

## “Green Revolution – Phase II”

Two Adjustments

### Green Revolution – Phase I

- \* High-Yielding Varieties of Wheat, Rice & Maize
  - \* Increased Productivity leads to Hunger Abatement and release of Labor to Modern Sector

### Green Revolution – Phase II

- \* Introduce Horticulture Crops-Fruits & Vegetables
- Stimulate Value-Added Processing *in situ* –
  - *Textiles, canneries, tanneries, dehydration, etc.*

## Limitations of HYV Grain Strategy

- Successfully introduced in Asia, especially India
- Limited success in Latin America with maize – no more than 3 tons per hectare on small farms in mixed cropping systems.
- Even less success w/wheat & maize in Africa – drought and timing of rains conditioned use of fertilizers and selection of these crops, often giving way to sorghum and drought resistant legumes such as pigeon peas and cowpeas.

## Low-Productivity Trap

### *What is it?*

- Grains yields of a couple tons/ha, coupled with low prices, generate less than \$1,000/ha. When imputed input costs are subtracted, net incomes are less than \$500/ha, and often less than \$200/ha under rain-fed conditions.
- These incomes prohibit investments in new infrastructure, and fail to provide sufficient incomes to recover from crop failures.
- They are caught in the low-productivity trap.

## An Alternative Strategy

- The Green Revolution showed that an agriculture-led strategy could be the engine for economic growth!
- But this locomotive needs some streamlining, it needs to add some accessories to make it more jet-propelled.
- To reach the Millennium *Challenge Goals* we need to increase the per hectare impact and the impact per crop or product.

## These adjustments I call the “Green Revolution – Phase II”

- Adjustment 1 - Shift from low-value crops to high-value crops; from grains to horticulture.
- Adjustment 2 - Promote value-added processing *in situ*, in the location of the production.

# Adjustment 1

## Shifting to Horticulture Crops

## Is this feasible?

- Green Revolution Strategy
  - introduction of HYV seeds, adaptive field trials, extension campaigns.  
(I helped develop this strategy in Colombia, Kenya and Mexico)
- Propose to use the same methodology for Horticulture, but add extensive interventions in marketing
  - cold storage, packaging, market information, production timing.  
(This I have done in Colombia, Kenya, Bangladesh, Egypt, Ecuador, Costa Rica, Georgia, Armenia, Afghanistan, Bolivia, The Gambia, and many others)

## Shifting to High-Value Crops

- Research in 8 countries over last 6 years reveals high returns to over 30 crops across all continents and diverse settings.
- Experience in several other countries supports conclusions.
- Analysis of results are *dramatic* and *startling*.

## Crop Budgets and Production Profiles

- Net income returns to wheat, maize and rice are roughly \$200 to \$500 per hectare.
- Net income returns to over 30 horticulture crops range from \$1,500 to over \$5,000 per hectare.
- Results taken from Colombia, Ecuador, Bolivia, Egypt, Kenya, Afghanistan, Bangladesh, Uzbekistan, Nepal and two ACDI/VOCA projects in Georgia and Armenia, where current work continues.

In Addition....

Analyses Show that Horticulture Crops  
are only possible alternative to drug  
crops - coca & poppy!

Secondly....

It has been demonstrated that  
horticulture crops can act as nutrition  
intervention tool for protein, calories  
and Vitamin A!

## How do we collect & analyze the data?

### Crop Budgets

- Land Preparation
- Seeds/Planting  
Materials
- Fertilizers
- Pest & Disease  
Control
- Weeding & Cultivating
- Watering/Irrigating
- Harvesting/Packaging

### Competitiveness Profiles

- On-farm Storage
- Cold Storage
- Sorting/Packing
- Transporting
- Wholesaling
- Distribution
- Exporting

## Calculating Costs of Production Quantity & Value ( $Q \times Px$ )

- Land Costs
- Material Inputs\*
- Labor Costs\*
- Water Costs
- Packaging\*
- Taxes
- Levies
- Quantity Produced
- Grading (% Grade A, B, etc.)
- Farm-gate Price
- Wholesale Price
- Retail Price
- Export Price

