Nudge Innovation and Paths of Convergence for Agriculture, Food, Health, and Wealth

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CULTIVATING AGRICULTURE, FOOD, AND HEALTH

DALHOUSIE AGRICULTURAL CAMPUS

JUNE 20TH 2013
Overview

1. FOOD AND EATING: The behavioral frontier between agriculture, nutrition, health, and wealth

2. Nudge Innovation, Pepsi case study, and small group/open discussion

3. Paths of Convergence

4. Convergent Innovation and small group/open discussion
1

FOOD AND EATING: The behavioral frontier between agriculture, health, and wealth
“Eating is an agricultural and an industrial act.”

Adapted from Wendell Berry (from E. Gustaffson presentation, Delhi, 2012, MWP/INCLEN convergence workshop)
Eating and Many Other Everyday Behaviors are Also Neurobehaviors
Eating is a neurobehavior from birth on and whether you are on the under, neutral or over side of the nutrition and Caloric Balance.
Motivated Choice in Neurobehaviors

- Tied to biological and/or overlearned tendencies
- Triggered by internal or external cues and modulated by social and cultural context
- Behavior result from a complex interplay between brain (perception, motivation, and executive control) and environmental triggers
- E.g., eating, smoking, drinking,
Can eating as a neurobehavior be better understood within social and cultural meanings and symbols to better address food insecurity, micronutrient deficiency, obesity and NCDs?
Eating: A Simple Behavior Whose Determinants Operate on Different Scales, and are Woven into the Fabric of Everyday Life
Why Changing Behavior and Transforming Agriculture, Food and Health Systems are Critical to Sustainable Development and Affordable Healthcare

Fig. 1. Noncommunicable diseases and the macroeconomy (Smith, Science 2012)
The Causes and Consequences of Complex World’s (Food) problems Cut Across Sectors and So Do the Solutions
(adapted from S. Kadiyala Presentation, Delhi, June 2012)

**Direct interventions**
- Infant feeding
- Vitamin A, Zinc
- Hygiene
- Fortification

**Indirect Interventions**
- Agriculture
- Social protection
- Education
- Health Systems
- Women’s empowerment
- Economic growth
- Poverty reduction
- Environment
- Institutions
- Governance

**Child Nutrition**
- Food/Nutrient Intake
- Health

**Immediate causes**
- Access to Food
- Maternal & Child Care
- Water, Sanitation & Health services

**Underlying causes**
- Environment, Technology & People

**Basic causes**
- Economic Structure
- Political and Ideological Frameworks

Source: Adapted from UNICEF 1990 and Black et al 2008
2

Nudge Innovation, Pepsi case study, and small group/open discussion
When Nutrition and Health are Not the Full Story of What Drive Human Behavior:

How to get people to say “yes” to healthier choices?
We need a new lens into the mind-set of the consumer

To succeed in positioning healthier choices we need to better understand why and how to deliver what consumers want:

- Why people say one thing - but do something different
- What drives their behaviors – or holds them back
- What is their deep rooted “relationship” with food and beverages (how it varies by occasion, state of mind, satiety, satisfaction, hunger, cravings; enjoyment, healthier, wiser choices)
- How do people successfully shift deeply ingrained behaviors
- How do low fat”, “sugar free”, “diet”, “light” foods and beverages impact choice and when does it become acceptable - and when not
- How do the above criteria deliver against “healthier” or not
- How do senses, metabolism, conditioning impact their decisions
- The real meaning behind risk/ reward trade-offs
Brain Imaging of Motivated Choice/Eating as Neurobehavior (Dagher et al 2012)
Overview of prominent brain areas involved in eating behavior. ACC = anterior cingulate cortex; dIPFC = dorsolateral prefrontal cortex; IOFC = lateral orbitofrontal cortex; mOFC = medial orbitofrontal cortex; NAcc = nucleus accumbens; vmPFC = ventromedial prefrontal cortex; VS = ventral striatum.
### Conflict between the valuation systems

