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Responsible Cultivation Areas

Identification and certification of feedstock production with a low risk of indirect effects

OUR MISSION: A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE

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Identification and certification of feedstock production with a low risk of indirect effects

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Property and use of the RCA methodology

The RCA methodology is open for use to all interested parties. However, any party that makes use of and refers to the RCA methodology is requested to abide by the following in order to provide clarity to all stakeholders on any claims made by parties referring to RCA:

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- No party shall claim any associated endorsement by any of the participating organisations (Ecofys, WWF, Conservation International, BP, Neste Oil, Shell) in the use of the RCA methodology without the express, prior, written consent of the referenced party involved.
- The developers of the methodology would like to know where and by whom the methodology is applied. It would therefore be appreciated if parties who choose to make use of the methodology inform Ecofys about this at b.dehue@ecofys.com.

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1 The need for sustainable bioenergy production methods

1.1 The importance of bioenergy

Bioenergy production has seen a sharp growth in recent years. Key drivers include reduction of greenhouse gas emission, energy security and rural development. While large scale bioenergy production has met concerns about sustainability, it is important to note that bioenergy will be important in a decarbonised economy. This is due to the fact that for several sectors with a large and growing energy demand few alternatives exist. This includes aviation, shipping, road freight transport and industries requiring high temperature heating. Developing a successful and sustainable bioenergy sector is therefore of key importance to decarbonising our economy.

1.2 Bioenergy requires large land areas

The bioenergy targets, especially the biofuel targets, of the European Union, the USA and the rest of the world, imply large land requirements, since most biofuels produced today are based on energy crops. This situation is not expected to change drastically in the future since most biofuels of the so-called second or third generation based on residues and algae are still in the R&D phase. In addition, total residue potential is finite and will be insufficient to fulfil total bioenergy demand (see Ecofys 2008).

To illustrate the large land requirements for biofuels, the figure below shows the land required to fulfil 10% of the EU energy demand in road transport by biofuels in 2020. Depending on what feedstock will be used and how one takes into account co-products that are generated during the production of biofuels, the total land requirement for 10% biofuels in the EU amounts to 8-31 million ha[1]: two to seven times the land surface of the Netherlands, see figure 1.

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[1] The high end of this estimate does not take into account the land saved by the provision of co-products (e.g. protein rich rapeseed meal, produced during the production of rapeseed oil for energy purposes, that can replace other animal feed such as soy meal). The lower estimate does take these co-products into account. Another important factor is the development of residue-based second generation biofuels. For more details, see Ecofys (2008).

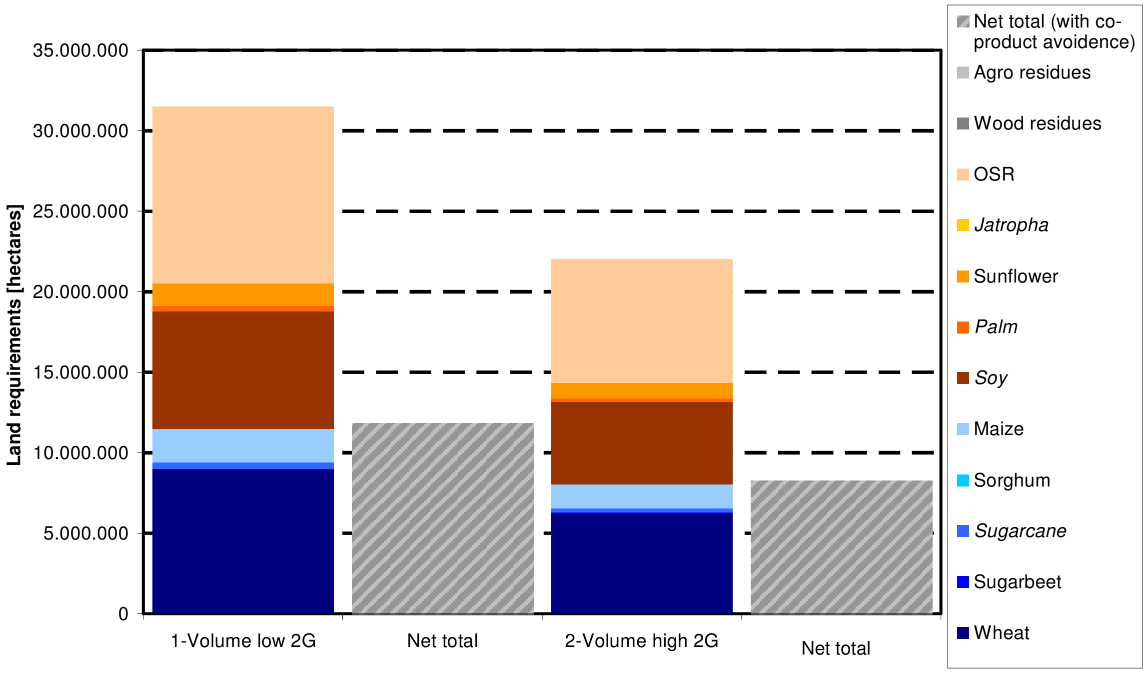


Figure 1: Land requirement for 10% biofuels in the EU in 2020. The left two bars show a scenario with a low contribution from second generation biofuels. The right two bars show a scenario with high contribution from second generation biofuels. Within each scenario the left bar shows the gross land requirements for growing the energy crops, without accounting for co-products. The right hand bar within each scenario shows the net land requirements: the gross land requirements minus the foregone land requirements for the crops that are replaced by the co-products generated by the biofuel production (such as rapeseed meal). Source: (Ecofys 2008)

1.3 Direct and indirect effects of bioenergy demand

The bioenergy feedstock demand and the associated land requirements can have direct and indirect effects. One of the main direct effects is direct land-use change (LUC). A direct LUC occurs when new areas (e.g. forest areas or Responsible Cultivation Areas; see the circles A and C in Figure 2) are taken into production to produce the additional feedstock demand for bioenergy. This can have both positive and negative consequences on aspects such as biodiversity, carbon stocks and livelihoods.

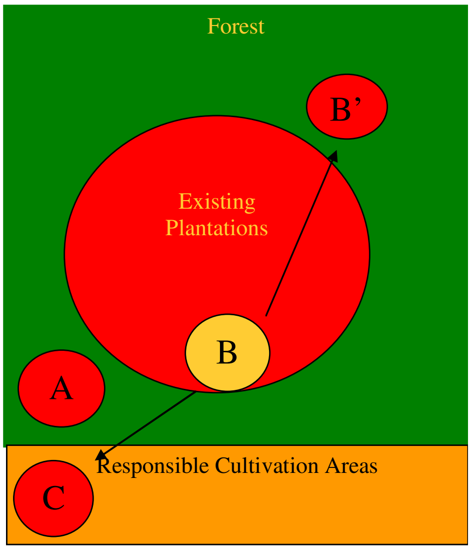
Direct LUC effects and other direct effects of crop production can generally be measured and attributed to the party that caused them. These properties make direct LUC relatively easy to control. The development of voluntary certification schemes such as the Roundtable on Sustainable Palm Oil and the Round Table on Responsible Soy aim to prevent negative direct effects from crop cultivation. However, as long as not all worldwide production is controlled by such certification schemes, effective enforcement of land-use planning, or alternative control mechanisms, such mechanisms are not able to control indirect effects.

Much of the feedstock use for bioenergy today is sourced from existing plantations, especially since many of today's biofuel feedstocks are food and feed crops. In this case no direct effects take place, but so-called indirect effects can take place. The main indirect effects of additional bioenergy feedstock demand are[2]:

- Indirect land-use change, explained in more detail below;
- Rise in agricultural commodity prices, with potential consequences for food security;
- Demand induced yield increases – where the additional demand for the feedstock triggers additional yield increases (Ecofys 2009b).

The indirect effect that is currently dominating the debate on the sustainability of biofuels is indirect land-use change (ILUC). ILUC can occur when existing plantations (see circle B) are used to cover the feedstock demand of additional biofuel production. This displaces the previous productive function of the land (e.g. food production). This displacement can cause an expansion of the land use for biomass production to new areas (e.g. to forest land or to Responsible Cultivation Areas , see circles B´and C) if the previous users of the feedstock (e.g. food markets) do not reduce their feedstock demand and any demand-induced yield increases is insufficient to produce the additional demand.

Figure 2: Illustration of the displacement mechanisms that may cause indirect land-use change. Adapted from (Dehue 2006)



[2] For a detailled discussion on these indirect effects and a review of existing modeling work that aims to quantify the sizes of these idirect effects, see "Summary of approaches to accounting for indirect impacts" (Ecofys 2009b).

1.4 Key characteristics of indirect land-use change

Since land requirements are a key concern for both environmental and social sustainability issues (LUC can cause negative effects such as loss of biodiversity, loss of carbon stocks and land right conflicts as well as positive effects such as an increase in soil carbon, rural development and a change to more sustainable agricultural practices), controlling direct and indirect LUC effects is a major challenge to ensure a sustainable energy crop production. Several key characteristics of ILUC are summarised in the Box below. Any mechanism aiming to resolve indirect effects will need to take these complexities into account.

Box 1: Key characteristics of indirect land-use change

- *Displacement effects act across national borders:* Commodities such as palm oil, soy oil and sugarcane are traded on a global scale. Therefore, displacement effects act across borders. Achieving effective national land-use planning in some producing countries should therefore not be taken as full protection against indirect effects. If, for example, Malaysia was to prevent further deforestation through effective land-use planning, sourcing increasing amounts of palm oil from Malaysia for the energy sector may still cause indirect land-use change in other producing countries such as Indonesia.
- *Displacement effects act across substituting crops:* This is caused by the fact that different crops can substitute each other to some extent. For example, if the EU diverts more rapeseed oil production from food to feed then it is likely to increase its imports of vegetable oils. This could be rapeseed oil but could also be a different vegetable oil as different vegetable oils are to some degree substituting products. Thoenes (2007) states that "EU palm oil imports have already doubled during the 2000-2006 period, mostly to substitute for rapeseed oil diverted from food to fuel uses."
- *Competition for land connects also non-substituting crops:* Another reason why displacement effects act across crops is that different (non-substituting) crops compete for the same agricultural land. A recent example of this occurred in 2008 when high maize prices led farmers in the US to plant more maize and less soy. This could trigger soy expansion in other world regions.

1.5 Options to prevent unwanted indirect effects

1.5.1 The bigger picture: Global versus project-level mitigation measures

In theory, three types of mitigation measures are available to prevent or minimise unwanted indirect impacts from bioenergy. The first two concern global mitigation measures, while the third describes project-level mitigation measures:

1 *Prevent unwanted direct LUC, globally and for all sectors.* Unwanted ILUC from bioenergy manifests itself through unwanted direct LUC for the production of agricultural products for other sectors such as the food and feed sector. Preventing unwanted direct LUC would thus eliminate unwanted ILUC altogether.

Note that because of the international characteristics of ILUC and the competition for land between different sectors, this mitigation measure requires global implementation for all land-intensive sectors to be effective. While a worthy mitigation measure for the longer term, this mitigation measure is unlikely to fully materialise in the short to medium term and is largely outside of the influence of the bioenergy sector.

2 *Reduce pressure on land from the agricultural sector as a whole* by increasing yields, supply chain efficiencies and/or a reduction in consumption, for example through increased public R&D or policy incentives. This could reduce the need for expanding the area used for agricultural production. However, a globally constant or shrinking agricultural area does not necessarily prevent unwanted LUC. Shifts in land used for agricultural production (without a net increase in the total area) can still cause unwanted LUC. Also, this mitigation measure is unlikely to materialise in the near future, with projections from leading agricultural institutions indicating an expanding agricultural area during the next decades. Also this option lies largely outside of the influence of the bioenergy sector.

3 *Practical production models that prevent indirect impacts at a project level.* While the other two mitigation measures take a more macro approach (in which governments will be key actors) this approach focuses on the role individual producers can play (in the absence of the above two mitigation measures.) This includes mitigation measures such as the much debated production on "unused land". Such mitigation measures are able to lend themselves to a certification approach as they focus on individual producers.

1.5.2 What individual producers can do to prevent unwanted indirect effects

Four main solutions have been put forward for producers to expand biomass usage for energy purposes without causing unwanted indirect effects (Ecofys 2007a, Ecofys 2008, Ecofys, 2009, RFA 2008):

1 Biomass production on "*unused land*" - land that currently does not provide provisioning services[3,4]. Because this does not displace other human uses of the land it does not cause any indirect effects. Clearly, expanding production on unused land does lead to a direct LUC. The big advantage is that direct LUC is controllable (e.g. through certification) and can be limited to those areas where effects are acceptable, while the effects of indirect LUC are largely uncontrollable[5].

2 Introducing energy crop cultivation without displacing the original land use through *increased land productivity or integration models*. Especially in developing

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[3] The Millennium Ecosystem Assessment distinguishes four categories of ecosystem services: Provisioning services, regulation services, cultural services and supporting services. Provisioning services are defined as harvestable goods such as fish, timber, bush meat, genetic material, etc.

[4] Also referred to as "degraded land", "marginal land", "waste land" or "abandoned land".

