

# Variable demand as a means to more sustainable biofuels and biobased materials

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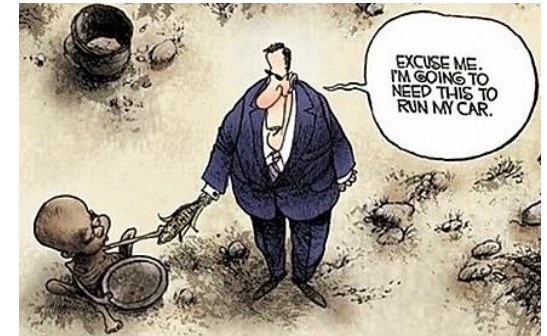
# First Generation Biofuels = Based on food crops (oil, sugar, starch crops)

## Advantages:

- ✓ Relatively easy to convert
- ✓ GHG savings > 50% compared to fossil reference
- ✓ Investment in technology and innovation
- ✓ Rural development
- ✓ Improved resource management

## Issues:

- ✗ Variable availability and price
- ✗ Competition with food, increased food prices → contributes to hunger
- ✗ (Indirect) land use change (iLUC) risk → more deforestation → GHG emissions + biodiversity loss



# The Claim

**Varying the demand of first generation biofuels** (ethanol / biodiesel) **according to feedstock availability / price**

- Will **increase food security**
- Will **increase** agricultural efficiency and **yield**
- Will help **reduce iLUC** (indirect Land Use Change) risk

FAO Director General José Graziano da Silva advocated "Flexible Biofuel Policies for Better Food Security"

# Survey of experts agree most on

Statement	Weighted score
<b>Very low food prices are equally bad for food security as very high food prices.</b>	<b>0.85</b>
A variable biofuel demand will have a <b>positive effect on agricultural productivity.</b>	<b>0.44</b>
A variable biofuel demand will have a <b>positive effect on food security</b>	<b>0.35</b>
A variable biofuel demand policy will <b>lead to improved productivity</b>	<b>0.31</b>
A variable biofuel demand policy <b>reduces the risk of iLUC</b>	<b>0.15</b>

# Experts disagree

Statement	Weighted score
A policy that varies biofuel demand based on feedstock availability and price <b>will make investments too risky</b>	0.06
A variable biofuel policy will be <b>effective only within protected markets</b>	-0.29
Biomass feedstocks for <b>chemical industries must be given priority</b> over feedstocks for biofuels	-0.31
<b>Sustainability certification, will prevent iLUC</b>	-0.37
<b>Most biofuels policies have mechanisms to vary production volume;</b> there is no need for a variable biofuel demand	-0.56

# Food Security

- Are first generation biofuels **bad** for food security?
- What matters is the way they are managed
- Biofuels can stimulate investments agriculture. Biofuel demand can improve availability and price of food

Very low food prices are equally bad for food security as very high food prices – 80% agreed



GCB Bioenergy (2016), doi: 10.1111/gcbb.12366

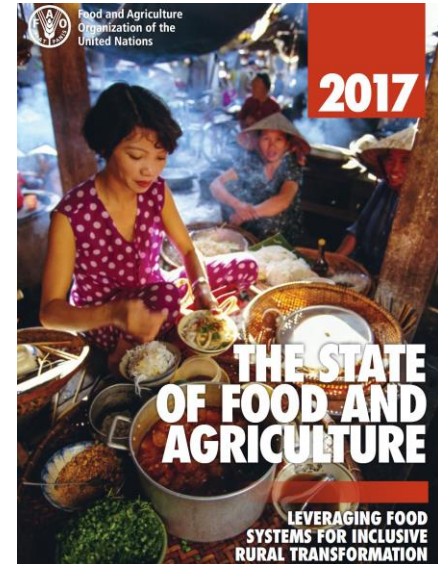
REPORT

## Reconciling food security and bioenergy: priorities for action

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# Food Security – Variable Biofuel Demand

- **Flex crops:** having multiple markets for their products brings more resilience to farmers
- **Bring incentive** to invest in their farms and increase production capacity and efficiency
- In times of abundance (and low prices), agricultural surplus can be absorbed by biofuel industry → investments still payoff
- In times of shortage (i.e., drought) biofuel feedstocks can serve as virtual food reserves
- ✓ The ability to shift **reduces price volatility**



# Agricultural Productivity

- To meet future demand will require improvement of **crop yields if land use change is to be avoided**
- **Intensification** rather than **Expansion** in cropland area !
- Variable biofuel demand could draw additional **investment and R&D** for crop intensification, provided that **good land management** is in place.