<table>
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<th>Pavlovian</th>
<th>Habitual</th>
<th>Goal-directed</th>
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<tr>
<td><strong>Pavlovian</strong></td>
<td>Example: hungry animal presented with food and electric shock simultaneously</td>
<td>Example: animal rewarded for running away from food</td>
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<td>Appetitive Pavlovian system: high value for food, low value for escape behaviours</td>
<td>Appetitive Pavlovian system: high value for running towards food</td>
<td>Appetitive Pavlovian system: high value for food</td>
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<tr>
<td>Avoidance Pavlovian system: high value for escape behaviours, low value for food</td>
<td>Avoidance habitual system: high value for running away from food</td>
<td>Health goal-directed system: low value for food</td>
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<tr>
<td><strong>Habitual</strong></td>
<td>Example: an animal trained to run towards a lever in response to a sound and away from a lever in response to a light being presented with both stimuli</td>
<td>Example: alcoholic considering having a drink at a bar</td>
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<td>Approach habitual system: high value for lever approach</td>
<td>Appetitive habitual system: high value for drink</td>
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<tr>
<td>Avoidance habitual system: high value for lever avoidance</td>
<td>Avoidance goal-directed system: low value for drink</td>
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<td><strong>Goal-directed</strong></td>
<td>Example: dieter considering having ice-cream</td>
<td>Appetitive goal-directed system: high value for ice-cream</td>
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<td></td>
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<td>Avoidance goal-directed system: low value for ice-cream</td>
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When healthy makes you hungry
(Finkelstein and Fishbach, 2010)

- People are experiencing more hunger when food frame as healthy (vs tasty) and they are more likely to eat in a subsequent episode.
- When imposing the consumption of a “healthy” item, people experience more hunger.

New health bar containing high levels of protein, vitamin and fiber.

A chocolate bar that is very tasty and yummy with a chocolate raspberry core.

[Graph showing experienced hunger as a function of the framing of the food sample and the nature of the consumption situation]
On Biological and Emotional Reinforcement and Conditioning

- Reinforcement and food consumption
  - The reinforcement is the process of associating contingent positive consequences with a behavior (Epstein et al. 2007).

  ![Diagram]

  Superior Affective States @ Home

  Individuals typically experience more intense positive emotions and less intense negative emotions at Home (H) than away-from-home (AFH) contexts (Côté & Moskowitz 1998).
Means of Post-meal Emotions after Home versus Away-from-home (AFH) Meals with Different Nutritional Quality

* Significant difference (p < 0.05) was detected in the hierarchical linear models used in analysis.
**Competing with Tony the Tiger**

**Craving:** TV ads. ("They’re grrreat!")

**Cue:** Tony the Tiger on the cereal box.

**Routine:** Child nags parent to buy Frosted Flakes.

**Reward:** Frosted Flakes.
Easy Eater & Hugo

**Craving:** Easy Eater iPad game. (Gold Stars)

**Cue:** Hugo on apple packaging or merchandise.

**Routine:** Child nags parent to buy apples.

**Reward:** Apples.
Easy Eater (iPad)
Children Ages 5-9

1. The goal is to earn **30** points at dinner each night.
2. **Healthier** foods give **more points**.
3. Win **real-world rewards**.
Now Choose a Character!
Each one has a super secret power. It’s a win-win-win situation.
The Vitality Wellness Group

- Member of South Africa-based *Discovery Holdings Limited*, a leading international financial services organization founded on the principles of consumer engagement and wellness
- Launched in 1997 with a focus on prevention, as there were so few doctors in South Africa
- Today South Africa’s largest health insurer, and a total of 4 million members worldwide
- By capitalizing on heritage of actuarial expertise, the Vitality wellness program is meeting the needs and cultures of a wide range of U.S. companies in their pursuit of increased workforce health and productivity
- The Vitality Group has numerous peer-reviewed outcomes and published studies, participating members in all 50 states, and the largest network of biometric screeners and fitness health club partners that verify engagement and secure return on investment
Get Rewarded for Making Healthy Choices