[5] Often an area is not completely "unused" and a sliding scale exists between this "unused land" concept with the "intensification" concept, see next bullet.

countries there is a significant potential for yield improvements. Potential negative environmental or social impacts from intensification models have to be taken into consideration for this type of solution.

3. Bioenergy production from *residues*. Current functions and uses of these residues must be well understood, otherwise displacement, and the associated indirect effects, may still occur.
4. Bioenergy production from *aquatic biomass* such as algae currently not used for other purposes. Specific sustainability aspects for such production would need to be taken into account.

The Boxes below give concrete examples for the first two solution types, on which this version of the Responsible Cultivation Area (RCA) methodology is focussed. More elaborate information on the potential for the RCA production models and their main barriers can be found in "Mitigating indirect impacts of biofuel production - Case studies and Methodology" (Ecofys 2009a) and the three reports of the three RCA pilot studies in Indonesia and Brazil (CI 2010a, CI 2010b, WWF 2010).

1.6 The Responsible Cultivation Areas concept

The version of the methodology presented in this report focuses on the first two options to prevent ILUC as indicated in the previous section – unused land and intensification or integration models. Because many different definitions and interpretations exist for terminology such as "idle land", "waste land", "degraded land" or "abandoned land", we have chosen a new terminology to avoid confusion and to better stress the underlying purpose of the concept. The terminology used here is that of "Responsible Cultivation Areas" (RCAs).

Box 2: Options for energy crop production without displacement (I/II)

Expanding oil palm production on "unused land"

- *Expanding production without ILUC:* Casson (2007) describes how carbon emissions from the oil palm sector can be reduced by redirecting oil palm expansion away from forested areas and peat lands to degraded lands. Planting oil palm on Imperata Grassland could lead to an increase in carbon stocks as well.
- *Potential:* Casson (2007) cites numbers on degraded land from the Indonesian Ministry of Forestry, which has classified over 23 million ha as degraded land. Garrity et al. (1997) estimated the total area of Imperata Grassland in Asia at 35 million ha (8.5 million ha in Indonesia). This compares to roughly 10 million ha of globally harvested oil palm plantations today.
- *Risks:* Not all degraded land will be available. Some of it will not be suitable for oil palm production. Furthermore, degradation is often caused by the presence of people and degraded areas are therefore often populated and the local population may be occupying some of the lands. In addition, degraded land can still contain high conservation values.
- *Economic viability:* Generally feasible. Some additional costs in the case of Imperata Grassland for herbicides treatment in the early years of establishment. Fairhurst et. al. (2009) find that Oil Palm plantations on grasslands are more profitable than plantations on secondary forest.
- *Added value from carbon benefits:* Ecofys (2007b) finds that the GHG-performance of biofuel from oil palm can be significantly improved if plantations are established on Imperata Grassland. This could lead to a higher economic value as mechanisms such as the EU Renewable Energy Directive and EU Fuel Quality Directive reward higher GHG savings.

Box 3: Options for energy crop production without displacement (II/II)

Integration of sugarcane and cattle

- *Expanding production without ILUC:* Sparovek et al. (2007) present an integrated sugarcane and cattle production model in which hydrolysed bagasse is used as animal feed. The additional feed would allow for more cows per hectare, freeing up part of the pasture land for sugarcane. As a result the same land that used to support a certain number of cattle, now supports the same amount of cattle while also producing ethanol from sugarcane. In other words, sugarcane production is expanded on pasture areas without displacing the original cattle production. This could reduce the migration of ranchers to remote areas in the Cerrado and the Amazon region.
- *Potential:* The authors do not give estimates for the total potential. Not all pasture land will be suitable for sugarcane. Total permanent meadow and pastures, both natural and cultivated, in South America amount to over 450 million ha, with 200 million ha in Brazil (FAO 2009). Total sugarcane area equals 8 million ha (6.7 in Brazil), suggesting a significant potential for the integration model. Also the RCA pilot study on sugarcane-cattle integration in Brazil finds a significant potential (CI 2010b).
- *Risks:* The integration model requires close interaction between two very different sectors. Diverting part of the bagasse from electricity generation to animal feed has only a minimal impact on the direct emissions of the sugarcane to ethanol chain (<1% reduction in the GHG-savings compared to fossil fuels.)
- *Economic viability:* The authors state that the model is feasible at current market conditions.
- *Added value from carbon benefits:* Policies to promote GHG-savings through biofuels in the EU and US are expected to include emissions from ILUC in the near to medium future. Projects that can demonstrate to prevent ILUC, such as the integration model, would then be recognised to achieve higher GHG-savings and may therefore obtain a higher value.

2 Goals and intended users of the RCA concept

2.1 Goal

The goal of this version of the Responsible Cultivation Area (RCA) methodology is twofold:

1. *To put forward a practical voluntary methodology to identify concrete areas and/or production models that can be used for environmentally and socially responsible energy crop production minimising unwanted direct and indirect effects.*
2. *To put forward a set of criteria and a methodology that enables parties to distinguish bioenergy with a low risk of indirect effects*[6]*. This includes:*
    a. *Criteria that must be met by producers in order to qualify as bioenergy with low risk of unwanted indirect effects;*
    b. *Suggestions on how producers can demonstrate compliance with the criteria for a low risk of unwanted indirect effects;*
    c. *Suggestions on verification requirements;*
    d. *Suggestions on the claims that companies can make.*

2.2 Intended users

Companies and land-use planners

The products of the first goal of the RCA concept, a practical methodology to identify concrete areas and/or production models that can be used for environmentally and socially responsible additional energy crop production without causing unwanted indirect effects, are primarily focussed on companies and land-use planners.

Companies and land-use planners can use this site identification module to identify concrete areas and/or production models that can be used for environmentally and socially responsible energy crop production without causing unwanted indirect effects. Thereby, it is not intended as a certification scheme, but rather as a practical tool for parties that want to identify areas for sustainable feedstock production, taking into account both direct and indirect effects. By properly following this methodology, parties 1) take into account the majority of the sustainability requirements with respect to land-use change of policies such as the EU Renewable Energy Directive (RED) or those of voluntary schemes such as the Roundtable on Sustainable Biofuels

[6] It should be noted here that this version of the methodology does contain operational procedures to verfiy any claims made on RCA compliant feedstock provision. Further work on verification and the claims that can be made by companies is currently carried out by Ecofys and WWF in the CIIB project ("Certification system addressing Indirect Impacts of Biofuels").

(RSB), and 2) take into account criteria for bioenergy with a low risk of indirect effects.

The focus here is on both direct and indirect effects. The reason for also including direct effects here is that it is of little use to identify areas and/or production models that have a low risk of indirect effects if they will lead to unwanted direct effects. For example, clearing primary forest for energy crop plantations may have a small risk of indirect effects if the land is not used by humans, but clearly the direct effects such as the loss of biodiversity and carbon stocks would not be considered sustainable. The direct effects that are taken into account in the site identification module are not a reinvention of the wheel but are built upon the sustainability criteria of today's key sustainability initiatives for biofuels: the Roundtable on Sustainable Biofuels, the EU Renewable Energy Directive (RED) and the UK Renewable Transport Fuel Obligation (RTFO). Therefore, sites selected with the use of the RCA site identification module will be well positioned to demonstrate compliance with the sustainability requirements of these initiatives[7]. The information gathered during the RCA site selection can later be used to demonstrate compliance with the criteria of the before mentioned policies and voluntary schemes.

Policy makers, governments and voluntary certification schemes

The products of the second goal of the RCA concept, the criteria and methodology that enables parties to distinguish bioenergy with a low risk of indirect effects, could be adopted by policy makers and voluntary certification schemes that wish to distinguish bioenergy with a low risk of indirect effects. Of course, market players are eventually the ones affected by these policies and certification schemes.

The focus here is purely on indirect effects, not on direct effects, as most policies and certification initiatives already developed criteria for direct effects themselves.

Box 4: Opportunities for an expansion of the use of the RCA methodology

The RCA methodology was initially developed specifically for the bioenergy sector. However, the methodology, or elements of it, may also be useful for other biomass consuming sectors such as the food, feed, and fibre sectors, even though it may need some adaptation for use in those sectors:

- The land identification module could be used by other sectors in cases where producers are looking to expand production, taking into account both direct and indirect effects.
- The module to specifically distinguish biomass production with a low risk of indirect effects could in theory also be used for other sectors than the biofuel sector.

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[7] Note that the RCA methodogy is focussed on the site selection phase. Many sustainability initiatives such as the RSB also have sustainability criteria that refer to how a plantation is managed, e.g. on soil and water quality among others, that will also have to be complied with for certification by those initiatives.

2.3 Project level approach

The RCA concept takes into account the needs of *market players*. This requires it to be feasible at the level of *individual production units*. This is in contrast to methodologies that aim to identify the national or global (sustainable) potential for energy crops or agricultural expansion in general.

2.4 Three main solution types to prevent unwanted indirect effects

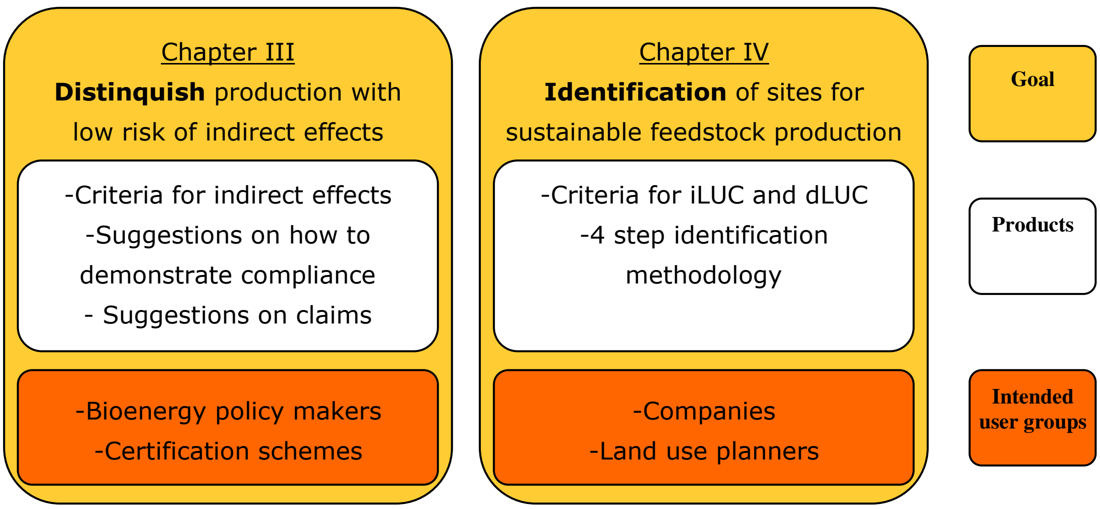
The current version of the RCA concept distinguishes three main types of solutions to increase the production of energy crops without unwanted indirect effects:

- The use of land without provisioning services.
    - For example oil palm on "unused" Imperata grassland
- Increasing land productivity through integration with non-bioenergy-feedstock systems
    - For example increasing cattle density through integration with sugarcane
- Increasing the land productivity of existing bioenergy feedstock systems
    - For example increasing the yields of existing rapeseed areas

2.5 Summary

The figure below summarises the two distinct modules of the RCA initiative, with their goals, main products and intended user groups.

Figure 3: The two modules of the RCA methodology, their goals, products and intended users. iLUC = indirect Land-Use Change; dLUC = direct Land-Use Change;



3 Module I - Distinguishing bioenergy feedstock production with a low risk of indirect effects

This Chapter puts forward a set of criteria and suggestions for a methodology that enables parties to distinguish bioenergy feedstocks with a low risk of indirect effects. This includes:

1. *Criteria that must be met by producers in order to qualify for bioenergy with a low risk of unwanted indirect effects*
2. *Suggestions on how producers can demonstrate compliance with the criteria for a low risk of unwanted indirect effects*
3. *Suggestions on verification requirements*
4. *Suggestions on the claims that companies can make.*

It is reiterated here that the suggestions given in this document on how to demonstrate compliance, how to verify compliance and the claims that can be made by companies have not yet been tested in practice. The CIIB project mentioned in Chapter 2 is a project that will test in concrete pilots how companies can demonstrate compliance, how this can be verified and what claims these companies can make.

3.1 Scope

Focus on indirect effects from energy crops with a high risk of indirect effects

The scope of RCA module to distinguish bioenergy feedstock production with a low risk of unwanted effects is limited to minimising the risk of unwanted indirect effects from those energy crops that have a high risk of unwanted indirect effects. As the understanding on indirect effects of energy crops increases, some energy crops (possibly grown in specific regions) may be found to have a low risk of unwanted indirect effects. Clearly, for such crops no additional measures need to be taken to prevent unwanted indirect effects. However, various modelling exercises indicate that the risk of indirect effects is high for many energy crops in many regions (Ecofys 2009b). It is these crops in these regions with a high risk of indirect effects that this module is focussed on. Thereby this RCA module aims to identify those production methods that minimise the risk of unwanted indirect effects for these crops, thereby enabling a large scale and sustainable use of these crops for bioenergy.

