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SETTING THE TABLE FOR A HOTTER, FLATTER, MORE CROWDED EARTH: INSECTS ON THE MENU?

SONNY RAMASWAMY

WICKED
PROBLEMS

PATH
FORWARD

TRANSFORMATIVE
DISCOVERIES

HUMAN
DIMENSIONS

OPPORTUNITIES

CHALLENGES



Societal Challenges aka Wicked Problems

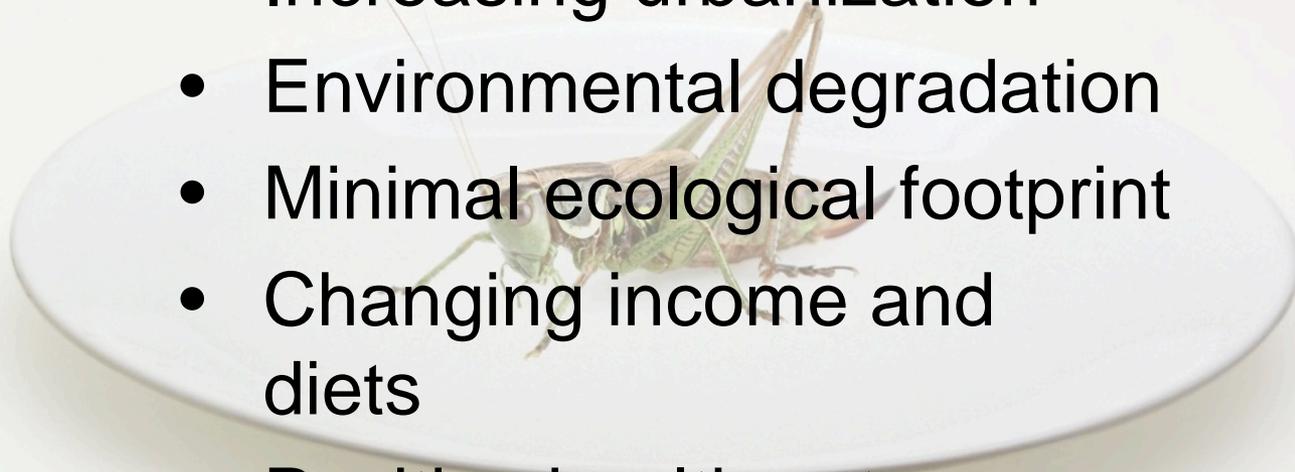
- Population
- Food
- Water
- Environment
- Climate Change
- Energy
- Health
- Poverty





Food, Feed, Shelter, Clothe, Fuel, Bio-Feedstock > 9 billion

- Climate change
- Land and water constraints
- Increasing urbanization
- Environmental degradation
- Minimal ecological footprint
- Changing income and diets
- Positive health outcomes

