EPA

WINROCK INTERNATIONAL

Cook Stoves & Indoor Air

Promoting Clean and Efficient Cooking in the Developing World

Cooking with Ethanol:

Benefits, key challenges and lessons learned

July 7th, 2015

Green Social Bioethanol

PROJECT GAIA ENERGY REVOLUTION

CLEANCOOK

SEI STOCKHOLM ENVIRONMENT INSTITUTE

Today's Speakers

- John Mitchell, U.S. Environmental Protection Agency, Webinar Facilitator
- Brady Luceno, Daniel Seals, and Hilary Landfried – Project Gaia, Inc.
- Ted Örbrink – CLEANCOOK
- Gaston Kremer – Green Social Bioethanol
- Anna Wikman– Stockholm Environmental Institute

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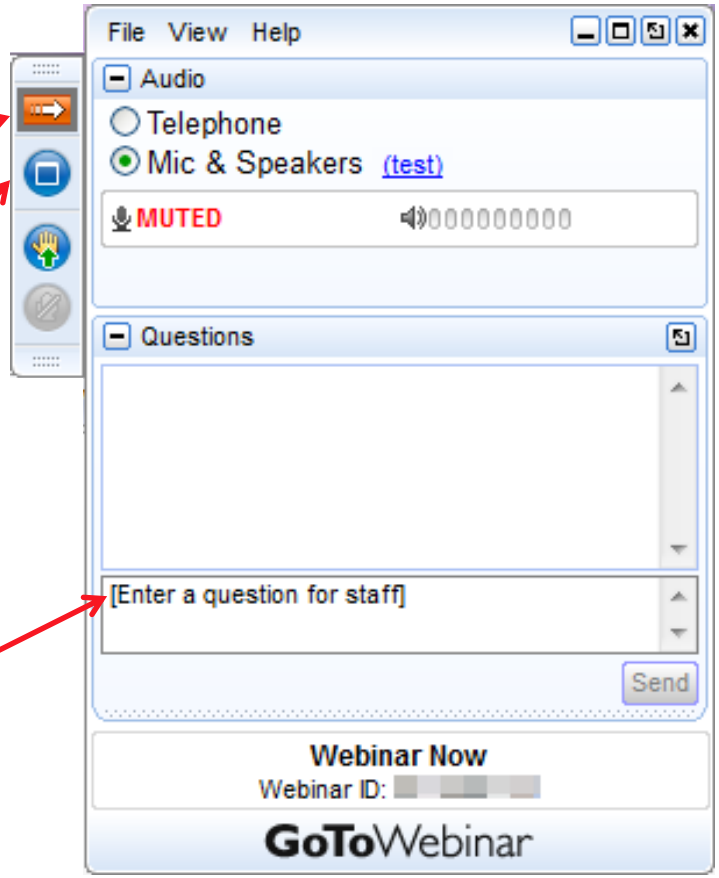
Question Feature



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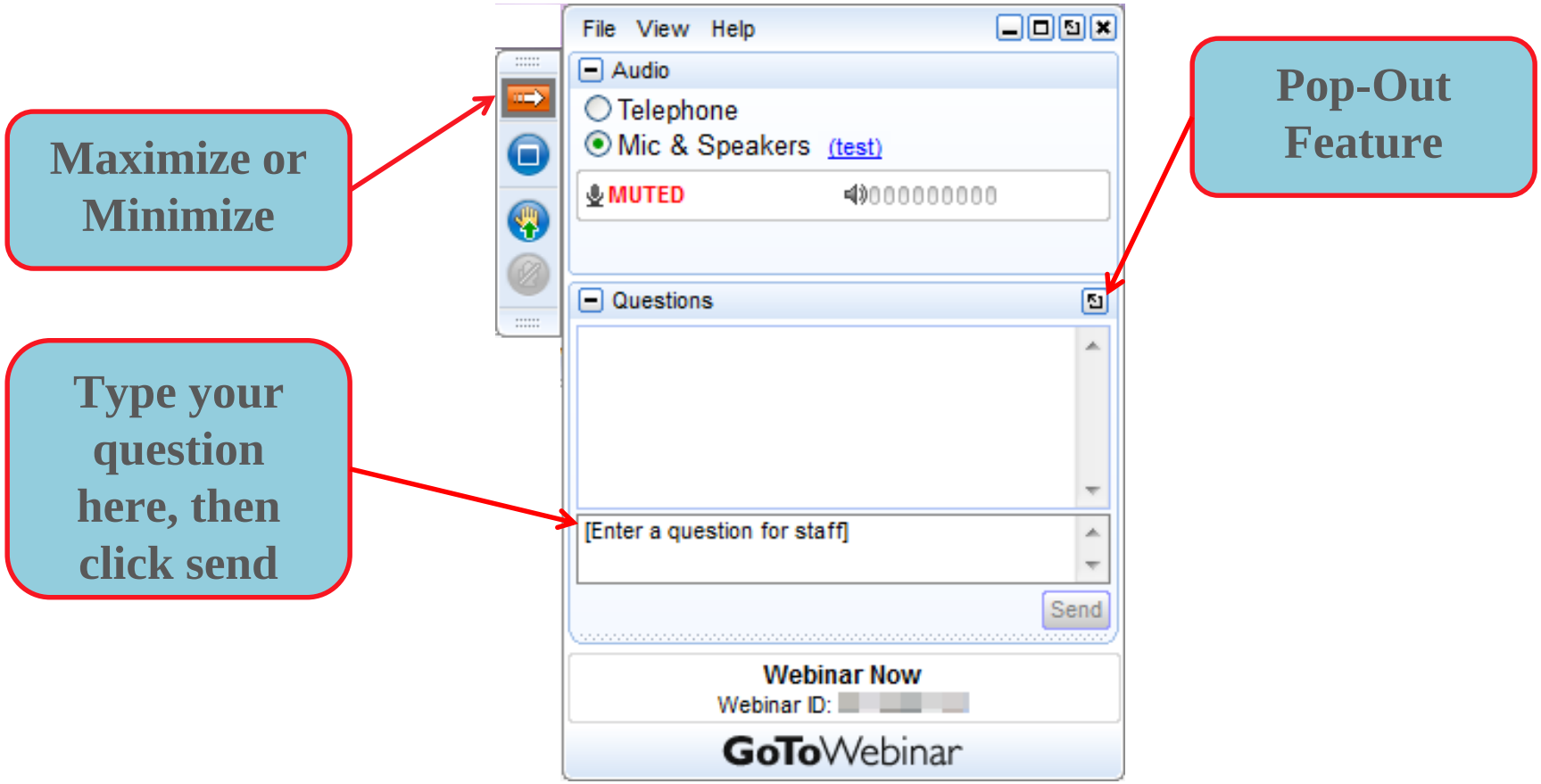

