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Domestic Resource Cost Analysis Workshop

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Rigorous Analysis for Agricultural Interventions

Training Workshop on
Domestic Resource Costs
June 22-23, 2011



Overview

With Examples from Azerbaijan



What is the Domestic Resource Cost Indicator?

- Can buy and sell at relatively constant prices on international market without limit, creating opportunity for local value added, which is the value of output minus the value of tradable inputs, e.g., value of wheat minus value of fertilizer, agricultural chemicals, fuel, etc.
- But domestic resources to produce output, such as labor, capital, and land, are limited
- How allocate these scarce resources most efficiently to get most value added, i.e., GDP



What is Domestic Resource Cost Indicator?

- Indicator of efficiency with which a country's domestic resources (labor, capital, land) are converted into output measured as value added at world market prices

$$DRC = (\text{Labor} + \text{Capital} + \text{Land}) / \text{Value Added in Pw}$$

- DRC is a cost/benefit ratio, with costs in numerator and net benefits in denominator
 - If $DRC < 1$, domestic resources used less than value added created = comparative advantage
 - If $DRC > 1$, domestic resources used greater than value added created = comparative disadvantage



What Does DRC Analysis Tell Us?

- Specific with respect to "value chain", defined as
 - Location and mode of production
 - Mode of collection from location of production to that of processing
 - Location and mode of processing
 - Mode of distribution from location of processing to that of final sales
- Differs from sub-sector, which normally comprises a number of value chains
- Calculates financial and economic profitability, as value of sales minus costs, for entire value chain and at each stage



What Does DRC Analysis Tell Us?

- Difference between financial profitability (market prices) and economic profitability (shadow prices reflecting real opportunity costs) often a measure of policy distortions (e.g., taxes, subsidies, trade barriers, exchange rate distortions)
- Expresses economic profitability in ratio form as DRC, which is a measure of underlying comparative advantage
- Differs from competitive advantage, which more closely related to financial profitability plus other competitive factors, e.g., quality, timeliness
- Link between comparative costs and incentives



Where is DRC Analysis Useful?

- Four levels of analysis to identify value chains in which to intervene and types of intervention
 1. Qualitative analysis of subsectors to identify those in which there is revealed comparative advantage, market potential, willingness to change, potential impact on income and employment, removable constraints, and strategic direction
 2. Quantitative analysis at DRC level of subsectors identified in (1) to determine the ranking of their potential financial/economic profitability and sustainability
 3. Detailed quantitative analysis at DRC level of most highly ranked subsectors in (2) to identify specific value chains and interventions that likely yield best results
 4. Cost-benefit or internal rate of return analysis where specific investments are very large, timespan is long, etc



Where is DRC Analysis Useful?

- Examples from Azerbaijan
 - Initial selection very broad: 36 subsectors
 - DRC analysis permitted grouping into
 - Exported fresh and processed apples, cherries, persimmons, pomegranate, greenhouse vegetables, tomato paste, early potatoes, hazelnuts, kiwi, feykhoa
 - Exported manufactures (carpets)
 - Competitive import substitution (grapes, rice, maize, animal feed, waste management, catering services)
 - Mixed or uncompetitive import substitution (wheat, barley, poultry, dairy, meat processing, furniture, building finishes, protective clothing, packing materials, computer assembly)



Where is DRC Analysis Useful?

- Examples from Azerbaijan
 - Detailed analysis of subsectors chosen for intervention
 - Apples and pomegranates (fresh fruit, juice, concentrate)
 - Improved grading, sorting, and packing for different markets
 - Investment in HAACP certification to sell concentrate to USA
 - Aquaculture
 - Expanding market for cold-water species
 - Deep freezing for warm-water species
 - Dairy
 - Optimum size and location of processing plant and milk collection center
 - Poultry
 - Medium-size farms upcountry versus large farms for Baku market
 - Impact of high trade protection of poultry and dairy



Objectives of the Workshop

- Demonstrate quantitative analysis used to evaluate financial and economic profitability of value chains, with application to Azerbaijan
- Practical exercise in financial and economic profitability analysis
- Compare analyses based on
 - Financial and economic profitability
 - Cost-benefit ratio
 - Internal rate of return
 - Domestic resource cost



Objectives of the Workshop

- Show relationship between domestic resource cost (DRC) and measures of trade protection
- Extend profitability analysis of value chains to analysis of nominal and effective protection and domestic resource cost
- Practical DRC exercise
- Extensions of DRC analysis
- Steps in undertaking DRC analysis
- Case studies of Liberia and Azerbaijan



DRC Methodology

With Practical Exercises



Financial Profitability

- Capital recovery factor used to calculate annual cost of capital (depreciation + cost of tied up capital), given initial capital cost, service life, and interest rate (same as annuity payment PMT in Excel)
- Have to adjust for different units over value chain as sum costs at each stage
 - Agricultural production per hectare
 - Processing ratio for converting paddy into rice
 - Capacity utilization of fixed plant and equipment
- Important to avoid double counting, e.g., paddy purchase as cost of processing

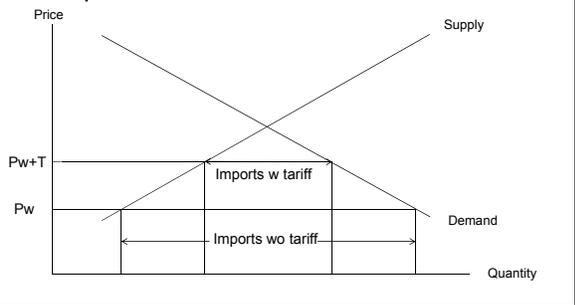


Financial and Economic Profitability

- Difference between financial and economic profitability
 - **Taxes:** financial cost = economic cost + tax
 - VAT of 18% raises price of chemicals from 10 to 11.8 AZN/l
 - **Subsidy:** financial cost = economic cost – subsidy
 - Government furnishing irrigation infrastructure lowers annual cost to farmer from 2000 to 0 AZN/Ha
 - **Import taxes and quantitative restrictions** raise prices of imported inputs and final products: financial cost or price = economic cost or price + import tax or import tax equivalent (in case of quantitative restriction)
 - Domestic price = world price + tariff (or tariff equivalent)
world price + tariff rate X world price