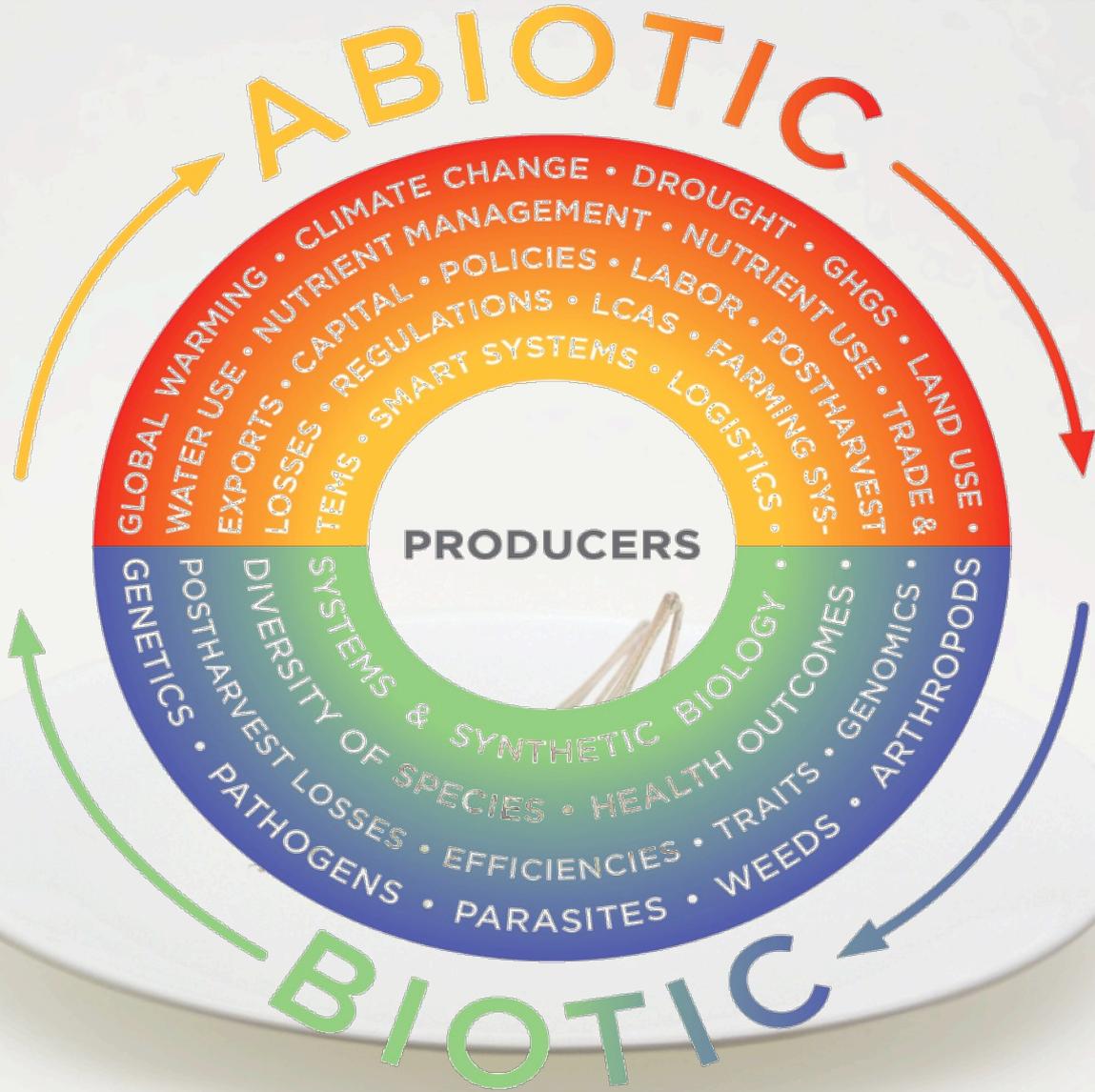




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The Nexus





Food Security: Paths Forward

- Transformative discoveries
- Farming systems
- Education
- Policies, regulation, marketing
- Human dimensions
- Insects as food



