts of the Right to Food section and the Voices of the Hungry Project at the FAO as well as the World Food Program.

According to the definition of food security of the 1996 World Food Summit and the Right to Food, we designed a conceptual framework, which is described in detail in the next section. Based on the conceptual framework, the relevant themes and elements for the rights-based food security principle were identified.

In a next step, sustainability standards for biomass were assessed to gain an overview of already existing criteria and indicators based on the themes and elements of the conceptual framework, i.e. the criteria were grouped according to the selected Right to Food guidelines (see also Section 3). The screening process included the following ten standards: FSC, RTRS, RSPO, RSB, ISCC, Bonsucro, UTZ Certified, REDCert, the German multi-stakeholder Initiative on Sustainable Supply of Raw Materials for the Industrial Use of Biomass, and the Global Bioenergy Partnership Sustainability Indicators of the FAO [28–37]. This overview resulted in a list of social and environmental criteria and indicators that already cover the themes of the conceptual framework. The list formed the basis for the selection and specification of criteria for the rights-based food security principle. It helped to identify themes which were not already addressed by existing criteria and indicators. For these themes we suggested criteria (see Section 4). This resulted in the first draft of criteria for the rights-based food security principle.

Once the first draft existed, a larger stakeholder consultation process was initiated. Interviews and consultations took place with a total of ten experts from the ISCC Standard, the standard 'Cotton made in Africa', experts from the FAO, the World Food Programme and German Agency for International Cooperation/Forum for

Sustainable Palm Oil. Two multi-stakeholder workshops with a total of 27 participants from certification bodies, standard initiatives, NGOs, ministries, researchers and enterprises were held to discuss the work in progress regarding the developed rights-based food security principle for biomass sustainability standards. Each workshop led to a revision of the rights-based food security principle and the respective documentation. The research took place from November 2014 until August 2015.

3. Conceptual framework

The review of food security literature and biomass sustainability standards showed that there is no uniform approach to address food security and many ways exist to measure it. To guide the selection of relevant food security criteria, there is a need for a robust conceptual framework which provides the normative basis for the selection decision. We decided to use two concepts for our rights-based food security principle – the Human Right to Adequate Food and the food security definition of the 1996 World Food Summit with the four dimensions of food security, i.e. availability, access, utilization and stability defined by FAO [41,42] and United Nations [43]. We are aware that many other food security concepts exist, and that definitions and thoughts around food security have changed over time [39,40]. The food security definition of the World Food Summit and the four dimensions present a globally agreed and very encompassing definition and concept which is of advantage. We focus on the Right to Food and not on the food sovereignty concept as the Right to Food is internationally accepted and endorsed by many countries worldwide and is relevant for national and international agricultural, trade and development policies [38].

Our understanding of the Right to food is based on Article 25 of the Universal Declaration of Human Rights in 1948, its further detailed explanation in the 'International Covenant on Economic, Social and Cultural Rights of 1966', Article 11, and the General Comment 12 of the UN Committee on Economic, Social and Cultural Rights in 1999 [44]. The need for a company to respect human rights and thus the Right to Food is part of manifold international agreements and also stipulated in the UN Guiding Principles on Business and Human Rights [19].

The 'Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security' further explain the various dimensions and elements of the Right to Food and provide recommendations on how the Right to Food can be implemented in a country [20]. In total, there are 19 voluntary guidelines which address important elements of food security such as good governance, market systems, legal frameworks, economic development policies, and access to resources and assets. Guideline No. 8 'Access to Resources and Assets' is further detailed in six sub-guidelines (labour, land, water, genetic resources, sustainability, services). Due to their historical development, the Right to Food guidelines are predominately directed at national governments but also refer to companies and international obligations, making other states and the private sector likewise responsible to respect and support the implementation of the Right to Food.

Since we found no adequate framework which combined both, the food security and the Right to Food concept, we developed a conceptual framework which does so and also integrates the Right to Food guidelines due their detailed and encompassing nature. The conceptual framework is based on the four dimensions of food security: (i) increasing food availability, (ii) improving food access, (iii) improving food utilization and the nutritional adequacy of food intake and (iv) securing stability of supply by enhancing crisis prevention and management. We added a fifth dimension covering

cross-cutting aspects highlighted especially in the Right to Food guidelines (Fig. 1). The fifth dimension covers women and gender equity as gender aspects and food security are highly linked and investments may build opportunities for women as well as increase inequity [45]. The dimension further covers educational aspects, participation in processes, accountability, non-discrimination, transparency, human dignity, empowerment, and rule of law, the so-called PANTHER principles of the FAO.

We list under each dimension of food security the determinants for that dimension and the relevant Right to Food guidelines that match the determinants (Fig. 1). To attribute a Right to Food guideline directly to one food security dimension is not always a clear-cut decision as the guidelines are broadly and encompassing formulated. Therefore, a Right to Food guideline is sometimes classified in more than one dimension. In total, we selected 17 guidelines and sub-guidelines out of the original 19 Right to Food guidelines. This leads to the five pillars of the rights-based food security principle. From this framework the criteria are derived to address food security in biomass sustainability standards.

The selection of the Right to Food guidelines as well as the selection of the criteria for the rights-based food security principle is done from the viewpoint of biomass production for trade and export, predominately for the private sector though not excluding state-owned enterprises. While generally the trade direction is not of major importance, we especially address the situation of biomass exports from food or income insecure countries to industrialized countries. Those themes and elements of the Right to Food guidelines which might potentially be affected by a biomass investment/trade were integrated. Right to Food aspects which are completely unrelated to the investment/trade, e.g. preference for breastfeeding, are not considered in the framework and suggested criteria. In the long run, the implementation of adequate activities to fulfil the criteria developed upon the framework can and shall contribute to a higher level of resilience of local food systems.