The Vitality Program

The “Air Miles” Model

- Earn points by exercising, buying healthy food or hitting certain targets
- Rise through levels as accumulate points
- Offers a high level of valuable and meaningful incentive options designed to motivate all members to take responsibility for their lifestyle choices and reap the benefits of healthier behaviors
  - reduced premiums, subsidized fitness memberships and exotic holidays

Alliances

- Discovery Holdings formed alliances with a host of companies to provide rewards linked to “vitality level” (grocery stores, airlines)
  - Pick’n’Pay, a south African grocery chain provides discounts of up to 25% on 10,000 “healthy foods”
- Formed partnerships with Humana and Prudential health insurers, as well as Ping An Health, one of China’s largest private health insurers
- 2012 HumanaVitality partnered with Walmart on an initiative to provide discount good-for-you foods; specifically a 5% savings for HumanaVitality members on products that are part of the Walmart’s Great For You program
Nudge Innovation: Making the “Good” Choice the Simplest One  
Dube, 2010

• Relies on a sophisticated understanding of neurobehavioral decision processes and judgmental biases and shortcomings to nudge individuals to act in their own and society’s best interest while preserving freedom of choice.

• What helps those who suffer from the biases has little impact on others (preserve freedom of choice)
The Vision of Long Term Food Research Is to Deliver All Three Credentials of the Real Food Experience

- Sensory Experience
- Inherent Functional Benefit
- Natural and Cultural Identity

Real Food Experience
Translation of Nutritional Requirements into Every Day Delicious, Nutritious, and Convenient Products

NUTRITION REQUIREMENTS
- Nutrients to Limit (e.g. sodium)
- Nutrients to Increase (e.g. fiber)
- Food Groups to increase (e.g. dairy)

ENERGY REQUIREMENTS
- Calorie Requirement Requires Education
- Unlock Calorie Insights to Focus on Balance
- Tools to manage individual caloric needs

DIETARY PATTERNS
- Consumers rarely change their diet
- Design product based on typical usage
- Focus on diet and occasion -- a snack, breakfast, a treat, during exercise

“Right” Nutrients

“Right” Occasion

“Right” Calories
ONE SIZE DOES NOT FIT ALL IN NUDGE INNOVATION
Life Course Segmentation and Targeting

**Development of NCD**

- **Fetal Life**
  - SES maternal nutritional status & obesity, fetal growth

- **Infancy and Childhood**
  - SES nutrition, diseases, linear growth, obesity

- **Adolescence**
  - obesity, lack of PA, diet, alcohol, smoking SE potential

- **Adult Life**
  - established adult risk factors (behavioral/biological)

**Accumulated Risk**

- Range of Individual Risk

**Age**
Affordable Nudge Innovation throughout the Global Economic Pyramid
(Adapted from R. Rodriguez, Delhi 2012)

Consumers with access to food & health products = 2.5 billion people

Over 4.5 billion people are not currently part of the global economy, potential market size = $4 trillion

1 billion people are living in the 21st Century
1.5 billion ...20th Century
2.5 billion ...19th Century
2 billion live in Stone Age conditions

7 billion people living today
Nudge Innovation: PepsiCo Case Study

(material from global executive vice president Mehmood Khan’s presentations 2008 and 2012)
Links with Agricultural Innovations: E.g., Biofortification

**HarvestPlus**
- High iron beans & pearl millet
- High vitamin A cassava, maize, sweet potato
- High zinc rice & wheat

**Orange-fleshed sweet potatoes**
- High vitamin A sweet potato for sub-Saharan Africa
...the emphasis on HS initiatives within PepsiCo Innovation Big Bets?

Natural Ingredients, Clean Label

Improved Nutrition Profile

New Platforms

Reduce negatives
Increase positives
Improve processing

“Artificial ingredients concern me”

“Health is about balance”

“I’d like my kids to eat more healthy snacks where possible”

“I want something fun that tastes great”

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PEPSICO R&D gears up...

Executive Summary

Infrared drying when used as part of a combination drying process in fruits and vegetables reduces drying time, saves energy and improves product quality. A pilot scale infrared dryer for produce will soon be available at FLNA (Page 2).