\* Costs included

## Deducing Labor Costs Deriving Net Income

- Family Labor – imputed wage rates
- Hired Labor – at actual wage rates
- Calculation of Net Incomes  
Total Revenue – Material Inputs & Labor Costs
- Net Incomes plus Labor Incomes  
Net Income plus the imputed costs of labor
- Returns to Factors ( $> Px$ )  
Land, Labor, Capital =  $TR - (TC - \text{Factor}) / \text{Factor}$

## Comparison of Costs

- Total Input Costs excluding Labor, similar across regions:
  - per hectare costs range from \$500 to \$2,000, depending on the cost of seeds, the amount of fertilizers used & degree of crop protection employed.
- Labor Costs, vary significantly:
  - Family labor costs are imputed at the local wage rate
  - Wage rates vary significantly =
    - Georgia \$5.50/workday
    - Egypt \$2.00/workday
    - Armenia \$9.00/workday
    - Bolivia \$4.00/workday
    - Afghanistan \$3.00/workday

## Labor Use per Hectare/Season varies by crop

- Wheat, Maize = 50 workdays
- Rice = 150 workdays\*
- Cotton = 120 workdays
- Potatoes = 105 workdays
- Fruit Trees = 60-100 workdays
- Annual Vegetables = 150 – 400 workdays
- Annual Fruits (berries) = 200 - 400 workdays
- Greenhouse Production = 1,000 workdays

## Seasonality

- Staple grains are usually grown once per year (maize in Caqueza takes 10 months)
- Annual fruits and vegetables can be grown 2-3 times per year, depending on local conditions
- If seedlings are grown under protection in greenhouses or tunnels, vegetable production can increase to 3 or 4 times per year.

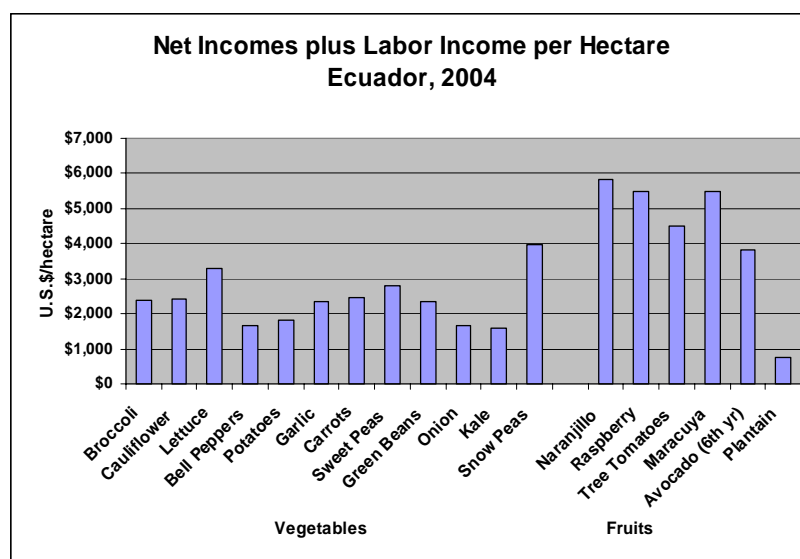
## Notable Experiences

- Caqueza Project, with IDRC in Colombia;
- Green Beans with KEDS in Kenya;
- Beans & Vegetables with World Bank in Mexico;
- Snow Peas, Broccoli, Cauliflower in Guatemala;
- Over thirty vegetables, spices, & fruits in Egypt;
- Over thirty fruits & vegetables in Afghanistan;
- Fruit trees in Georgia, Uzbekistan and Armenia;
- Forty coca-substitute crops in Bolivia;
- Thirty-five coca-substitution crops in Ecuador;
- Greenhouse vegetables in Georgia & Armenia;
- Hortex formulation in Bangladesh.