We also distinguish between those Right to Food guidelines which we see as applicable and relevant for private enterprises and those being only applicable by a state. The following guidelines are considered to be only implementable at national level: Guideline 5 on institutions, Guideline 7 on the legal framework, Guideline 8D on genetic resources for food and agriculture, Guideline 12 on national financial resources, Guideline 13 on the support for vulnerable groups and Guideline 18 on national human rights institutions. Guideline 15 on international food aid is not integrated because there is no direct relation to investments/trade in the biomass sector. We suggest the development of a 'national screening tool' that provides an overview on how the state performs concerning food and nutrition security and the Right to Food in the country where a biomass investment for production or processing is to be certified. The extent to which the legal and institutional framework of national policies provides adequate safeguards for local food security, e.g., land and resource rights, effective mechanisms for local participation in decision making or the degree of good governance, will frame the effectiveness of any certification scheme in the specific country [46–48]. If this screening tool shows a low performance, the audit process regarding the rights-based food security principle has to be conducted more thoroughly than usual with more interviews and cross-checks including NGOs or other key actors. In severe cases, where correct trustful information to verify compliance with the Right to adequate Food principle will not be available, the principle may not be certified.

4. The rights-based food security principle

How to best address food security in biomass production and private voluntary certification schemes was a point for intensive

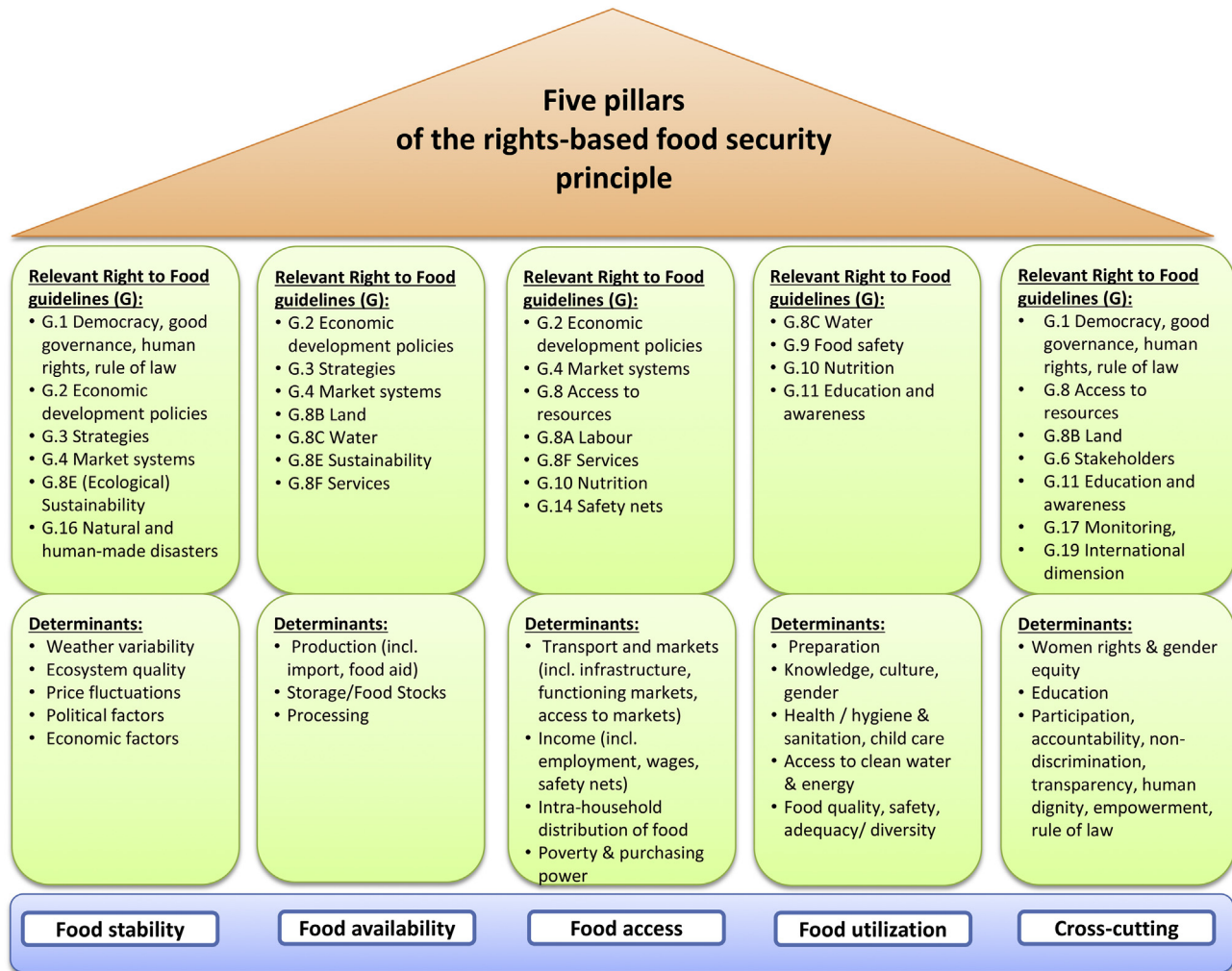


Fig. 1. The five pillars of the rights-based food security principle with relevant determinants and right to food guidelines necessary for food security and the human right to adequate food when producing and processing biomass for sale.

discussions and changes during the research process. The initial approach to directly measure impacts of certified biomass production on the food security of local communities generated a discussion about the relationship between the operator's activities and the impacts on a community.

The challenge is to retrace the food security outcomes directly to the activities of one local operator as food security can also be negatively affected by, e.g., unfavourable weather events like droughts or floods, food price hikes at global and thus also local level, other biomass operators and enterprises using and polluting land and water resources, or there may be interactions with national policies or the national and international market. To establish causality in these environments, large data sets including panel data are necessary combined with rigorous quantitative (econometric) impact assessment methodology—an activity done by scientists in lengthy studies and far beyond the scope of an audit and of any auditor's capacities.