Fruit and Vegetable Research Summit to develop research priorities for snacks and beverages will be held in Purchase, NY September 3-5, 2008 (Page 3)

Project RED in the UK is well poised to deliver a line of baked

Research News: Scientists at the PepsiCo Fruit and Vegetable Research Center have developed...
Renovate and Innovate Portfolio
Building Demand For and Making Anemia Prevention Cool
Leverage New Corporate R&D Structure to Deliver the Innovation Pipeline...

- Biological & Ingredient Research
- Packaging and Processing Research
- Health & Science Policy
- Food Safety & Regulatory Affairs
- Nutrition
Long Term R&D Strategic Alliances
Exploring alliances based on strategic platforms

- M&A/In-Licensing
  - Venture Capital/Small Start-up
    - Physic (initiated)
  - Academia
    - North Carolina
  - Emerging Markets
    - Ayurvedic Medicine
    - TCM
- Pharma
- Large Food
  - Unilever
- Strategic Suppliers
  - Cargill
  - IFF
Paths of Convergence
Convergence in Development, Nutrition, and Health Literature: The *World* Converging with the *West*

- Convergence in GDP and Income
- Convergence in Agriculture, Industry, Urbanization
- Convergence in Diet
- Convergence in Lifestyle
- Convergence in Diseases
Searching for a New Type of Convergence: The 2005-2010 series of McGill Health Challenge Think Tank

- Spearheaded by the MWP, a think-and-do tank that has been in incubation since 2005, with involvement of leading 21st Century visionaries and a worldwide network of local, national and global action partners, supported by academic backbone from disciplinary and complexity sciences, science/policy research agencies, and philanthropies

- Capitalize on innovation for whole-of-society solutions

Daniel Kahneman
2002 Nobel Economics Laureate

Paul Krugman
2008 Nobel Economics Laureate

Muhammad Yunus
2006 Nobel Peace Laureate

C.K. Prahalad
Late business strategist
Whole-of-Society Approach To Convergence between Human and Economic Development and Growth (Agriculture, Food, Health, and Wealth)

Human & Economic Development & Growth

Private Sectors – Agriculture, Agri-Food and Other Economic Sectors

Private Sector – Bio-tech, Pharma, Medicine, Health, Healthcare, Education & other Human Sectors

Civil Society Sectors

Government Sectors

- Information & Communication Technology Sectors & Systems
- Trade, Finance and, Other Economic Sector & Systems
- Housing, Transportation & Infrastructure Sectors & Systems
- Agriculture/Agri-food Sectors & Systems
- School, Education & Health Systems
- Social Support & Systems
Cover image: Pictured are open-air markets amidst heavy traffic in Hyderabad, India, showing the chaotic environments that populations in developing countries must contend with to obtain produce. Much of the food in these markets is transported from small farms outside the city and carried through clogged streets by a vast ad hoc network of small trucks, scooter trucks, and bicycle carts. Laurette Dübé et al. propose a roadmap for progress toward sustainable global nutrition security. Such roadmaps could help reduce hunger and poverty, and halt the spread of noncommunicable chronic diseases. See the article by Dübé et al. on pages 12294–12301, which introduces the Agriculture Development and Nutrition Security Special Feature. Image courtesy of Alex R. Freedman (Community Cooperative Farms, Sheffield, MA).

From the Cover

12294  Paths of convergence for agriculture, health, and wealth
12369  Topological soft matter
12680  The influence of Ig isotype
12805  Cell walls constrain diffusion
Convergent Innovation and small group/open discussion
Figure 2: Moving towards an integrated health and agriculture and agri-food strategy
Four Key Features of Convergent Innovation for WoS Transformation

1. Innovation has been the lifeblood of industrialization for its benefits and ills and remains so for reaching impact, scale and resilience

2. Beyond Industrial innovation, businesses, social enterprises, other NGOs, philanthropies and governments are called upon for many other building blocks to effect meaningful transformation at the community, state, and national and global levels

3. There is an emphasis on simultaneously achieving humanitarian and economic goals through a convergence of technological, organizational, social and institutional innovation

4. The process must enable different types of actors to work independently as well as collaboratively toward well-integrated, time-bound, targeted, and achievable goals, and on a sustained, real-world basis, rather than only in conferences and workshops
CONVERGENT INNOVATION
The LEGO strategy to innovate in the way we innovate

1. Nudge Innovation
   • In depth knowledge of human biology and behavior; in depth-focus for and with the poor for nutrition and health as successful drivers of technological innovation

2. Convergence in Technological Innovation
   • Convergence in siloed technological innovation including, agriculture, food, transportation, healthcare, IT, etc...