Next to preventing unwanted indirect effects, for bioenergy production to be sustainable, unwanted direct effects have to be prevented as well. However, this has been the focus of other initiatives (e.g. the RTFO meta-standard and the various Round Tables). In order to avoid duplication, this RCA module focuses on indirect effects only. Furthermore, this RCA module (to distinguish bioenergy feedstock production with a low risk of unwanted effects) focuses on bioenergy derived from energy crops. Indirect effects from bioenergy from "residues" are not addressed in this version of the methodology[8].

Working in a world with imperfect control over global LUC

As discussed in Chapter 1, the ideal long term solution to unwanted indirect LUC is a globally effective control of direct LUC. However, such a solution requires the participation of many governments and will be a long term process. In the meantime, if bioenergy production is to be sustainable, practical solutions will be needed that prevent unwanted indirect effects of bioenergy production *given the imperfections in the control of global LUC.* In other words, the RCA methodology recognises the importance of control over global direct LUC but it does not aim to solve it.

Focus on period up to 2020

The methodological proposals in this paper are primarily focussed on the short to medium term: the period until 2020. This coincides with the obligation period of the EU RED. This is relevant in discussions on the time period over which the proposed solutions must be effective in terms of minimising the risk of unwanted indirect effects.

3.2 Criteria for energy crop cultivation with a low risk of indirect effects

Indirect effects of additional energy crop production are the result of a displacement of other productive functions of the land. For example, existing palm oil production that was previously used for the food sector is now used for biodiesel production. Or land previously used for cattle is now used for sugarcane production for ethanol.

Displacement of existing production is therefore at the heart of the concept of indirect effects. Preventing displacement, by realising additional production instead of displacing existing production, is therefore at the heart of the solution to minimise the risk of indirect effects. The first criterion for energy crop cultivation with a low risk of indirect effects therefore is:

1 *Additional production has been realised without displacing other provisioning services of the land[9]. Or, where existing provisioning services are displaced, alternatives shall be implemented that comply with all criteria for RCAs, for both direct[10] and indirect effects[11].*

[8] The CIIB project mentioned in Chapter 2 will also address indirect effects from "residues" and how to prevent these.

[9] Note that the requirement for additional production, that would not have occurred in the absence of the RCA bioenergy demand, is consistent with the need for "additional carbon" for biofuels to save GHG-emissions as set out in the paper by Searchinger (2010).

[10] The criteria for the direct effects are set out in Chapter 4.

In addition there is a risk of unwanted indirect effects if remote areas are opened up that contain high conservation values. Therefore, the second criterion for a low risk of unwanted indirect effects is:

2 *In remote areas with one or more High Conservation Values[12], where the nearest road or settlement is more than 25 km removed from the High Conservation Value Areas, new plantations and infrastructure should remain at least 25 km from the High Conservation Value Areas[13].*

This criterion is waved if the High Conservation Value Areas in a 25 km radius of the project area and its infrastructure all lay within the project area and it can be assured that the High Conservation Values are maintained or improved.

3.3 Demonstrating compliance: Baseline, additionality and registration

One of the above criteria states that additional production must be realised to prevent indirect effects. To be able to demonstrate compliance with this criterion the following is suggested:

1. Determine the *baseline production* levels of the project area. The increased production levels will be compared to this baseline after implementation of the project activity. The increase in production levels above the baseline is eligible for crediting.
2. Determine whether the project activity is *additional*, i.e. that in absence of the RCA bioenergy feedstock demand the project activity would not have been implemented during the crediting period[14].
3. The project must be *registered*.

The next sections discuss in more detail how the above concepts could be implemented.

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[11] This conditional exception is meant to allow for the use of land that does already provide limited provisioning services as long as sustainable alternatives for these provisioning services are implemented. An example would be the collection of grass for roof thatching in areas where ample grass is available also after the implementation of the bioenergy project.

[12] The High Conservation Values are set out in Chapter 4.

[13] In line with empirical data from the report "Amazon Cattle Footprint" (Greenpeace 2010).

[14] For a definition of the crediting period, see section 3.5.2.

3.3.1 Setting the baseline and system boundary

This section provides suggestions on how the baseline and the system boundary could be set.

System boundary

The displacement criterion states that no provisioning services may be displaced by the project. To be able to assess this, a system boundary must be defined. The analysis will then focus on the provisioning services within the system boundary. Table 1 below gives suggestions for the system boundary of the three different solution types.

Table 1: Suggestions on the system boundary for different solution types

Project type	System boundary	Example
System boundary limited to the area used for the bioenergy feedstock production		
The use of land without provisioning services	The total area associated with the bioenergy feedstock production that is no longer available for other provisioning services. This includes the area used for plantation(s), infrastructure, processing facilities, etc.	The oil palm estate including the area used for the palm oil mill.
Increasing the land productivity of existing bioenergy-feedstock systems	The existing plantation area on which the productivity increase is implemented.	The collective area of oil palm owned by the small holders that are part of the yield increase programme.
System boundary extends beyond the area used for the bioenergy feedstock production		
Increasing land productivity through integration with non-bioenergy-feedstock systems	The total area dedicated to the bioenergy feedstock production as above. In addition, the total area dedicated to the non-bioenergy-feedstock production, with which the bioenergy feedstock production system integrates.	The sugarcane estate including the area used for the mill. In addition, the area used for grazing of the cattle that now receives a bagasse-based feed supplement.

Baseline

Two options exist for setting the baseline production levels:

- *Static baseline* in which the baseline production levels are set equal to the current (BAU) production levels.
- *Dynamic baseline* in which the baseline production levels change over time, for example by taking into account business-as-usual yield changes.

Table 2 provides suggestions on how the baseline can be set depending on the project type and whether the baseline is set in a static or dynamic manner.

Table 2: Guidance on static and dynamic baselines

Project type	Static baseline	Dynamic baseline
The use of land without provisioning services	Zero The land currently provides no provisioning services.	Zero The additionality test must demonstrate that the land would not be taken into production in the crediting period.
Increasing the land productivity of existing bioenergy-feedstock systems	-Current production levels of existing bioenergy feedstock system (yield) based on a multi-year average, OR; -Production levels that would currently be achieved with BAU practices[15].	-Projected production levels of existing bioenergy feedstock system (yields) based on historic yield trendline, OR; -Production levels that would be achieved with BAU practices, anticipating BAU yield increases[15].
Increasing land productivity through integration with non-bioenergy-feedstock systems	-Current production levels of existing non-bioenergy feedstock system (yield) based on a multi-year average, OR; -Production levels that would currently be achieved with BAU practices[15].	Projected production levels of existing non-bioenergy feedstock system (yields) based on historic yield trendline, OR; -Production levels that would be achieved with BAU practices, anticipating BAU yield increases[15].

[15] In case of rotational systems, the production levels are averaged to a per annum basis.

3.3.2 Proving additionality

How to demonstrate additionality

To prevent displacement, and thereby indirect effects, the bioenergy feedstock production must be additional to the BAU. To demonstrate such additionality for the three different types of solutions, the following is suggested:

- *The use of land without provisioning services*: either demonstrate that in absence of the RCA bioenergy feedstock demand, land with certain characteristics would not have been used for the supply of other provisioning services (i.e. it would not have been taken into production)[16], or, if it can not be demonstrated that the land would otherwise not have been used for the supply of other provisioning services, demonstrate that the resulting displacement effect would not cause unwanted indirect effects. The Box below provides additional information on how the above could be demonstrated in practice.
- *Increasing the land productivity of existing bioenergy-feedstock systems*: demonstrate that in absence of the bioenergy feedstock demand, the yield increasing measure (e.g. drip irrigation) would not have been implemented.
- *Increasing land productivity through integration with non-bioenergy-feedstock systems*: demonstrate that in absence of the bioenergy feedstock demand, the integration model (e.g. sugarcane-cattle) would not have been implemented.

Additionality and transaction costs

Demonstrating additionality could potentially incur high transaction costs. The level at which the additionality test must be performed will have a large impact on these transaction costs. At least two options exist:

- One additionality test is required for each individual project: for example for each sugarcane-cattle integration project in Brazil.
- One additionality test is required for a certain project type in a certain region: for example one additionality test would be performed for projects that integrate sugarcane with cattle in (a certain region of) Brazil. If this additionality test shows such a project to be additional, then all such project in (a certain region of) Brazil would be considered additional, without the need for each individual project to do its own additionality test. Of course, compliance with the displacement criterion (i.e. no displacement of provisioning services) must still be validated for each individual project (e.g. existing milk or beef production levels must be maintained.)

In the choice between the above options there is a trade-off between transaction costs and a potential erroneous conclusion on the additionality of an individual project.

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[16] To gain a reliable insight in the actual provisioning services of an area, local stakeholder consultation will always be needed. One could not rely soly on secondary data sources such as national land classifications. Also, the fact that the land is not used at a particular point in time does not mean the land has no provisioning services. The land may be used in a rotational scheme with long fallow periods.

Box 5: Practical guidance on how compliance could be demonstrated with the additionality requirements for RCA projects using land without provisioning services.

The text above sets out the suggested requirements for RCA projects using land without provisioning services. In order to demonstrate compliance with these requirements in practice companies could demonstrate the following:

1. The land did not deliver provisioning services in the last 5 years. This ensures the land is unused at the time the project is initiated, AND;
2. One of the following conditions is met to ensure that either the land would not have been taken into production during the crediting period, or, if it can not be demonstrated that the land would otherwise not have been used for the supply of other provisioning services, demonstrate that the resulting displacement effect would not cause unwanted indirect effects:
   a. The project area is located in a region in which no additional agricultural development takes place or is foreseen (except for biofuels).
      i. If there is no agricultural development in that region, the project can be considered additional because in absence of the biofuel project the land would unlikely have been developed for agriculture.
   b. The project area has certain characteristics that form a barrier to its development into agriculture and thereby make its development in the next years unlikely in absence of the biofuel project.
      i. In this case again the project could be considered additional.
      ii. Example: an area suitable for oil palm that officially lays outside the government designated agricultural development areas which makes it hard to obtain a permit for such an area. Such an area was identified in the pilot study for this methodology in Kalimantan, see WWF (2010).

   Or, if it can not be demonstrated that the land would otherwise not have been used for the supply of other provisioning services, demonstrate that the resulting displacement effect would not cause unwanted indirect effects:

   c. The project area is located in a region that has a large [to be defined] unused potential of land with similar characteristics as the project area.
      i. In this case there may be displacement of future projects for other sectors that would have wanted to use the same land. However, the requirement for a large unused potential would ensure that sufficient land, with similar characteristics, is still available for such future projects for other sectors. In that case the (future) displacement would not have unwanted consequences.
      ii. Example 1: a region in an EU country in which agricultural land is diminishing (the potential can be considered large as long as the amount of "unused land" is increasing).
      iii. Example 2: regions in a country with a significant remaining cropland potential such as Brazil and Colombia.

Could the additionality requirement be relaxed?

The methodology described here requires a demonstration of additionality. For example, for land without provisioning services the land should not be in use at the time of project registration and it should be demonstrated that, in the absence of the RCA bioenergy demand, the land would not have been taken into production during the crediting period[17]. This test is required to ensure that the production is truly additional to the BAU baseline. If it would not be additional to the BAU baseline there would still be a displacement of BAU production for other sectors and there would therefore still be the risk of unwanted indirect effects.

A simplified alternative of this methodology could only require that the project activity is not yet implemented at the time of registration and no additionality test would be needed. The benefit of this simplified approach is that it is easier to implement as it does not require an additionality test. The disadvantage is that it may well be less effective in preventing unwanted indirect effects because it credits measures that may have been implemented anyway within the crediting period. For example, this would allow the registration of production units that have not yet implemented a yield increasing measure but for which it could be reasonably expected that the yield increasing measure would anyways be implemented within the crediting period. For example, because the relevant yield increasing measure has become common practice in the specific region. Similarly, for RCA projects on land without provisioning services such a simplified methodology would only require that the land is not already in use at the time of registration without the need to demonstrate that the land would also not have been taken into production during the crediting period. If it is likely that the land would actually have been taken into production, also without the RCA project, effectively, displacement still occurs. A more detailed analysis of why a simplified methodology without the need for additionality may well be ineffective in preventing unwanted indirect effects is included in Appendix A.

3.3.3 Project registration

If parties want to make claims about compliance with the criteria for bioenergy with a low risk of unwanted indirect effects, the additionality concept requires the project to be registered before implementation. The implication of a strict approach to additionality is that existing production units, that already implemented measures that would normally qualify as low risk of indirect effects, are not rewarded by the methodology. A similar situation exists for most carbon markets such as the Kyoto Protocol's Clean Development Mechanism (CDM).

The concept of registration implies the need for a body and a governance process that does not currently exist for the application of this methodology. Such a body could be appointed when voluntary schemes or policies implement this methodology.

[17] Exceptions apply, see Box 5 on previous page.

Box 6: Opportunities for expansion of the RCA module to distinguish bioenergy feedstock production with a low risk of unwanted indirect effects to the food/feed/fibre sectors and the additionality requirement.