Import Taxes and Quantitative Restrictions





Financial and Economic Profitability

- Other differences between financial and economic profitability can include
 - Shadow prices of land, labor, capital, and foreign exchange
 - Effects of externalities
 - Influence of monopoly
 - Non-economic objectives such as employment generation, income distribution, etc. Requires weighting these in relation to income.
- In practice, the basis for these adjustments is relatively weak, except for shadow pricing capital and foreign exchange



Financial and Economic Profitability

- In following example from Azerbaijan
 - Difference between financial and economic costs resulting from indirect taxes and subsidies, e.g., VAT
 - Financial cost = economic cost + tax (or minus subsidy)
 - Difference between domestic price and border price (CIF or FOB) resulting from trade policy (tariffs, export taxes, non-tariff barriers)
 - Domestic price = border price + import tariff equivalent (or minus export tax equivalent)
 - Breakdown into tradable and nontradable costs based here on type of input
 - Breakdown into tradable and nontradable costs required to calculate DRC and important if have serious distortions in exchange rate



Financial and Economic Profitability

Rice Production in Astara, Processing in Lankaran, and Sale in Baku (AZN)

Input	Financial Cost	Taxes & Subsidies			Economic Cost		
		Total	Tradables	Nontradables	Total	Tradables	Nontradables
Farm							
Irrigation infrastructure	0	-235	0	-235	235	0	235
Tractor operations	640	0	0	0	640	640	0
Fertilizer	30	-60	-60	0	90	90	0
Harvesting and threshing	150	0	0	0	150		150
Total/ha	820	-295	-60	-235	1115	730	385
Farm Sales/ha	900				900		
Farm Profit/ha	80				-215		
Farm Cost/kg paddy	0.273	-0.098	-0.020	-0.078	0.372	0.243	0.128
Farm Profit/kg paddy	0.027				-0.072		
Collection	0.020	0.000	0.000	0.000	0.020	0.020	



Practice Exercise: Financial and Economic Profitability

- What is the on-farm profit per hectare in financial and economic terms?
- What is the on-farm profit per ton of shelled maize in financial and economic terms?
- What is the total cost per ton of shelled maize of the value chain in financial and economic terms?
- What is the total profit per ton of shelled maize of the value chain in financial and economic terms?
- What is the rate of import taxation?



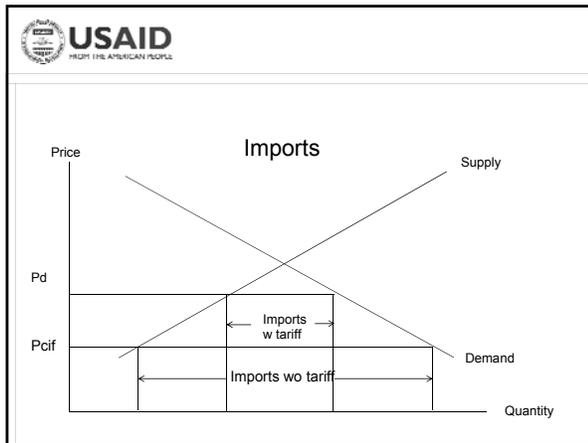
Practice Exercise: Financial & Economic Profitability of Maize Production - USD

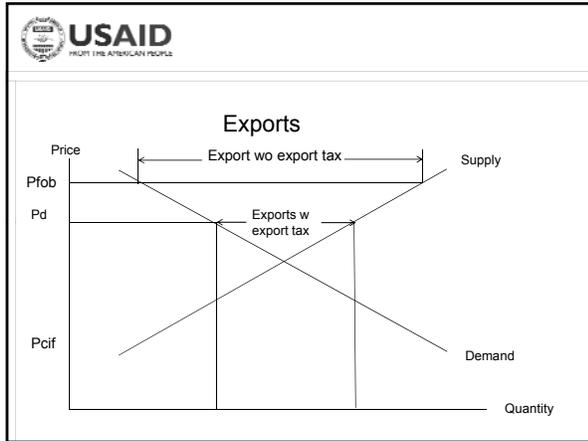
Input	Units	Nr Units	Unit Price	Financial Cost	Taxes/ Subsidies	Economic Cost
Labor	day/ha	120	2	240	0	240
Fertilizer	tons/ha	0.2	500	0	-100	100
Total/ha				240	-100	340
Farm Sales/ha	ton/ha	2	150	300		300
Farm Profit/ha				60		-40
Farm Cost/ton maize				120	-50	170
Farm Profit/ton maize				30		-20
Milling (shelling)	tons	1	20	20		20
Distribution	tons	1	30	30		30
Total Cost						
Farm	ton	1		120	-50	170
Milling	ton	1		20	0	20
Distribution	ton	1		30	0	30
Total				170	-50	220
Final Sales	ton	1		200	40	160
Profit	ton	1		30		-60