We decided to withdraw from the approach to directly measure impacts on local food security due to reasons regarding costs, practicability, problems with causality and the freedom of an individual to forego food or reduce food quality e.g. in order to purchase luxury goods (see Section 4.1). We decided to instead use an approach which seeks to ensure the capabilities to secure food and nutrition at the individual level. This was also welcomed in the

stakeholder workshops. To protect local communities against adverse impacts on their Right to Food that might occur through an operator, we define criteria which lie directly in the area of responsibility of an operator. Through this approach, the operator can be directly held accountable for noncompliance.

In countries and regions where the undernourishment level is below 5% based on national or FAO data, the application of the rights-based food security principle is not necessary. Local and regional data needs to be cross-checked as many middle-income countries still have regional hotspots with higher levels of food insecurity than the country average. If a biomass operator is to be certified in a region with a prevalence of undernourishment over 5% food insecurity, all criteria of the principle have to be checked. It always has to be checked in countries where the Global Hunger Index, which is calculated each year by the International Food Policy Research Institute, is defined as moderate, serious, alarming or extremely alarming.

4.1. Reflections on the responsibilities of an operator concerning local food and nutrition security

From the discussions with the stakeholders it became clear that the responsibilities of the private sector, the state and the individual concerning food security need to be clearly defined as they

differ widely (Fig. 2). The state must provide the needed institutional and legal framework to be food secure, which includes policies that support the implementation of the right to food, education or access to remedy. The individual is responsible to use her or his capacities to work and/or produce food (especially relevant for resettled communities) and to be well nourished.

The food security situation of a household or an individual cannot be part of the operator's responsibility, as the individual has the freedom to decide whether and what to eat and how the obtained wage should be spent. For example, the operator pays a living wage but the individual decides to eat simple food and instead buy other products such as a TV or prefers an unhealthy diet. A food security measurement may then detect food and nutrition insecurity, yet the operator cannot influence this decision as it is not related to its activities and he/she has no right to impose certain food consumption patterns on individuals. However, the operator has to provide all means to enable an individual and her/his household to be food secure and to fulfil the Right to Food.

Another important issue is that the responsibility of an operator to ensure the Right to Food in the locality where the operator acts must be directly verifiable on a cost-effective basis by a third-party audit during the certification process. This limits the choice of possible criteria.

4.2. Development of the rights-based food security principle

From the above described conceptual framework, the rights-based food security principle is derived, which comprises 45 criteria grouped in 17 themes (for all criteria see the Appendix). The short title for each criteria group originates from the Right to Food guidelines [20].

Five questions were important for the selection of criteria: (i) what falls under the responsibility of the local operator, (ii) what is desirable from a food security/Right to Food perspective, (iii) what is possible and realistic for an operator (including small investors/farmers) to implement, (iv) what is verifiable/measurable at adequate cost in the field, and (v) can a sound causality be established between the investment and impacts on food security/the Right to Food.

As we identified already existing criteria through the screening of certification systems, only eight criteria are completely new in the rights-based food security principle: Criterion 2.1 on compliance with national food security strategies, Criterion 3.1 on local value creation, Criterion 3.2 on access to local markets, Criterion 4.1 and 4.2 on the operators' responsibilities in case of adverse impacts through natural disasters, Criterion 6.1 on the proof of long-term economic sustainability of the operation, Criterion 13.1 on efforts to improve workers' access to food, and last Criterion 17.2 on the operator's specific responsibility for communities inside his holding. The other criteria are already implemented in one way or another in sustainability standards, though wording or comprehensiveness may differ greatly and not every standard covers the same aspects.

Some existing certification schemes divide their criteria into 'minor musts' and 'major musts' such as in the ISCC system, or 'minimum requirements' and 'process requirements' such as in the Fairtrade system. This categorization reduces the burden for the producer and allows participation in the certification system [23]. In the assumption that farmers already benefit from the system in the first years, the additional income can be used to progressively fulfil all criteria (ibid.). We therefore also distinguish between criteria with immediate application and criteria which allow for a

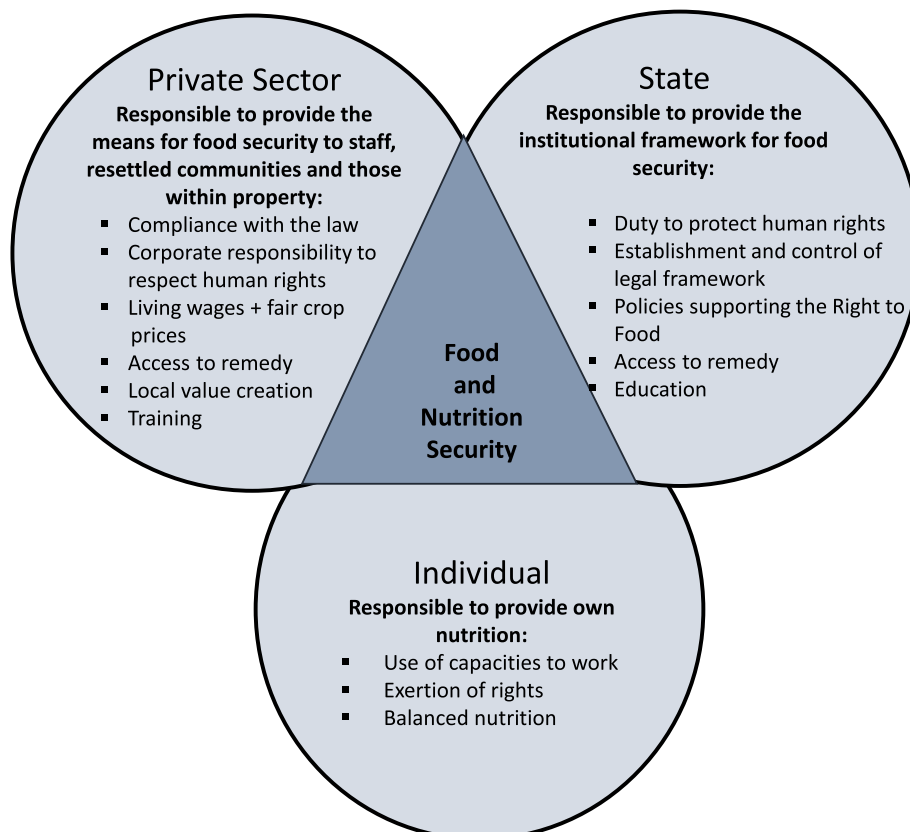


Fig. 2. Responsibilities of the private sector, the state and the individual.

