

Biofuels Scoping Review

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Overview

- Introduction, objectives of the review, and background
- Biofuels research maps
- Biofuels sub-topics
- Research programmes and operational interventions
- Research gaps
- Where can DFID add value?
- Conclusions

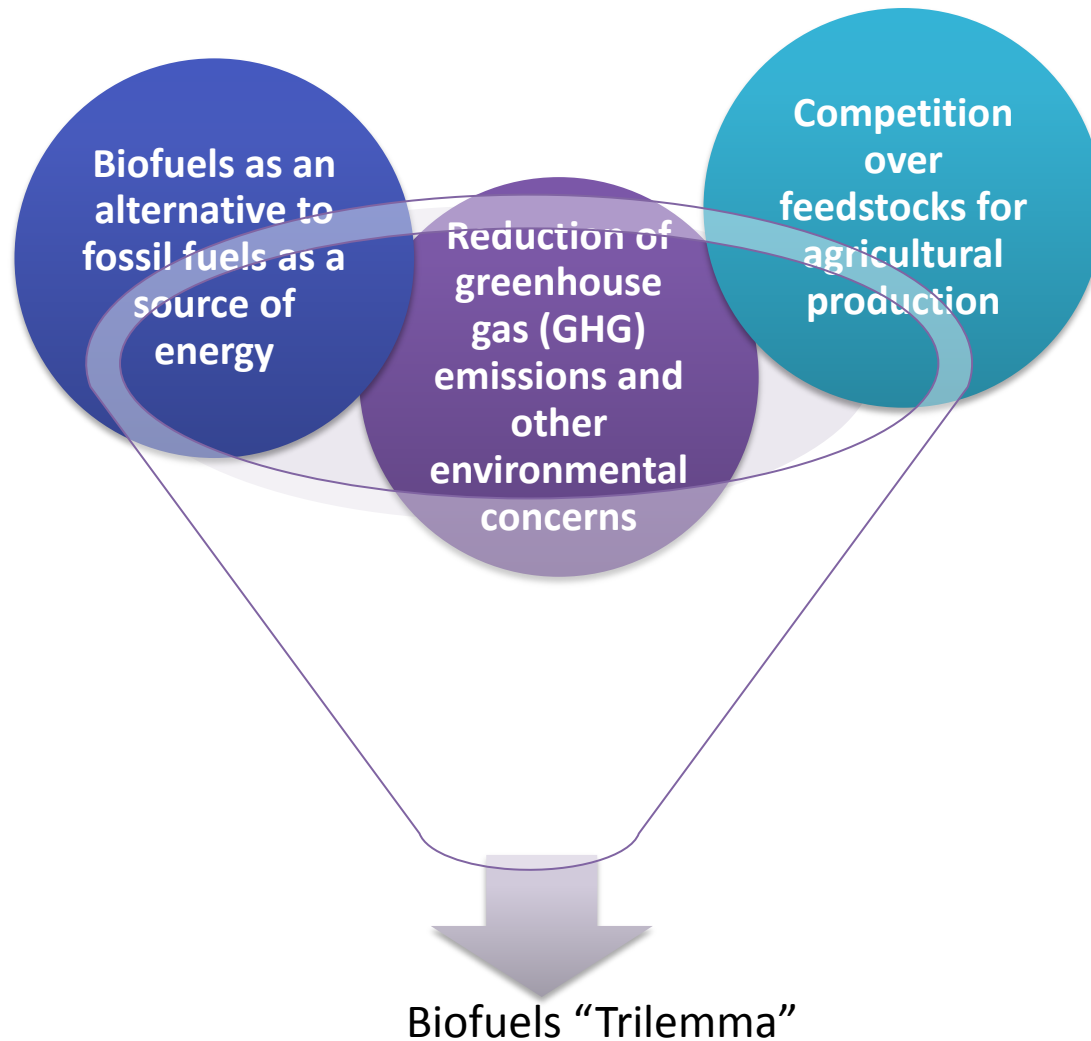
Introduction, Objectives of the Review, and Background

- Evaluate the current literature on research related to eight identified sub-topics
- Research undertaken in the African context

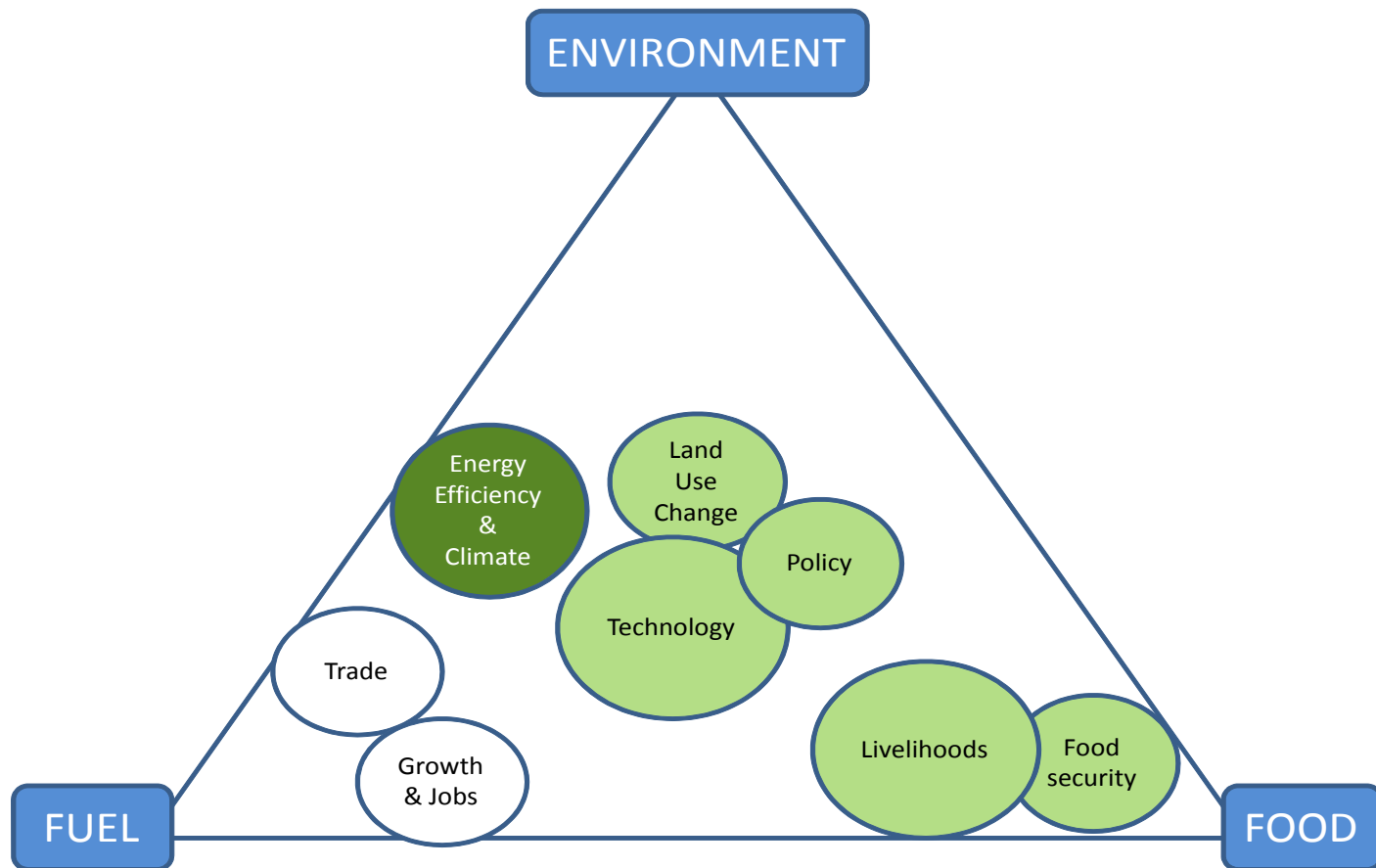
Biofuel Sub-Topics

1. Energy efficiency and climate change potential
2. Food security
3. Land-use change
4. Livelihoods
5. Economic growth and jobs
6. Technology
7. Trade
8. Policy