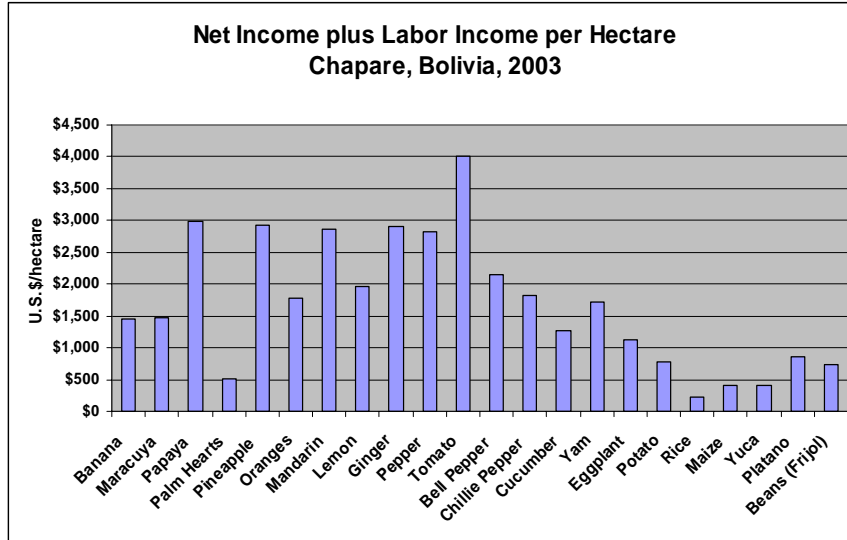
Now, let's take a look at the results from several countries.

- Ecuador, Bolivia, Afghanistan, Georgia, Armenia

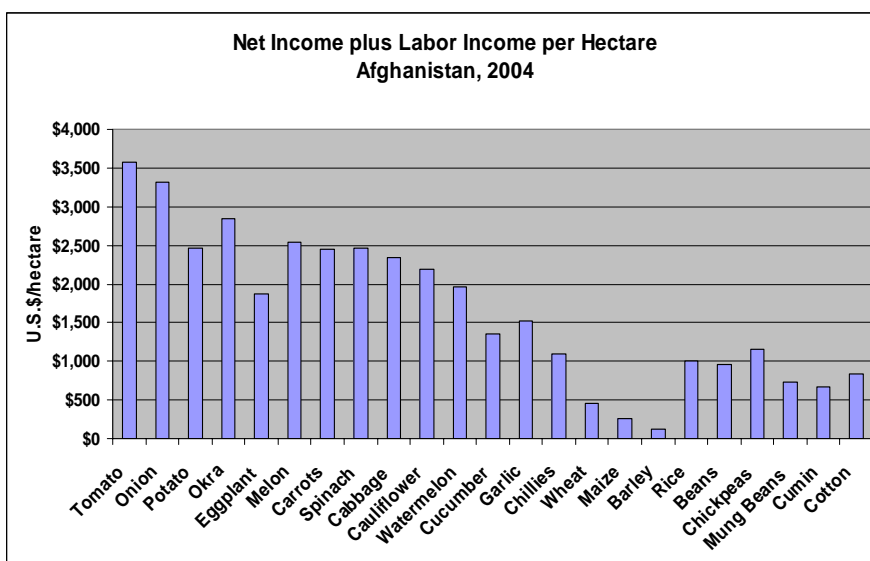
## Keeping Coca out of Ecuador



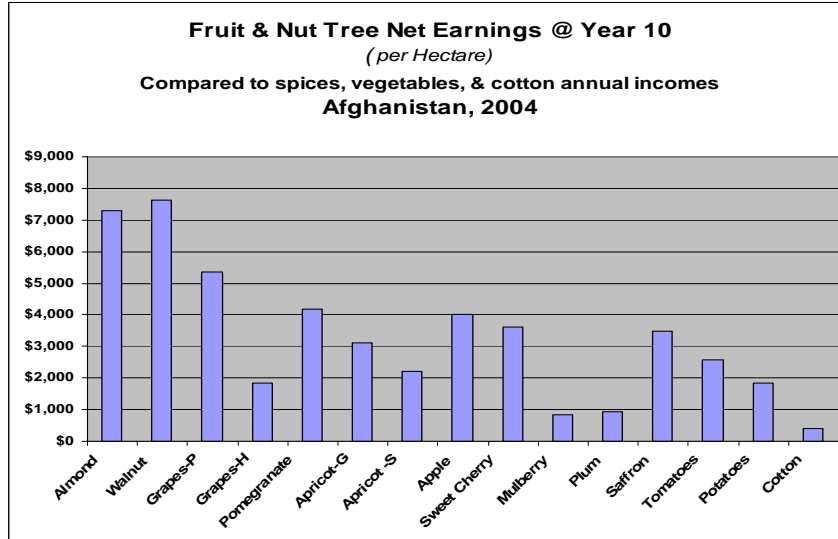
## Substituting for Coca, Chapare, Bolivia