larger implementation period for existing operators is defined. Ideally, the whole set of criteria should be ensured from the beginning of the operation and/or certification process.

Since local communities may experience positive or negative impacts of a certified biomass production depending on the business size and production model of the operator, the stakeholders emphasized that this must also be reflected in the requirements of the certification system. We hence distinguish between (i) family farmers where work relies predominantly on family labour [56], (ii) operators with at least one permanent employee, and (iii) companies with a certain size or production model where a high impact on local communities can be assumed.

It is important to determine implementation periods and to recognize a continuous improvement by the operator in order to reach the goals defined in the criteria list. Depending on the size and kind of operator, the implementation period might need to be further adapted to the specific conditions of marginalized farmers e.g., for family farmers. The column 'explanation' in the Appendix gives first indications what is to be assessed about the corresponding criterion as well as further explanations and recommendations for actions. A reference to international guidelines, mainly the VGGT and the RAI-Principles, is included. Verifiers, verification guidelines and a comprehensive auditor handbook, which also includes the technical knowledge of international guidelines, still need to be developed.

4.3. Explanations to selected criteria

This section describes and explains in detail those criteria which are new for existing sustainability standards. Furthermore, the criteria defined under the guideline labour, land and sustainability are described which were particular critical in discussions. More information on all criteria is provided in our working paper [55].

4.3.1. Strategies (Guideline 2)

The operator has to revise and adapt its business activities to the national strategies concerning food security such as National Food Security Strategies, Poverty Reduction Strategy Papers, or National Climate Change Adaptation Plans. The findings from the criterion on "strategies" must therefore be addressed in the business plan of the operation and must consider its potential contribution to national policies on integrated development objectives. This criterion does not need to be applied by family farmers, as it is considered too demanding given their low potential to contribute to or conflict the national strategies.

4.3.2. Market systems (Guideline 3)

For this criterion, we originally thought to measure impacts on food prices on the local market. However, we refrained from this approach for two reasons: (i) the rise in market prices for local food cannot per se be interpreted as a negative effect on local food security due to possible positive effects for food producers and a general rise in living standards that may overcompensate price increases; (ii) a rise in local market prices cannot be easily attributed to be the consequence of an operator's activities, as other factors such as seasonality, unfavourable weather or exchange rate fluctuations also influence market prices.

During the first stakeholder workshop, the participants agreed that the proposed food security principle should create the conditions that allow local communities to cope with changing market constraints which is also indicated in the Right to Food guideline. We therefore focus on local value creation to provide access to food, and see the responsibility of an operator in supporting local value creation through e.g., providing employment to locals, inclusion of local suppliers, investments in local processing to provide jobs.

4.3.3. Natural and human-made disasters (Guideline 4)

The assessment of possible natural disasters was identified as a means to stabilize food security in risk-prone areas within the certification process. Through the recognition of a natural disaster risk plan, the operator may prevent and foresee possible risks for her/his production. This can stabilize the economic sustainability of the production process. Operators cooperating with local suppliers must include these groups in the natural risk assessment, inform them about the risks, provide emergency plans, and offer support in case of adverse impacts through natural disasters based on the local conditions, e.g., through water storage systems in cisterns, food support, provision of drinking water or seed supply. This support in case of disasters is not a criterion which can be verified by ticking off a specific requirement due to context specificity. The operator must prove that measures are taken to reduce risks and improve or stabilize the conditions.

4.3.4. Sustainability (Guideline 15)

This guideline refers exclusively to ecological sustainability according to the Right to Food guidelines. Therefore, this criterion demands compliance with the 'Good Agricultural Practices'. Food security strongly depends on the preservation and sustainable management of soil resources, which includes water management as addressed in Criterion 10, and sustainable farming techniques. We acknowledge that ecological sustainability refers to much more, with many aspects being essential for food security. However, as this proposed set of criteria is designed as complementary to already existing sustainability standards (e.g., those mentioned in Section 2), no criteria covering all aspects of ecological sustainability were defined.

4.3.5. Economic development policies (Guideline 6)

An agricultural investment in food-insecure regions should respond to the involved country's overall development objectives in terms of social, economic and environmental development. If an environmental and social impact assessment has been conducted (as required by some standards), the results and recommendations of these assessments must be reflected in the business plan. To assess the financial viability, the operator should provide, for example, the cost-benefit ratio or net present value of the investment respectively the discounted cash flow calculations, including an economic risk or sensitivity analysis. The acquired land should correspond to the capital invested. A recent World Bank and UNCTAD study of 179 agricultural investment projects in 32 countries found that 50% were regarded as partial or complete financial failures due to fundamental flaws such as inappropriate sites, poor crop choices or over-optimistic planning assumptions [8]. A due diligence assessment of the business plan and activities might also reduce adverse effects on local suppliers and support their long-term market opportunities. An abrupt withdrawal from an investor might have negative effects on the local food security situation especially when land has been converted to perennial (non-food) crops. During the audit, information about the operator's and investor's background and expertise in agricultural investments in food-insecure regions is essential to obtain an impression of the capacity to manage such investment and the attached risk for the local communities in case of business failure.