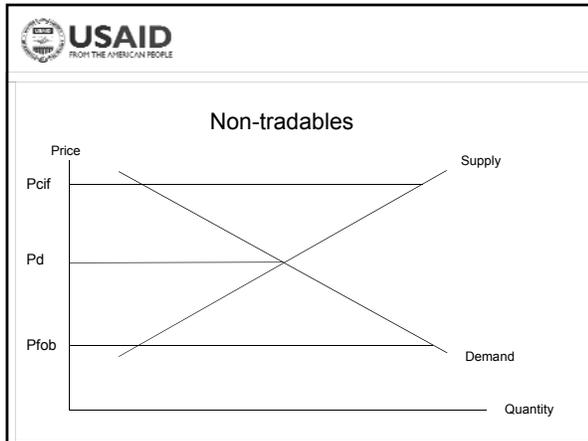


Financial and Economic Profitability

- Importance of international prices
 - Serve as standard of valuation for exports and imports
 - Given price in major world market P_w , border price given by
 - $P_{cif} = P_w + \text{Transport Cost for imports}$
 - $P_{fob} = P_w - \text{Transport Cost for exports}$
 - Direction of trade determined by relationship between border price and domestic price in absence of trade
 - If $P_{cif} < P_d$, country imports
 - If $P_{fob} > P_d$, country exports
 - If $P_{cif} > P_d > P_{fob}$, product is considered to be non-tradable
 - Domestic prices determined by world market prices and trade taxes or subsidies for imports and exports, and within world price band for non-tradables









Financial and Economic Profitability

- Transport costs act as a form of natural protection
 - For any product, but especially for bulk commodities, $P_{cif} > P_{fob}$, reducing tradability
 - Implies that the prices of goods that are expensive to transport in relation to their value are not closely related to world market prices, e.g., root crops, houses
 - Transport costs protect internal markets compared with those in ports
- Differences in quality also limit substitutability, and thus price relationships, between goods produced domestically and those that are traded



Financial and Economic Profitability

- Limits to Profitability Analysis
 - Profits are determined in relation to some arbitrary unit, e.g., kilogram of rice. Allows comparison between regions, techniques, etc for the same product but not comparisons between products
 - Can express profits in relation to sales, but this does not take into account difference in rates of turnover
 - Profits not defined in relation to value of scarce resources used, so no guide to the allocation of these resources



Alternatives to Financial and Economic Profitability

- Benefit/Cost Ratio = Final Sales/Total Costs
 - Can express either in financial or economic terms
 - Can make all the adjustments referred to earlier, e.g., shadow prices, externalities, monopoly, non-economic objectives
 - Although costs are in the denominator, these do not reflect the value of only scarce inputs since some costs incurred by importing inputs, e.g., fertilizer. Thus not a very good guide to the allocation of scarce resources, the supply of which is limited.

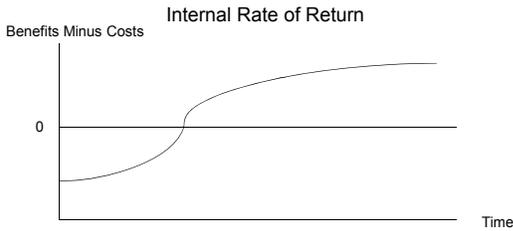


Alternatives to Financial and Economic Profitability

- Internal Rate of Return (IRR)
 - Rate of discount that will cause the net present value of a stream of costs and benefits over time to equal zero
 - Normally expect a period of negative net benefits followed by one in which the net benefits are positive
 - If the IRR > than the cost of capital, taking into account the degree of risk, then should make the investment
 - Allows ranking of investments by IRR. If not know the shadow price of capital but capital is scarce, invest in projects with the highest IRR first, until capital is exhausted.
 - Problem that IRR is not independent of the distribution of net benefits over time. Need for dynamic programming.



Alternatives to Financial and Economic Profitability





Alternatives to Financial and Economic Profitability

- Domestic Resource Cost (DRC)
 - Indicator of efficiency with which a country's domestic resources (labor, capital, land) are converted into output measured as value added at world market prices, where value added is the value of output minus the cost of all tradable inputs
 - $DRC = (Labor + Capital + Land) / Value\ Added\ in\ Pw$
 - DRC is a cost/benefit ratio, with costs in numerator and net benefits in denominator
 - If $DRC < 1$, domestic resources used less than value added created = comparative advantage
 - If $DRC > 1$, domestic resources used greater than value added created = comparative disadvantage



DRC Analysis

- Measure DRC in terms of shadow prices
 - Evaluate scarcity value (shadow prices of non-tradables) of domestic factors of production in numerator, which want to allocate most efficiently
 - So as to maximize net value added in denominator, measured in world prices (shadow prices of tradables)
 - Numerator and denominator converted into common currency at shadow exchange rate. This is the marginally efficient rate at which non-tradable primary factors of production may be transformed into tradable value added.
- DRCs can be thought of as activity-specific exchange rates. Profitable if DRC less than marginal exchange rate in a manner similar to IRR and cost of capital.



DRC and Effective Protection

- Nominal and effective protection refer to structure of incentives involving international trade (tariffs and other import taxes, export taxes, non-tariff barriers)
- Nominal protection coefficient (NPC)
 - $NPC = P_d/P_w = P_w(1+t)/P_w$
 - P_d is domestic price of a product
 - P_w is world price of a product
 - t is tariff rate
 - Measure degree to which consumers are either taxed or subsidized by trade policy
 - If $NPC > 1$, $t > 0$, consumers are being taxed because they are paying prices higher than world market prices
 - If $NPC < 1$, $t < 0$, consumers are being subsidized vis-à-vis the world market



DRC and Effective Protection

- Effective protection coefficient

Measures incentives that affect the prices of both outputs and inputs, and is therefore a better indicator of protection offered to producers.