> As discussed in Chapter 1, the RCA methodology was primarily developed for the bioenergy sector. However, (parts of) the methodology may also be useful in preventing unwanted effects from expansion in other land-intensive sectors such as the food, feed and fibre sectors. However, if used by, for example, the food sector, the additionality requirement cannot be applied in the same way as proposed here for bioenergy. After all, the additionality requirement in the RCA methodology implies that the RCA bioenergy feedstock production is additional to the BAU production of the other sectors including the food sector. Because the food sector is part of this BAU production, the additionality requirement cannot be applied in the same way to the food sector.
>
> Nonetheless, also the expansion in these other sectors risk unwanted indirect effects if they displace other productive functions of the land. Therefore realising (part of) this expansion in ways that do not displace other productive functions, for example through yield increases or expansion onto land without provisioning services, can also assist in reducing unwanted indirect impacts of these other sectors. The RCA Identification module, discussed in Chapter 4 can help parties identify such opportunities.

3.4 Verification

For companies to be able to make a credible claim on the low risk of indirect effects of their bioenergy, independent verification will be required. Suggestions for what information would need to be verified are included below. Before the certification module could become operational this would need to be worked out in more detail[18].

- *Before the project is implemented:* verification of additionality and the baseline. This happens only once.
- *After the project is implemented:* verification of continued compliance with the criterion that the original provisioning services of the land are not displaced (during the crediting period). This differs for the three solution types.
    - For land without provisioning services, all production is additional. This means only the actual production levels have to be monitored to ensure no more products are claimed than are actually produced on the project site. Note that this is common practice for all certification schemes and therefore does not form an additional administrative burden.

[18] Further work on verification and the claims that can be made by companies is currently carried out by Ecofys and WWF in the CIIB project ("Certification system addressing Indirect Impacts of Biofuels").

- For the integration with non-bioenergy-feedstock systems, the provisioning services in the baseline scenario must be monitored to validate that they are maintained (e.g. milk production levels)[19].
- For the increased productivity of existing bioenergy-feedstock systems, the realised production levels must be monitored for validation. The "additional production without displacing the existing provisioning services of the land" then equals the realised production levels minus the production levels of the baseline scenario.

3.5 Claims

3.5.1 The quantity of product for which a claim can be made

Suggestions for the claims that could be made for projects of the three different approaches are:

1. *The use of land without current provisioning services*: all production from the land could be claimed to have a low risk of indirect effects.
2. *Integration with non-bioenergy-feedstock systems*: all production of energy feedstock could be claimed to have a low risk of indirect effects (provided that baseline production levels of the non-bioenergy feedstock level are maintained).
3. *Increasing the land productivity of existing bioenergy-feedstock systems*: all production of bioenergy feedstock above the baseline can be claimed to have a low risk of indirect effects.

3.5.2 The crediting period

The crediting period is the finite length of time during which the project's claim of low indirect risks is valid, for example 5 or 10 years. The crediting period can be renewed, but this requires a new assessment of additionality and the baseline.

Note that within the crediting period the owner of the RCA production is free to switch from selling its product to the bioenergy sector to selling it to other sectors (e.g. the food sector) and back.

3.6 Summary

The table below summarises the methodology for the RCA module to distinguish bioenergy feedstock production with a low risk of unwanted indirect effects for the three different RCA solution types. It summarises how additionality can be demonstrated, how the baseline can be established, what monitoring is required, and what claim can be made.

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[19] In some cases the provisioning services in the baseline scenario may be reduced temporarily due to factors outside the influence of the RCA project, such as weather conditions. In the detailled verification requirements developed in the CIIB project this will be accomodated for.

Table 3: Summary of the RCA module to distinguish bioenergy feedstock production with a low risk of indirect effects.

	Land without provisioning services	**Integration with non-bioenergy system**	**Increased productivity of existing bioenergy feedstock system**
Displacement criterion	Additional production has been realised without displacing other provisioning services of the land		
System Boundaries	System boundary limited to the area used for the bioenergy feedstock production	System boundary limited to the area used for the bioenergy feedstock production	System boundary extends beyond the area used for the bioenergy feedstock production
Demonstrating additionality	Demonstrate that the project activity that increases feedstock production is additional: i.e. in absence of the bioenergy feedstock demand the measure would not have been implemented during the crediting period.		
	i.e. the land would not have been taken into production[20].	i.e. the integration model would not have been implemented.	i.e. the yield increasing measure would not have been implemented.
Setting the baseline	Zero	Business as usual (BAU) production levels of non-bioenergy system (e.g. milk or beef)	BAU production levels of existing bioenergy system
Monitoring	Monitoring of realised bioenergy feedstock production levels	Monitoring that baseline production levels of non-bioenergy feedstock are maintained	Monitoring of realised bioenergy feedstock production levels
Claim that can be made	All realised production has a low risk of indirect effects	All realised bioenergy feedstock production has a low risk of indirect effects	The additional production ('realised production' minus 'baseline production') has a low risk of indirect effects

[20] Exceptions apply, see Box 5 on previous page.

4 Module II - Identification of Responsible Cultivation Areas

This Chapter describes a methodology to identify concrete areas and/or production models that can be used for environmentally and socially responsible energy crop production without causing unwanted indirect effects. Companies and land-use planners can use this methodology to identify areas for sustainable energy crop production without displacement[21]. Thereby, it is not intended as a certification scheme, but rather as a practical tool for parties that want to identify areas for sustainable feedstock production, taking into account both direct and indirect effects. By properly following this methodology, parties 1) take into account the sustainability requirements of policies and voluntary schemes such as the EU Renewable Energy Directive (RED), the UK Renewable Transport Fuel Obligation (RTFO) and the Roundtable on Sustainable Biofuels (RSB), as far as site-selection is concerned, and 2) take into account the displacement of current provisioning services and the opening up of remote areas in order to minimise the risk of unwanted indirect effects.

The focus here is on both direct and indirect effects. The reason for also including direct effects here is that it is of little use to identify areas and/or production models that have a low risk of indirect effects if they will lead to unwanted direct effects. The direct effects that are taken into account in the methodology are based upon the sustainability criteria of a number of today's key sustainability initiatives for biofuels: the RSB[22], the EU RED and the UK RTFO. Therefore, sites selected with the use of this methodology will be well positioned to demonstrate compliance with the sustainability requirements of these initiatives as far as site selection is concerned.

4.1 Scope

Before describing the site identification methodology in detail, this section clarifies the scope of the methodology.

4.1.1 Stage in the project development cycle

The RCA concept is focussed on *identifying* areas that can be used for environmentally and socially responsible energy crop cultivation without causing unwanted indirect effects. The RCA site identification module is not intended to guide parties in designing their actual plantation once the site has been selected. The RCA concept stops where site selection stops and where detailed planning and design on the selected site starts.

To further clarify the boundaries of the RCA identification module, consider the following steps that may still need to be taken after site selection: obtaining relevant

[21] Note that for production to be sustainable sustainable management practices are needed in addition to the selection of the proper site.

[22] Several oher schemes exist that aim to mitigate direct land use change, such as the Roundtable on Sustainable Palm Oil (RSPO), Better Sugarcane Initiative (BSI) and the Roundtable on Responsible Soy (RTRS).

permits, performing environmental and social impact assessments, making detailed plantation design, obtaining land lease contracts, etc. These activities fall outside the scope of the RCA concept.

Finally, note that the concept might also be used by market players which already possess a certain area of land and want to assess whether this area, or part of the area, could classify as an RCA.

Box 7: Site selection versus site development.

After an area has been identified that meets the RCA criteria, the plantation setup process will start. Based on experiences from the RCA pilot in Indonesia, it has become evident that in many areas community participation in the plantation setup and plantation operation is crucial to avoid unwanted displacement effects (e.g. caused by the immigration of the plantation workforce from other provinces to the project areas or the emigration of local communities if they cannot maintain their previous living). Thus, appropriate measures need to be taken to mitigate these risks.

Since the RCA site identification module focuses on the site selection process only, criteria on plantation development and plantation operation are not included in the RCA methodology.

Box 8: Identification of local partners.

For the solution type that focuses on increased land productivity through integration of energy crops with non-bioenergy crops, the land productivity of an existing production system will need to be improved. In some instances the owner of this existing production system may not be the same as the owner of the project that aims to cultivate energy crops with a minimum risk of unwanted indirect effects. In those cases, an important factor for project success will be the identification of suitable partners. While this is recognised as an important factor for project success, no detailed guidance is given here on how to identify such partners as this will vary strongly for different locations and production models.

4.2 Sustainability criteria used for identifying RCAs

The purpose of the RCA identification module is to put forward a practical methodology to identify concrete areas and/or production models that can be used for environmentally and socially responsible additional energy crop production without causing unwanted indirect effects.

Terms such as "sustainable" or "responsible" are open to many different interpretations and therefore need to be defined more precisely. For this purpose the RCA concept builds upon existing initiatives with an added emphasis on indirect effects.

In the RCA concept, an area is considered suitable for "environmentally and socially responsible" cultivation if its conversion does not cause unwanted direct effects and has a low risk of unwanted indirect effects. For this purpose a set of sustainability criteria on the direct effects of the conversion of an area have been defined. These sustainability criteria for the direct effects are based on the criteria of the following biofuel sustainability initiatives:

- EU Renewable Energy Directive (RED)
- UK Renewable Transport Fuel Obligation (RTFO)
- Roundtable on Sustainable Biofuels (RSB), version Zero.

These are complemented by the criteria on indirect effects introduced in Chapter 3.

This leads to the following five principles for RCAs:

1 *Establishment of energy crop plantations maintains or increases High Conservation Values*

   a. *No conversion of areas with recognised High Conservation Values[23] on or after January 2008[24]. This includes legally protected areas and areas with recognised global importance for biodiversity listed in Box 10.*

   b. *No conversion of areas with one or more High Conservation Values[18] on or after January 2008 that are not formally recognised as one of the areas referred to in principle 1.a.*

2 *Establishment of energy crop plantations does not lead to significant reductions in carbon stocks*

   a. *No conversion of areas that had one of the following statuses in January 2008:*

      i. *Continuously forested areas with a canopy cover of more than 30%*

      ii. *Peatland*

   b. *The carbon payback time for carbon losses resulting from land-use change (including above-ground and below-ground carbon stocks), shall not exceed 10 years in line with the RTFO requirements. To calculate the carbon payback time, the methodology as laid down in the RTFO Technical Guidance shall be used[25].*

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[23] HCV 4 contains areas that provided basic ecosystem services in critical situations (e.g. areas critical to water catchments). When checking the presence of HCV 4 within the scope of the RCA concept, it has to be checked in addition that the intended energy crop establishment does not cause negative downstream effects (e.g. a regional scarcity of the water supply caused by the competition between the water demand of the plantation and other users).

[24] This cut-off date was chosen to be consistent with the EU RED.

[25] RFA (2010) - Carbon and Sustainability Reporting within the Renewable Transport Fuel Obligation. Technical Guidance. Version 3.0, March 2010.

3 *Establishment of energy crop plantations respects the legal land status and customary land rights*

a. *The regulatory permission to convert the land to the foreseen crop must be known. Where obstacles are identified these shall be documented. These obstacles shall be addressed after the RCA site identification but before actual conversion commences.*

b. *Both formal and customary land rights (including use rights) must be known. Where potential land conflicts may arise between the energy crop cultivation and formal or customary land rights, these shall be documented. They shall be addressed after the RCA site identification but before actual conversion commences.*

4 *Establishment of energy crop plantations does not cause unwanted indirect effects*

a. *Additional production has been realised without displacing other provisioning services of the land. Or, where existing provisioning services are displaced, alternatives shall be implemented that comply with all criteria for RCAs, for both direct and indirect effects.*

b. *In remote areas with one or more High Conservation Values , where the nearest road or settlement is more than 25 km removed from the High Conservation Value Areas, new plantations and infrastructure should remain at least 25 km from the High Conservation Value Areas. This criterion is waved if the High Conservation Value Areas in a 25 km radius of the project area and its infrastructure all lay within the project area and it can be assured that the High Conservation Values are maintained or improved.*

5 *Intensification does not cause adverse environmental or social effects.*

a. *In case of intensification, the sustainability risks of intensification are identified and mitigation measures are defined for implementation.*

Notes:

- P1) The High Conservation Values mentioned in principle 1 refer to the six values identified by the High Conservation Network, see the Box shown below. The HCV concept also plays a central role in the methodology as tool-kits have been developed to identify HCVs.
- P2) The carbon payback time is defined as the number of years after which the project has a zero net effect on GHG emissions. In other words, this is the number of years after which GHG emission savings, resulting from the bioenergy produced by the project, have compensated net losses in carbon stocks[26].
- P3) Principle 3 on land rights and regulatory permission does not mean that land to which certain parties claim the ownership or use rights, can not qualify as an RCA. Such land can still qualify as RCA, if HCV values 5 and 6 are respected and

[26] Because the RCA site identification module is not intended as a certification scheme, parties are free to adapt the carbon stock criterion to the policy or the voluntary scheme with which they seek to comply.

fair and equitable agreements on the transfer of land rights can be agreed upon with the free prior and informed consent of all owners/users. As explained above, it is not within the scope of the RCA concept to finalise such agreements.