Path Forward: Knowledge Gaps

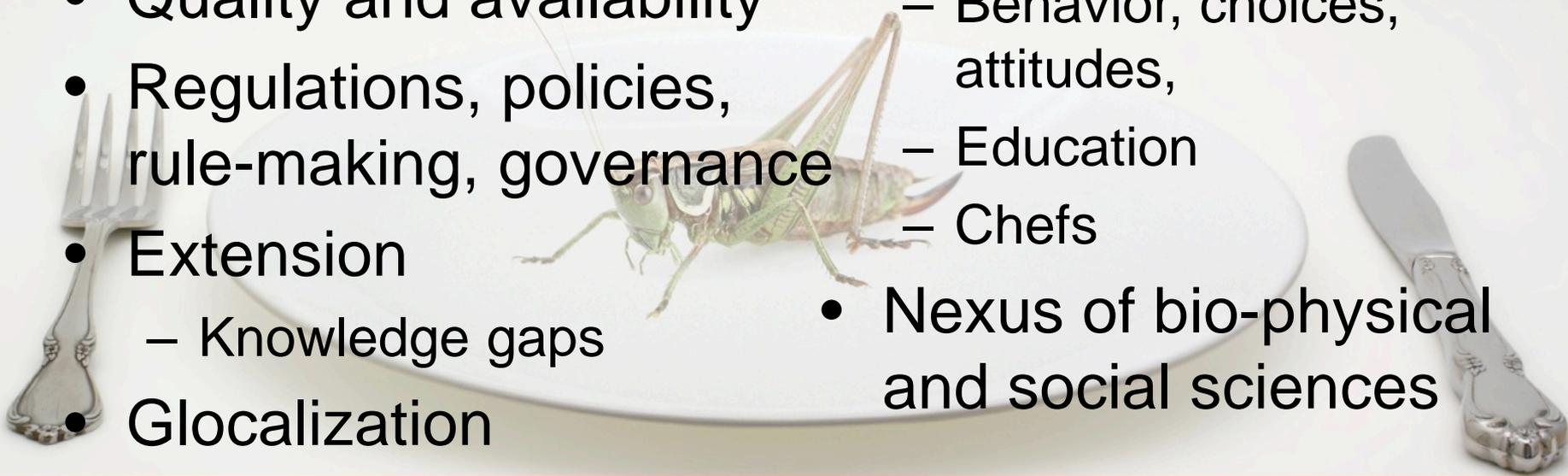
- Biology and ecology of insects as food/feed
 - Biotic and abiotic constraints
 - Ecological footprint – LCAs
- Nutritional quality
- Healthy/therapeutic foods
- Scale of production
- Food safety and allergens
- Regulations and policies



Path Forward: Transformative Discoveries

- 
- “Wildcrafted”
 - Insect farming
 - Biology
 - Human and animal nutrition
 - Biodiversity
 - Ecological issues
 - LCAs
 - Supplements
 - Bioprospecting
 - Waste management
 - Animal feed
 - Bioproduct feedstocks
 - Food safety
 - Allergens
 - Facilities
 - Production scale

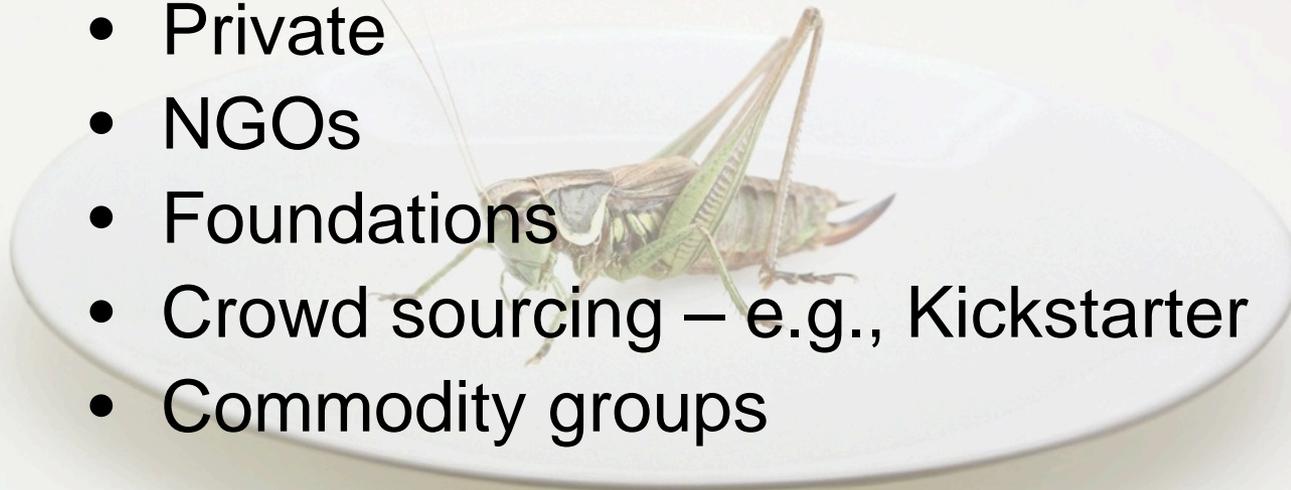
Path Forward: Human Dimensions

- 
- Market hubs
 - “Market Maker”
 - Lessons from Organics?
 - Quality and availability
 - Regulations, policies, rule-making, governance
 - Extension
 - Knowledge gaps
 - Glocalization
 - Jobs
 - Acceptance
 - “Yuck” factor
 - Behavior, choices, attitudes,
 - Education
 - Chefs
 - Nexus of bio-physical and social sciences