 - Effective protection coefficient (EPC) measures value added in domestic prices relative to value added in world prices

$$EPC = \frac{P_{dj} - \sum a_{ij} P_{di}}{P_{wj} - \sum a_{ij} P_{wi}}$$

- P_{dj} is domestic price of output j
- P_{di} is domestic price of input i
- P_{wj} is world price of output j
- P_{wi} is world price of input i
- a_{ij} is coefficient linking input and output



DRC and Effective Protection

- Effective protection coefficient
 - EPC > 1, producers receive positive incentives vis-à-vis the world market
 - EPC < 1, producers receive negative protection.
- Relation between NPC and EPC
 - If protection on tradable inputs is less than protection on output, EPC > NPC
 - If protection on tradable inputs is greater than protection on output, EPC < NPC



DRC and Effective Protection

- Domestic resource cost ratio measures cost in terms of domestic non-tradable resources relative to value added in world prices

$$DRC = \frac{\sum f_{sj} P_s^*}{P_w - \sum a_{ij} P_{wi}}$$

- where f_{sj} is a technical coefficient relating non-tradable primary factor s (land, labor, capital) to output j ,
- P_s^* is the economic opportunity cost or shadow price of non-tradable factor s ,



DRC and Effective Protection

- DRC an indicator of the efficiency with which scarce domestic resources are converted into value added in world prices either through exports or by substituting domestic production for imports
- Denominator of DRC and EPC is the same; the numerator expresses
 - Costs for the DRC
 - Incentives for the EPC. Examples of
 - Tariff protection raising domestic prices for local producers
 - Export taxes lowering domestic prices to local producers



Breakdown into Tradables and Nontradables

- Approach used thus far to distinguish between tradable and non-tradable inputs (Balassa Method) fails to take into account the fact that most inputs can be subdivided into tradable and non-tradable components, e.g., transport and handling of imported inputs
 - Corden Method breaks down inputs into tradable and non-tradable components using I-O table or semi-input-output
 - Demanding of data, which may not be of very good quality, but less sensitive to tradable-nontradable classification
 - Use Balassa method where most costs are nontradable and not have very good I-O data, e.g., Liberia
 - Use Corden where have complex intermediate inputs and I-O data available



Steps Involved in Undertaking DRC Analysis

- Examine existing qualitative value chain analyses
 - Most important subsectors in terms of output, growth, employment, investment, exports
 - Target markets and their potential
 - Industrial structure and behavior, e.g., buyer or supplier dominated
 - Technological potential
 - Bottlenecks, constraints
 - Historic evolution over time
 - Regulatory control
 - Important elements of enabling environment, e.g., trade regime



Steps Involved in Undertaking DRC Analysis

- Preliminary design
 - Which subsectors are most likely to be profitable and sustainable?
 - What is already known about these subsectors?
 - What are most important problems and constraints?
 - How collect the existing data required for the analysis?
 - How collect information on best practice, new technology?
- What data need to be collected?
 - Prices all along each value chain
 - Costs at each stage of the value chains
 - Taxes and subsidies applicable to each value chain
 - Import and export parity prices, costs, taxes and subsidies



Steps Involved in Undertaking DRC Analysis

- What sources of data?
 - Collection of existing data from available sources, e.g., statistical agencies, customs, tax authorities
 - Collection of data from feasibility studies, agencies working in the field, etc.
 - Informal interviews
 - Formal surveys with questionnaire
- Survey design
 - Size and composition of sample
 - Focus on best practice, new technology, deeper investment
 - Emphasis on depth of understanding rather than statistical accuracy
 - Who will administer the questionnaires? Need understanding or issues



Steps Involved in Undertaking DRC Analysis

- Design and pretesting of questionnaires
 - Specificity with respect to subsector and value chains
 - Level along value chain, e.g., producer, collector, processor, distributor
 - Language
 - Pre-testing essential but how integrate with logistics and availability of personnel
- Execution of surveys
 - Oversight and feedback regarding problems
 - Checking for accuracy and consistency
 - Follow-up questions
 - Data entry while fresh



Steps Involved in Undertaking DRC Analysis

- DRC analysis
 - Joining different sources of data and filling the gaps
 - Assessing the consistency and reasonableness of results
 - If economic profitability is negative, DRC should be greater than one
 - Differences between financial and economic profitability should be related to taxes, subsidies, and import or export price/cost structure
 - Attention to units
 - Importance of price comparisons in estimating barriers to trade, e.g.,



Case Studies

Second-Stage Analysis: Liberia





DRC Analysis in Liberia Central Corridor

- Liberia is recovering from years of conflict and national priority is shifting from relief and rehabilitation to a development phase
- Major issue is the extent to which agricultural policy should focus on food crop production (especially rice) or on tree crops (e.g., cocoa, oil palm)
- World food price spikes in 2008/09 combined with commodity price boom in the last decade
- The DRC study examined the economic and financial profitability of the two sectors in Liberia's central corridor (Bong and Nimba Counties)



Rice Subsector

- Liberia has open policy towards rice imports and is heavily dependent on international rice market
- In 2010 imports were 147,000 MT of rice at a value of USD 85 million, compared with total consumption of 350,000 MT
- As 2008/09 world food price spikes showed, there are risks associated with depending on food imports
- Major issues:
 - Can Liberia depend on rice imports?
 - Can domestic rice production be competitive with imports?
 - Which value chains of domestic rice production are most competitive?



Rice Subsector

- Major issues (continued):
 - How do NERICA varieties change the competitiveness of domestic rice production?
 - What are the relative efficiencies of swamp and upland rice production techniques?
 - Can rice produced upcountry compete with imported rice in the Monrovia market, where a majority of the population lives?
 - How do these rice value chains compare with tree crop value chains in terms of domestic resource cost?



Cocoa Subsector

- Liberia has excellent agro-climatic conditions for cocoa production
- Structural changes in the world demand for cocoa suggest favorable medium and long-term markets
 - Growing middle class in emerging economies like China, India, and Brazil
 - Top regional producers such as Côte d'Ivoire and Ghana have largely reached production capacity
 - Political situation in Côte d'Ivoire is uncertain
- Government policy has thus far focused largely on rehabilitating existing plantations



Cocoa Subsector

- However, new establishment with improved cocoa seed varieties is also taking hold
- Major issues:
 - What is the financial and economic profitability of rehabilitated cocoa?
 - How does this compare with cocoa replanted with improved seed varieties?
 - Considering the relative efficiency of domestic resource use, how does cocoa compare with domestic rice production and with other tree crops, such as oil palm?