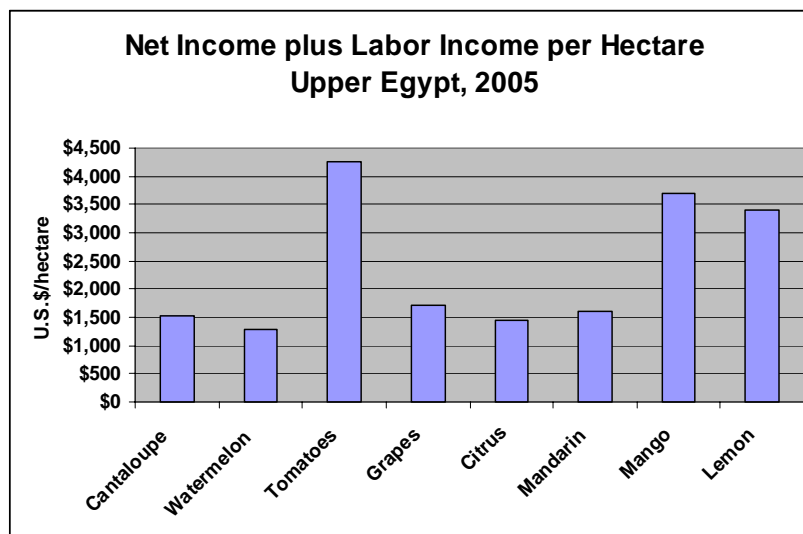
## Alternative to Poppy in Afghanistan



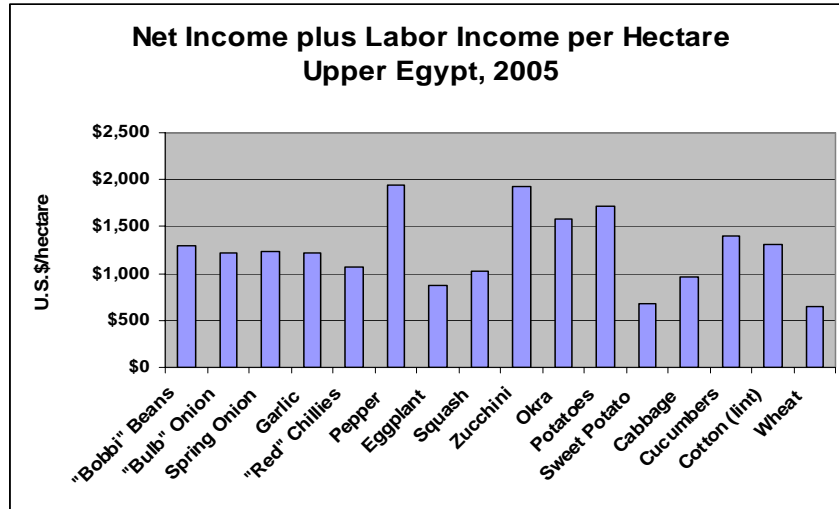
## Fruit & Nut Trees in Afghanistan



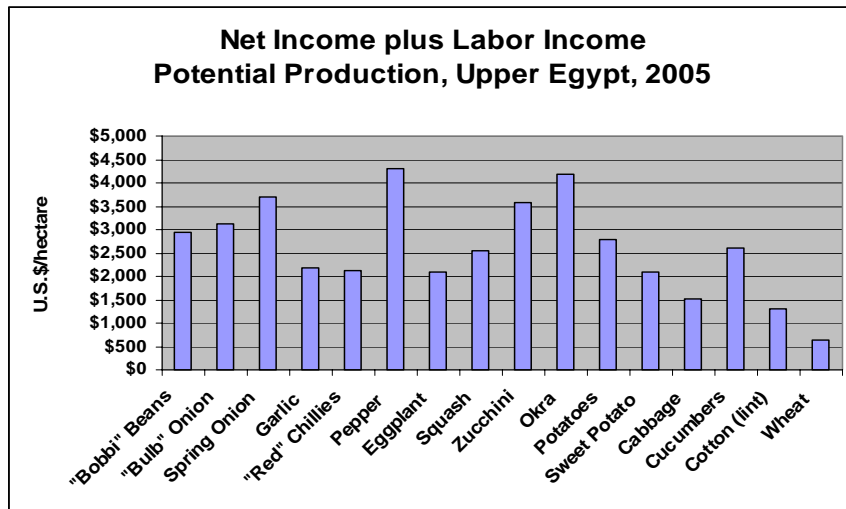
## Bringing Fruit Product'n to Upper Egypt