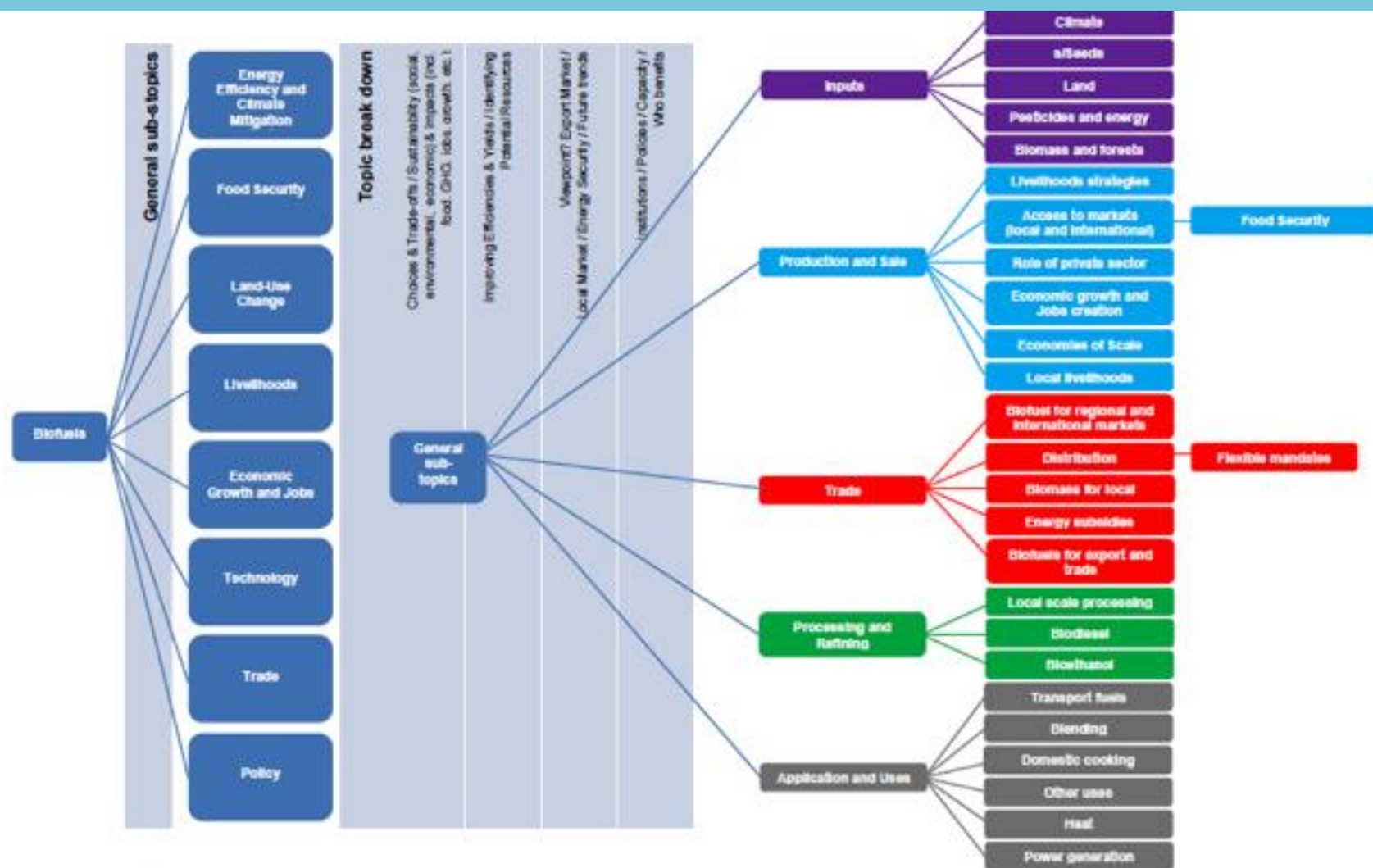
Introduction, Objectives of the Review, and Background



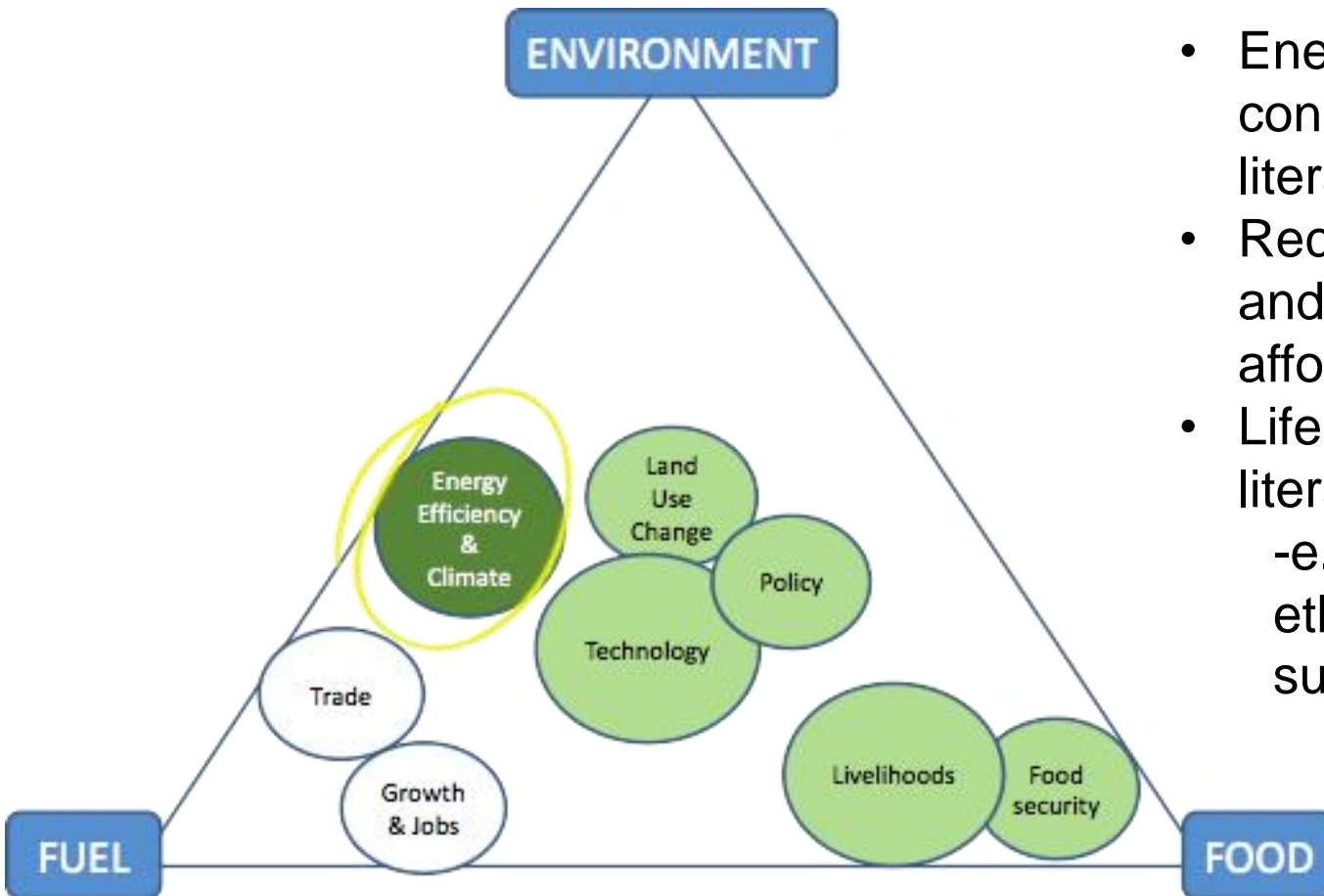
Biofuels Research Map



Biofuels Research Map



Energy Efficiency and Climate Change Potential



- Energy efficiency major concern in development literature
- Recurring power failures, and lack of access to affordable energy
- Life-cycle analysis literature
 - e.g. efficiency of ethanol production from sugarcane vs. maize

