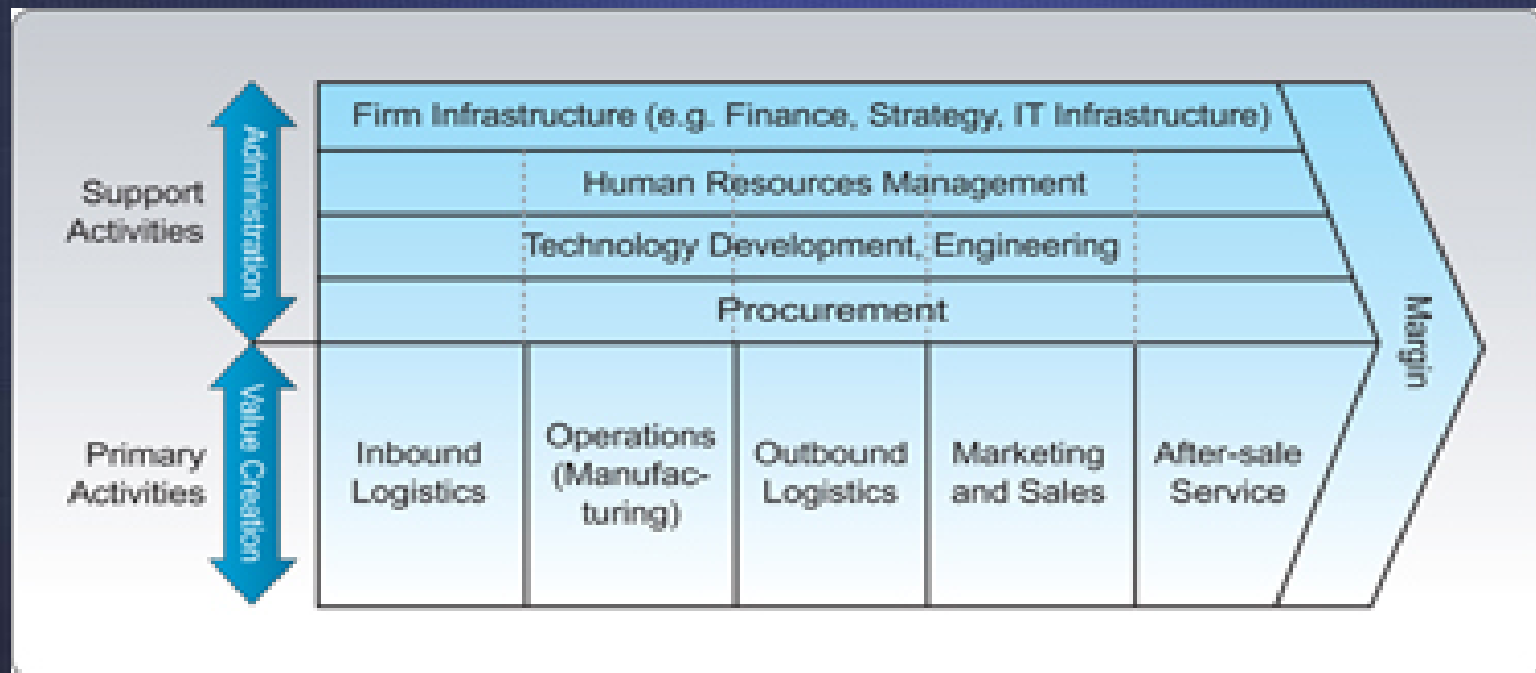


Fruit and Vegetable packaging research opportunities in the expanded and integrated value chain

Dr. Claire Koelsch Sand
Packaging Technology and Research
Presented to MSU's School of Packaging 2008

Linear model has evolved



Packaging as the center

- Common key drivers of \$, time in for all players
 - Sourcing raw material
 - Converting packaging
 - Packaging product
 - Packaging distribution
 - Disposal/reuse
- Links well with joint CSR activities

Topic Relevance

- Business world uses expanded & integrated value chain (EIVC)
- This is an opportunity for Packaging Research
- When package is at the center:
 - enables linkages between technologies
 - connects vertically integrated growers & market
 - raises users technical knowledge
 - enables profitability in increasingly consolidated markets