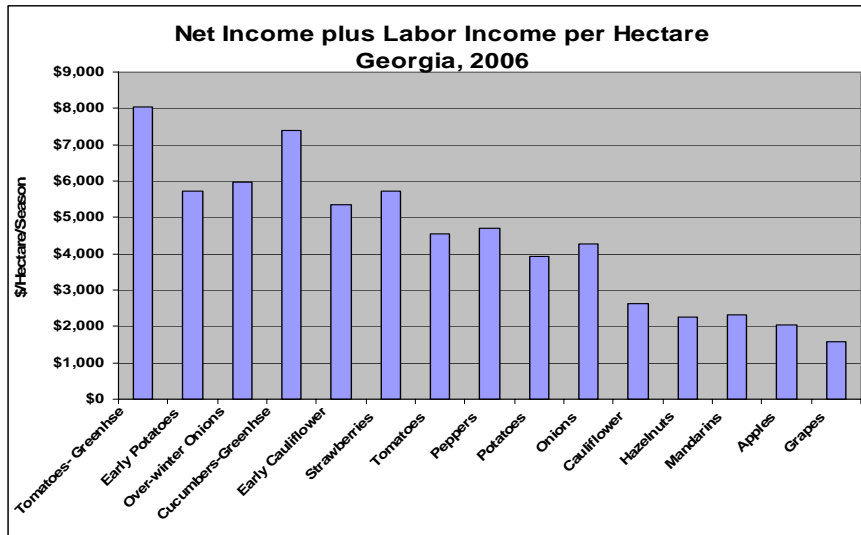
## Bringing Vegetables to Upper Egypt – Current Production Level



## Bringing Vegetables to Upper Egypt – Potential Production Level

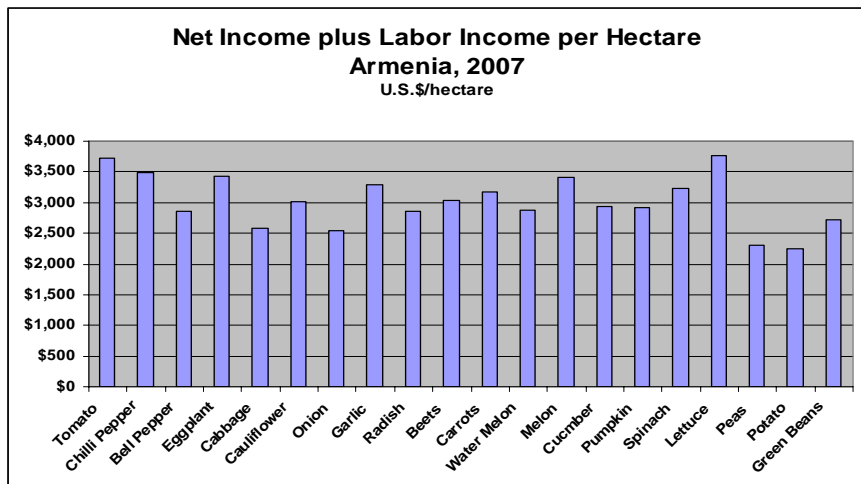


## Diverting Sales to EU in Georgia- ACDI/VOCA AgVANTAGE Project



## Shifting from Wheat to Horticulture in Armenia

- ACIDI/VOCA Millennium Challenge Account



## Adjustment 2

Promoting Value-Added Processing *in situ*,  
in the location of production

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*Cotton textiles, glass & can canneries,  
leather, sheep, goat & animal skin tanneries,  
fruit & vegetable dehydration, fruit &  
vegetable freezing, pickling, wool scouring,  
cashmere spinning, turning flax into linen, silk  
spinning, stone cutting, vegetable seed  
milling, milk processing – cheese, cream,  
butter, liquid milk, ghee, drinks – coffee, tea,  
cocoa, juices, cold storage – pre-cooling and  
long term, ..... and the list goes on!*

## The Most Eye-Opening Case!

- Egypt produces the “best” cottons in the world – the *barbadense* cottons, a long staple, extra soft and fine cotton fiber.
- BUT, they process only a portion of it – most of it is processed here in India, or in Pakistan or Turkey, even Switzerland.
- AND the value is in processing not growing!