Oil Palm Subsector

- Liberia has favorable agro-climatic conditions for oil palm production
- Domestic, regional, and international markets suggest favorable medium and long-term trends
 - Growing local market
 - Substantial informal exports to Guinea and other neighboring countries
 - Regional market: ECOWAS imports 300,000MT of CPO – a market that Liberia could break into
 - Potential on the international market, especially in the biofuel industry, which uses oil palm as a key input



Oil Palm Subsector

- Major issues:
 - Given these potential markets, what is the financial and economic profitability of oil palm?
 - Is small-scale processing technology (Freedom Mill) profitable?
 - Considering the relative efficiency of domestic resource use, how does oil palm compare with cocoa or domestic rice production?



Research Design

- Study to be done in four weeks
- Very little good primary data so had to collect via informants and surveys
- Secondary goal to train ministerial staff
- Geographical focus
- Limited to three crops
- Focus on small-scale sector
- Needed to include frontiers of technology, e.g., NERICA rice varieties, replanted hybrid cocoa, new oil palm varieties



Research Design

- Initial workshop for training ministerial staff and interviewers
- Drafting of questionnaire
- Field visit to meet with farmer associations, best practice farmers, traders and to pretest questionnaire
- Full survey with continued participation of analysts
- Follow-up meetings with development agencies, traders in Monrovia
- DRC analysis using IMPACT template
- Drafting of report



DRC Results for Rice, based on sale in local market and in Monrovia

Seed Variety and Technique of Production	Yield (MT/ha)	Financial Profit/Kg (USD)	Economic Profit/Kg (USD)	NPC	EPC	DRC
RICE						
NERICA Variety						
Local consumption						
Upland	1.7	0.169	0.155	1.0	1.03	0.72
Swamp	2.8	0.361	0.156	1.0	1.45	0.66
NERICA Variety						
Monrovia market						
Upland	1.7	0.107	0.093	1.0	1.04	0.81
Swamp	2.8	0.299	0.094	1.0	1.51	0.76
Traditional Variety						
Local consumption						
Upland	1.1	-0.4	-0.04	1.0	1.0	1.06
Swamp	1.7	0.06	0.06	1.0	1.0	0.88
Traditional Variety						
Monrovia market						
Upland	1.1	-0.07	-0.05	1.0	1.0	1.17
Swamp	1.7	-0.004	-0.004	1.0	1.0	1.01



Findings of Study: Rice Value Chains

- Swamp rice production of NERICA seed varieties has lowest DRC
- Upland production of NERICA varieties also competitive
- Swamp and upland production of NERICA varieties are competitive both in local markets (upcountry) and in the Monrovia market where majority of the population lives, where have greatest need for import substitution, and where transportations costs work against competitiveness



Findings of Study: Rice Value Chains

- Rice produced using traditional seed varieties is competitive only when swamp production technique is used and the rice is consumed upcountry
- Use of traditional varieties is marginal for consumption in Monrovia, even for swamp rice; upland production with traditional varieties is not at all profitable in competition with imports in Monrovia
- Profitability of rice hullers quite high due limited number, newness, and efficiency



DRC Results for Cocoa and Oil Palm, for export through Monrovia (cocoa) and Ganta (palm oil)

Technique of Production	Yield (MT/ha)	Financial Profit/kg (USD)	Economic Profit/kg (USD)	NPC	EPC	DRC
COCOA						
New Establishment	2.1	1.16	1.23	0.98	0.96	0.34
Rehabilitated	1.2	0.39	0.46	0.98	0.96	0.76
Technique of Production	Yield (liters/ha)	Financial Profit/liter (USD)	Economic Profit/liter (USD)	NPC	EPC	DRC
PALM OIL						
New Establishment, semi-improved, custom milled (Freedom Mill II)	1,600	0.44	0.44	1.0	1.0	0.34
New Establishment, semi-improved, farmer milled (Freedom Mill II)	1,600	0.35	0.44	1.0	1.0	0.34



Findings of Study: Cocoa and Oil Palm

- For cocoa, new establishment has the strongest financial and economic profitability, with DRC substantially lower than for rehabilitated land
- However, rehabilitated cocoa is still financially and economically profitable and has a DRC below unity
- The oil palm value chain is very profitable (both financially and economically) and has a DRC as low as any of the value chains in the study
- Newness of Freedom oil mills results in custom milling price much higher than annualized cost of mill
- Advantages of strong local/regional market for oil palm and a relatively low maintenance cost



Comparison Between Subsectors

- DRC analysis shows that Liberia has a comparative advantage in both rice and the two cash crops that were studied
- Degree of advantage varies both within specific subsectors and across subsectors
- Cocoa and oil palm have much lower DRC results than rice, suggesting that while rice production is a good use of domestic resources, cocoa and palm oil are more efficient
- Set against risk associated with dependence for food on world market, e.g., experience in 2008



Value Chain Constraints: Rice

- The most critical constraints facing rice value chains include:
 - Lack of irrigation infrastructure
 - Absence of input and a weak input industry
 - Scaling up multiplication, certification and distribution of improved seed varieties to a national level
 - Disease (such as schistosomiasis) from exposure to working in flooded rice paddies
 - Lack of effective farmer training programs
 - Poor transport infrastructure
 - Inadequate quality of milling in relation to market opportunities



Value Chain Constraints: Cocoa

- The most critical constraints facing cocoa value chains include:
 - Financing for smallholder cocoa farmers who want to rehabilitate existing plantations or plant new ones
 - Availability of improved seed varieties and absence of an efficient private seed multiplication, certification, and distribution system
 - Lack of input and a weak input industry
 - Weak quality control throughout the entire value chain (currently, a discount is applied on Liberian cocoa on the international market)
 - Poor transport infrastructure



Value Chain Constraints: Oil Palm

- The most critical constraints facing oil palm value chains include:
 - Availability of improved seed varieties and absence of an efficient private seed multiplication, certification, and distribution system
 - Lack of input and a weak input industry
 - Large-scale commercial processing is seriously limited. Current processing technologies (both traditional and Freedom Mill technology) produce low-grade oil that can only be sold on the local or regional market
 - Lack of well-developed local, regional, and international market
 - Poor transport infrastructure