Topic Relevance

- F&V are more valued
 - Energy costs increase
 - Consumers demand variety
 - Retailers demand a 24/7 supply
- Evolved technology and decision making models presents an opportunity for packaging research dollars



The opportunities

- From the packaging center out
 - Sourcing raw material
 - Converting packaging
 - Packaging product
 - Packaging distribution
 - Disposal/reuse

Opportunities for research expansion-sourcing

- Assess overall efficacy of packaging in preserving food for consumers
- Assess producing packaging in area of product growth importing packaging
 - mangoes-India, coffee-Rwanda vs a
 - blueberries, cherries-MI & Chile
- Enabling industrial development may outweigh initial costs
- Naturally Iowa's tagline “We Milk the Cows and Grow the Bottles!”

Opportunities for research expansion-sourcing-continued

- Expand global distribution of more F&V with packaging research that:
 - Identifies unique/indigenous material sources
 - Addresses sustainability of material sources
 - Develops ethylene adsorbers-beyond potassium permanganate
 - Assesses antimicrobials efficacy
 - Beyond silver ion, isothiocyanate, etc
 - Essential oils-clove, carvacol, thymol
 - Explores tracking and nano size biosensors

Opportunities for research expansion-converting

- Research opportunities in:
 - Refining concepts into commercialization
 - Leveraging MSU SOP
 - Incorporating packaging into new Horticulture CRSP and similar initiatives
 - Employing packaging to formally link market to growers
 - Naturipe