## Failing to take *advantage of comparative advantage*

- Buying an Egyptian Cotton trade-marked towel made in Turkey shows how Egypt has failed to take advantage of their comparative advantage of their *barbadense* long staple cotton:
- Farm-gate price of cotton in Egypt = \$1.89/kg
- Price of cotton lint FOB Alexandria = \$2.64/kg
- Price of cotton lint CIF London = \$2.92/kg
- Price of yarn, FOB Egypt = \$3.36/kg
- Price of cloth, Egypt = \$5.00/kg
- Dyed & finished garments = \$8 to \$10 (medium count yarns)
- Dyed & finished garments = up to \$30/kg (high count yarns)

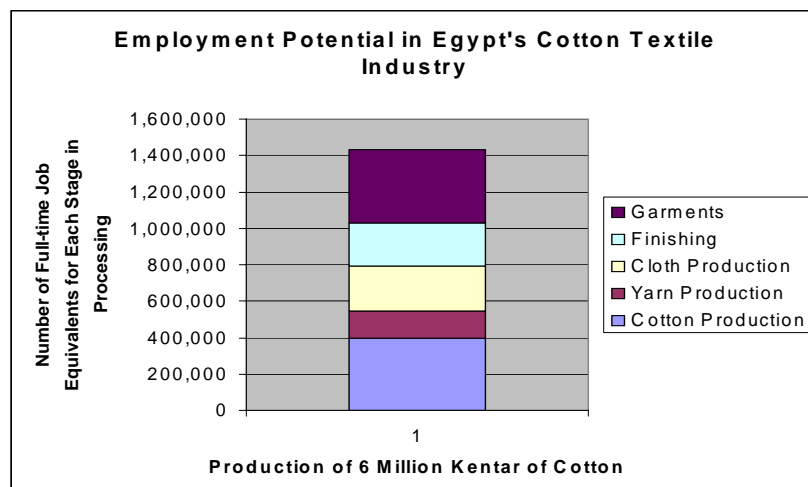
## Creating “Competitive Advantage”

- One could argue that Egypt does not have the ability to create the required “competitive advantage” needed to process their “comparative advantage” cottons.
- Not True – they have 22 older factories, many of which currently produce high quality yarns and cloth.
- They have several new factories for spinning and weaving and dyeing yarn and cloth.
- Yet in their 100’s of cut and sew operations, they contract with name brand foreign firms to make garments out of imported low count, short-staple cottons.

**Why?**

## What would be the Impact of Putting those Factories to Work processing all the Egyptian Cottons?

**Over 1 million jobs!**



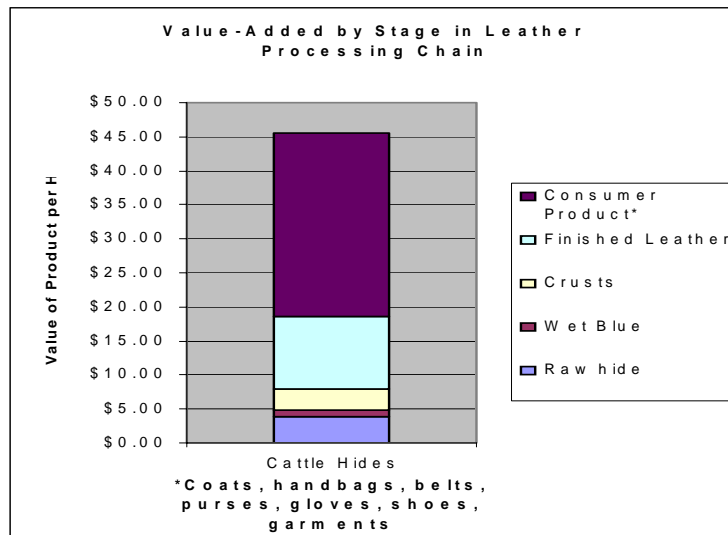
## The Situation is even more Tragic in Afghanistan