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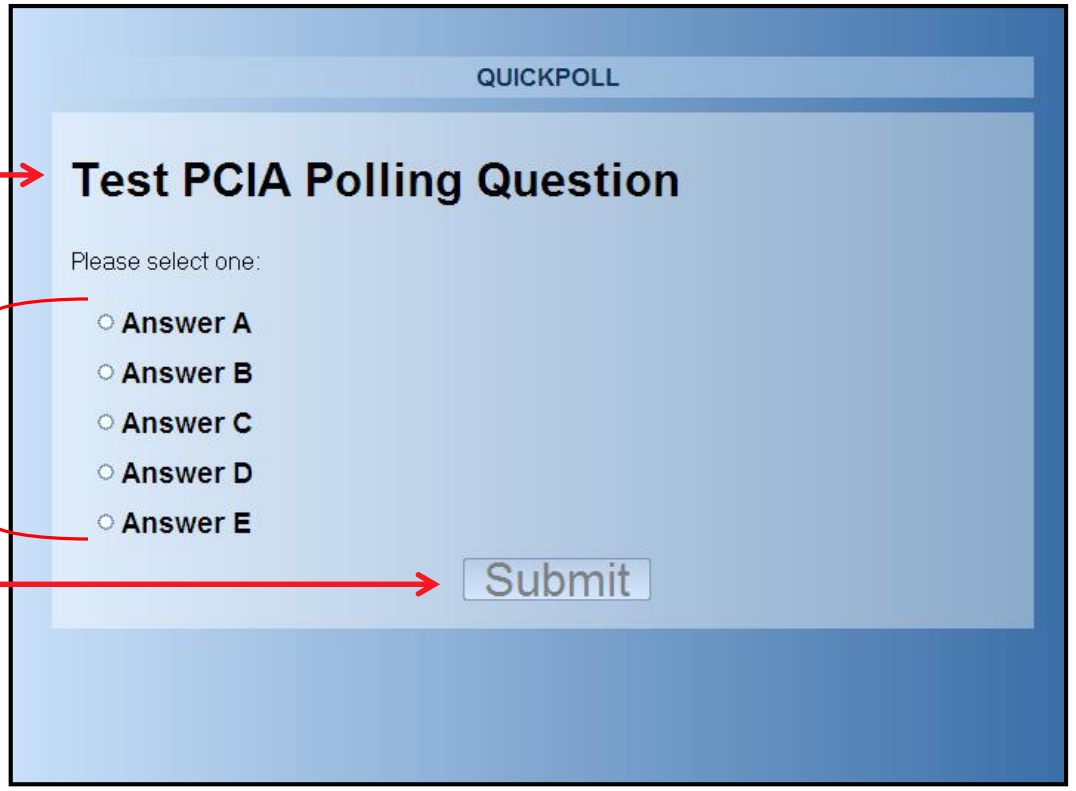


Purpose of the Webinar

- Learn about ethanol as a clean fuel for cooking.
- Discuss the main challenges to increasing the use of ethanol as a cooking fuel, focusing on fuel supply and policy issues.
- Discuss recent changes that make the industry feel like they are gaining traction.
- Provide case study examples of solutions to these challenges currently being implemented by partners.

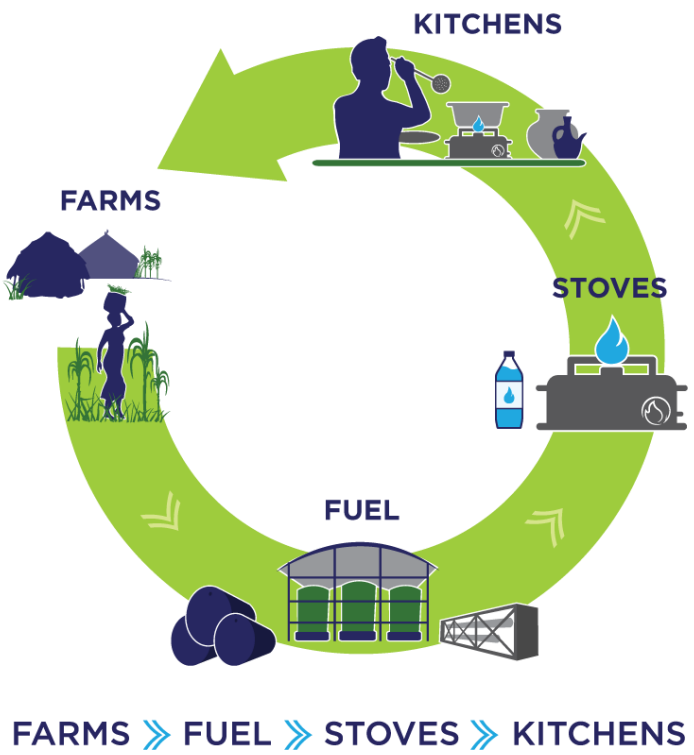
Agenda

- What is ethanol?
- Benefits of ethanol
- Stove technologies
- Main challenges to scaling up
- Efforts to address challenges
  - Micro scale solutions
  - Macro scale solutions
  - Policy and adoption challenges and solutions (Ethiopia case study)
- What's next?
- Presenter Interaction/Q&A

Questions to Consider

- What are some specific lessons and approaches from this webinar that can be applied to your work and your local context?
- What supports or barriers to the production and use of ethanol for cooking exist in your local context?