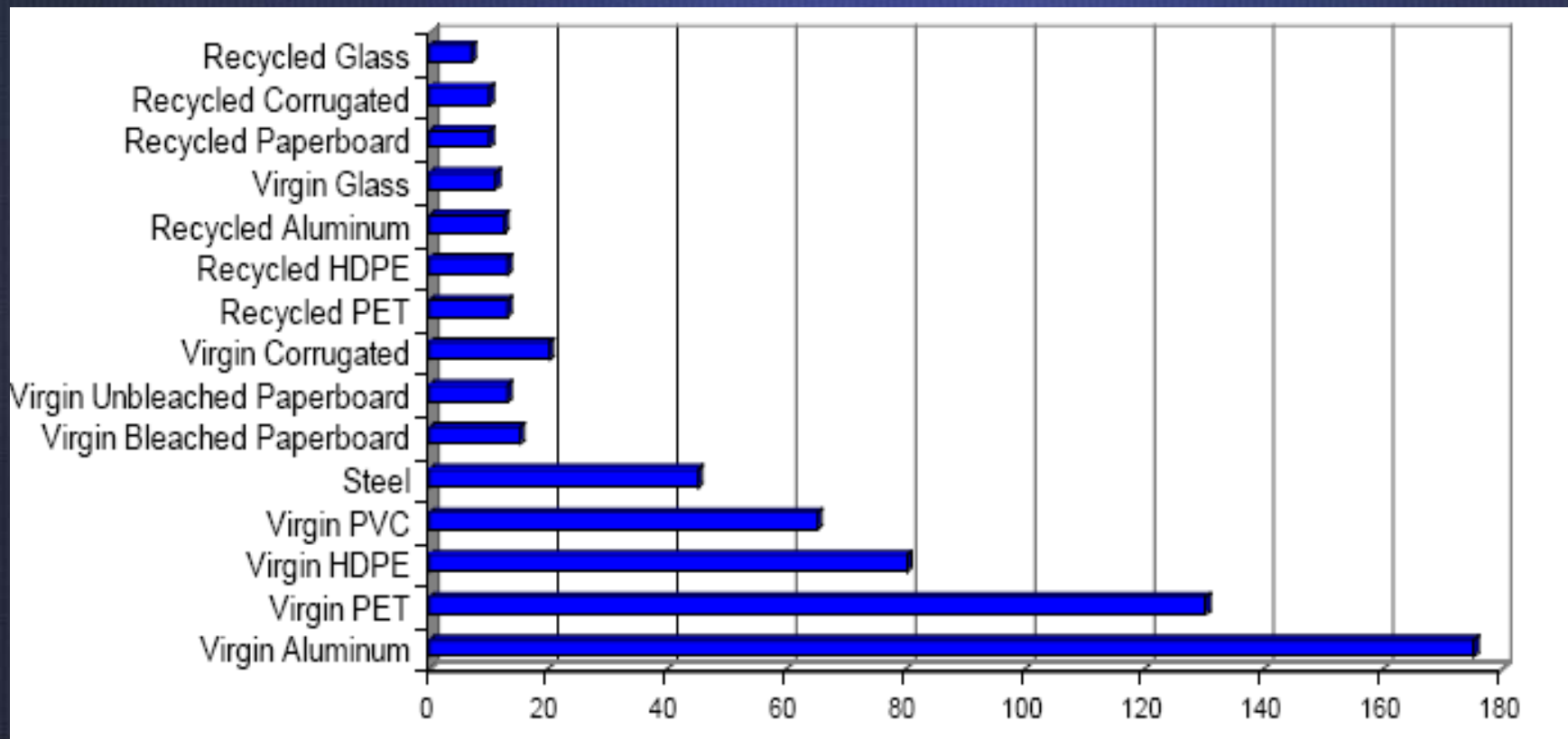


Opportunities for research expansion-converting-continued

- Allow for more ID and effective converting with packaging research that:
 - Explores new extraction technologies of new materials
 - With fibers, adhesives, etc
 - Identifies consistent processing methods
 - New materials, new processes
 - Addresses country specific environmental situations

Opportunities for research expansion-converting-continued

- Environmental situations
 - Energy to produce each gram of material

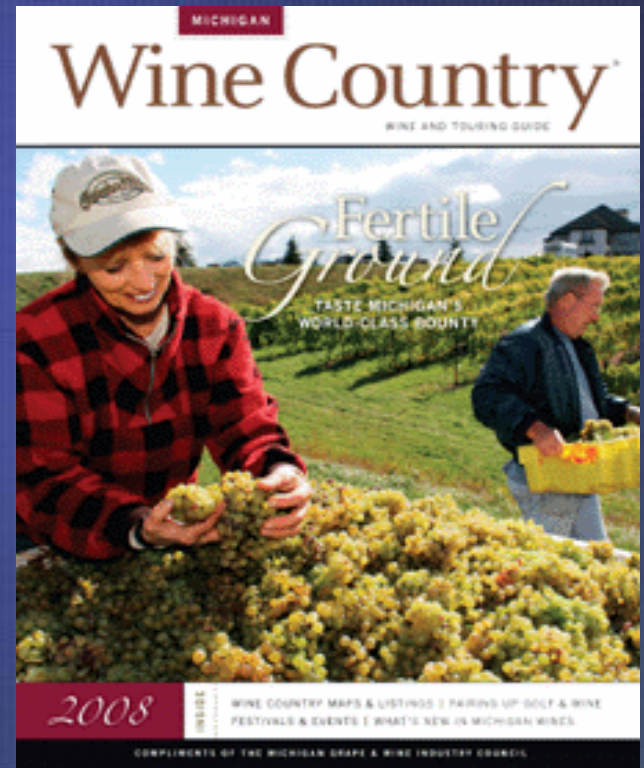


Opportunities for research expansion-converting-continued

- Research on environmental issues:
 - Explores costs of technology & resources
 - Conducts package LCA/LCIA
 - Develops sector based strategies
 - Enables sustainability
 - Creates infrastructure
 - e.g., Madagascar

Opportunities for research expansion-packing

- Packaging research can make operations more sustainable:
 - Enables technology infusion in facilities
 - Wines in MI infused with technology from MSU
 - Collective promotion strategy
 - Selling outside MI law change
 - Speciality coffee in Rwanda
 - Packaging makes wine distinctive
 - returnables, recyclables?



Opportunities for research expansion-packing-continued

- Research that addresses what adds package value in:
 - Level of convenience
 - Size, package type
 - Easy environmental disposal options
 - Added nutrition
 - Shelf life offered and how
 - patents
 - Product variety-heterogeneous food mixes
- for a competitive edge of only at “_____”

Opportunities for research expansion-distribution

- Research that explores how to compete against global sourcing with concentrated suppliers
 - Forge relationships via packaging
 - Attain preferred supplier status via packaging
 - Compete with global distribution of Sysco, Ahold, McDonald's