- The Gulbahar Factory outside of Kabul remains idle, although it is in near mint condition, can process 24 tons seed cotton per day, could employ 20,000 people (7,000 spinning & weaving, 13,000 RMG), and could absorb 7,000 tons lint cotton (out of 13,000 tons currently produced).
- A similar but smaller factory is located in the poppy area of Kandahar (3,000 tons, 10,000 employees).

## Once Again in Afghanistan

- 10,000 skins/hides available per day and NO tanneries? (Salted & dried skins are sent to India and Pakistan for tanning)
- If raw hide costs \$4, then wet blue is \$5, crusted leather \$7, finished leather \$18 and handbags/garments \$45. (Prices from Armenia, 2002)

## Prices for Different Stages in Leather Processing



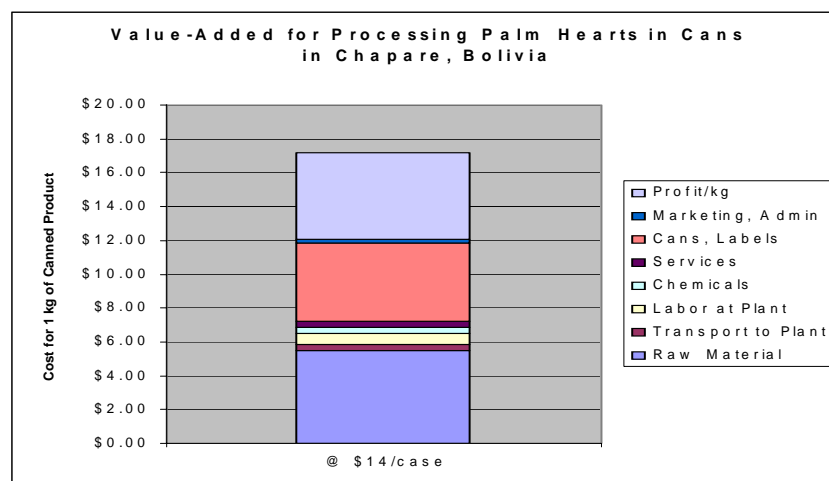
## Other Textiles

- Scouring of wool for spinning, weaving & RMG's.
- Silk cocoons for wet spinning/weaving, RMG's.
- Cashmere, collected w/o combing of long hairs, for scouring, spinning/weaving, RMG's.
- Flax retting to produce hackled tows.
- Linen spinning/weaving & garments w/blends.
- 3 employees in processing for 1 in production.

## Horticulture Products

- Processing facilities exist everywhere
  - “I have not visited a country that doesn't have them, albeit they may be in disrepair!”
- Canned goods in whole or in pieces, gourmet jarred mixes, pickles of all types in brines and salts, fruit compotes, sauces and spreads.
- Drying, dicing, dehydrating, freezing, juicing, pouching.
- 1 employee in processing for 4 in production.

## Canning Palm Hearts in Chapare, Bolivia



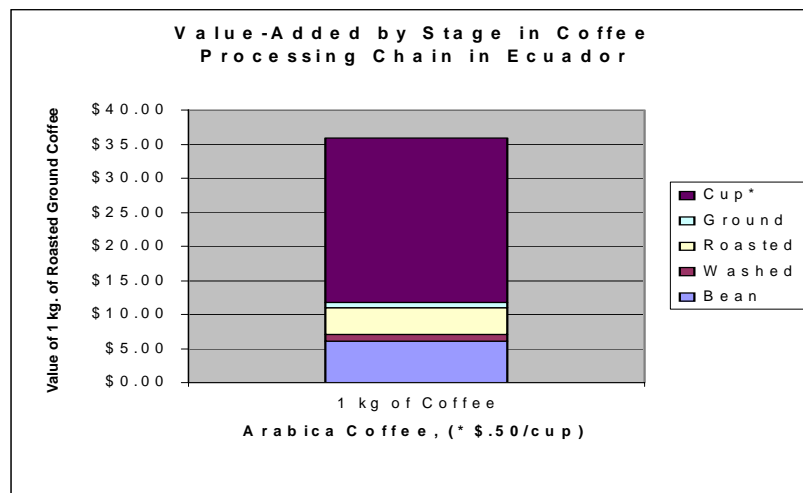
## Specialty Drinks

### Coffee, Cocoa and Tea

- Kenya makes Brooke Bond tea
- Colombia makes Juan Valdez roasted coffee
- Jamaica makes Mountain Blue coffee

“But most countries send their coffee and cocoa beans to other countries for processing!”