- All principles refer to the site selection as the RCA identification module is focussed on site selection. For such sites to produce biomass in a sustainable manner, a more elaborate set of sustainability criteria will need to be complied with during actual establishment and production: for example on labour conditions, soil, air and water. Such production criteria are defined in other initiatives and legislation.
- The following criteria of the RTFO or RSB are not included literally in the RCA concept for the following reasons:
    - "Biofuels projects shall be designed and operated under appropriate, comprehensive, transparent, consultative, and participatory processes that involve all relevant stakeholders." (RSB principle 2, also covering RTFO 7.2). This is excluded because it refers to the design and operation phase, which is beyond the scope of the RCA concept. However, within the scope of the RCA concept, stakeholder consultation is crucial to assess the presence of HCVs, the risk of displacement of existing production, and the respecting of land rights and is addressed in the methodology described below.
    - "Biofuel production shall not impair food security". Avoiding conflicts with the current food supply is already covered by the requirement that no displacement of other production may occur. If energy crop cultivation displaces food production, without compensatory measures, this would clearly form a displacement of existing production and such a project would therefore not qualify as an RCA.

The above sustainability criteria are based on the criteria relevant for site selection from the EU RED, the UK RTFO and the RSB. Thereby, sites that comply with these criteria will be well positioned to demonstrate compliance with the requirements of these policies and/or certification schemes as far as site selection is concerned[27]. However, as indicated before, the RCA site identification module is not intended as a certification scheme but rather as a practical tool for parties that want to identify areas for sustainable feedstock production, taking into account both direct and indirect effects. Therefore, users can in principle choose to make use of modified sustainability criteria to best fit their needs. For example parties seeking RSB certification may choose to work with the exact wording of the criteria of the RSB.

[27] Parties seeking compliance with one of the above policies or initiatives will always need to demonstrate compliance with the specific requirements of the relevant policy or initiative. Compliance with the RCA criteria does not guarantee acceptance by these policies or initiatives.

Box 9: The HCV Concept. Source: ProForest (2008)

The HCV concept

The concept of High Conservation Values (HCV) has originally been developed in the context of forest certification by the FSC and is today used by many NGOs, sustainability certification standards such as RSPO, biofuel initiatives such RSB and Governmental legislation such as the UK's RTFO.

According to ProForest (2008), a high conservation value is a biological, ecological, social or cultural value which is considered to be of outstanding significance or critical importance at the national, regional or global scale. HCV areas are critical areas in a landscape which must be managed to maintain or enhance HCVs. An HCV area contains one or more of the following attributes:

HCV 1 Areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g. endemism, endangered species, refugia).

HCV 2 Globally, regionally or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance.

HCV 3 Areas that are in or contain rare, threatened or endangered ecosystems.

HCV 4 Areas that provide basic ecosystem services in critical situations (e.g. watershed protection, erosion control).

HCV 5 Areas fundamental to meeting basic needs of local communities (e.g. subsistence, health).

HCV 6 Areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

4.3 Overview RCA site identification process

This section gives a general overview of the process of the RCA identification module. The process consists of four steps. These steps are described in detail in the remaining sections of this chapter. The reports for the RCA pilot projects performed in Indonesia and Brazil provide additional useful information and concrete examples for parties interested in identifying RCAs (WWF 2010, CI 2010a and CI 2010b).

4.3.1 Integrated approach

The definition for RCAs discussed in section 4.2 consists of four principles to ensure the area: 1) can be used for environmentally and socially responsible energy crop cultivation, and 2) such energy crop cultivation would not cause unwanted indirect effects. The RCA site identification process follows these same four principles and adds one additional dimension for practical reasons – agricultural suitability. The agricultural suitability of a potential RCA is taken into consideration throughout the identification process to ensure its suitability for energy crop cultivation.

This leads to the following five aspects that will be evaluated in the identification of RCAs:

- High Conservation Values (P1)
- Carbon stocks (P2)
- Legal land status and customary land rights (P3)
- Risk of displacement effects (P4)
- Risks of intensification (P5)
- Agricultural suitability

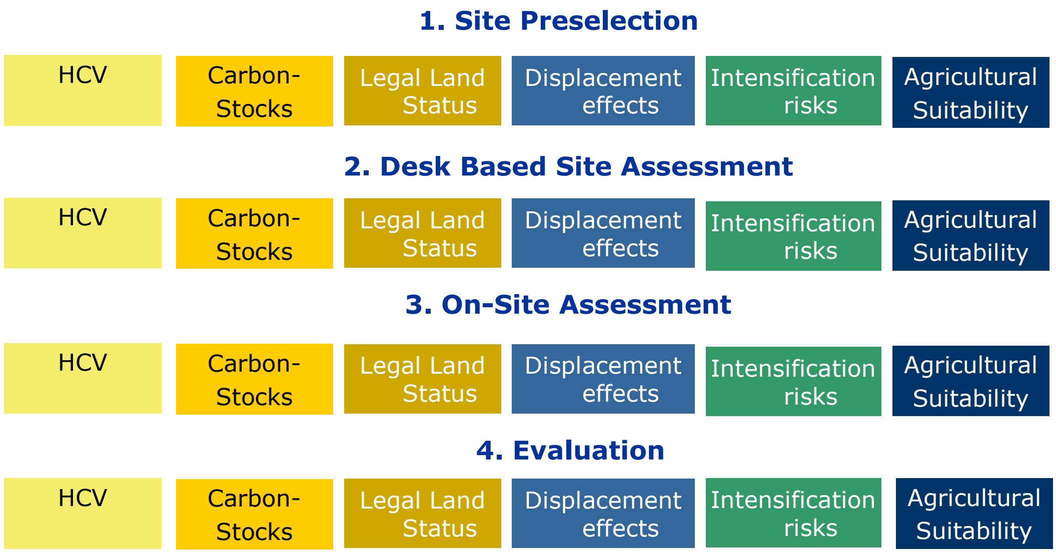
This document focuses on the steps that must be undertaken to comply with the four sustainability principles for RCAs. While the agricultural suitability needs to be assessed throughout the RCA identification process, this document does not describe in detail how such an assessment should take place because: 1) the key factors determining the agricultural suitability will depend on the crop, and 2) companies identifying areas for energy crop cultivation are expected to have the knowledge to assess the agricultural suitability of potential areas.

4.3.2 Four-step process

A four-step process is proposed to identify RCAs, see figure below. The four step-process results from the need to have a practical and cost-effective approach. The process starts on a large scale with coarse and readily available information to quickly identify the most promising areas (Site Pre-Selection). Next, a more detailed assessment is performed on these promising areas to further refine the Pre-Selection of promising areas (Desk-Based Assessment). The third step, the On-Site Assessment, has the purpose to verify the results of the first two steps and to fill all remaining knowledge gaps. In step 4, the Evaluation phase, all of the collected information is evaluated to determine whether (a part of) the area classifies as an RCA and under what conditions.

An RCA can only be fully mapped if all 4 stages of the process have been completed. Before starting the process, the user must choose the crop(s) and cultivation model(s) he considers to use on the RCAs, to be able to identify appropriate areas.

Figure 4: The four steps of the RCA site identification process



4.3.3 Central role for existing HCV methodology

The RCA identification module aims to make maximum use of existing tools and methodologies. For High Conservation Value assessments, reference is made to the existing guidance documents for such assessments:

- Good practice guidelines for High Conservation Value assessments - A practical guide for practitioners and auditors (ProForest, 2008).
- The national HCV interpretations, providing more nationally specific information and threshold values, if available. National interpretations can be found at the HCV website: www.hcvnetwork.org.
- The global HCV Toolkit - part 1, 2 and 3 (ProForest 2003).

The HCV assessment methodology will be used in both the desk-based assessment (step 2) and the On-Site assessment (step 3) of the RCA identification process.

In the next sections, all steps of the identification process are explained in detail.

4.3.4 Note on demonstrating additionality

Chapter 3 set out the requirement for bioenergy feedstock production to be additional to the BAU scenario for the production to have a low risk of unwanted indirect effects. However, how exactly producers should demonstrate compliance with this additionality requirement has not been worked out in detail yet (see section 3.3 for more details)[28]. The first version of the RCA identification module therefore does not provide these

[28] The CIIB project is expected to provide detailled guidance on how producers can demonstrate additionality of their production.

details on how to demonstrate additionality and how exactly to set the accompanying baseline. With respect to the displacement principle (P4) it does contain guidance on how to identify sites that do not provide provisioning services already and how to identify sites with extensive production systems of which the productivity could be improved. This is also the version of the site identification module that has been tested in the pilot projects in both Indonesia and Brazil.

4.4 Phase 0 – Feasibility study

The feasibility study is an extra step that is only performed for the "increased land productivity" options of the RCA methodology, being:

- Increasing land productivity through integration with non-bioenergy-feedstock systems
    - For example increasing cattle density through integration with sugarcane
- Increasing the land productivity of existing bioenergy-feedstock systems
    - For example increasing the yields of existing rapeseed areas

This feasibility study is performed before the actual identification of concrete potential project sites is started.

4.4.1 Goal

The success of "increased land productivity" projects critically depends on the sustainable increase of the land productivity of an existing production system. The goal of this phase to:

- Obtain a good understanding of the feasibility of such a productivity increase and to identify potential risks and opportunities that will require special attention during the RCA assessment.
- For the intensification options, to obtain a good understanding of the risks of planned intensification measures and how these risks can be mitigated (P5).

4.4.2 Output

A feasibility study that provides an insight into at least the following:

- The original production system and its main characteristics: for example extensive cattle grazing, with a typical density of one head per hectare, practiced by both small and large scale producers, etc.
- The measures that would be implemented to achieve an increase in the land productivity. For example feeding the cattle part of the bagasse – a residual product from sugarcane.
- An estimation of the productivity increase that can be achieved: for example a 100% increase in the number of cows per hectare.
- High level economic analysis, considering both the bioenergy feedstock production system and the system it will interact with. (The latter is only relevant for integration models.)

- Potential environmental and social sustainability risks that will require special attention during the assessment. For example dependency of cattle farmers on the sugarcane mill for their feed (P5).
- Experience with the high productivity model and lessons-learned from that experience.

4.4.3 Methodology

The aspects that should be covered are mentioned above. Recommended sources of information include: literature on the proposed integration/intensification model, interviews with experts, interviews with parties with first hand experience with similar models and site-visits to similar projects. Interviews with (representatives of) affected parties should not be omitted.

4.5 Phase 1 – Desk-based pre-selection of promising areas

4.5.1 Goal

The goal of Phase 1 is to obtain a rapid and cost-effective pre-selection of the most promising areas within the total area of investigation.

4.5.2 Output

For both the land without provisioning services and the increased land productivity options, the output of Phase 1 is a preliminary map in GIS-format containing the most promising areas within the total research area. The resulting GIS map is based on the overlay of several layers of GIS maps. Each of these maps contains information on one of the six aspects considered in the RCA identification process: High Conservation Values, carbon stocks, formal and customary land rights, risk of unwanted displacement effects, and agricultural suitability.

Since it is not possible to assess the full compliance of promising areas with all the principles of RCAs in this phase of the methodology, the map has only a preliminary character that serves as input to the next steps of the methodology.

4.5.3 Methodology

In this phase, a constraint-driven approach is combined with an opportunity driven approach.

- *Constraint-driven exclusion of areas.* Based on predominantly GIS-based information on each of the six aspects, large areas can be excluded as potential RCAs. By excluding areas based on the more objective criteria with good data availability (e.g. carbon stock proxies such as forested areas) no additional information needs to be collected for these areas on RCA criteria for which data is scarcer or more resource intensive to collect, such as data on social issues. Suggestions for useful data sources for this phase are included in Appendix B. The following exclusion criteria are used in this phase for each of the six aspects:

- HCV (P1)
  - Areas under legal protection
  - Areas critical to maintain HCVs as identified by selected datasets included in the Integrated Biodiversity Assessment Tool (IBAT 2009). The different datasets included in the IBAT tool are listed in Box 10 and 11. The IBAT datasets included in Box 11 are not appropriate for the exclusion of project areas, as they are coarser in scale and encompass larger areas that may still contain RCAs. Such data sets may provide contextual information but they are not used to exclude areas in the site pre-selection phase. All other IBAT datasets contain critical areas that shall be initially excluded as promising RCAs[29], see Box 10.
  - Areas which are suitable for energy crop cultivation, but run the risk of negative downstream effects of energy crop cultivation (e.g. areas which run the risk of a regional scarcity of the water supply caused by the competition between the water demand of the energy crop plantation and other users)
  - Other areas with HCVs that have previously been identified and mapped.
- Carbon-stocks (P2)
  - Forested areas
  - Wetlands
  - Areas with peat soils
- Land rights and regulatory permission (P3)[30]
  - Areas without regulatory permission for cultivation of the intended energy crop (e.g. according to the land use planning on national and provincial level) and where such permission is unlikely to be obtained[31].
- Displacement (P4)
  - Areas that are already used for intensive agricultural production
  - Areas that are used for human settlements or infrastructure

[29] For specific areas, further research may show that the HCVs can be maintained or improved in combination with bioenergy feedstock production. Such areas are therefore not per definition excluded but they generally do not form the most promising opportunities in the site identification process.