What Is Ethanol?



Ethanol is a clean and renewable fuel that revitalizes local economies by creating energy independence.

- Multiple feedstocks: sugar, starch, cellulose
- Liquid vs. gelled cooking fuel
- High energy content & efficiency when used with complimentary products

Multiple Uses:

- Transport fuel, beverage, solvent, heating fuel, NASCAR, Fuel cells, pharmaceutical

Co-products

- Dried Distillers Grains (DDG) – animal feed
- Fertilizers
- CO2 (beverage, medical, dry ice)

What is Ethanol?

What type of ethanol do we use for stoves?

- Hydrous 90-95% ideal
- Some methanol OK (handling considerations)
- Low impurities (fusel oils)
- Blue flame

Ethanol as a household fuel

- Denatured – non-potable
- Dyed
- Distribution models (bottles, jerry cans, drums)
- Standards (in process)

Average family of 5 uses .5 – 1 liters per day
Price ranges between $0.20 – 1.90 USD per liter

Benefits of Ethanol

A UNIQUE SOLUTION

Ethanol & Methanol are clean and sustainable fuels that revitalizes local economies by creating energy independence.

Clean Cookstoves can burn these fuels safely and efficiently.

No trees cut. No Smoke.

REDUCED EMISSIONS.
HEALTHY, HAPPY FAMILIES.

Benefits of Ethanol

CleanCook Stoves

Challenging development dogma, the CleanCook is a modern stove that runs on truly clean fuel - suitable for families everywhere.

EFFICIENCY

6 times more efficient than a traditional woodfire stove.

SAFETY

In over **8** million days of use, there has not been a single stove accident on record.

HEALTH

0 household air pollution. Drastically reduces risk of lung and respiratory illnesses.

DESIGN

The innovative stove canister holds **1.2** liters of ethanol and cannot leak. One canister provides a full day of cooking for a family of five.

ISO TIER

4/4

Stretches beyond goals which achieve significant, measurable health and environmental targets.

Benefits of Ethanol

Evolution of Cleancook

>55.000 Cleancook stoves distributed

Company/Product Development		Key Acquisitions
Ongoing R&D to increase performance, decrease cost and work on new concepts	2015	
Manufacturing of single burner in South Africa	2015	
	2015	Carve out of the Cleancook business from Dometic forming new Cleancook Sweden AB
Manufacturing of double burner moved to South Africa	2012	
Aluminium body versions of single and double burner launched	2007	
Stainless Steel single burner for developing world launched	2006	
Stainless Steel double burner for developing world launched	2003	
Dometic approached by Project Gaia to develop alcohol stove for developing markets	2002	
Dometic assets sold from Electrolux forming Dometic Group	2001	EQT acquires Dometic Group from Electrolux
	1984	Electrolux acquires alcohol stove manufacturer Origo

Evolution of the Cleancook stove

~ € 59

~ € 92

1

€ 46

€ 69

2

€ 35

€ 59

3

Current Cleancook stove range

Fuel canister

Nova 1: **€ 30** **- 50%**

Nova 2: **€ 50** **- 45%**

How does it work?

- Canister absorbing the fuel
- Fuel evaporates and mixes with air
- Fuel and air mix burn above canister opening (no wick)
- Chimney effect increasing power
- Flame spreader evening out the flame and act as safety against filling from top
- Wind protection ensures stable flame
- Regulate the flame for simmering mode