4.3.6. Labour (Guideline 7)

Most biomass certification standards already require the payment of (sector-specific) minimum wages. That workers and suppliers need to receive a living wage is already recognized in the International Labour Organization Constitution (1919), United Nations Universal Declaration of Human Rights (1948), the Council of Europe's European Social Charter (1961) and the UN International

Covenant on Economic and Social Cultural Rights (1966). Hence, a living wage is considered a fundamental human right and the basis to ensure the Right to Food. We follow the definition of a living wage of the ISEAL Alliance which is: “Remuneration received for a standard work week by a worker in a particular place sufficient to afford a decent standard of living of the worker and her or his family. Elements of a decent standard of living include food, water, housing, education, healthcare, transport, clothing and other essential needs including provision for unexpected events” [57].

The payment of a living wage is also recognized by international guidelines for a sustainable agricultural sector, for example, the RAI-Principle 2 (Chapter 22 ii) [58]. The FAO provides a procedure to assess the payment of a living wage [59].

Under the umbrella of the ISEAL alliance, six certification schemes, among others Fairtrade International and the FSC, agreed to the above definition of a living wage and will use the proposed methodology for estimating living wages. Currently, these organizations seek to determine living wages for different countries with first reports from the wine, tea and flower sectors in different African countries and the banana sector in the Dominican Republic [60,61]. Those values could serve as a benchmark for this criterion. Several certification schemes have already reacted to the findings for living wages. In 2014, UTZ Certified approved the new ‘Code of Conduct for Individual Farms’, which introduced a criterion on living wages [62]. The revised ‘Fairtrade Standard for Hired Labour’ requires employers to negotiate with workers’ representatives on wages, and claims annual increases in real wages towards the living wage [63].

4.3.7. Land (Guideline 10)

Land is an important factor to secure access to and the availability of food through own production. The criteria required under this topic were derived and built upon the VGGT, which also defines guidelines for the private sector to ensure land rights and therefore the Right to Food [21]. The recognition and assessment of all existing land and water rights, which often come together with customary (traditional) land rights and land use rights, are essential to ensure the Right to Food. Investments often target land governed by customary rights that are not adequately recognized and protected under national laws, or sites where governments lack the capacity to enforce the law [64]. The key principle for any land acquisition and resettlement process and a key component of effective stakeholder engagement and consultation is the Free, Prior and Informed Consent (FPIC). In conjunction with the VGGT, the FAO released a technical guide which supports the identification of stakeholders, land rights holders and the implementation process of FPIC [65]. Experience in applying FPIC in the extractive sector already exists [66,67], but knowledge on its applicability during a biomass certification process is still lacking. The implementation of FPIC in a certification process must therefore be monitored and strengthened. Current evidence from research is that local people’s capacity to bargain or give free consent to investments is limited by their lack of access to institutions and economic alternatives in the region, limited education and power differentials including a limited understanding of the consequences [68].

4.3.8. Nutrition (Guideline 13)

The individual nutrition is the responsibility of the individual itself (see Section 4.1). The operator must make demonstrable efforts to improve workers’ access to adequate, safe, sufficient and affordable food. Access to food could be supported either through wages, through a canteen providing nutritious food, or through affordable, diversified and nutritious food in a shop on the property. To enhance the local value creation, the operator should provide

locally produced diversified and nutritious food. If a canteen or shop selling food is managed by the operator, the products must be free of contamination and safe to be consumed.

4.3.9. Monitoring, indicators and benchmarks (Guideline 17)

Studies and reports identified negative impacts of large-scale land acquisitions on the food security of local communities [48,68–72]. Although we assume that a full compliance with the rights-based food security principle would not lead to negative impacts through the operation, an additional monitoring of food security impacts must be implemented to gain certainty about this assumption. This is important as rigorous impact assessments of the effects of certification systems on poverty, food security or the environment are still scarce [73] and research results are not that consistently positive. Likewise, effects on family farmers certified via cooperatives or group certifications can be much more complex to detect and additional value and income for the farmer is not per se guaranteed [74–76].

For that reason, the criteria require (i) an ex-ante Right to Food impact assessment, and (ii) an (ex-post) monitoring procedure. The ex-ante impact assessment is an indispensable tool to address food and nutrition security, especially possible negative impacts of an operation, before investments take place. The tool still needs to be developed. Meanwhile, the ‘Bioenergy and Food Security Operator Level Tool’ [77] developed by the FAO could be used. It is essential to test its applicability for certification, as no public experience in this regard is available.

In a second step, we propose an (ex-post) monitoring of possible impacts on (i) communities inside the operator’s property, (ii) resettled communities due to the operator’s activities, and (iii) on communities surrounding the operator’s property. A grievance mechanism must be established for all three groups. We see a clear responsibility of the operator for the first two groups, as both groups are very likely to be directly affected by the activities. Also for the third group, it is important that the availability, access, quality and stability of food for local communities may not be reduced through the certified operator. For all three groups it needs to be regularly assessed whether the food security situation in any of the five dimensions of the conceptual framework is deteriorating—for this an appropriate screening tool allowing for a fast, cost-effectively and reliable assessment still has to be developed. If it deteriorates, the operator must take immediate action to improve the food security and right to food for the first two groups. For the third group, it has to be identified whether changes occurred due to the operator’s activities. If easy identifiable causes such as droughts, floods, global food price hikes or exchange rate fluctuations can be ruled out, an in-depth assessment needs to be conducted to establish the causality between the deterioration of local food security and the operator’s activities. This assessment should be executed by an independent body e.g., university or research institute. If the operator causes a deterioration of food security, corrective measures have to be jointly agreed upon with the affected communities.