[30] Data on formal and customary land rights that could result in land conflicts with the use of the land for energy crops is often not available in this phase. Therefore the focus for principle 3 in this stage is on data on the regulatory permission to develop the land.

[31] In the RCA pilot project in Kalimantan a promising site was identified for which currently no regulatory permission can be obtained because the land is formally clasified as forest while the actual forest cover has been cleared long ago. This illustrates that areas that lay outside the official area designated for agricultural development can still form an RCA if the official status of the land can be changed such that regulatory permission can be obtained.

    - Remote areas without transport- and residential infrastructure vulnerable to negative effects due to the presence of HCV values in the areas that would be made accessible by the projects infrastructure[32].
  - Intensification risks
    - Information on this is collected in the subsequent phases.
  - Agricultural suitability
    - Areas not suitable for the relevant energy crop(s). If a complete agricultural suitability assessment for a certain crop in a certain region is not available, a new suitability assessment should be carried out which analyses at least the following aspects[33]:
      - elevation and topography (slopes)
      - climate (including rainfall, evaporation, day length, solar radiation and temperature)
      - soil suitability (including soil drainage, water holding capacity, soil depth and soil chemical properties)
- *Opportunity driven identification of areas.* The above mentioned process excludes areas with a low likelihood of complying with the RCA criteria. All, or a selection of, the remaining areas will be evaluated further in the next steps of the methodology. If data is available on areas that have a high chance of meeting the RCA requirements, for example degraded areas such as Imperata Grasslands in South East Asia, these areas can be given a special focus. This opportunity driven approach can help focus the more detailed analysis in the next phases of the methodology, thereby saving time and resources.

Identification of increased land productivity options is much more opportunity driven than the identification of land without provisioning services. The feasibility study will have generated a general understanding of the occurrence and location of the relevant production system. In the area pre-selection phase, it will be important to gather information on the location of occurrence of the extensive production model that the project aims to increase the land productivity of, for example extensive cattle grazing, as this determines the location of the project opportunities. In as far as possible in this phase, information will also be collected on the intensity of the relevant production system: for example on the average number of cattle head per hectare.

The information on promising areas is combined with the information on areas which are less likely to qualify as RCAs. This double-sided approach is illustrated in Figure 5 below. The data sources shown are examples. Suggestions for data sources for this phase of the RCA identification process are included in Appendix B.

[32] This requires a detailled knowledge about the local infrastructure. This information may only be available in subsequent phases.

[33] If data is available. Otherwise these aspects need to be studied in more depth in later phases.

Box 10: Fine scale data presented via the Integrated Biodiversity Assessment Tool for Business (Birdlife International, Conservation International, IUCN and UNEP-World Conservation Monitoring Centre) as per 2009. The areas in these data sets are excluded as potential RCA unless further research confirms that the cultivation and harvesting of bioenergy feedstock does not negatively affect the area.

- Key Biodiversity Areas: Sites, protected or unprotected, identified by national partners using international standards as a conservation priority based on the known occurrence of globally significant threatened and/or endemic species, significant concentrations and/or unique assemblages. (See footnote)
- Alliance for Zero Extinction (AZE) Sites: Sites, protected or unprotected, occupied by the majority of the remaining population of the highest class of threatened species (IUCN Critically Endangered or Endangered). These are the highest priority Key Biodiversity Areas.
- Internationally Recognised Sites: Protected areas recognised or designated by international conventions or treaties such as UNESCO World Heritage Sites, Ramsar wetlands or UNESCO Man-And-Biosphere reserves. Where relevant agriculture production is allowed under the protected area's legal designation and by its management plan, this should be noted.
- Nationally Designated Sites: Protected areas designated at the national level. These are assigned to one of six IUCN management categories:
    - IUCN Category I-IV: Areas protected for science, wilderness protection, ecosystem protection, recreation, specific natural features and/or for conservation through management intervention.
    - IUCN Category V: Areas where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity.
    - IUCN Category VI: Areas managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

  Where relevant agriculture production is allowed under the protected area's legal designation and by its management plan, this should be noted.
- IUCN Not Designated: These sites have either been degazetted or are proposed protected areas that currently have no national recognition.
- IUCN No Category: These are sites where no IUCN Category has been assigned although they are still recognised nationally as protected areas.

*) Note: The potential exclusion of KBAs as RCA should be based on consultation with relevant national partners and experts who mapped these sites and who are best placed to advise on whether proposed conversion will impact the biodiversity values that triggered KBA status. Some KBAs include areas of productive lands that are required to support biodiversity values in their current state while others include remnants of pristine habitat that are more likely to be excluded.

Box 11: Coarse scale data presented via the Integrated Biodiversity Assessment Tool for Business (Birdlife International, Conservation International, IUCN and UNEP-World Conservation Monitoring Centre) as per 2009. The information in these data sets can provide contextual information but the areas in these data sets are not excluded as potential RCA.

- CI Biodiversity Hotspots : Regions of global conservation importance defined by the presence of high levels of threat (at least 70% habitat loss) in areas with high levels of species endemism (at least 1,500 endemic plant species).
- CI High Biodiversity Wilderness Areas : Large areas (at least 10 000 km2) consisting of regions defined by their relatively undisturbed nature (at least 70% intact) and high level of species endemism (at least 1,500 endemic plant species).
- BirdLife International Endemic Bird Areas: A region of global conservation importance where the distributions of two or more restricted-range bird species overlap.
- WWF Ecoregions: A large unit of land or water containing a geographically distinct assemblage of species, natural communities, and environmental conditions.

Figure 5: Exclusion-driven and opportunity-driven identification of RCA areas. Information sources cited are examples.

Exclusion-driven approach

Agricultural Suitability

Globally available

Information	Data Source
Crop suitability	Fischer et al. (2000) Global Agro-Ecological Zoning

Regionally

Information	Data Source
Crop suitability (e.g. for palm oil)	ISRIC (2007) Biophysical Land Suitability for Oil Palm in Kalimantan

Own Assessment

Information	Data Source
Soil information	FAO (2000)
Height and slope information	Shuttle Radar Topography
Climate information	CGIAR-CSI (2006) Global Climate DB

HCV (P1) / Carbon Stocks (P2)

Information	Data Source
HCV 1,2,3	CI (2008) IBAT
HCV 4 - Carbon stocks	ESA (2008) Globcover global land cover map
HCV 4 - Water Catchments	ESA (2008) Shuttle Radar Topography

Information	Data Source
HCV 1,2,3	Rainforest Alliance (2003)
HCV 4 – carbon stock Forest cover Peat Soils	Rainforest Alliance (2003) ISRIC (2007) Sarvision
HCV 4 – Water Catchment and soil erosion etc.	Sarvision: Remote sensing of Indonesia

Land Rights (P3)/Displacement (P4)

Information	Data Source
Infrastructure & communities	ESA (2008) Globcover global land cover map
Current agriculture	ESA (2008) Globcover global land cover map

Information	Data Source
Infrastructure & Communities	Sarvision: Remote sensing maps of Indonesia
Current agriculture	Sarvision: Remote sensing maps of Indonesia
Spatial plan	WWF (2008) Heart of Borneo initiative
Concessions	WWF (2008) Heart of Borneo initiative

Opportunity-driven approach

Information	Data Source
Promising Areas (e.g. Imperata grasslands)	Garrity (1997) The Imperata grasslands of tropical Asia: Area, distribution, and typology

4.6 Phase 2 – Desk-based assessment of pre-selected areas

4.6.1 Goal

Phase 1 makes use of rather coarse or easily available data sets to quickly eliminate large areas and to identify the most promising areas for a more detailed assessment. Before committing resources to a field trip, the goal of phase 2 is to collect more detailed and additional information about the pre-selected areas. This will:

- Reduce the chances that during the relatively resource-intensive field work, the pre-selected areas are found to be unsuitable as an RCA;
- Identify any remaining knowledge gaps that must be filled-in during the field work.

In addition, for the increased productivity option, it will be important in this phase to identify potential partners. However, as described in the scope of the RCA methodology, no detailed guidance is given on this latter aspect.

4.6.2 Output

The output of phase 2 consists of:

- A description of the additional information found on the selected areas, the sources of this information, and the consequences of these new findings on the potential status of (part of) the areas as an RCA
- An updated GIS-map of the preselected area, showing the additional information collected in this phase and clearly demarcating the areas to be evaluated during the field work.
- A detailed overview of the data to be collected during the field work, consisting of:
    - desk-based findings that must be verified on the ground, and;
    - knowledge gaps resulting from the desk-based assessment that must be filled-in during the field work.

4.6.3 Methodology

For the pre-selected areas, the following tasks are carried out:

- *HCV (P1).* Desk-based HCV-Assessment of the preselected areas according to step 1, 2 and 3 of the Good Practice Guidelines for HCV assessment (ProForest, 2008). The desk-based assessment is especially relevant for the identification of HCVs of type 1, 2, 3 and 4. Expert consultation is part of this work. This work can be guided, at an initial stage, by tools such as IBAT and the core data it holds.
- *Carbon stocks (P2).* Verification and refinement of information on land cover and presence of peat areas and wetlands through regional studies and interviews with experts (Universities, NGOs, regional government departments, etc.)
- *Land rights and regulatory permission (P3).* Refinement of the desk-based information from site pre-selection phase (e.g. collection of information from local NGOs and/or government departments on land claims and potential land conflicts). Special focus will be given to the possibility of conflicting information about land-use planning and actual land use. A thorough understanding of land

rights and the roles and responsibilities of different actors in land development are crucial.

- *Displacement (P4)*. Verification and refinement of information on current land uses through regional experts (Universities, NGOs, regional government departments, etc.)[34] For the "increased productivity" option, a further verification and refinement of the information gathered in the feasibility study on the current production models applied in the region and the potential for productivity increases through the RCA project will need to be made through interviews with experts and stakeholders. For the land without provisioning services, information is collected on the availability of such unused land in the region, past and expected trends in the developments of these lands.
- *Intensification risks (P5).* Refinement of the understanding on the sustainability risks of the intended intensification measures and the effectiveness and local suitability of the intended mitigation measures. Information sources include interviews with local agricultural and environmental and social experts depending in the intensification measures. Special focus should be put on gaining a better understanding of the local conditions and thereby the specific risks and appropriate mitigation measures for that region. In addition, visits to sites which have already implemented similar measures, if possible, can provide valuable lessons learned.
- *Agricultural suitability*. Refinement of the desk-based information from site-selection phase (e.g. collection of more detailed soil and slope information) through local experts.

Based on the more detailed information collected in this phase, changes may be made to the pre-selected areas that will actually be field-tested. For example, interviews with local NGOs may reveal that severe land conflicts exist in (part of) the area. Or more detailed soil information may reveal that the area will not be able to provide sufficient yields for economic production. In parallel to the tasks described above, the consultation with the stakeholders affected by the implementation of the RCA concept is started. Clearly, during phase 2 only some of the stakeholders can already be addressed since the exact regional location of the RCAs is not known yet. With an increasing knowledge on the location of potential RCAs, more and more local stakeholders will be consulted.

In very remote areas, it can be useful to carry out an orientating field trip or a flyover across the areas identified to be able to choose the right focus areas for the fieldwork. This step can save a considerable amount of time and money, for example in cases when the land cover maps used for the pre-assessment appear inaccurate in practice.

[34] In some cases this information may only be available in the next phase, field work.

4.7 Phase 3 – Field work

4.7.1 Goal

Phase 3 has the following goals:

- Verify the findings of the desk-based Site Assessment
- Fill all knowledge gaps after the desk-based Site Assessment
- Identify sustainable alternatives for current uses in the area that may be displaced by the RCA project.

4.7.2 Output

The output of phase 3 consists of:

- A report on the information obtained in the field and the methodologies used to obtain that information.
- A survey of current uses of the land and the potential for sustainable alternatives of these existing uses.
- A geographically explicit map of the project area.