Knock-down Distribution

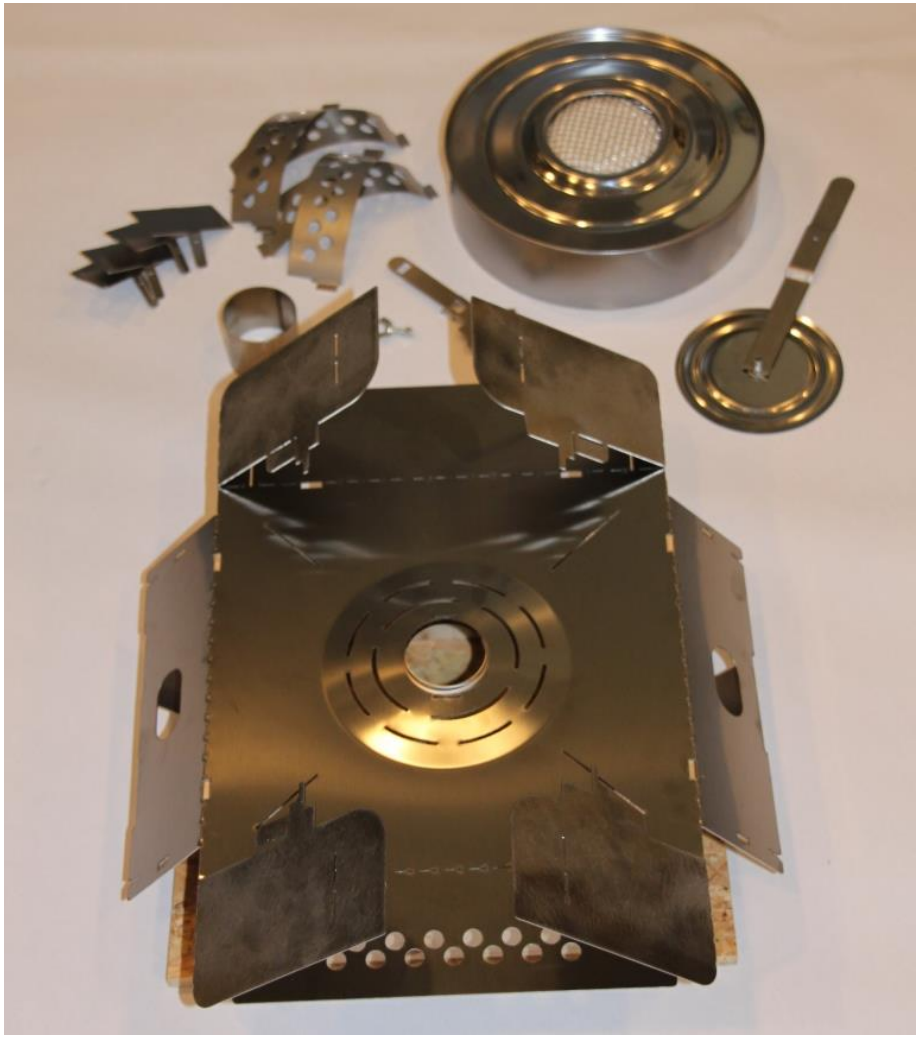
- Current Nova models shipped unassembled from South Africa for local assembly
- Local investment needed for assembly approx. <1000 USD (rivet gun etc)
- Benefits:
  - More units in each container = lower freight cost / unit
  - Import of unassembled products = lower duties
  - Local assembly = local jobs created

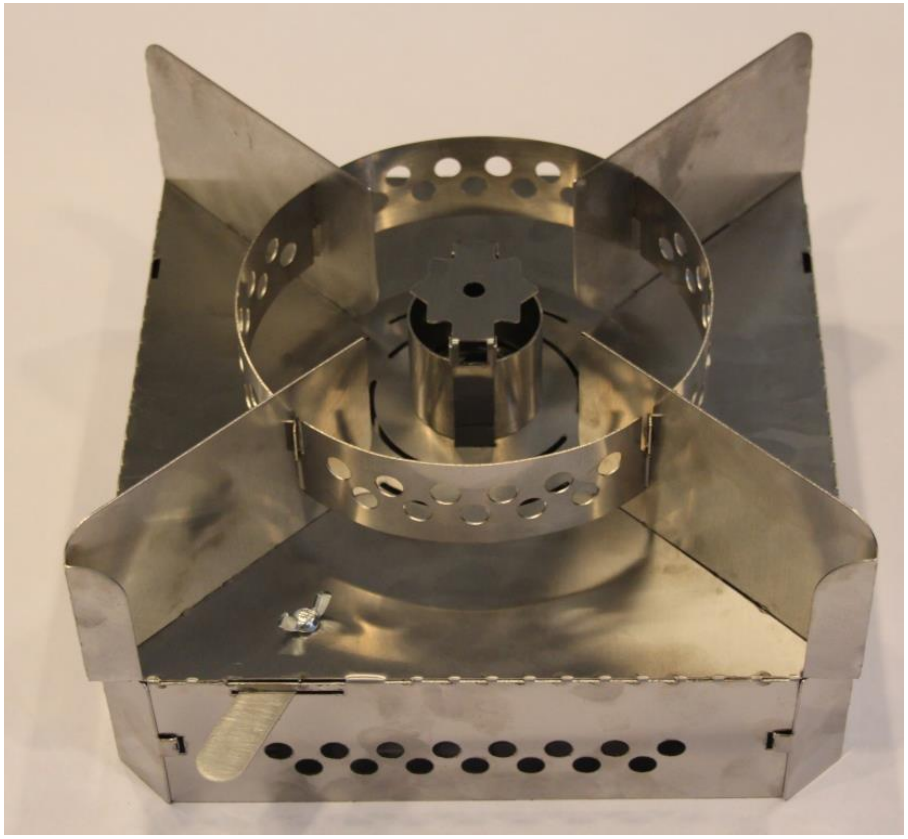
Cleancook Star Stove

New concept for local assembly:

- Automated mass production = increased capacity = lower cost of production
- Flat metal sheets = increased number of units/ container = lower freight cost/unit
- Import of unassembled products = lower duties
- Local assembly = local jobs created
- No tooling needed locally, only folding by hand
- Same canister & combustion = same performance

Cleancook Star Stove





~ € 21 → **- 65%**

Polling Question #4

What do you think is the biggest challenge with promoting or distributing ethanol for cooking?