DRC Analysis of Profitability of Overcoming these Constraints: Example of Processing Rice

- Identify technical choices, e.g., hand pounding, small hullers, medium-size mills, large mills
- Analyze system for delivering paddy to mills and for distributing milled rice – custom milling, miller buys paddy, transport costs
- Estimate costs of milling
- Analyze marketability of milled rice and price gain from improved milling
- Calculate financial and economic profitability of entire value chain and improved milling segment
- Compare improved with existing value chain



International Price Fluctuations

- As following charts show from 1990 to 2011, there are periodic commodity price fluctuations and risks associated with relying on international markets
 - Rice prices relatively stable between \$200/mt and \$400/mt until 2004, after which rose dramatically, then declined but to higher level than before peak (\$500-\$600/mt)
 - Cocoa prices fluctuated widely between \$900/ mt and \$1800/mt until 2000, after which continued to fluctuate but on a strong upward trend to \$3500/mt by end of 2010.
 - Palm oil prices have risen from \$200/mt at beginning of period to \$1200/mt at end, with significant fluctuations about this trend



Rice Prices (USD/ton)
1990-2011



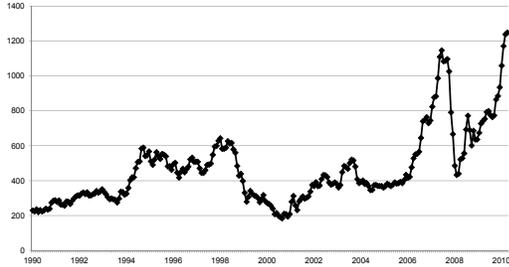


Cocoa Prices (USD/ton)
1990-2011





**Palm Oil Prices (USD/ton)
1990-2011**





International Price Fluctuations

- Especially important for food imports due problems of food security and political sensitivity
- Sensitivity analysis was carried out to understand how changes in world prices of rice would affect DRC results
- Three prices considered
 - Base case of \$520/mt, which is close to the average post-peak rice price level.
 - Peak of world food prices during 2008/09
 - Pre-peak average price levels



Sensitivity Analysis Results: Rice

Seed Variety & Techniques of Production	Yield (MT/ha)	DRC (base case CIF, \$520)	DRC (CIF, \$1015)	DRC (CIF, \$266)
NERICA Variety				
Local consumption				
Upland	1.7	0.72	0.35	1.51
Lowland	2.8	0.66	0.30	1.79
NERICA Variety Monrovia market				
Upland	1.7	0.81	0.38	1.96
Lowland	2.8	0.76	0.32	2.75
Traditional Variety				
Local consumption				
Upland	1.1	1.06	0.53	2.16
Lowland	1.7	0.88	0.41	2.12
Traditional Variety Monrovia market				
Upland	1.1	1.17	0.56	2.64
Lowland	1.7	1.01	0.44	2.96



Sensitivity Analysis: World Rice Price

- Using the 2008/09 world rice price peaks results in a lower DRC and makes domestic rice production more profitable
- The results are especially favorable for the NERICA variety, but even upland rice produced using traditional seed varieties becomes competitive in the Monrovia market
- Using the pre-peak average price, DRC is substantially greater than one in every case, even with NERICA varieties grown in swamps
- Thus world market price is a fundamental parameter



Sensitivity Analysis: Rice with Irrigation Infrastructure

Seed Variety & Techniques of Production	Yield (MT/ha)	Financial Profit/Kg	Economic Profit/Kg	NPC	EPC	DRC
NERICA Variety Local consumption						
Lowland	5.0	0.4	0.2	1.0	1.2	0.84
NERICA Variety Monrovia market						
Lowland	5.0	0.36	0.14	1.0	1.2	0.72
Traditional Variety Local consumption						
Lowland	2.5	0.12	-0.01	1.0	1.0	1.17
Traditional Variety Monrovia market						
Lowland	2.5	0.06	-0.16	1.0	1.0	1.32



Sensitivity Analysis: Rice with Irrigation Infrastructure

- With an irrigation infrastructure cost of \$4000/hectare, swamp rice with NERICA varieties is profitable for both upcountry use and the Monrovia market
- NERICA varieties are profitable with this level of irrigation infrastructure despite higher cost because of resulting increase in yields (from 2.7mt to 5mt/hectare)
- If the same irrigation infrastructure is used with traditional varieties, the resulting DRC is above 1 for both upcountry use and the Monrovia market



Sensitivity Analysis: Cocoa & Oil Palm

Technique of Production	Yield (MT/ha)	DRC (base case CIF= 3500/ton)	DRC (CIF= 3500/ton)	DRC (CIF= 1500/ton)
COCOA				
New Establishment	2.1	0.35	0.29	0.76
Rehabilitated	1.2	0.76	0.62	1.62
Technique of Production	Yield (liters/ha)	DRC (base case FOB 260LD)	DRC (FOB 300 LD)	DRC (FOB 160 LD)
PALM OIL				
New Establishment, semi-improved, custom milled (Freedom Mill II)	1,600	0.34	0.28	0.88



Sensitivity Analysis: Cocoa and Oil Palm

- Assuming that world prices continue to rise (FOB \$3,500/ton), both new establishment and rehabilitated cocoa become more profitable
- If prices decline and go back to their 2005 levels, new establishment cocoa continues to be economically profitable, but rehabilitated farms are no longer profitable
- Custom processed oil palm is profitable at the various prices considered. For instance, oil palm continues to be profitable even if prices are LD160/liter



Some Issues to Consider

- With favorable growth opportunities for the country, labor costs are likely to go up, which in turn will affect the financial/economic profitability of value chains, especially for rice, which is labor intensive
- For cocoa and palm oil, the challenge is the extent to which production area can be expanded into land that is suitable
- How upgrade milling of oil palm and rice so as to produce quality more competitive with international market without raising costs