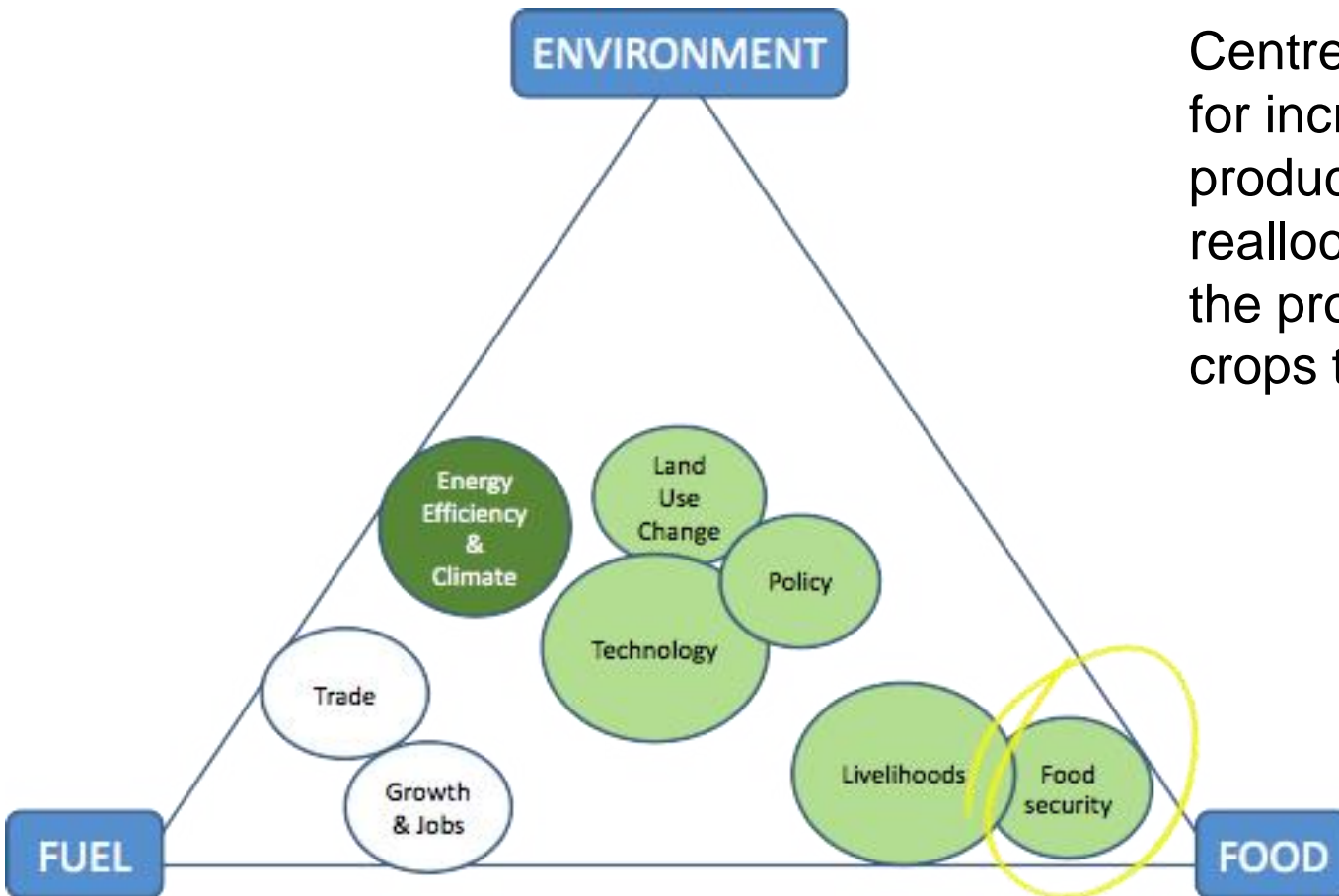
Energy Efficiency and Climate Change Potential

Habib-Mintz (2010)

- What is the potential for biofuel policy in Tanzania to help address climate change?
- Qualitative/quantitative approach
 - Key people within the biofuels industry as well as households in Tanzania were interviewed
- Stronger regulatory frameworks needed
 - Biofuel policy across Africa appears to be less driven by climate concerns and more by energy and development-led needs

Food Security

Centres on the potential for increased biofuel crop production leading to a reallocation of land from the production of food crops to biofuel crops



Food Security

Current Research

Molony and Smith (2010)

Less food available due to crop diversion



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graph TD; A[Less food available due to crop diversion] --> B[Increased demand for biofuels has increased competition for land and water resources]; B --> C[Therefore, food prices will increase];
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The diagram consists of three rectangular boxes arranged in a descending staircase pattern. The first box is purple and contains the text 'Less food available due to crop diversion'. A light purple arrow points from the bottom right of this box to the top right of the second box. The second box is a darker blue and contains the text 'Increased demand for biofuels has increased competition for land and water resources'. A light blue arrow points from the bottom right of this box to the top right of the third box. The third box is a teal color and contains the text 'Therefore, food prices will increase'.

Increased demand for biofuels has increased competition for land and water resources

Therefore, food prices will increase

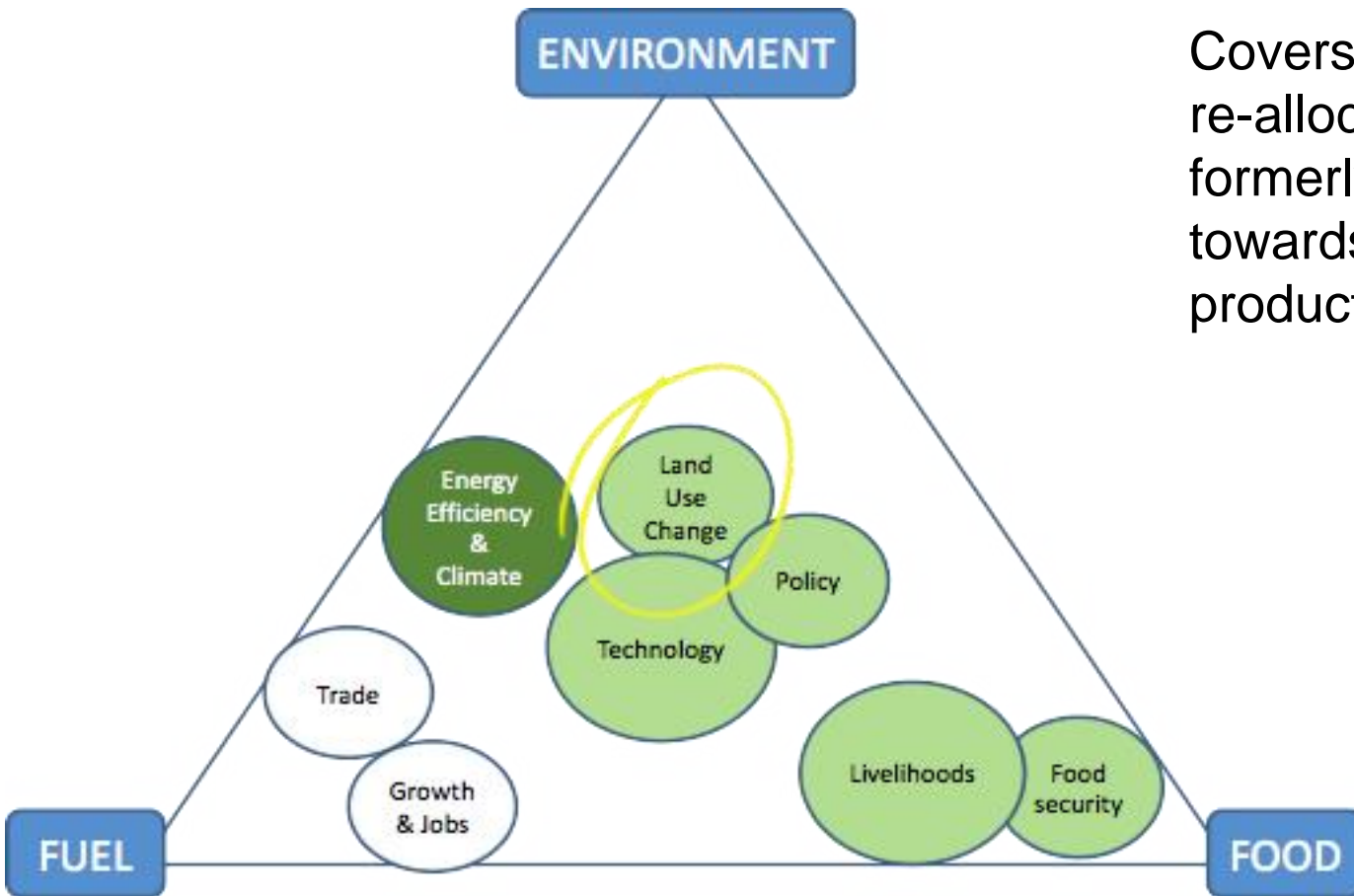
Food Security

Sulle and Nelson (2009)