A. Finding the right stove

B. Fuel production challenges

C. Fuel distribution challenges

D. Policy challenges

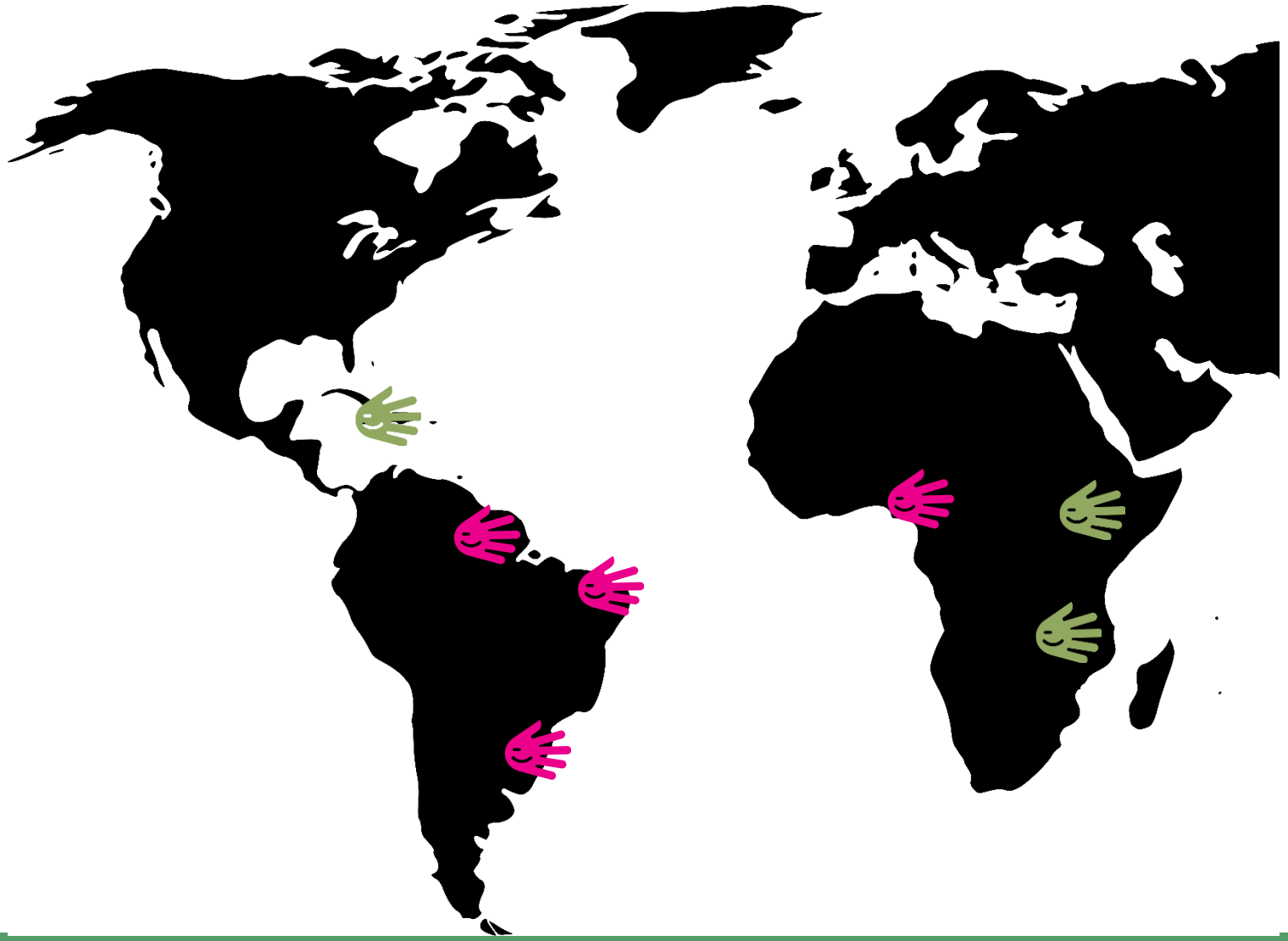
E. Other (cost, competition, etc.)

Main Challenges

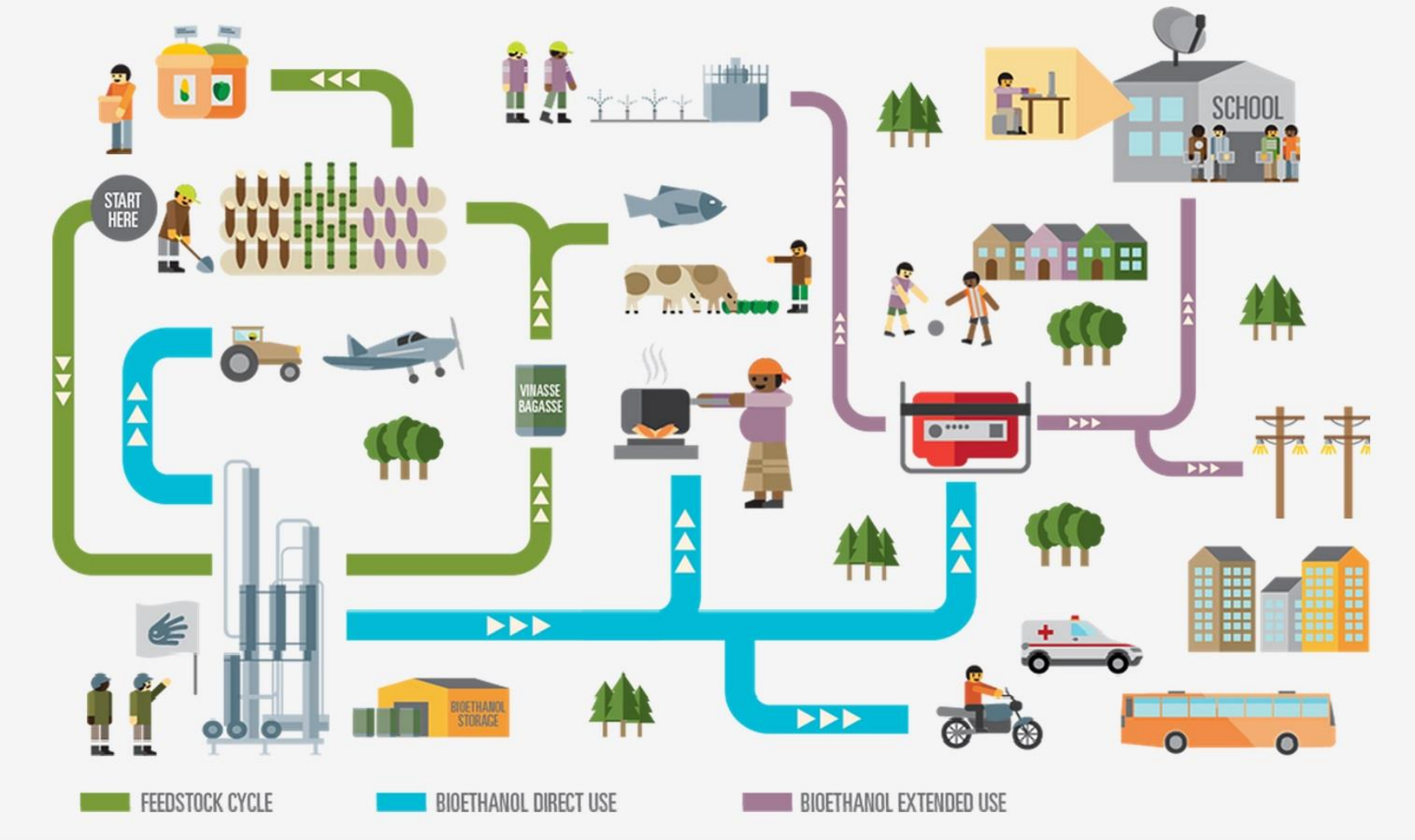
1. Supply Chain
2. Prohibitive Policies
   - Standards
3. Seed funding
   - Access to capital for technology & business infrastructure