Path Forward: Funding

- Public
 - Stealth approach
 - Food security programs
 - SBIR
- Private
- NGOs
- Foundations
- Crowd sourcing – e.g., Kickstarter
- Commodity groups



Path Forward: Opportunities

- Marketing
 - Insect farming, specialty crop, land shrimp
- Healthy and therapeutic foods
- Locavores
 - Chefs as culinary trendsetters
- Insects as animal feed source
- Bioprocessing, bioproducts, bioprospecting
- Condiments, supplements, additives
- Waste management
- Diversified farming systems





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Path Forward: Challenges Policies, Regulations, Rule-Making



Food, Drug, and Cosmetic Act (FD&C)

- *“Under the Act as amended, **bugs/insects** are considered **food** if that is the **intended use** (Sec. 201(f)). Food must be **clean and wholesome** (i.e. free from **filth, pathogens, toxins**), must have been **produced, packaged, stored and transported** under **sanitary** conditions, and must be **properly labeled** (Sec.403). The label should include the **scientific name** of the insect.*
- *Insects must be **raised** specifically for **human food** following current good manufacturing practices (cGMP).*
- *Insects **raised** for animal or **pet food** cannot be **diverted** to human food. They cannot be **"wildcrafted"** (collected in the wild) and sold as food due to the potential of **carrying diseases or pesticides**.*
- *The manufacturer also needs to demonstrate the **"wholesomeness"** of the product. There is a growing body of scientific literature that people who are **allergic to shrimp, clams, etc.** may also be **allergic to insects** either as food or as adulterants in foods.*

Insect Protein Supplements

- **Subject to *regulation like any other food ingredient*, which means that the protein is a *food additive unless the use of the substance is GRAS*.**
 - ***Fish protein isolate is regulated as a food additive in 21 CFR 172.340.***
 - ***To be considered GRAS, the substance would have to meet the GRAS criteria in 21 CFR 170.30.***
 - ***A company can make a GRAS determination independent of FDA. However, self-GRAS determination can be challenged by FDA if it disagrees.***
 - ***Company can voluntarily submit a GRAS notice of their claim to FDA for review. If the substance is a food additive, it would be considered unsafe under section 409 of the FD&C Act since there is no food additive regulation authorizing insect-derived protein in food.***
 - ***Company interested in seeking a food additive regulation for the substance, they should submit a food additive petition that follows the format in 21 CFR 171.1.***

<http://www.fda.gov/Food/IngredientsPackagingLabeling/GRAS/default.htm>

<http://www.fda.gov/Food/IngredientsPackagingLabeling/FoodAdditivesIngredients/default.htm#>



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Animal Feed

- Need rule-making
 - FDA purview





Imagine: The Possibilities

SUNDAY, FEBRUARY 9, 2014

The Washington Post

KNIGHT LIFE

By Keith Knight





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Coming: To A Grocery Store Near You?