5. Discussion and recommendations

Standards and certifications as a private governance instrument require the support of a strong legal foundation to be really effective. The effectiveness of certification is subject to national and regional laws, and their enforcement. This applies also to the potential of a standard to foster local food security. In a state with weak enforcement of legislation, land tenure rights or a weak juridical system, standards may not be an effective mechanism, and may be unable to replace missing state regulations. Especially companies sourcing agricultural commodities from countries with

weak enforcement of legislations need to implement control mechanisms. For this, a guideline for companies and certification systems to conduct an assessment on the national right to food situation needs to be developed (as described in Section 3).

Many sustainability standards already have sound experiences with implementing some of the criteria while for the newly proposed criteria experiences regarding the verifiability are lacking. Although being discussed with auditors, practitioners and standard setters, we see the need for a field testing phase of the whole criteria set of the rights-based food security principle in food insecure regions with different institutional settings. The experiences derived from this test phase should be integrated in a comprehensive auditor handbook supporting the verification and handling of the principle.

Experiences so far have shown that sustainability standards can monitor well agricultural practices and management. It is less clear whether voluntary standards can satisfy sustainability expectations regarding complex problems, such as food security, transparency and informed consent, basic human rights or land conflicts. Options to solve complex challenges and increase the performance towards more sustainability are needed. Once the rights-based food security principle is implemented in biomass sustainability standards, it is necessary to conduct rigorous impact assessments to identify how the local food security situation has developed and whether the principle is working in the intended way.

Given that voluntary standards and certifications need to comprise with a limited market demand in their strictness, performance and costs, the chances to address complex problems in an optimal way are limited. A key concern remains whether voluntary certification systems are sufficient or whether state regulations requesting the respect of local food security for imported biomass would not achieve more of the desired impact in regard to food security and the human right to adequate food. More discussions on this topic are required at political level. At global level, trade-offs between food security and non-food biomass uses are still likely to occur and cannot be prevented by the proposed certification system. Thus, adequate monitoring and future regulatory action at global level is additionally necessary.

6. Conclusions

The increased use of biomass for non-food purposes and hence the rising competition with food requires solutions that guarantee food security. We developed a conceptual framework that respects

The 45 criteria of the rights-based food security principle.

Criteria of the rights-based food security principle		Explanation
Stability	1 Democracy, good governance, human rights and the rule of law (RtaF-G. 1)	
	1.1 The operator must demonstrate compliance with all applicable national, regional and local laws and regulations.	For family farmers special adaption periods can be implemented according the national regulatory context.
	1.2 The operator holds a written policy committing to the "Guiding Principles on Business and Human Rights" in all operations and transactions. The implementation of the policy must be documented and communicated to all levels of the workforce and operations.	Not applicable for family farmers. This must be available in all languages of the employed workers and signed. Implementation must be part of the job description of management personnel.
	2 Strategies (RtaF-G. 3)	
	2.1 The operator endorses existing national strategies with regard to food security and does not contradict them by any of its business activities.	Strategies: national food security strategies, poverty reduction strategies (PRSP), national development programmes, Local land use plans and climate mitigation and adaptation strategies. Not applicable for family farmers
	3 Market systems (RtaF-G. 4)	
	3.1 The operator adopts an implementation plan support local value creation.	Local value creation could be supported through e.g. employment of local workers, the rising inclusion of local supplier into the supply chain, local investments in processing, school/training centres, services for suppliers such as training, input, transport,

local food security and the Human Right to adequate Food when producing biomass and suggest relevant criteria for voluntary biomass sustainability standards. The derived rights-based food security principle reflects with its criteria all dimensions of food and nutrition security and is applicable to all biomass types and uses, farm sizes and business types. It is adjustable to local contexts, relatively easy to measure and can be added as a whole to the existing criteria and indicators of any biomass sustainability standard. The rights-based food security principle is a best-practice set which provides guidance for regional and national standard setting as well as for private certification systems. It is hence an important tool to avoid negative effects on local food security, induce positive changes and monitor the local food security situation.

Starting with private and mostly voluntary control systems, the elaborated criteria can gradually be adapted and implemented in national legislation and control mechanisms. In the long term, this allows 'non-food' biomass production and marketing (incl. export) to sustainably contribute to poverty reduction and food security.