- Look into the potential impact of biofuel production on the price of food crops in Tanzania
- Sustainable and beneficial biofuel investments must be encouraged

Land-Use Change

Covers the topic of possible re-allocation of land that was formerly used for agriculture towards biofuel crop production



Land-Use Change

Current Research

- The literature differentiates between direct and indirect land-use change
- Andrade de Sa et al. (2013)* used econometric analysis to provide evidence for the displacement of cattle pasture from Sao Paulo State to the Brazilian Amazon as a consequence of expanding areas of land under sugarcane production

Land-Use Change

Cotula et al. (2008)

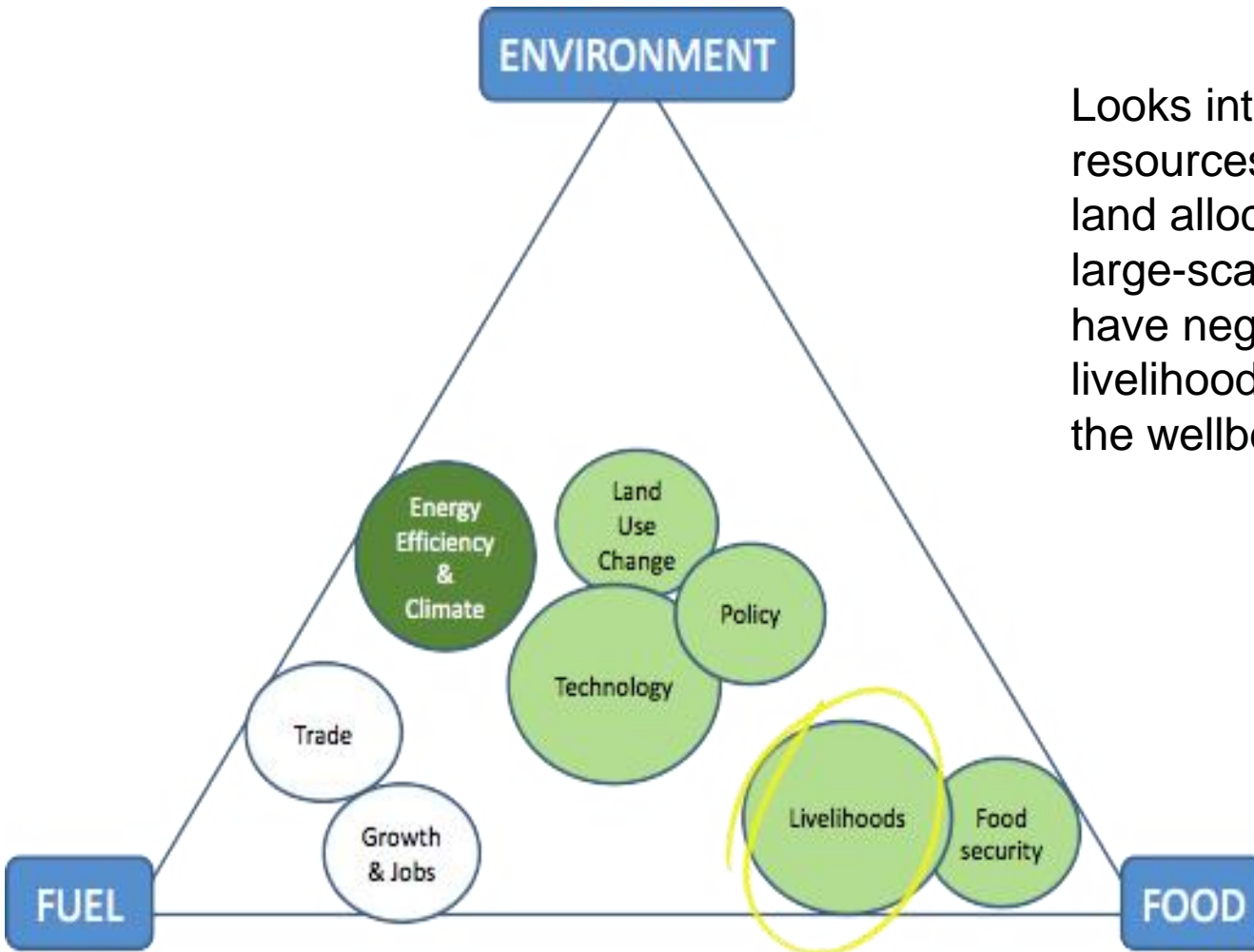
- Discuss the potential exclusion of the rural poor due to the 'expropriation' of their land claims
 - Referred to as "land grabbing"

Molony and Smith (2010)

- Discuss how groups such as nomadic herders, who depend on land with weak property rights at certain times of the year, could be excluded as a consequence of land being allocated to biofuel producers

Livelihoods

Looks into the loss of claims to resources as a consequence of land allocated by the state for large-scale biofuel production may have negative impacts on rural livelihoods, specifically related to the wellbeing of the rural poor



Livelihoods

Current Research

Jumbe et al. (2009):

“If left unregulated, large-scale production of biofuels could push rural dwellers off their land to pave the way for commercial exploitation of biofuels. This will damage rural livelihoods and increase poverty if large-scale production biofuels creates artificial food supply shortage”