3. Organizational Innovation
   • Nutrition and health-promoting work practices, business processes, value-chain transformation, shared-value creation, and BoP

4. Social Innovation
   • Social entrepreneurship, social business, micro-finance

5. Financial Innovation
   • Impact investment, consumption, investment market signaling systems, venture capital

6. Institutional Innovation
   • Enabling policy environment, norms and media for highest humanitarian and economic return on investments in all of the above
Convergence Innovation Roadmaps

- Orchestrate effective experiments
- Manage failures
- Craft solutions
- Generate co-mingled competitive advantage
- Design
- Create market opportunities
- Scale
- Build in social embeddedness

Cross Sector Collaborations
Linking business initiatives with community mobilization, philanthropy and development investments, public policy
4 Roadmaps for Real World Change with Impact, Scale, and Resilience

**Obesity & NCD Prevention and Control**
- Global Obesity Roadmap Project to understand the drivers of (un-)healthy consumer behavior (ACTIVInsight™)
- Healthy Eating

**Micronutrient Sufficiency**
- Improve nutritional practice in pregnant /lactating women and young children (1000 days)
  - Micronutrient sufficiency (anemia)
  - Convergent Innovation Prize for Stunting

**Dietary Diversity and Balance**
- Scaling up pulse household production and consumption in rural India (value chain assessment)
- Increased pulse consumption through processed foods in developing countries

**Home Health**
- Generate awareness about provision of health, nutrition and development services using digital technology
- Assess low cost market-based products for improving quality of diets in pregnancy / infants
CI Operationalization

WoS conditions, challenges and possibilities for sustainable development and affordable health care

CI ARENA FOR ROADMAP DEVELOPMENT AND DEPLOYMENT

CI Input
- Characteristic of problem/solution domains
- Characteristics of roadmap project partners
- Institutional context of problem solution domains and roadmap project partners

CI Process
- Social learning
- Social capital formation
- Collective action

CI Building Blocks
1. Nudge Innovation
2. Convergence in Technological Innovation
3. Organizational Innovation
4. Social Innovation
5. Financial Innovation
6. Institutional Innovation

CI Outcomes
- Innovation in the way we innovate
- Increased capacity to innovate for roadmap partners
- Increased share of resources society can devote to nutrition, health & economic outcomes
Convergent Innovation: A Multi-Stakeholder Approach

HN Food Offerings

HN Food R&D

HN Food Subsidy

Government Tax Labeling Set Levels

HN Marketing & Education Programs

AgriFood Community Rollout

Retail Pricing, Promotion
An alliance of public and private organizations, civil society and academia, including:

- The MCCHE, CGIAR (ICRISAT and CRP4), IFPRI
- Small, medium and large national NGOs in agriculture extension, school and health
- Small, medium and large national processing companies
- Multi-national manufacturers (farming, processing, packaging, sensory, food technologies)
- Leading advertisement agency
- Pulse grower organizations
- Micronutrient fortification company

**Vision**: move from feeding people to nourishing people around the world

**Mission**: provide balanced nutrition by enhancing pulse perception as protein source that improves environmental sustainability

**Goals**: scale up private sector engagement in agriculture and nutrition, develop innovation in processing and manufacturing to allow pulses to enter the market
Pulse Convergent Innovation Roadmap (in progress)

• Product Development
  – An open innovation platform to boost pulse consumption worldwide on an economically sustainable basis.
  – Develop good tasting processed pulse foods with health/nutrition benefits at low cost
  – Innovation at multiple steps of processed food value chain
  – Utilize multi-sectoral partnerships