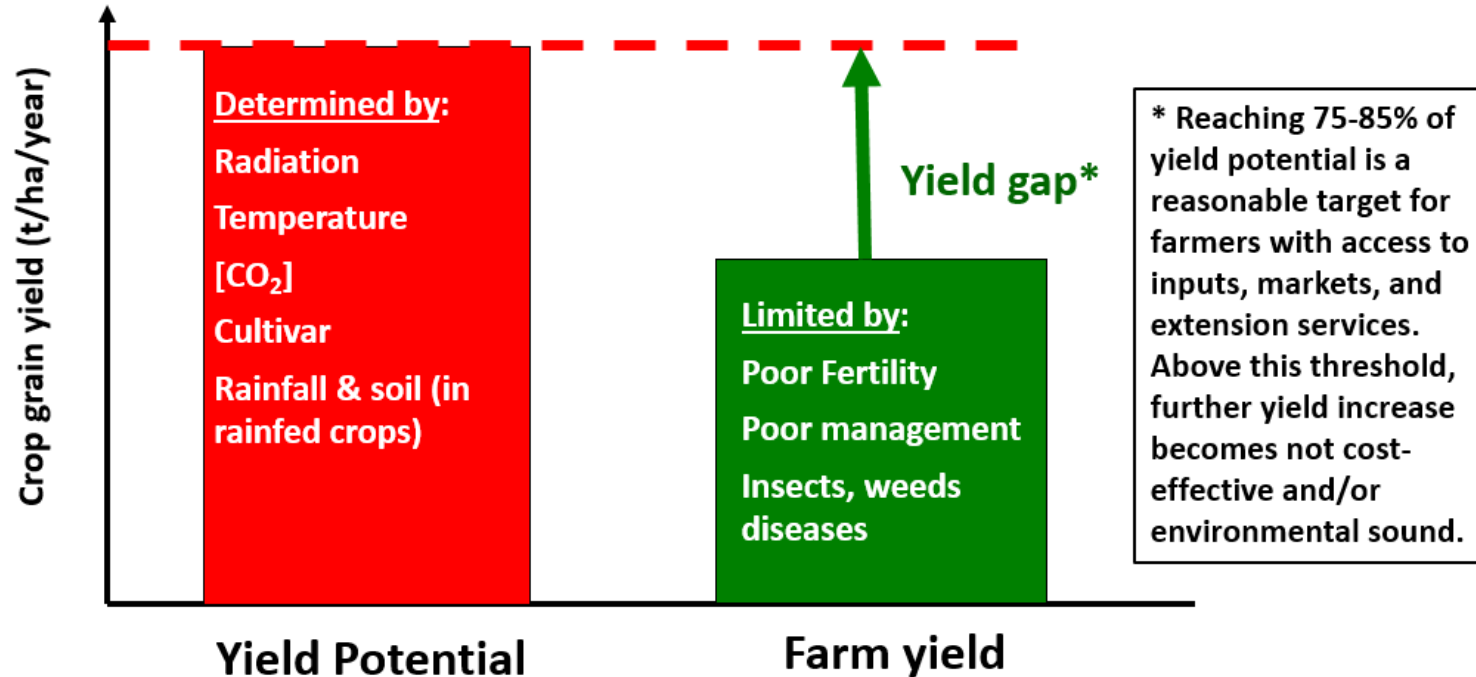


# Example: Brazil

- Sugar and ethanol in Brazil are **produced from sugar cane**
- Brazil **adjusts gasoline / ethanol blend mix** in response to global prices
- Pro-Alcohol (ethanol program) boosted investment and improved **cane breeding** and processing efficiency
- No issues about sugar prices.....