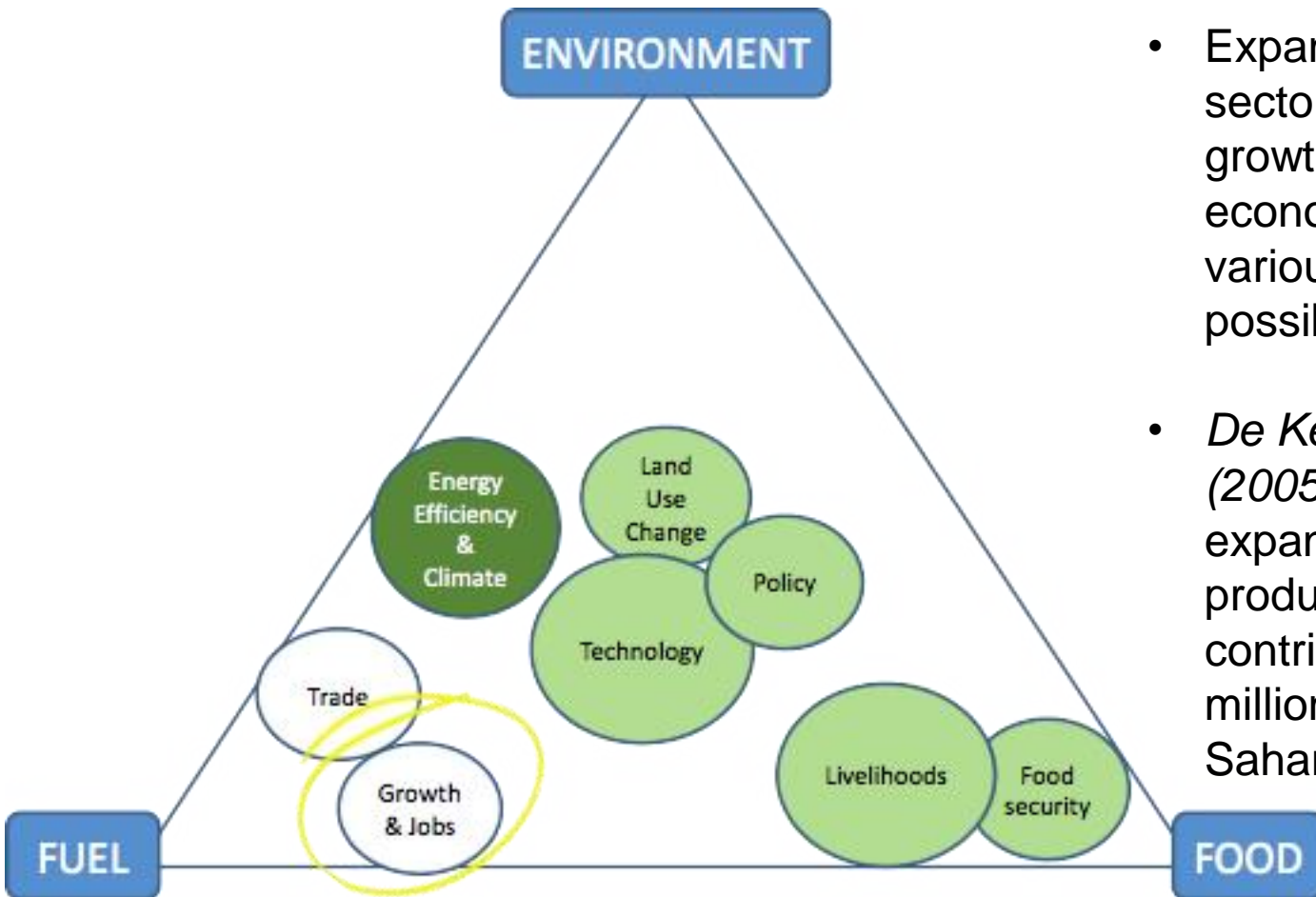
(Jumbe et al., 2009, p.4985)

Livelihoods

Montobbio et al. (2010)

- Used empirical analysis to determine how the cultivation of jatropha affected the livelihoods of farmers in India
- The authors found that jatropha cultivation is neither 'pro-poor' nor is it profitable
- They also show that jatropha cultivation favours better-endowed farmers while possibly reinforcing processes that contribute to the marginalisation of small-scale farmers.

Economic Growth and Jobs



- Expanding biofuel sectors could lead to growth in the economy, through various employment possibilities
- *De Keiser and Hongo (2005)* estimate that expanding biofuel production would contribute up to 1.1 million jobs in Sub-Saharan Africa

Economic Growth and Jobs

Current Research

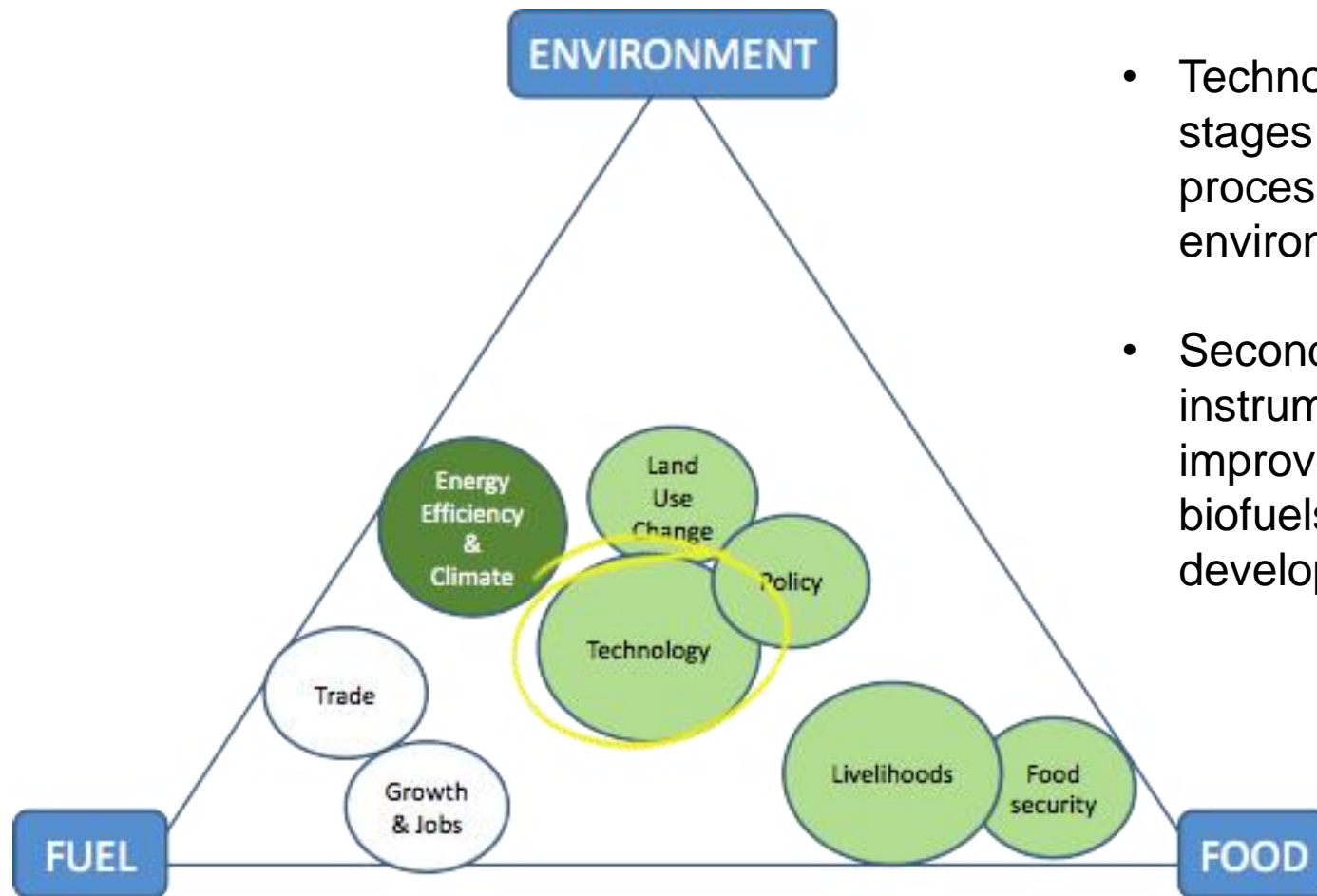
- Research by the *World Bank (2010)* has found that the expansion of oil palm cultivation for biofuels use has increased levels of employment, leading to a reduction in poverty
- *Wang and Tian (2011)* state that one of the goals of Chinese biofuel policy is to increase rural employment

Economic Growth and Jobs

Vermeulen and Cotula (2010)

- Studied the biofuel industries in India and Tanzania
- Discuss the difficulty in determining country-level net employment effects of an expanding biofuels industry

Technology



- Technology relevant for all stages of biofuel production, processing, end uses, and environmental concerns
- Second-generation biofuels instrumental in efforts to improve the contribution of biofuels to sustainable development

Technology

Current Research

von Braun and Pachauri (2006)