Fair Trade = 20% increase for farmer;  
Value-Added Processing increases farmer's  
income 2 - 3 times!



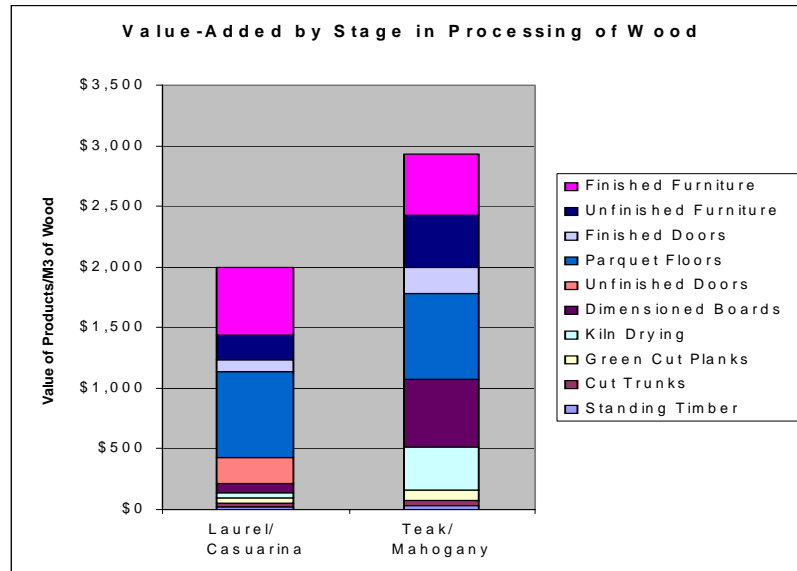
## Wood Products

- Farmer's in Ecuador receive \$8/cubic meter of standing timber; 15 truckloads of trunks leave Chapare, Bolivia daily for \$15/cubic meter.
- Doors in Quito, Ecuador and La Paz, Bolivia sell for \$600/m<sup>3</sup>, tongue & groove/parquet flooring for \$1,000/m<sup>3</sup>, and furniture for \$3,000/m<sup>3</sup>. Europe & U.S. prices are double these amounts.

Can finished wood products be made in developing countries?

- “Of course, with proper kiln drying, carpentry shops can manufacture the whole range of doors, windows, flooring, and furniture – my partners have done it in China, Bolivia, Peru, Mexico, Costa Rica, and Cameroun, and are now planning to set up shop in Gabon and Equatorial Guinea.”

## Value-added in Wood Processing



## How to Finance Tree Production?

- “Tree Bonds” can *annualize* the income from future cash flows, i.e. provide income up front and during the growing period.
- Concept pioneered in India with Teak, Sevan, & Mangoes.
- Currently working in Costa Rica, Bolivia, Colombia, Ecuador, & Egypt.
- Poised to start in Afghanistan, Armenia.

- The list goes on and on ....ceramics, stone cutting, vegetable oils, nuts, spices, herbs, flowers, ornamentals, and many industrial crops – palm oil, rubber, grain milling, ...
- Value-added processing *in situ* expands farmer and regional incomes several fold.

## Conclusions

- The “Green Revolution – Phase I” set the stage for using agriculture as the engine for growth to produce a surplus of grains, to provide higher incomes to poor farmers, to provide employment for the modern sector and to create an intervention strategy that has served the world well in addressing the issues of hunger and poverty. That strategy now needs retooling to move into the new Millennium.
- This paper makes a case for shifting from grain crops to horticulture crops as the main focus of the crop targeting, and to add value to all agricultural products at the point of origin in order to obtain the full value of their natural raw material resource. These two new thrusts become the “Green Revolution – Phase II”.