4.7.3 Methodology

Within the field work, the following tasks are carried out on the sites selected based on the results of phase 1 and 2:

- *HCV (P1).* An HCV identification according to step 3 of the Good Practice Guidelines for HCV Assessment (ProForest, 2008) including ground truthing of remote sensing data and literature and analysing those HCVs which could not be analysed properly in the desk-based analysis phase, especially HCVs 5&6. Potential downstream effects of the intended energy crop cultivation (e.g. negative effects on the local water supply)[35] will also be analysed. All HCVs, such as riparian strips, should be mapped.
- *Carbon stocks (P2).* Two tasks are performed on carbon stocks:
    - Identify and map forested areas within the sites. These areas will then have to be left in tact if the site were to be developed. Techniques that can be used for this purpose are fly-overs, high resolution satellite images and field assessments. The remote sensing options will often be more economic if the area is large and has little existing infrastructure.
    - Determine the carbon stocks on the areas to be converted. For this purpose several alternative methods can be used. For all these methods it will be necessary to stratify the site into various strata, where the carbon stocks in each stratum are relatively homogeneous (see Pearson et al. 2005). The first available method is the use of IPCC Tier One default values as laid

[35] Within the RCA pilot carried out in Kalimantan/ Indonesia, it was experienced to be practical to evaluate HCV 5-6 in the same process step as the evaluation of principle 4 (displacement) during the field work since HCV5-6 are relating to the potential displacement of essential economic (and cultural services) to communities.

down in IPCC (2006). If using IPCC default values, it must be documented and justified what IPCC land categories were used – i.e. that the IPCC land categories are representative for the strata of the site. Alternatively, if more specific regional carbon stock studies are available, these can be used. In that case, the references source must be from a reliable source (e.g. peer-reviewed literature) and, as with the IPCC default values, it must be demonstrated that the values in the referenced source are relevant for the strata in the site. Finally, if no proper default values are available from IPCC (2006) or other reliable sources, it will be necessary to perform a site specific carbon stock assessment for the various strata. In this case, a credible carbon stock assessment methodology must be used, such as "Sourcebook for Land Use, Land-Use Change and Forestry Projects" (Pearson et al. 2005), which provides practical step-by-step guidance.

- *Land rights and regulatory permission (P3)*. Filling in the knowledge gaps and a verification of the results of the desk-based information on:
  - Regulatory permission to develop the land for the foreseen energy crop (as far as clarity has not already been obtained in the previous phases) through interviews with local authorities.
  - Potential land conflicts through consultation with representative groups from local communities.
- *Displacement (P4)*. A displacement assessment including:
  - The identification of the current provisioning services of the selected areas and their levels.
  - An identification of potential alternatives to provide the identified provisioning services of the selected areas to the local communities.
  - An analysis of the impacts of using these alternatives and the preconditions for a sustainable use of the alternatives.

  Practical guidelines and questionnaires for this task are given in the global HCV toolkit of ProForest 2003 and in the national interpretations of the global toolkit. An example of a questionnaire adapted from the HCV toolkit is given below.
- *Intensification risks (P5).* On-site assessment of the risks of intensification at the specific site and whether the intended mitigation measures will be effective in those specific circumstances. The exact nature of this assessment will depend on the intended intensification measures but could for example include an assessment of the water availability (in different times of the year) for irrigation projects. As knowledge of the local circumstances is vital, it is recommended to always work in collaboration with local experts.
- *Agricultural suitability*. An agricultural suitability assessment (including e.g. soil analysis) conducted by a expert with experience with the relevant crop(s).

Table 4: Example for a questionnaire on HCV 4 and 5 and current provisioning services or the land. Source: (ProForest 2003 adapted by Ecofys)

Village: Example	**Sub-Group: Example**
Resource from the area (e.g. timber for housing material, spring water, etc)	Ranking of importance of the area in meeting this need
Are there available alternatives?	List the alternatives here. If there are none, this resource may be an HCV. If there are some, continue with rest of table.
Are these alternatives available • all year long every year? • in sufficient quantities to replace the forest resources? • and in an accessible location by available means of transportation?	If the answer is no to one of these questions: there may be an HCV. If the answer is yes to all questions: continue below.
If yes, can they be obtained for free or would there be a cost involved? (for example / cash needed to buy and transport a replacement, labour and land needed to start new agricultural activities?)	If the replacement is available for free (for example, free medicine at village dispensary), this is not an HCV. If there is a cost, continue.
If there is a cost, is it within the reach of all the people (for example do they have enough cash to buy it, or do they have enough labour and land to start a new agricultural production as replacement?)	If no: Fundamental/HCV; If yes: not
Is there a risk that the use of the available alternatives would have violate any of the RCA criteria?	If yes: continue.
Can mitigation measures be defined to would mitigate the risks of violating the RCA criteria?	If no: the area does not qualify as an RCA. If yes: define the preconditions that must be implemented.

4.8 Phase 4 – Evaluation

In the evaluation step, the following activities are carried out:

- An analysis of whether the pre-selected areas meet the principles of RCAs, based on all information collected, and whether any specific preconditions must be met for these areas to qualify as a Responsible Cultivation Area.
- A report on the findings and all relevant conclusions, including:
  - Conclusion on which areas qualify as Responsible Cultivation Areas, including a clear demarcation of these areas.
  - Any preconditions that must be met on the different RCAs during and after plantation establishment in order to meet the RCA principles.
  - Conclusion on the agricultural suitability of the RCAs and the economic implications of their use
  - Optional: an overview of the areas that have been excluded and on what ground

- A summary on the stakeholder consultation, the key points raised and how these have been addressed.

Box 12: Lessons learned from the pilots in Indonesia and Brazil

The RCA identification module has been tested in both Brazil and Indonesia. In Brazil, both the integration option and the unused land option were piloted. In Indonesia, only the unused land option was piloted. The lessons learned from the pilots have been incorporated in the methodology. The key lessons learned in the pilot studies are:

- Part of the GIS-data collected on land use, legal land status and land cover within phases I and II was found to be incorrect during the fieldwork. For example, some forested areas had not shown up as forest in the land cover maps and a plantation had already been started in one of the concession which was classified "inactive" in the official maps. Therefore, special care has to taken when interpreting existing maps and while such information is useful as a first screening in phase 1 and 2, the information must always be ground-truthed during the field work in phase 3. Flyovers and preparatory field visits can be efficient techniques to gain a reliable first impressing of the actual land cove and use.
- In case of countries with a high risk of conflicting land rights, the legal land status has to be checked on all administrative levels early in the process. Within the pilot of Indonesia, a concession with two different legal land classifications on the provincial and the governmental level was identified.
- It is recommended to cooperate with local partners for the field work in phase 3.
- It was found practical to assess HCV 5 and HCV 6 and the displacement of other uses (P4) together in one step.
- Complete data is not always available. Every effort should be made to gather and use the best available data, and to develop information where it does not exist. In some cases, decisions may need to be based on expert opinion. This should be documented.

Future developments of the RCA methodology

This is the first public version of the RCA methodology. It contains two distinct modules:

- A practical methodology to identify concrete areas and/or production models that can be used for environmentally and socially responsible additional energy crop production, taking into account both direct and indirect effects. This module is primarily focussed on companies and land-use planners that want a practical methodology that helps them select areas for responsible energy crop cultivation. The methodology has been tested through three pilot projects in Brazil and Indonesia and has proven practical and effective in its application with concrete sites selected in all three pilot studies.
- Criteria and suggestions for a methodology that enables parties to distinguish bioenergy production with a low risk of indirect effects. This module could be adopted by policy makers and voluntary certification schemes that wish to distinguish bioenergy with a low risk of indirect effects. Additional operational details will be needed before actual certification of bioenergy feedstock production with a low risk of indirect effects is possible.

For the future, the following developments of the RCA methodology are foreseen:

- For the RCA site identification module three pilots have been performed. It is expected that more parties will use the site identification module to identify new sites for sustainable bioenergy feedstock production. The lessons learned from this additional experience could result in an improved update of the site identification module.
- Based on the RCA module to distinguish bioenergy feedstock production with a low risk of unwanted indirect effects, a certification module will be developed in a project by Ecofys, WWF and partners: "Certification system addressing Indirect Impacts of Biofuels" (CIIB). This certification module should enable market players to make credible claims that their bioenergy has a low risk of unwanted indirect effects. It is hoped that it will be adopted by voluntary schemes and policies that aim to distinguish bioenergy with a low risk of unwanted indirect effects. The project will take the RCA criteria for bioenergy with a low risk of unwanted indirect effects as a starting point and will work to develop the additional critical components for an operational certification scheme. This might also necessitate the development of additional indicators. Critical components to be developed are:
    - Detailed guidance for producers on how to demonstrate compliance with the additionality requirement.
    - Detailed guidance for producers on how to set the system boundary and baseline.

- Verification requirements.
- Good practice guidelines for the various solution types:
  - Use of land without current and foreseen provisioning services
  - Increase in land productivity through integration with a non-bioenergy system.
  - Increase in land productivity of existing bioenergy feedstock production system.
  - Use of residues for bioenergy

- Finally, this version of the RCA methodology has focussed on the bioenergy sector. Several stakeholders have suggested that (parts of) the methodology could be useful in improving the sustainability of other land-intensive sectors such as the food, feed and fibre sectors. While no additional work is foreseen in this area at the time of writing, the ideas and concepts of the RCA methodology are free to be used by other sectors and parties wishing to develop these ideas and concepts further with a stronger focus on the special needs and characteristics of these other sectors.

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Appendix A Can the additionality requirement be relaxed?

As discussed in Chapter 3, a simplified version of the RCA module to distinguish bioenergy feedstock production with a low risk of unwanted indirect effects could not require additionality. For RCA projects on land without provisioning services such a simplified methodology would only require that the land is not already in use at the time of registration without the need to demonstrate that the land would also not have been taken into production during the crediting period. If it is likely that the land would actually have been taken into production anyway, also without the RCA project, displacement effectively still occurs and the methodology may be ineffective in preventing unwanted indirect effects. This Appendix explains in more detail the mechanisms that would cause this ineffectiveness and provides a brief analysis of the probability that such a simplified RCA methodology would indeed be ineffective in preventing unwanted indirect effects.

Indirect effects from the use of currently unused land

The figures below illustrate the indirect effects that can still occur if currently unused land is used for bioenergy, without the need to demonstrate additionality. The figures are a highly simplified version of reality and use hypothetical numbers but they illustrate the mechanisms at work. The next section sheds more light on the real life values of the key parameters.

The conclusion of the figures below is that an ILUC policy that does require biofuels to come from land that was unused in 2010, but does not require additionality, could lead to just as much unwanted LUC in 2020 as a scenario without any ILUC policy. The reason for this is that the unused RCA land that was in any case taken into production in the BAU scenario by the food/feed/fibre market between 2010 and 2020 could be shifted to use for biofuel feedstock production. In that case (scenario IIa in the figure below) the biofuel feedstock production still displaces food/feed/fibre production, with the resulting ILUC. This displacement and the associated ILUC is only prevented if the additional biofuel feedstock production takes place on land that would otherwise not have been taken into production (scenario IIb in the figure below). In other words, if the production is truly additional.

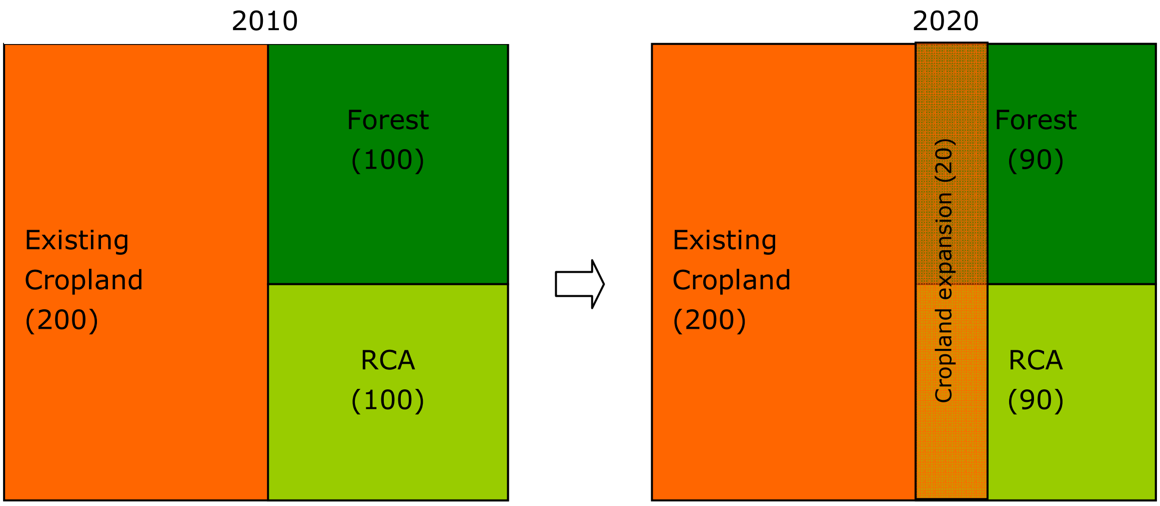
Whether an RCA policy without additionality would indeed be ineffective in reducing unwanted ILUC (as in scenario IIa) depends on:

- The size of the free-riding potential: how much RCA land that was unused in 2010 is used by other sectors by 2020? This depends on:
  - the total new land taken into production by other sectors
  - the fraction of this land that was unused in 2010 and complies with the RCA criteria for direct LUC.
- The fraction of the free-riding potential that is actually relocated to biofuels.

While the values for these parameters are difficult to estimate due to a lack of data, the next section provides a rough indication.