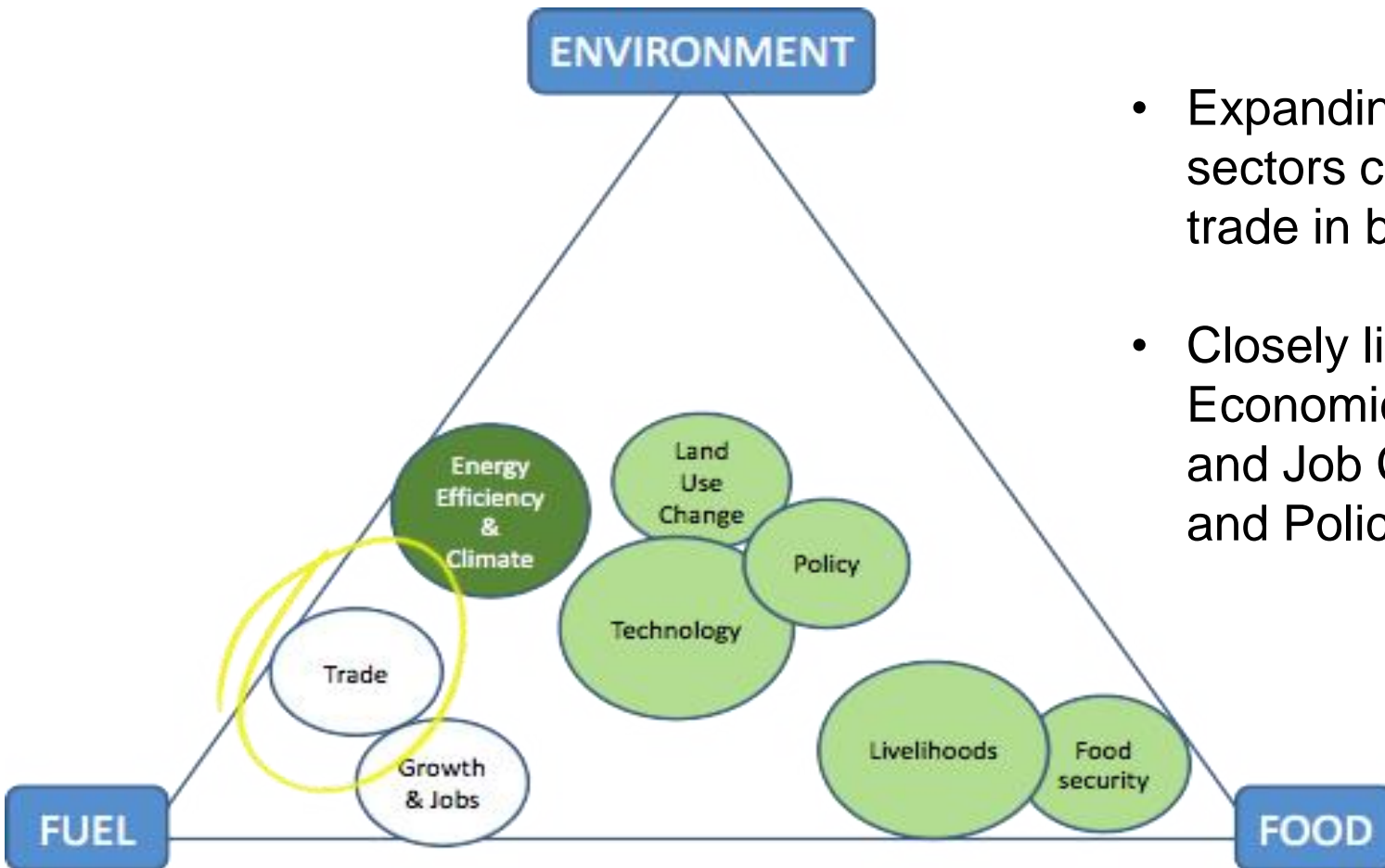
“...in order to make a difference in the lives of poor people as both energy producers and consumers, and to make strong environmental and economic contributions, biofuel technology needs further advancement, and investments and policies facilitating agricultural innovation and trade will have to be considered” (p.1).

Technology

Jumbe et al. (2009)

- Highlight the need for training in biofuels technologies in order for African countries to reap benefits from producing biofuels
- Authors state that technologies expected to filter into Africa through foreign investors

Trade



- Expanding biofuel sectors could lead to trade in biofuels
- Closely linked to Economic Growth and Job Creation, and Policy

Trade

Current Research

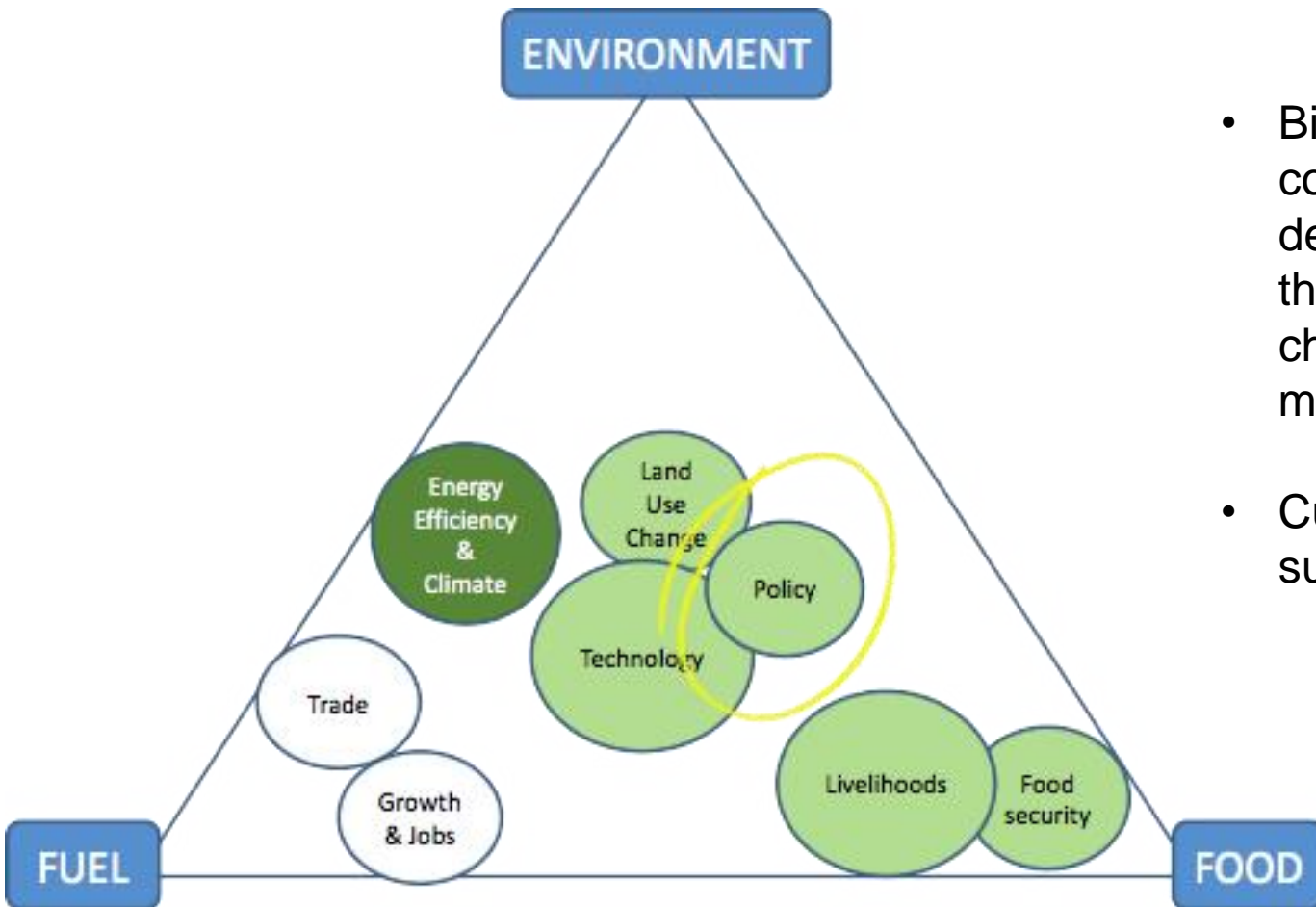
- *Doku and Di Falco (2012)* empirically assess the effect of import tariffs on the motivations of countries to undertake biofuel policy
- *von Braun and Pachauri (2006)* suggest that opening up trade in biofuels could help decrease price fluctuations

Trade

Amigun et al. (2010)

Argue that in order to achieve sustainable biofuel production in Africa, priority should be given to strengthening local production to satisfy national need and benefits at a local level

Policy



- Biofuels have competing policy demands and balancing these is complex and challenging for policy makers
- Cuts across all other sub-topics

Policy

Current Research

- Much of the current research advocates appropriate and efficient biofuel policy creation
- *Wang and Tian (2011)* discuss China's research into biofuel policies in different countries