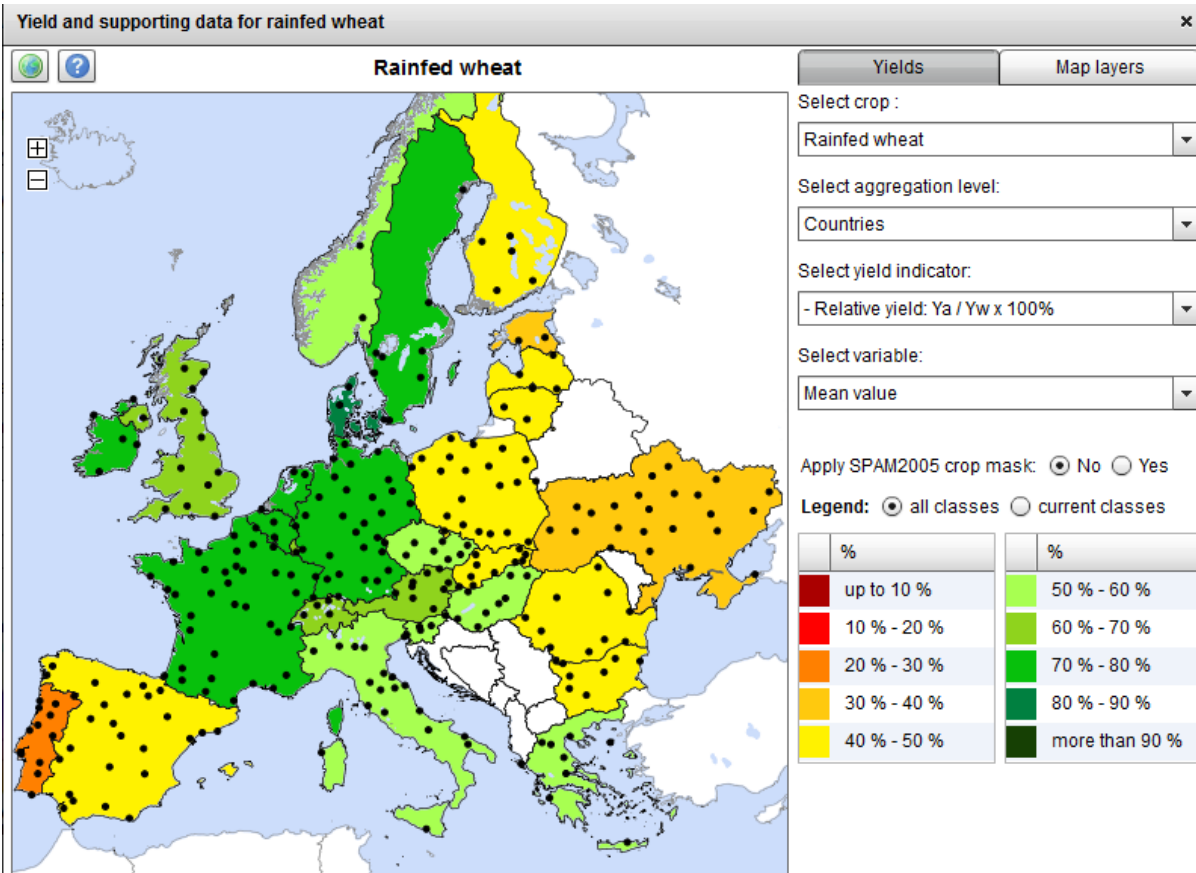


# Can yield be increased? Yield Gap



Modified from: van Ittersum and Rabbinge, *Field Crops Research* (1997)

# Yield Gap



- Yield of rainfed wheat as % of potential yield
- High opportunity to increase yields in many countries i.e., Eastern Europe

# Securing Supply for Bio-based Materials / bioplastics?

Criteria	Energy use of biomass	Material use of biomass
<b>GHG reduction</b>	Significant reduction compared to fossil-based	GHG saving generally higher compared to biofuels –
<b>Circular economy</b>	No additional use or possibility to recycle	Possibility of re-use or conversion to energy
<b>Employment, Value-added</b>	limited	Up to 10 times more employment & value-added compared to fuel production
<b>Alternatives?</b>	Yes → fossil gasoline / diesel	No → difficult to temporarily switch to fossil alternative
<b>Added functionality</b>	Less emission (Pm <sub>10</sub> , CO, etc)	Can offer added functionality compared with their fossil-based counterparts (biodegradability, reduced toxicity)
<b>Cost</b>	Low – up to 80% of biofuel cost is feedstock cost	Conversion generally requires more investment....

# How to implement?

Develop and evaluate possible interventions:

- Option to have an **emergency break** in the policy that can prevent potential food crises?
- Buffer system to cope with fluctuations in feedstock availability?
- Banking / **credit carry forward** system?
- Can it respond quickly?
- Will variable biofuel demand make investments in the first-generation biofuel industry **too risky**?

Partial mechanisms do exist in the world e.g., Brazil, USA

# Conclusions

- Don't deny the problems, don't dwell on problems, but rather **solve** the problems

Variable Biofuel Demand is one of the **solutions**

- ✓ can stimulate investments and enhance efficiency / crop productivity
- ✓ can limit negative effects of food / fuel competition
- ✓ may also address iLUC problem

Implementation mechanisms need to be assessed!

# Thank you!

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Perspective



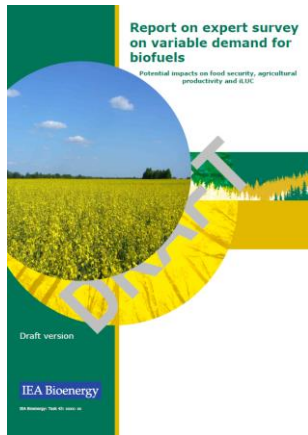
## Variable demand as a means to more sustainable biofuels and biobased materials

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DOI: 10.1002/feb.2164; Biofuels, Bioprod. Bioref. (2020)

**Abstract:** Expanding the use of biofuels is controversial because of concerns about competition with food. Here we describe how varying the biofuel demand could help address these concerns. Variable biofuel demand can be implemented through market or policy mechanisms that adjust biofuel production according to feedstock availability, expanding or contracting in response to supply surplus or limitations. Based on a survey, an expert workshop, and relevant literature, the effects of a variable biofuel demand approach are evaluated with respect to food security, agricultural productivity, detrimental land-use change, and feedstock competition with biobased chemicals and materials. Here we provide evidence that variable biofuel demand can enhance the synergistic development of agriculture, renewable biomass feedstocks and biofuels, but implementation poses several challenges. Recommendations are provided for governance options to tackle these challenges. © 2020 The Authors. Biofuels, Bioproducts, and Biorefining published by Society of Chemical Industry and John Wiley & Sons, Ltd.

**Key words:** biofuels; food security; ILUC; agricultural productivity; biobased chemicals; bioeconomy; policy; market competition



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