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Appendix

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Criteria of the rights-based food security principle	Explanation
3.2 The operator must not reduce the access to markets for local communities through its operations.	storage facilities and health centres. Local food production sold in shops run by operators. There must be access to local markets for communities e.g. transport ways.
4 Natural and human-made disasters (RtaF-G. 16)	
4.1 The operator recognizes all national and/or international natural disaster risk assessments, strategies and maps in the business plan/strategy.	If no assessment is available, the operator has to conduct the assessment and address the findings in its business plan within three years. Natural disasters include drought and floods. Process indicator to be implemented within 3 years.
4.2 The operator informs suppliers and communities in the concerned region about natural risks and provides support in case of strong adverse natural and human made disasters.	Support must be adapted according the risk exposed e.g. insurance scheme, irrigation system, food support etc.
5 Sustainability (RtaF-G. 8E)	
5.1 The operator has to apply Good Agricultural Practices (concerning soil management, chemical application and use, water management, fertilizer application).	
Access	6 Economic development policies (RtaF-G. 2)
6.1 Provision of a business plan showing evidence to long term economic viability of the operation.	
6.2 The operator has to provide fair, legal and transparent arrangements with suppliers. Agreed payments shall be made in a timely manner.	The arrangements can be verified also through contracts, bills or any signed agreement. Are the suppliers independent or a part of the group of the company or its mother organization? Are verbal contracts accepted?
7 Labour (RtaF-G. 8A)	
7.1 Compliance with the ILO Core Conventions and the Declaration on Fundamental Principles and Rights at Work	ILO Convention 87 on Freedom of Association and the Protection of the Right to Organise; ILO Convention 98 on the Right to Organise and Collective Bargaining; ILO Convention 29 on Forced Labour; ILO Convention 105 on the Abolition of Forced Labour; ILO Convention 138 on Minimum Age; ILO Convention 111 on Discrimination (Employment and Occupation); ILO Convention 100 on Equal Remuneration; ILO Convention 182 on Worst Forms of Child Labour; Labour laws and union agreements are available in a language workers understand.
7.2 The operator pays wages for all workers according at least to the calculated national adequate Living Wages.	According to RAI Principles Principle 2, Paragraph 22; iii. Regional estimates of Living Wages are published by Fairtrade International. If no Living wages are estimated, the operator pays wages for all workers that are (at least) according government regulated minimum wages in the specific sector for the applicable work as required by law, including all mandated wages, allowances and benefits. If there are no national or specific sector wages agreed, the producer agrees freely a wage with the workers (annual). The agreements have to be in line with all applicable laws and international conventions and local collective agreements.
7.3 If payment for piecework is applied, the pay rate, based on an 8 h workday, allows workers to earn at least the adequate Living Wage.	According to RAI Principles Principle 2, Paragraph 22; iii, Wage must be determined in a clause of the contract.
7.4 Men and women earn equal pay for equal work.	
7.5 Workers are not subjected and their awareness is trained in any form on discrimination in hiring, remuneration, benefits, access to training, promotion, termination, retirement or any other aspect of employment, based on race, colour, gender, religion, political opinion, national extraction, social origin, sexual orientation, family responsibilities, marital status, union membership, age or any other condition that could give rise to discrimination.	Workers refers to permanent and casual workers. Meeting and training minutes, worker interviews
7.6 Workers confirm that no deductions from wages as a result of disciplinary measures are made.	
7.7 The operator provides all employees with fair, legal, written contracts, signed by both the employee and the employer.	The contracts detail all payments and conditions of employment (e.g. working hours, deductions (Clearly state what for: loan, rice, cooking oil, housing, water supply, transport, etc.), overtime, sickness, holiday entitlement, maternity leave, reasons for dismissal, period of notice) in the national, local and foreign languages and explained carefully by a manager, supervisor or trust person. Copies of working contracts can be shown for every employee indicated in the records. If though cultural habits no contract is available any other proof must be available.
7.8 The operator endorses a health and safety policy where the main health and safety risks are assessed. An implementation plan addressing measures for mitigation of these risks is in place. The policy and plan applies to all	

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Criteria of the rights-based food security principle	Explanation
<p>workers, including contractors, workers and suppliers. The implementation is regularly monitored and improved.</p> <p>7.9 All workers involved in the operation shall be adequately trained in safe working, using adequate and appropriate protective equipment.</p> <p>7.10 An adequate share must be trained in first aid.</p>	<p>According the ILO Workplace Safety and Health (First Aid) Regulation No. S137 of 1 March 2006. As not defined we recommend 1 person for companies <20, and 5% for companies >20 employees. Process indicator to be implemented within 1 year.</p>
<p>7.11 Occupational injuries shall be recorded using Lost Time Accident (LTA) metrics.</p>	
<p>8 Services (RtaF-G. 8F)</p> <p>8.1 The operator provides agricultural services and capacity building for suppliers and communities inside the property (plantation). A plan has to be available.</p>	<p>Services and capacity building in e.g. integrated pest management, good agricultural practices, fertilizer management, quality management, health and safety, disaster risk management, social awareness etc. The dialogue with the community should be documented and lead to actions. Process indicator to be implemented within 1 year.</p>
<p>9 Safety nets (RtaF-G. 14)</p> <p>9.1 Workers are provided with medical care in case of accidents or work related diseases. Additionally, workers are covered with a public accident and medical insurance, if existent. Sick leaves are paid according the law.</p> <p>9.2 All permanent workers are provided with an occupational pension fund according the national law.</p>	
<p>Availability 10 Land (RtaF-G. 8B)</p> <p>10.1 The operator respects all human rights and legitimate tenure rights and conducts an appropriate assessment to prevent any adverse impacts on them (see VGGT 3.2).</p>	<p>The operator demonstrates that the legitimate land tenure rights have been comprehensively assessed, established and documented. Legal boundaries of the operator shall be clearly demarcated and visibly maintained.</p>
<p>10.2 All decisions regarding land rights and land use rights, such as buying, selling or valuing related to the operator were based on the Free, Prior, and Informed Consent of all stakeholders involved.</p>	<p>See VGGT Chapter 3.2; Note: it is not sufficient to regard only national rights; If no cadastral land register exists, maps of an appropriate scale showing the extent of legitimate tenure rights shall be developed through participatory mapping involving affected parties (see VGGT Chapter 17 Records of tenure rights). Note: it is not sufficient to assess only governmental assigned land rights.</p>
<p>10.3 There has been no forced or involuntary physical or economic displacement, resettlement or relinquishment of land rights for the purpose of the production.</p>	<p>If communities are resettled, it must be according their FPIC and VGGT Chapter 16. Expropriation and compensation</p>
<p>10.4 Land used by operator may not be under dispute, contested and/or under conflict.</p>	<p>In case of any conflict a conflict resolution processes must be implemented and accepted by all parties involved according the Free, Prior and Informed Consent (FPIC) and VGGT Chapter 25. Conflicts in respect to tenure of land, fisheries and forests incl. the technical guidelines for FPIC in VGGT.</p>
<p>Utilization 11 Water (RtaF-G. 8C)</p> <p>11.1 The operator implements a water management plan and a monitoring system. If communities rely on the same water source the plan must be agreed with free, prior, informed consent by stakeholders and may not be under dispute.</p>	<p>Management plan, developed and/or examined by qualified hydrologists, must follow legislation and existing water rights, both formal and customary. Good agricultural practices have to be applied in the plan to reduce water usage and to maintain and improve water quality. Negative affect are i.e. reduce and/or alter in quality or quantity. This applies to water resources within and/or used by the local community. If access to water resources for the community and their livelihood activities was reduced, an agreement under the FPIC must be negotiated.</p>
<p>11.2 Water used by the operator does not negatively affect availability, quality and access to the water supply to communities which rely on the same water resources. There has to be a continuous monitoring of the availability, quality and access to the water resources.</p>	
<p>12 Food safety and consumer protection (RtaF-G. 9)</p> <p>12.1 The operator must not use pesticides and chemicals that are categorised as World Health Organisation Class 1A, 1B, or 2 and/or that are listed by the Stockholm or Rotterdam Conventions. Any use of pesticides and other chemicals must be documented.</p>	<p>Comparison of regional positive list. Process indicator to be implemented within 2 years for the WHO 2 categorized chemicals.</p>
<p>12.2 The operator uses integrated pest management (IPM) and supports scheme suppliers with training in IPM.</p>	
<p>12.3 Workers have always access to safe drinking water.</p>	
<p>13 Nutrition (RtaF-G. 10)</p>	
<p>13.1 The operator shall make demonstrable efforts improve workers' access to adequate, safe, sufficient and affordable food.</p>	<p>Access to food can be supported by income or a canteen. If the operator provides food it shall be diversified, locally produced and nutritious. Gratis or subsidized delivery of nutritious food.</p>
<p>13.2 Breastfeeding women have two additional 30- minute breaks per day to nurture the child.</p>	
<p>Cross-cutting 14 Stakeholders (RtaF-G. 6)</p> <p>14.1 The operator has to establish an internal grievance mechanism for workers and an external grievance mechanism for</p>	<p>According to RAI Principle 9 Chapter 29. The monitoring documents have to address how it was dealt with the</p>