Policy

Duvenage et al. (2012)

- Surveyed international experts, and conducted a literature review
- Found that projects with a high degree of transparency, that incorporate local stakeholder involvement, and ideally include local villagers as partners are more likely to achieve sustainable biofuel production

Sulle and Nelson (2009)

- Village Land Act in Tanzania provides compensation payments for displaced citizens, although it is not certain whether such compensation can adequately aid in promoting opportunities for alternative livelihoods

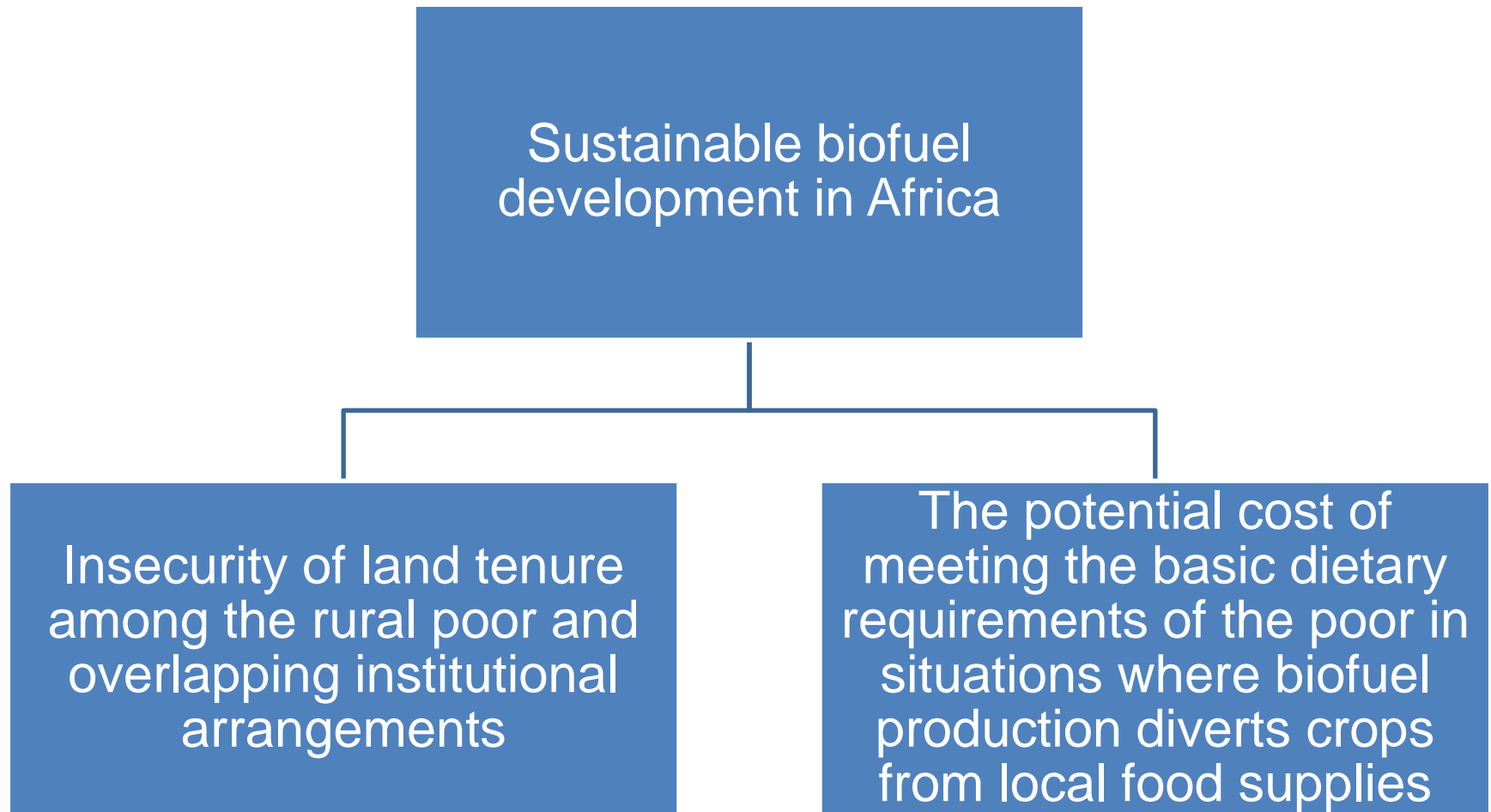
Research Programmes and Operational Interventions



Research Programmes and Operational Interventions

| Country/Region | Agency | Research programme/ Operational Intervention | Details | Relevant sub-topic(s) |
|----------------|--|--|--|---|
| | World Bank | Research into biofuels in Africa | Discusses opportunities for biofuels in Africa; challenges posed; biofuel production costs in Africa; and policy framework and development strategies. | <ol style="list-style-type: none"> 1. Energy efficiency and climate mitigation potential 2. Land-use change 3. Policy 4. Trade 5. Economic growth and jobs 6. Food security |
| Brazil | Shell | Raízen | A joint venture between Brazilian firm Cosan and Shell to produce ethanol. | <ol style="list-style-type: none"> 1. Energy Efficiency and climate change 2. Technology 3. Trade |
| Angola | Eni and Sonangol | Biodiesel development in Angola | Italian oil company Eni, and Angolaian oil company Sonangol have established a framework for joint mining initiative, both within Angola and abroad. A part of this initiative is to create a pilot project in biodiesel in Angola | <ol style="list-style-type: none"> 1. Energy Efficiency and climate change 2. Trade 3. Food security |
| Nigeria | Nigerian National Petroleum Corporation (NNPC) | Nigerian biofuel initiative | NNPC has developed a biofuel project which aims to develop ethanol fuel and palm oil diesel. Ethanol is to be derived from processed cassava or sugarcane. | <ol style="list-style-type: none"> 1. Energy Efficiency and climate change 2. Economic growth and jobs 3. Livelihoods |
| Madagascar | World Wildlife Fund (WWF) | Jatropha biofuel project | The WWF and the United Nations Development program created a program to develop sustainable biofuel processing of jatropha. | <ol style="list-style-type: none"> 1. Energy Efficiency and climate change <p><i>It is stated that this project aims to create a guide on social and environmental impacts on biofuel investment; therefore, it is likely to cover further sub-topics.</i></p> |

Research Gaps



Research Gaps

Variation in study types

- Lack of empirical studies
- Increase of LCA with in African countries
- Further studies into the impact of biofuels production on domestic food availability and food prices within African countries
- Differing effects of biofuel production on small-scale and large-scale farmers is needed
- Finding further methods to calculate net employment effects

Research Gaps

Potential Research ideas

- Determining the actual energy benefits of biofuels in developing countries, rather than just the potential benefits
- Further research into the potential of biofuels as a substitute for fossil fuels in African countries
- Research into understanding how policies that incentivise growing biofuel crops may also affect farmers' strategies to privately deal with the implications of climate change and deal with food security

Where can DFID add value?