Micro scale solutions

Green Social Bioethanol



Social Bioethanol Concept



Green Ethanol Micro Distillery

- Innovative no-cook Simultaneous Saccharification and Fermentation (SSF) process at 28ºC to 32ºC.
- Does not require high temperature fermentation.
- Low energy consumption, having a positive energy balance.
- Ethanol-powered generator 40-120 KVA.

Green Ethanol Micro Distillery

Equipment:

- Modular Equipment for small-scale bioethanol production.
- Internationally patented continuous system technology, producing 95º GL standard Bioethanol.
- Robust structure, low maintenance cost.
- Versatile – efficient with a variety of starch and sugar feedstock (cassava and sugar cane for instance).


NO
SPOILER

Macro Scale Solutions

GLOBAL OUTLOOK

POTENTIAL GLOBAL DEMAND FOR ETHANOL AS A HOUSEHOLD COOKING FUEL

People using traditional biomass fuels	# in Millions	# of Families	Ethanol required per year (Million Liters)	Ethanol required per year (Million Gallons)
Africa	698.0	139.6	28,025	7,404
Developing Asia	1,814.0	362.8	72,832	19,242
Latin America	65.0	13.0	2,610	689
Middle East	10.0	2.0	402	106
Total	2,587	517	103,868	**27,442**
People using coal				
Mainly China, also India & South Africa	400.0	80.0	16,060	**4,243**
People using kerosene				
Africa	24.0	4.8	964	255
Asia	184.5	36.9	7,408	1,957
Latin America & Caribbean	9.6	1.9	385	102
Total	218	44	8,757	**2,314**
People using LPG				
Africa	73.8	14.8	2,965	783
Asia	634.9	127.0	25,492	6,735
Latin America & Caribbean	236.1	47.2	9,480	2,505
Total	945	189	37,937	**10,023**
GRAND TOTAL	4,150	830	166,622	**44,022**

Assumptions:

Assumes a family size of 5 people

Assumes 0.55 liter per family per day x 365 days per year

Sources:

* International Energy Agency: World Energy Outlook, Global Status of Modern Energy Access, 2010

** Global Alliance for Clean Cookstoves: http://www.cleancookstoves.org/resources/data-and-statistics/

Macro Scale Solutions

Macro Scale Solutions (continued)

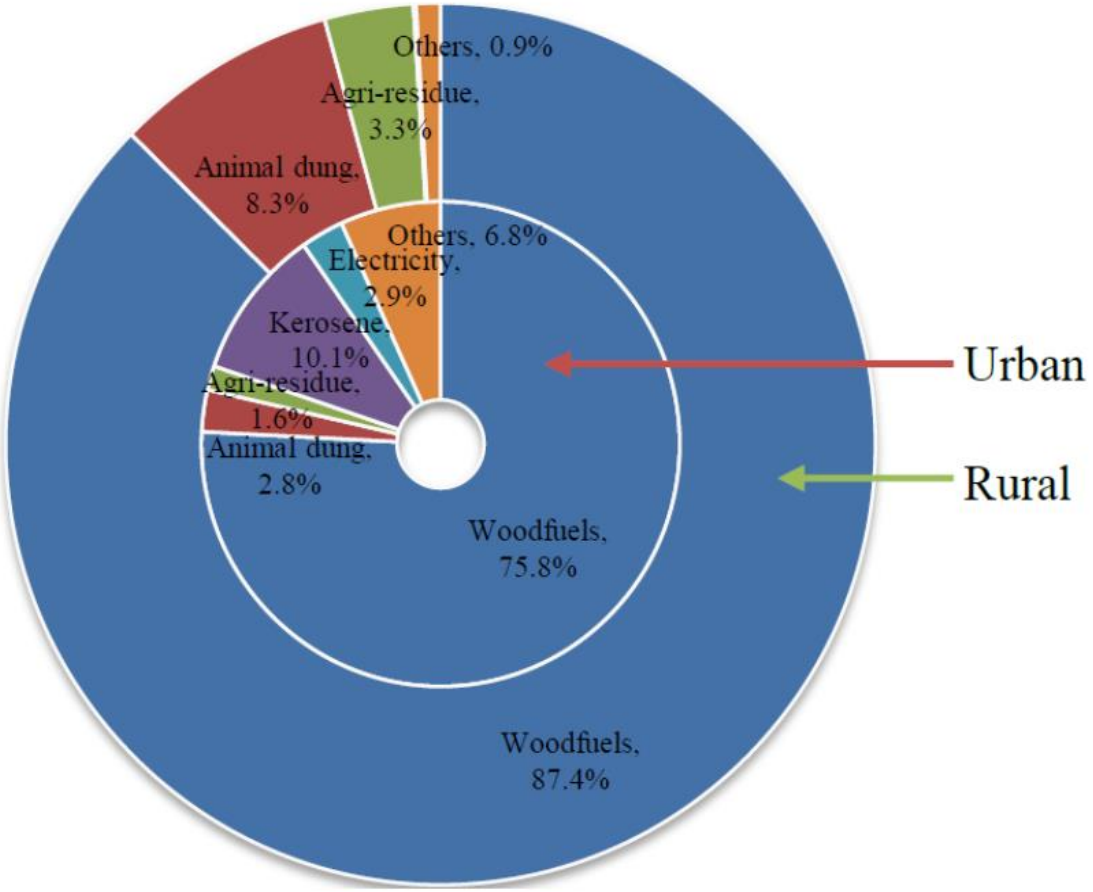
- Importing Ethanol
  - Creating the market
  - Is ethanol a competitive fuel alternative?
  - Demonstrated market for ethanol drives increased local production, lowers cost
- Fuel Supply Infrastructure
  - Access and Affordability
    - Access
      - Infrastructure development to reach households
      - Ease of transition
    - Affordability
      - Compared to alternative fuels in market place
      - Purchasing power flexibility