Images: Courtesy of Rakesh Soman; Caren Wilcox



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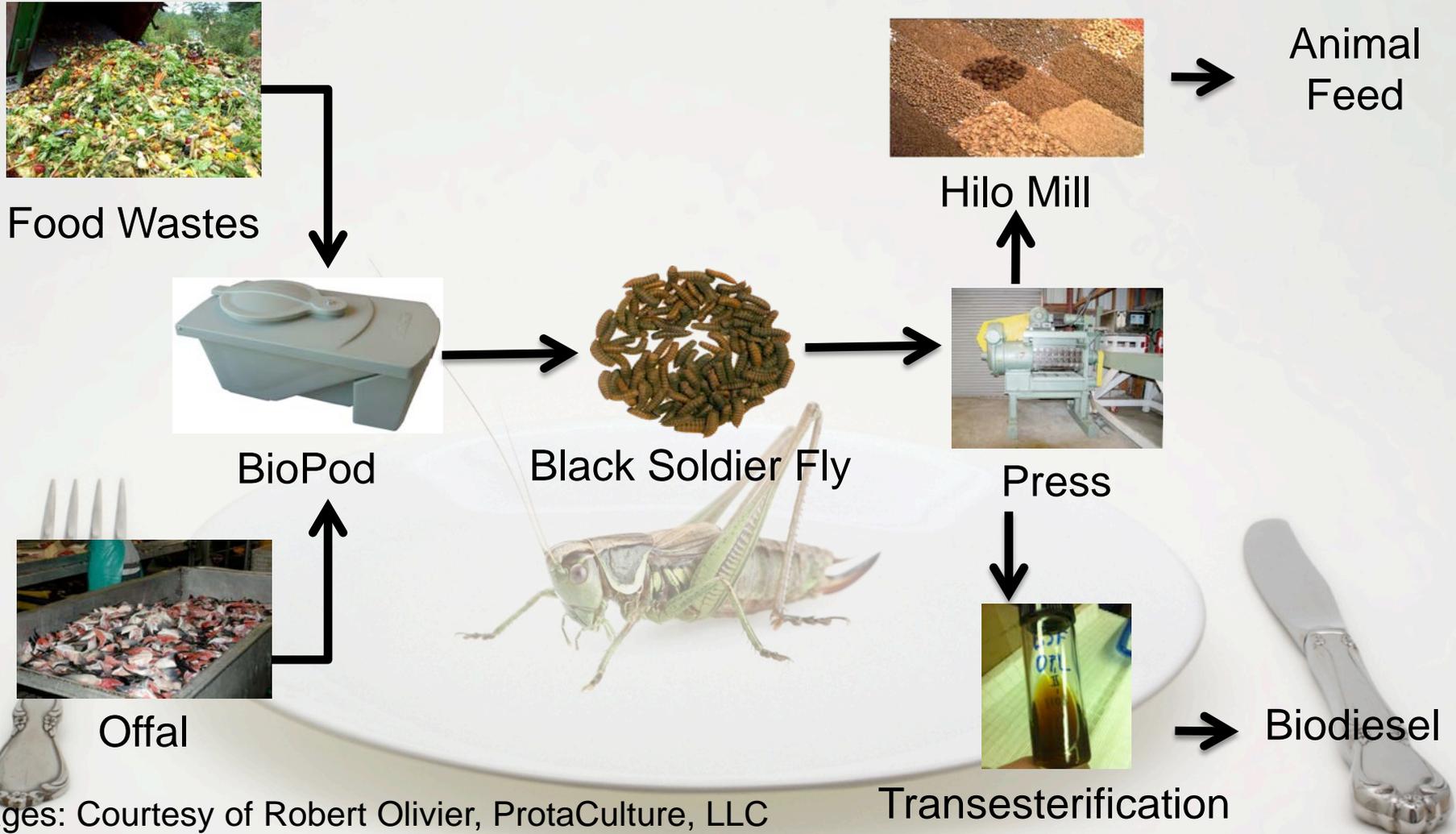
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Healthy/Therapeutic Foods



Image: Courtesy of Gabi Lewis, Exo

From Wastes to Value Added (NIFA SBIR Funding)



Images: Courtesy of Robert Olivier, ProtaCulture, LLC

Transesterification



USA Based Companies/Non-profits

- Insects as food
 - Chapul
 - Exo
 - SixFoods
 - World Entomophagy
 - Little Herds
 - All Things Bugs
- Insects as feed
 - ProtaCulture
 - Enviroflight





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A photograph of a green grasshopper with long antennae and hind legs, positioned on a white ceramic plate. The plate is set on a white tablecloth with a faint floral pattern. To the left of the plate is a silver fork, and to the right is a silver butter knife. The word "YES!" is superimposed in large, bold, black capital letters over the grasshopper.

YES!

SETTING THE TABLE FOR A **HOTTER, FLATTER, MORE CROWDED** EARTH: **INSECTS** ON THE MENU?