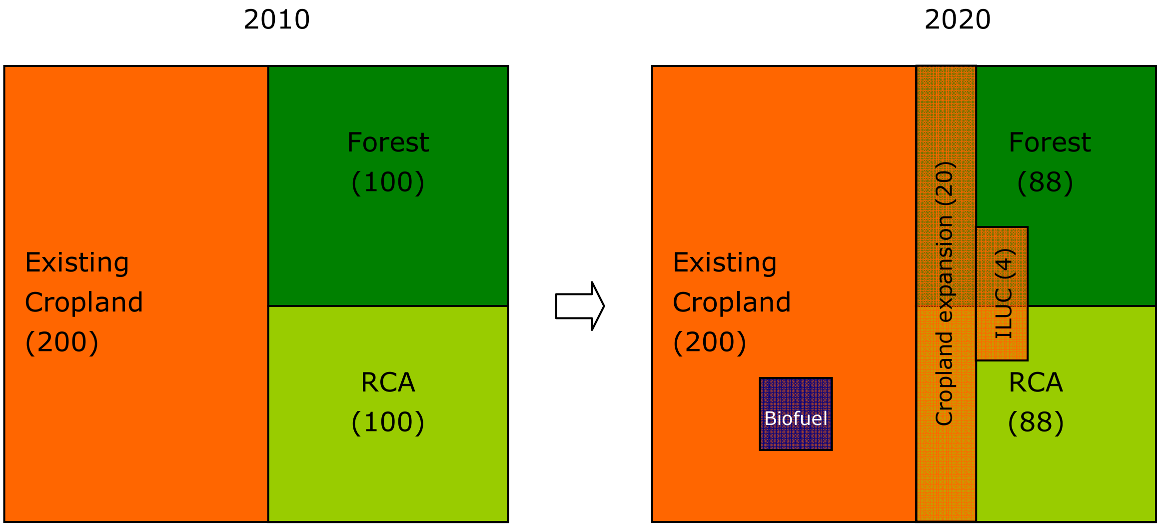
Ia. BAU situation without biofuels. Expansion for food/feed/fibre (fff) amounts to 20, The expansion takes place 50:50 into sustainable and unsustainable areas.

- Total unwanted LUC = 10.



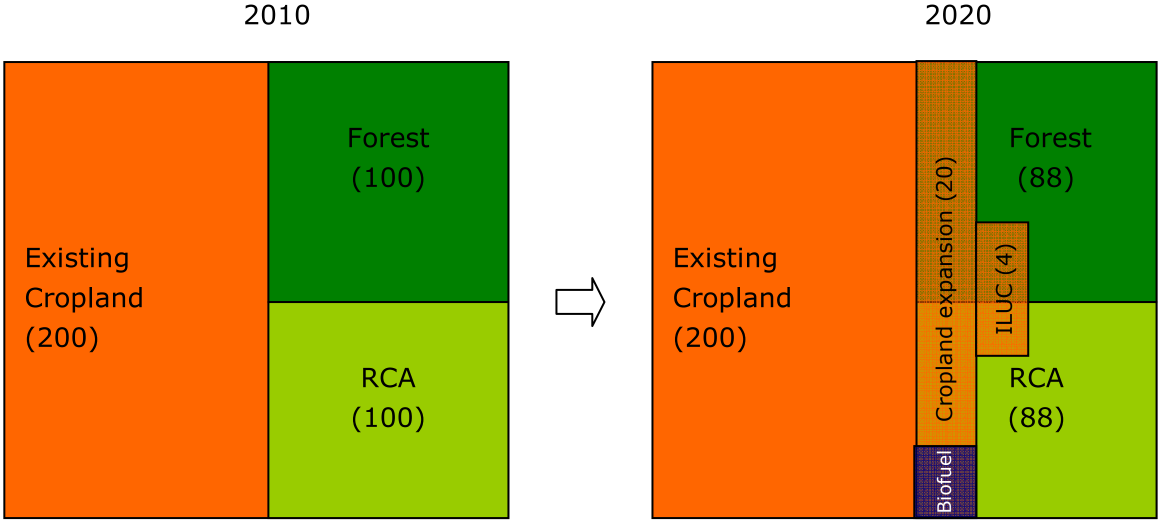
Ib. BAU situation with biofuels, with no additional ILUC measures. Expansion for food/feed/fibre (fff) amounts to 20. The area needed for biofuel amounts to 4. It is assumed that all biofuels come from existing cropland and that this leads to 4 ILUC. All expansion takes place 50:50 into sustainable and unsustainable areas.

- Total unwanted LUC = 12. In other words, biofuels caused 2 additional unwanted LUC in this scenario.



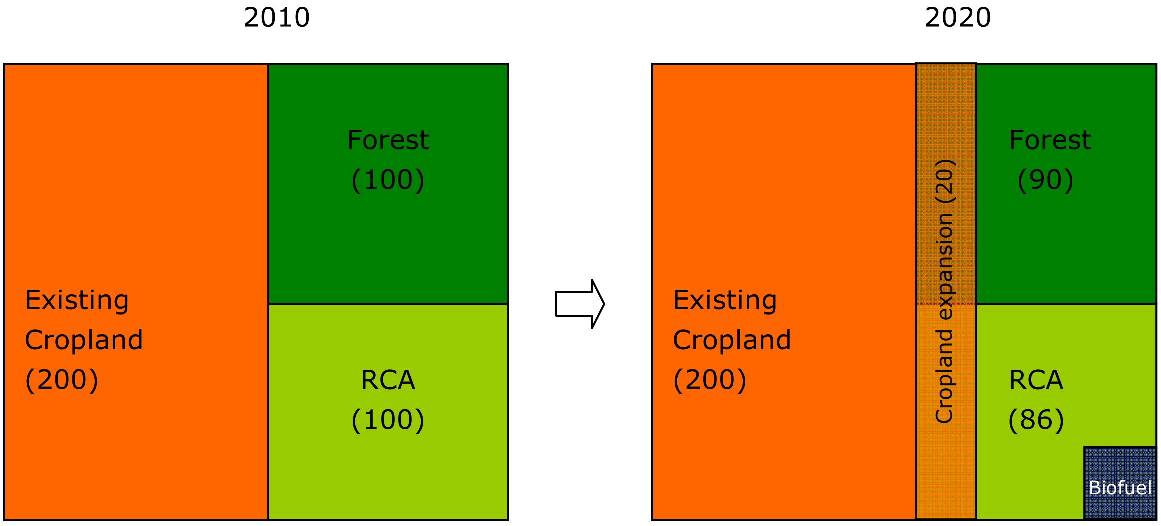
IIa, As Ib, but with an ILUC policy that requires all biofuels to come from land that was not in use by 2010, without the need for additionality. This leads to RCA land that would have been used for food expansion in the BAU to be shifted to biofuel crops. The displaced food production leads again to 4 ILUC, of which 2 are unwanted LUC.

- Total unwanted LUC = 12, the same as in the biofuel scenario without any ILUC policy. The ILUC policy has therefore not reduced ILUC.



IIb. As Ib, but with an ILUC policy that requires all biofuels to come from land that would not have been taken in production in absence of the biofuel feedstock demand (additionality). This leads to a situation without ILUC because no food, feed or fibre production is displaced.

- Total unwanted LUC = 10, the same as in the BAU without biofuels. In other words, biofuels have not led to any additional unwanted LUC.



Values of key parameters for effectiveness RCA without additionality

While the values of the key parameters, identified in the previous section, are difficult to estimate, several sources can be used to gain an understanding of their magnitude.

- The free-riding potential – the amount of RCA land that was unused in 2010 that is used by other sectors by 2020. This depends on:
    - The total new land taken into production by other sectors:
        - The net global cropland expansion for all sectors has historically been around 2.2 Mha per year (based on FAOSTAT 2010). In a ten year time period this would amount to about 22 Mha, although not all this net expansion in cropland will take place on previously unused or natural land.
        - New land taken into use as cropland due to shifts in cropland within and between countries. How large this shift is, is unknown. However, the Winrock study for the US Renewable Fuels Standard implies it is large. They compared remote sensing land cover datasets from 2001 and 2004 and estimated the percentage of land that was originally cropland in 2001 and that was no longer cropland in 2004. These values amounted to 60% for Brazil, 27% for Indonesia, 15% for China, 18% for the US and 9% for Germany. The authors do indicate that these numbers should be used with caution due to the limited accuracy of the available land cover products. Nonetheless, even a conservative average of these numbers would amount to more than 12% in a three year period, or more than 4% per annum. At a global cropland area of around 1,500 Mha this would amount to 60 Mha per annum or 600 Mha of new cropland in a ten year period although not all these shifts in cropland will take place on previously unused or natural land.
    - The fraction of this land that was unused in 2010 and complies with the RCA criteria for direct LUC.
        - The fraction of the total new land taken into use as cropland in the BAU by other sectors that meets the simplified RCA requirements (and therefore forms the free-riding potential) is unknown.
- The fraction of the free-riding potential that is actually relocated to biofuels.
    - It seems unlikely that all RCA-compliant land taken into production by the food, feed and fibre sectors could be redirected to biofuel feedstock production. For example, some land will not be suitable for biofuel feedstock, some land will be taken into production in areas that are not an important player in the biofuel market, some biofuel feedstock will come from within the EU where there will be little BAU expansion of cropland, etc.

Conclusion

The above figures are rough estimates only but they illustrate the risk that an RCA policy without additionality may well be ineffective in reducing unwanted LUC. Even if of the total 622 Mha new cropland taken into use between 2010 and 2020 (identified above) only 20% involves previously unused land that meets the RCA-criteria for direct LUC, that still amounts to a free-riding picking potential of 120 Mha. This compares to a total gross land requirement of 22-31 Mha for 10% biofuels in the EU (see Figure 1 in Chapter 1). Therefore, even if 1) all EU biofuels in 2020 would be sourced from land that was unused in 2010 and that also meets the RCA criteria for direct LUC, and 2) only 25% of the free-riding potential is actually redirected to biofuels, then, according to the above numbers, unwanted LUC would still not be reduced (as shown in scenario IIa in the figure above).

Appendix B Databases for the desk-based pre-selection of RCAs

Relevant for RCA principle	Author	Year	Name	Available information	Source
HCV Assessment Carbon Stock Assessement	South Dacota State University	2005	Humid Tropical Forest Monitoring	Forest extent, Forest change	http://globalmonitoring.sdstate.edu/projects/gfm/humidtropics/data.html
HCV Assessment Carbon Stock Assessement Displacement effects	ESA	2008	*Globcover global land cover map*	Global map on the land cover in 300 meter resolution	http://ionia1.esrin.esa.int/index.asp
HCV Assessment Carbon Stock Assessement Displacement effects	SarVision	2008	*Remote sensing maps of Indonesia*	Remote sensing maps of Indonesia compiled in a number of already completed and currently running projects	http://www.sarvision.nl/
HCV Assessment Carbon Stock Assessement Legal Land Status	WWF Indonesia	2008	*Heart of Borneo project*	Map on the land cover, deforestation, concessions, and land use planning of Borneo (all forest areas, all peat areas, all conservation areas including a buffer zone of 1 km, all forestry development plan areas were excluded in the pilot)	WWF Indonesia
HCV Assesment	CI, BirdLife, UNEP	2008	*Integrated Biodiversity assessment tool*	Global maps on protected areas and areas with high biodiversity (all areas in the database were excluded in the pilot except the areas types "Endemic Bird Areas", "Biodiversity Hotspots" and "High Biodiversity Wilderness Areas" since their demarcation is too coarse for the purposes of the RCA-concept)	http://biodiversityinfo.org/ibat/
Carbon Stocks	CDIAC	2008	*Global Biomass Carbon Map*	Global map of biomass carbon stored in above and below ground living vegetation	http://cdiac.ornl.gov/epubs/ndp/global_carbon/carbon_documentation.html
Displacement effects	Garrity et al.	1997	*The Imperata grasslands of tropical Asia: area, distribution, and typology*	Maps of imperata grassland in tropical Asia	http://www.springerlink.com/content/ugwg0v6x11550206/
Displacement effects	McGill University	2008	*Land Use and Global Environmental Change*	Datasets on global land use with focus on croplands	http://www.geog.mcgill.ca/~nramankutty/Datasets/Datasets.html
Displacement effects	Modis	2010	*Active fires and burned areas*	Global map on active fires and burned areas	http://modis-fire.umd.edu/BA_getdata.html
Agricultural Suitability	Fischer et al.	2000	*Global Agro-Ecological Zoning (GAEZ)*	Inventory of global land resources and an evaluation of their biophysical limitations and potentials for crop production	http://www.citeulike.org/group/344/article/730179
Agricultural Suitability	FAO	2000	*Digital soil map of the world*	Global soil map at 1:5.000.000 scale with harmonized soil information	http://www.fao.org/geonetwork/srv/en/metadata.show?id=14116
Agricultural Suitability	NASA	2000	*Shuttle Radar Topography Mission*	High-resolution digital topographic database of the world	http://www2.jpl.nasa.gov/srtm/
Agricultural Suitability	CGIAR-CSI	2006	*Global Climate Database*	Time-series of climate variables, for the period 1901-2002, covering the global land surface, excluding Antarctica, at 0.5 degrees resolution	http://cru.csi.cgiar.org/
Agricultural Suitability	ISRIC	2007	*Biophysical Land Suitability for Oil Palm in Kalimantan / Indonesia*	Map on the biophysical land suitability of Borneo for oil palm cultivation (areas not suitable for oil palm cultivation were excluded in the pilot)	http://library.wur.nl/WebQuery/wurpubs/lang/366750