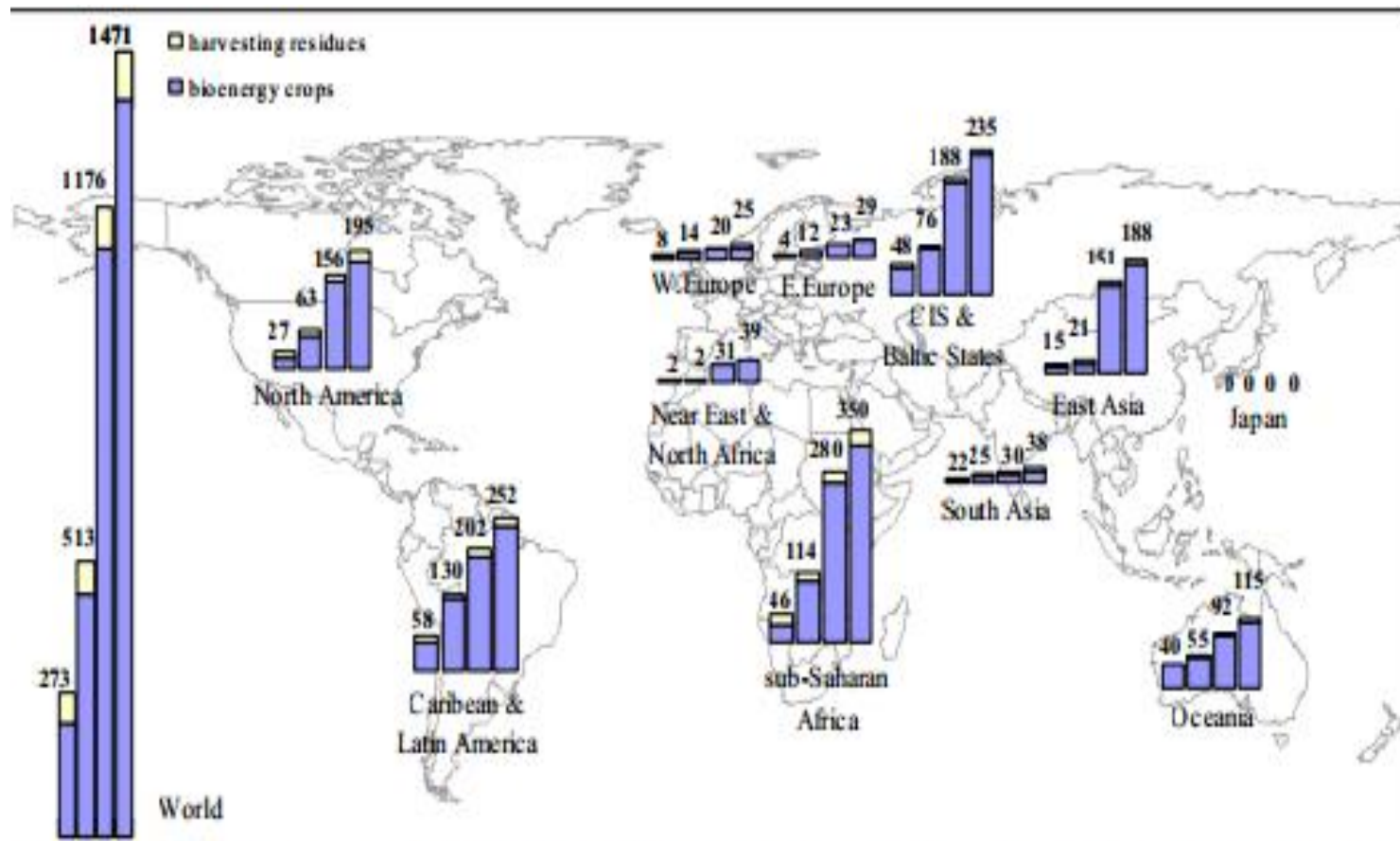


Figure 12. Total bioenergy production potential in 2050 in scenarios 1 to 4 (EJy⁻¹; the left bars is scenario 1, the right bar is scenario 4).

(Smeets et al, 2004 p.57)

Where can DFID add value?

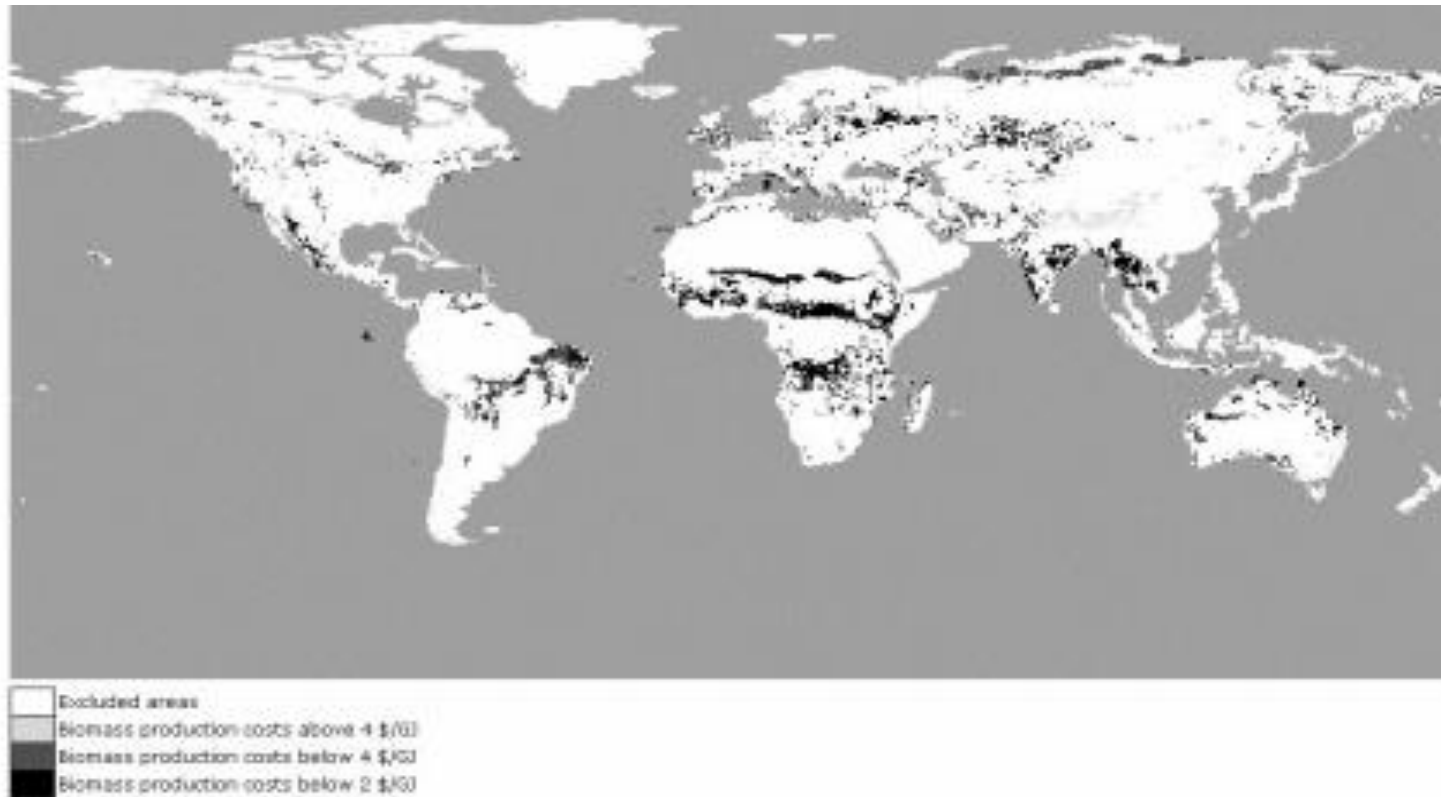


Figure 9a: Spatial distribution of production cost of energy crops for abandoned and rest land category in the year 2010 for the A1 scenario at abandoned and rest land area.

(Hoogwijk, 2004, p.106)

Where can DFID add value?

Energy Efficiency and Climate Mitigation Potential

- DFID could aid in determining how the severity of a policy change towards greater energy efficiency could affect the lives of the rural and urban poor

Food Security

- The impact biofuel production has on food availability within Africa should be researched

Land-Use Change

- Determine to what extent informal tenurial arrangements and property regimes affect the ability and capacity of local people to participate in land-allocation decisions regarding biofuels

Livelihoods

- A project determining whether the adoption of biofuel feedstocks could lead to a possible 'rural safety net'

Where can DFID add value?

Economic Growth and Jobs

- DFID could attempt to find different methods of determining net employment effects of increasing the biofuel sector, and how this would affect economic growth

Technology

- Determine the potential role of developing countries to contribute to the development of new technologies

Trade

- Determining the conditions under which African countries could be competitive in and benefit from trade in biofuels at the regional and international levels

Policy

- Important to note how potential differences in factors such as corruption and rent-seeking could affect biofuel policies

Conclusions

- Significant research gaps found
- Some evidence of potential for viable biofuel production within African countries
- Different areas of research where DFID could add value