Case Studies

Third-Stage Analysis: Azerbaijan





Goals of First Study

- Identify and evaluate 36 sub-sectors that PSCEP might target for assistance - should demonstrate high potential for income growth, employment potential, and either
 - export expansion, or
 - ability to substitute competitively for imports
- Contribute to policy dialogue surrounding
 - WTO accession
 - food security program



Sub-Sectors Reviewed

- **Fresh fruit and vegetable exports** (apples, cherries, persimmons, pomegranates, greenhouse vegetables, early potatoes, hazelnuts, grapes, kiwi, feykhoa)
- **Agricultural processing** (pomegranate and apple juice, tomato paste, meat, dairy, poultry)
- **Agricultural inputs** (packaging materials, feed, truck transport)
- **Grains** (wheat, rice, barley, corn)
- **Textiles** (protective clothing, carpets, silk)
- **Support services** (brine recycling, catering)
- **Light manufacturing** (building finishes, furniture, low voltage electrical equipment)
- **ICT** (computer assembly, software solutions)
- **Petrochemicals**
- **Metallurgy** (aluminum, iron and steel)



Problems Presented

- Number of sub-sectors too large to do much intensive work
- Very little existing data
- Initial value chain analysis just getting underway
- Conflicting objectives
 - Identify subsectors with greatest potential and sustainability
 - Identify major constraints inhibiting their development
 - Deal with policy issues posed from outside, e.g., wheat subsidy, WTO accession
 - Cover some sectors for political reasons, e.g., petrochemicals, oil sector linkages



Research Design

- Drafted questionnaires in Azeri and English
- Contracted BDS providers to administer
- Initial visits to pretest, scope the terrain, and acquire information from informants
- Analyzed about 300 questionnaires
- Grouped results into categories for presentation
- Numerous meetings with policy makers, business leaders, stakeholders, BDS providers, and the public



Conclusions: General

- Abundant opportunities for export based on
 - Climate, soils, and mineral resources
 - Abundant labor
 - Rapidly growing markets in neighboring countries, e.g., Russia
 - Common language and culture
 - Existing capital stock, much of which is old and outmoded
- Most, but not all, products competing with imports in Baku have comparative disadvantage, encouraged by high protective barriers
 - High tariffs plus value added tax on imports but not on local production
 - High transactions cost cause domestic prices to be even higher than CIF prices plus import taxes, handling, and transport
 - Monopoly pricing of imports
- Highly fragmented and high cost financial market



Conclusions: Fruits and Vegetables

- Most fresh and processed fruit and vegetable exports have strong comparative advantage
- Tomato paste and fruit juice concentrate have very low DRCs compared with branded labels
- Lack of productive varieties (apples, tomatoes, cucumbers)
- Problem of high cost and uncertain quality of chemicals
- Lack of access to sufficient water (kiwi)
- Lack of equipment for sorting and grading
- High price and unavailability of modern packaging
- Lack of wholesale centers and market information
- High cost and lack of refrigerated storage and transport



Conclusions: Fruits and Vegetables

- Major gains from refrigerated storage
 - Take advantage of seasonal rise in prices
 - Avoid high cost of transportation and long delays at customs during busy season
 - Take advantage of cheap Russian backhaul during slack season
- Need for more diversified market contacts (hazelnuts, kiwi, fruit juice, tomato paste)
- High cost of fuel and inefficient greenhouse heating systems (tomatoes, cucumbers, hazelnuts)
- Lack of sufficient raw material (tomato paste)
- Not always able sell lesser quality to processors (apples)



Conclusions: Poultry and Feed Milling

- DRCs for poultry vary widely from 0.71 to 6.06
- Inefficient firms can operate due high import barriers
- Tend to be better for medium scale broiler and hatchery operations upcountry
- Feed mills generally profitable and a means of reaching medium-scale poultry farmers
- Local raw materials of corn, second-quality wheat, and protein concentrate in short supply
- Feed mills complain that not able find buyers at same time that poultry farmers claim that not have access to high quality feed, importance of education



Conclusions: Dairy

- DRCs for dairy vary widely from 0.67 to 3.06
- Moderate degree of import protection
- Tend to be better for more traditional delivery upcountry, with very low capital costs
- Lack of profitable modern processing facilities
- Problem for processing of small-scale, fragmented, highly dispersed dairy farms
- Integrated dairy farms also unprofitable
- Problem of poor breeding stock and disease
- Lack of high quality, uncontaminated feed



Implications for PSCEP

- Sustainable access to investment and finance is key
- Greatest comparative advantage is in exports to Russia, but there is a strong need to diversify markets
- In current economic crisis and potential loss of markets, Azerbaijani firms must significantly increase their competitiveness
- Essential to address cross-cutting segments of value chains such as sanitary and phytosanitary standards, cold storage and warehousing, packaging materials, and transportation



Implications for Policy Makers

- There are many agricultural, agro-industrial, manufacturing, and service sub-sectors that merit strong support to increase their competitiveness via infrastructure, more efficient regulatory and policy environment, and education.
- Current wheat subsidies cost 40 million AZN per annum, or 10% of agricultural budget, if fully implemented – but they have little impact in increasing profitability and thus incentive to produce.
- If the government chooses to provide agricultural subsidies, a more efficient system would be a broad direct income subsidy or investment in infrastructure, which not discriminate between alternative crops.
- The import trade regime is very restrictive. Monopolies significantly increase local prices and distort production incentives. The need to reform the export trade regime is also crucial.