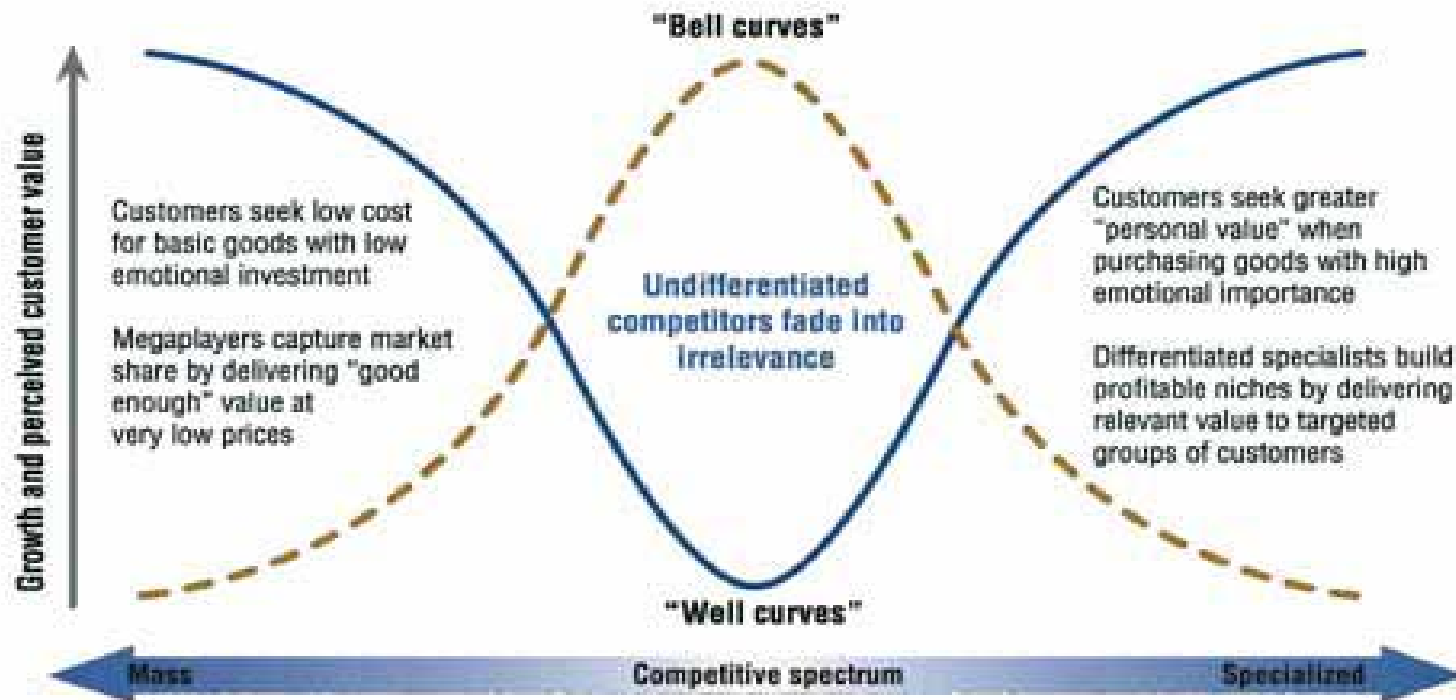
Opportunities for research expansion-distribution - continued

- Distribution research in QSRs:
 - Pizza Hut mushrooms
 - McD's apples
- Market food packaging safety
- GHA (2006)
- Distribution research depth of Burgess, Singh, Twede

Opportunities for research expansion-consumers/retail

- Consumer/market directed research on switching:
 - Package design
 - F&V designed for single serve market
 - F&V in ageing market
 - Peeling grapefruit>opening jar
 - How to add value with customization
 - Global opportunities in “flexible” packaging

Opportunities for research expansion-consumers/retail - continued



Source: IBM Institute for Business Value analysis, 2004.

Wal-Mart
Target
Hyundai

Montgomery Ward
Traditional Retailers

Bath & Body Works
Whole Foods
Starbucks
Ferrari

Opportunities for research expansion-end use

- Research that responds to LOHAS need for environmental disposal of packaging
 - Addresses disposal in country of origin & sale
 - Facilitates connecting consumers to disposal
 - Links back to sustainable sourcing

Net

Integrated & Expanded Value Chain offers many packaging research opportunities and sources for funds

Thank you

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