Ethiopia Case Study

Ethiopia – 94 million and
one of the worlds larges fire wood consumers

94% of energy demand is covered by fuel wood, charcoal, branches, dung cakes and agricultural residues

Every year, 200,000 hectares of forest are destroyed in Ethiopia



Fuel used for cooking in the household sector, 2011.

Berkeley Lab: http://cookstoves.lbl.gov/ethiopia.php

Ethiopia - Climate Resilient Green Economy

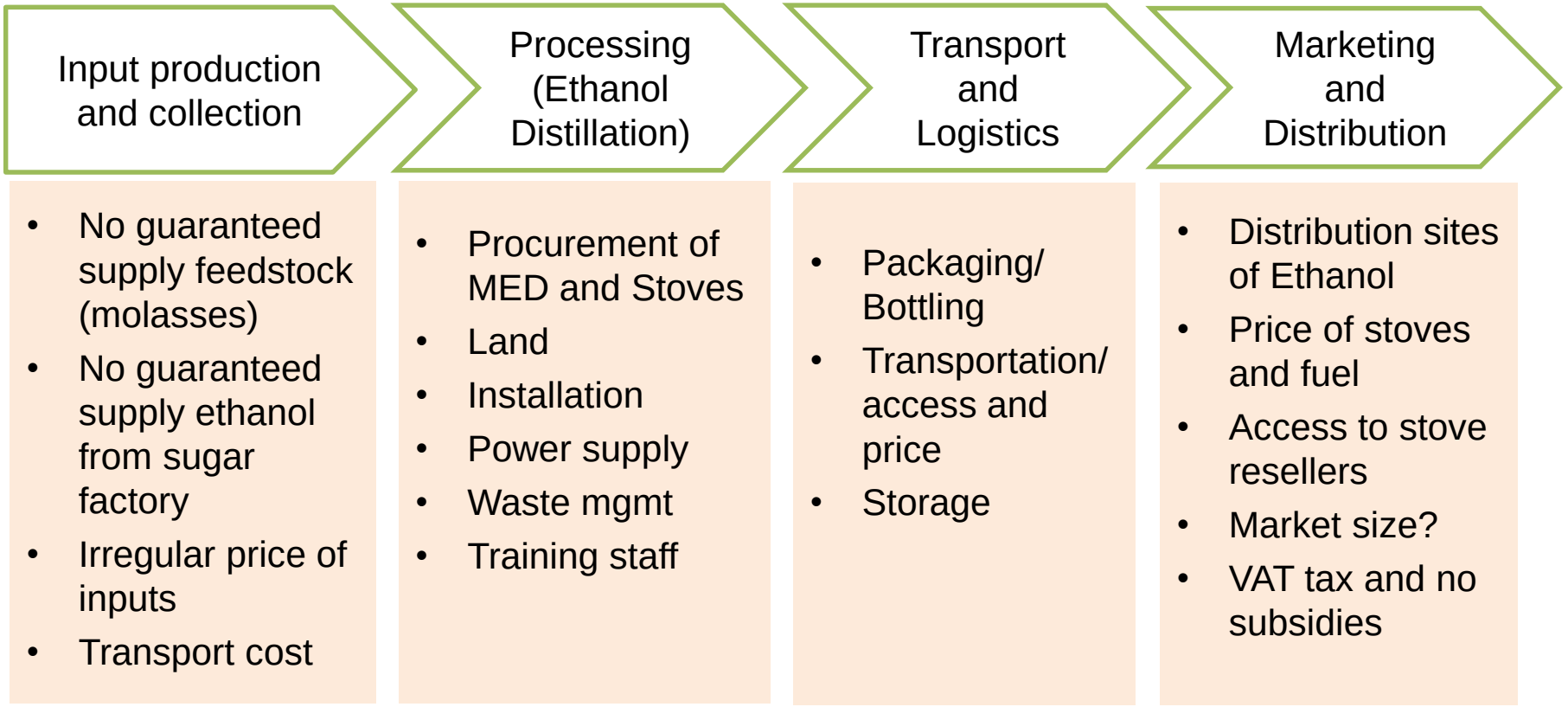
Ethiopia aims to become Middle Income and Carbon Neutral by 2025 through:

- Improving crop and livestock production practices to increase food yields, hence food security and farmer income, while reducing emissions
- Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks
- Expanding electric power generation from renewable sources of energy fivefold over the next five years for markets at home and in neighboring countries
- Leapfrogging to modern and energy-efficient technologies in transport, industry, and buildings.