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Criteria of the rights-based food security principle	Explanation
stakeholder. The mechanism has been made known and is accessible to the communities. All grievances were documented and monitored. A responsible person for grievances is named and known to the workers and communities around the farm.	submitted grievances. Methods (e.g. information sharing, group meetings, interviews, questionnaires, workshops, written materials, languages including local dialects, etc.) have to be suitable to achieve the intended engagement and consultation processes. Stakeholder can be community members, NGOs etc.
14.2 The affected persons and the community at large do support the project before the operator starts the process.	
15 Women rights and gender equity (RtaF-G. 8)	
15.1 Women should not be discriminated and their rights have to be respected.	Regarding other conditions of employment like maternity leave, social security provisions, non-monetary benefits, etc. must be fulfilled.
15.2 No work with pesticides must be undertaken by pregnant or breast-feeding women.	
16 Education and awareness raising (RtaF-G. 11)	
16.1 The operator implemented a formal training programme that covers all agricultural activities of the company (e.g. use and application of chemicals and fertilizers). This includes regular assessments of training needs and documentation of the programme.	The training program provides an adequate program according to the workers' tasks. Process indicator to be implemented within 1 year.
16.2 All children living on the operation have access to quality primary school education which does not exceed local school fees.	Access to school can be provided through transport or an onsite installation.
17 Monitoring, indicators and benchmarks (RtaF-G. 17)	
17.1 The operator has to conduct an ex-ante impact assessment on food security and the Right to Adequate Food of concerned communities (on the operator's property, within its operating scale (e.g. outgrower schemes) and nearby surrounding communities. The availability, access, quality and stability of food must not be negatively affected by the planned operator investments and activities. This applies only for new investments.	The assessment shall provide suggestions to avoid negative impacts. Any anticipated negative impacts on food security and the Right to Adequate Food must be addressed before the investments take place. If negative impacts cannot be avoided, the investment cannot become certified as compliant with the Rights-based food security principle.
17.2 The operator is responsible to ensure food security for inhabitants (communities) within the operator's property and administrative boundaries, even when the inhabitants are not employees of the operator. The food security situation must be monitored by a food security screening.	Food security is understood according to the four dimensions: stability, availability, access and utilization. Measures can be: access to land, fields and gardens for agriculture, access to safe drinking water, subsidies for staple and nutritious foods. In those communities and for those inhabitants which are affected by food insecurity—detected by the food security screening—, the operator has to establish a social plan agreed with directly impacted stakeholders which includes special measures to benefit women, youth, indigenous people and vulnerable people to eliminate their food insecurity.
17.3 In communities resettled according to the FPIC the operator has to monitor the food security situation through a food security screening and e.g. a continuous dialogue and ensure their food security.	This applies to resettlements after January 2012. Food security is understood according to the four dimensions: stability, availability, access and utilization. If the food security screening indicates food insecurity, a comprehensive Food Security Impact Assessment must be carried out on behalf of the operator. The impact assessment shall evaluate the scope of accountability and determine corrective measures. The indicated measure should be monitored and will be assessed during upcoming audits. In those communities and for those inhabitants which are affected by food insecurity, the operator has to establish a social plan agreed with directly impacted stakeholders which includes special measures to benefit women, youth, indigenous people and vulnerable people to eliminate their food insecurity.
17.4 Operations above 1000 ha have to conduct a food security screening also in the surrounding communities of the operator's property and administrative boundaries. In the surrounding communities the availability, access, quality and stability of food must not be reduced by the producers' activities. The operator is responsible to ensure that the investment does not create or exacerbate local or national food security.	If the food security screening indicates a negative impact on the food security situation and detects food insecurity, a comprehensive Food Security Impact Assessment must be carried out by an independent organization, paid by the operator. The impact assessment shall evaluate the scope of accountability and determine corrective measures and needs to be submitted to the certification system. In those communities and for those inhabitants which are affected by food insecurity due to the operator's activities, the operator has to establish a social plan agreed with directly impacted stakeholders which includes special measures to benefit women, youth, indigenous people and vulnerable people to eliminate their food insecurity. The corrective measures have to be monitored and are assessed during upcoming audits.

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