• Value Chain
  – Multi-stakeholder engagement to support small holder farmers with processing/production
  – Two regions with varying degrees of agro-ecological and development transition challenges: Bihar and Karnataka
  – Introducing agricultural innovations to increase yield
  – Institutional design experiments to increase productivity
Towards a Fruit & Vegetable CI Roadmap...
THE BUILDING BLOCKS
EU School Fruit Scheme

- Budget 90 M Euros
- Reaches over over 8 M children (25 %) of target in 54,267 schools
- FV demand increased by 43,730 tons in 2010/11 (0.06% total gross net supply)
- High level of cooperation between Ag, Health and Ed. at ground level
Learning from Innovation to fight micronutrient malnutrition

Supplementation

Commercial Fortification

Dietary Diversity

Biofortification

Biofortification is the name given to the process of enriching the nutrient content of plants as they grow. (Jeong and Guerinot, 2008).
The image is a map of a city with various locations marked. The map includes:

- **Farmers Markets** (yellow dots)
- **FFFI Supermarkets** (green dots)
- **Schools** (purple dots)
- **Recreation Centers** (red dots)
- **Corner Stores** (blue dots)

Additionally, there are high priority zip codes marked in pink, indicating poverty rates of 20% or higher. The map delineates different sections of the city, providing a visual representation of the distribution of these facilities.
Part of a comprehensive approach:

Food marketing strategies that may help parents, caregivers and youth select and purchase healthier foods and beverages at the grocery store.

Integrate these healthy food retail strategies into the business model of the supermarket and food industries.
Process, Partnerships and the TAKE 10!® Program: 10 Years of Learning
Innovation in Taste and Flavor has Multiple facets

- Biosynthesis
- Analytical Chemistry
- Food Science
- Brand

Resources/RM
Sustainable Planet
Shifting Demographics
Policy

Physiology/Sensory
Nutrition
Lifestyles/Social Habits
Behavioral Economics

THE INCLON TRUST
McGill World Platform for Health and Economic Convergence
jive HEALTH
HELPING CHILDREN EAT HEALTHIER.
Three Core Wholesome Wave Programs

Double Value Coupon Program
Incentives to leverage public nutrition benefits.

Healthy Food Commerce Investments
Capital and business development

Fruit & Vegetable Prescription Program (FVRx)
Integrated clinical/community intervention
Towards a FV roadmap...

...The Lego Strategy

• Starts with a deep understanding of food choice and human behavior to embed nutrition and health within other motives

• Taste and image – new partnerships to understand the role of taste, convenience, and image to increase fruit and vegetable consumption

• The importance of early intervention – reshaping food choice in pregnancy and infants

• Changing the choice architecture at home, in school, in community, in business, and in government
Towards a FV roadmap...

• Community development and local value chain innovation models for improving access to fruit and vegetables for all

• Linking local communities and value chains to state, national and global agriculture, food, and health practices and systems

• Innovative, sustainable and resilient finance

• Enabling norms, institutions and policies
From Aruba to Bruxelles and Copenhagen via Halifax, Delhi, Dhaka, Montreal, Washington, Geneva, and Mexico
Reframing the Conversation (London 2012)

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CIC 5-YEAR START-UP PLAN

Vision and concepts (innovation and convergence)

Elaboration and publication

Coalition-building for continuous convergent innovation

Innovative convergence metrics to inspire, assess and monitor value-added innovation and outcomes

Empirically-verified case studies/roadmap projects

Replication (efficacy; nutrition/health /development/ economic)

Scaling up, documenting effectiveness

Cost-effectiveness alternatives; value-added

Defined ‘how to’ (constraints, how overcome, what to do differently)

Synthesis of lessons; polycentric WoS guidance

Polycentric WoS translation

Study of sharing, uptake, leadership, governance, and other convergence innovation process

McGill World Platform for Health and Economic Convergence
The MWP combines the joint power of the best minds and leading organizations in private industry, health and social domains with the most recent developments in genetics, neuroscience, management and computational systems sciences.

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