Three Studies in Ethiopia

- Ethanol: towards a viable alternative for domestic cooking in Ethiopia – **SEI**
- Demonstrating the Feasibility of Ethanol for Household Cooking – **Gaia and SEI**
- Holistic Feasibility Study of a National Scale-up Programme for Ethanol Cook Stoves and Ethanol Micro Distilleries (EMDs) in *Ethiopia: Feasibility Study of EMDs: Market, Financial and Economic Analyses* **– Gaia Association**

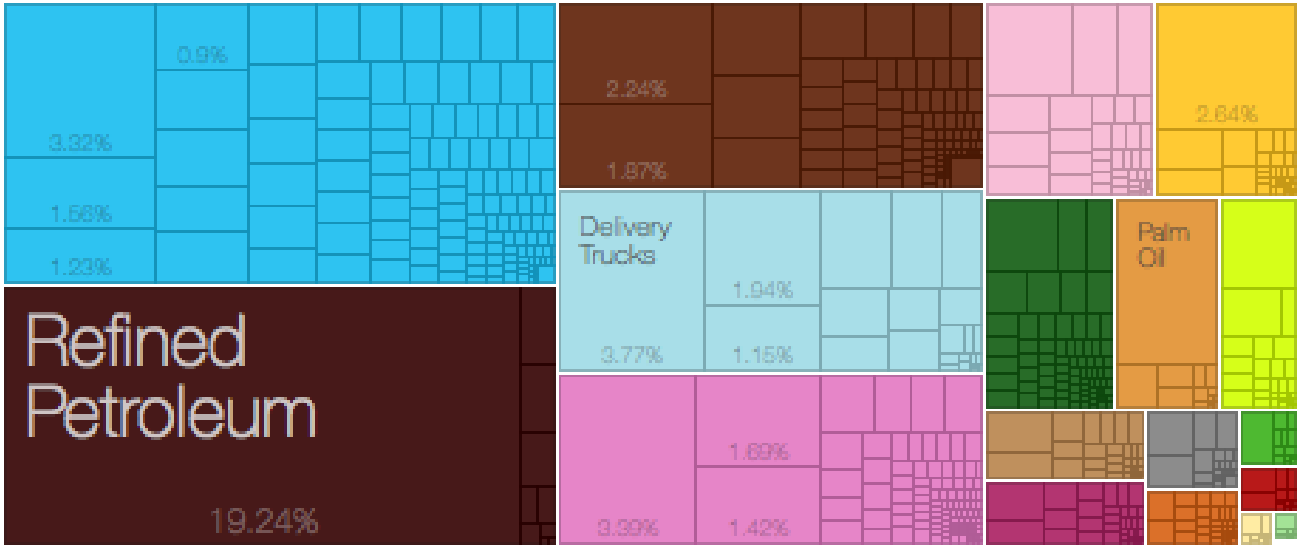
Adaptation Challenges for Ethanol



http://www.sei-international.org/publications?pid=2746

Opportunities for Government of Ethiopia

- Ethanol could replace kerosene in 100% of urban households, and charcoal in up to 50% of rural households – if price is competitive
- Emission Reduction Payments
- Health - national burden of disease attributable to solid fuel use - 4.9%
- Save Foreign Exchange for the Government of Ethiopia

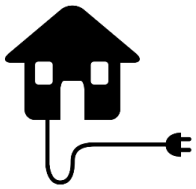


Ethiopia Import, Total Country Trade: $11.5B https://atlas.media.mit.edu/en/profile/country/eth/

Consumer Feedback and Market Opportunities

TIME! Children will not go to school hungry

Movability – replace charcoal (e.g., in coffee ceremony inside the house)



Ethanol is a compliment to electricity according to users

http://www.sei-international.org/publications?pid=2746

Recommendations

"The key to stimulating private sector involvement is to regulate the input and output prices of ethanol"

"The government needs to play a central role in promoting ethanol for household cooking to stimulate demand amongst households"

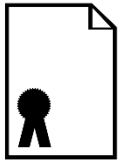
Gaia Association (2014). Holistic Feasibility Study of a National Scale-up Programme for Ethanol Cook Stoves and Ethanol Micro Distilleries (EMDs) in *Ethiopia: Feasibility Study of EMDs: Market, Financial and Economic Analyses.* Addis Ababa, Ethiopia.

Recommendations

VAT – Tax exemption and subsidies for ethanol - not kerosene

National Ethanol Fuel Program

Private Sector Support



Revision of the Ethiopian Biofuel Development and Utilization Strategy – however – *“policy in itself is not a goal”*

Market Size Assessment

http://www.sei-international.org/publications?pid=2746

Lessons Learned and Next Steps

Lessons Learned
1. Start with modern technology
2. Private sector engagement
3. Involve policymakers early
4. Micro AND Macro approach
5. Facilitate access to technology & capital

Next Steps
1. Build global supply chain & conduct market research (local feedstocks)
2. Develop international standards for fuel and stoves
3. Replicate successful models
4. Continue to innovate technology
5. Commercialize

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Questions and Answers

To ask a question, please type in your question in the Questions/Chat pane on your webinar console.

Next Steps

Following the webinar…

- The presentation and answers to your questions will be posted to http://www.epa.gov/cookstoves
- Please complete the Survey Monkey Evaluation you will receive shortly

Let us know…

- What surprised/interested you most about what you heard from the presenters?
- What information would you like to hear more about?
- What other topics would you like to see presented in the future?