Current DRC Analysis

- Subsectors chosen for intervention: apples, pomegranates, aquaculture, dairy, poultry, hazelnuts
- DRC results from initial study:
 - Fruits and vegetables have favorable DRCs
 - Dairy and poultry mixed DRCs and profitable primarily because of protection from imports
 - Aquaculture not analyzed but experience elsewhere suggests that warm-water at least will be profitable – cold-water needs to develop market
- Use of previous results and discussions with Value Chain Specialists frames major issues



Issues: Fruits and Vegetables

- Comparative advantage in exporting fruits, vegetables, hazelnuts, but not clear if sustainable
 - DRCs estimated assuming sunk capital in old orchards
 - Experiencing declining soil fertility and diminishing returns as move away from best land
 - Good potential for market development
 - Supermarkets for high end exports and domestic
 - Sales of juice concentrate in Europe and US
 - Need to modernize grading, sorting, packaging
 - Need for upgrading HACCP certification
 - Problem of monopoly in juice processing



DRC Analyses Proposed for Fruits and Vegetables

- Apples from replanted orchards in Guba being exported to green markets in Russia in wooden boxes
- Apples from replanted orchards in Guba being graded and packed properly for export to Russian supermarkets, with the second-grade apples being sold for juice
- Number 2, but with cold storage for three months to take advantage of higher prices and lower transport costs
- Production of branded apple juice made from local apples for sale in Baku
- Production of branded apple juice made from local apples for sale in Russia
- Production of apple juice concentrate made from local apples for sale in Europe



Issues: Aquaculture

- Warm-water carp profitable and in high demand but very seasonal
- Cold-water trout profitable but market restricted to hotels and restaurants and sold at much higher price than frozen imports
- Development of local hatcheries and feed mills frustrated by restrictive trade on imported inputs



DRC Analyses Proposed for Aquaculture

- Existing carp value chains from central and southern regions of the country, for sale in the local region and in Baku via wholesalers
- Existing trout value chains from the north, for sale in high-end hotels and restaurants
- Existing trout value chains from the north at prices that would likely prevail with much higher levels of production, requiring price elasticity of demand and evolving market.
- Influence of improved production, local hatcheries, and locally produced feeds.
- Carp value chain with improved processing and cold chains.
- Local hatcheries selling to aquaculture fish producers
- Local fish feed mills selling to aquaculture fish producers.



Issues: Poultry

- Very high levels of effective protection due to import monopoly
- Baku market dominated by six large poultry producers along the coast using imported feed, for which no cost information is available
- Middle-size broiler and day-old chick producers are profitable if sell in local market but not if sell in Baku
- Profitable medium size feed mills throughout country supplying medium-size poultry farms
- Problem of choice and consistent supply of local feed grains, so forced to depend on expensive imported feed grains subject to trade barriers



DRC Analyses Proposed for Poultry

- DRC analysis of large poultry farms, with sensitivity analysis of profitability if decrease import barriers
- Investigate markets for medium-size poultry farms and why not able to sell profitably in Baku, e.g., restrictions, transport
- Local production of feeds using better feed grain mixes, e.g., substitute maize for second-grade wheat
- Tax policy and its application (especially value added tax) regarding importation of feed grains and protein concentrates, and sale of poultry products
- Extent to which importation of chicken limbs threatens local industry



Issues: Dairy

- Growth of large milk processors using milk collection centers, but problem of operating at full capacity given large number of small dairy farm suppliers providing small quantities of milk of satisfactory quality
- Small dairy farmers hindered by poor breeding stock, low quality feed, bad pasture management, poor health conditions, and inadequate refrigeration
- Small processors suffer from dispersed dairy farmers, poor equipment for processing and storage, inadequate refrigerated transportation



DRC Analyses Proposed for Dairy

- Options for combining small farmer production of raw milk with milk collection centers and central milk processors., with respect to optimum scale, number, and location of processing plants and milk collection centers
- Improved small farmer milk production through upgrading the quality of the dairy herd, better animal nutrition and pasture management, reducing incidence of disease, and improving quality of raw milk so as to reduce rejection rates.
- Small milk processors for local consumption, with expanded markets by increasing the flow of milk from small farmers, improving the quality of their products, and better transportation and storage involved in milk collection?



Extensions of DRC Analysis

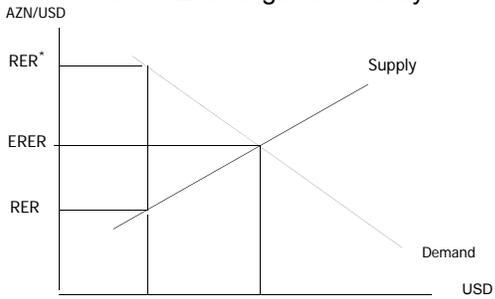
- Shadow pricing
 - Capital
 - Long-term real rate of interest adjusted for risk & inflation
 - Large margin between saving and lending rates, especially in developing countries, which often highly fragmented
 - Issue of pre-tax or post-tax rates of return
 - Importance of opportunity cost of source of capital
 - Labor
 - Normally start with market wage
 - May adjust if there are serious distortions due minimum wage, high payroll taxes, etc.
 - Biggest question in agriculture related to valuation of family labor



Extensions of DRC Analysis

- Shadow exchange rate especially important
 - May be influenced by inflows of foreign exchange from oil, foreign aid, etc.
 - Tend to cause overvaluation in the short run compared with longer term (Dutch Disease)
 - Results in higher DRCs at nominal exchange rate
 - Impact of trade taxes and quantitative restrictions
 - Also leads to overvaluation
 - Protected industries more than offset with trade protection
 - Unprotected industries, including exports, are injured

Shadow Exchange Rate Analysis



Extensions of DRC Analysis

- Multiply denominator of DRC times the ratio of the first-best equilibrium real exchange rate (ERER) or the second-best real exchange rate (RER*) to the nominal exchange rate, with the difference being whether trade distortions are removed
 - Multiply denominator times ERER/RER if there are no policy distortions
 - Multiply denominator times RER*/RER if policy distortions remain in place and want to value foreign exchange at real value in terms of domestic currency in policy-constrained situation
- Each of these actions will lower DRCs

How might DRC analysis respond to your needs?
