What is the Economic Impact of irrigation in the Okanagan?

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THE SHORT ANSWER

- We don’t know!

ECONOMIC IMPACT

Direct Effects

Increase in Farm Sales

Indirect Effects

Inputs Purchased

Wages Paid

Profits Spent

Induced Effects

Suppliers Expand

Workers Immigrate

Businesses Expand

External Effects

Landscape Aesthetics

Pollution, Noise, …

MEASUREMENT ISSUES

Gross Economic Impact

- Add farm sales, sales by suppliers, and sales where profit spent.
- Double counting problem, counting costs (suppliers, etc.) as benefits.
- Gives biggest, most impressive numbers

Value Added

- Add incremental value, or only value of final products
- Avoids double counting, but some value added ‘leaks’ from area.
- Best measure of overall (national/global) economic impact.

Household or Labour Income Impact

- Impact on income of households in region
- Best measure of impact in region of study, hardest to calculate.

External Effect

- Most difficult to measure, often not quantified
- Can be positive or negative

EXAMPLE: USA WESTERN IRRIGATED AGRICULTURE

The Economic Importance of Western Irrigated Agriculture: Impacts, Water Values, and Strategic Policy Questions (2013)

- Family Farm Alliance and Irrigation Association.

Findings:

- $117 billion from 42 million irrigated acres.
- Direct household income impact: $64 billion.
- Total household income impact (direct, indirect and induced): $156 billion.
- Value generated by irrigation water: $1,500 to $3,000 per acre foot.
- External impacts not estimated.

EXAMPLE: TEXAS HIGH PLAINS IRRIGATION

Regional Economic Impact of Irrigated versus Dryland Agriculture in the Texas High Plains (201?)

- Texas AgriLife Extension and Texas Tech Univ.

Findings:

/ acre	Irrigation			Dryland		
	Gross	V. Add	L. Inc.	Gross	V. Add	L. Inc.
Direct	373	111	54	104	32	18
Indir.	53	25	14	12	6	4
Induc.	27	16	8	8	5	2
Total	452	152	76	124	43	24
Net	328	109	52			

EXAMPLE: IRRIGATION IN NEBRASKA DURING 2012 DROUGHT

Economic Impact of the Ability of Nebraska Agriculture to Irrigate (2012)

- Nebraska Farm Bureau

Findings (8.4 million acres):

- Estimated loss in millions relative to 2012 drought if irrigation was not available.

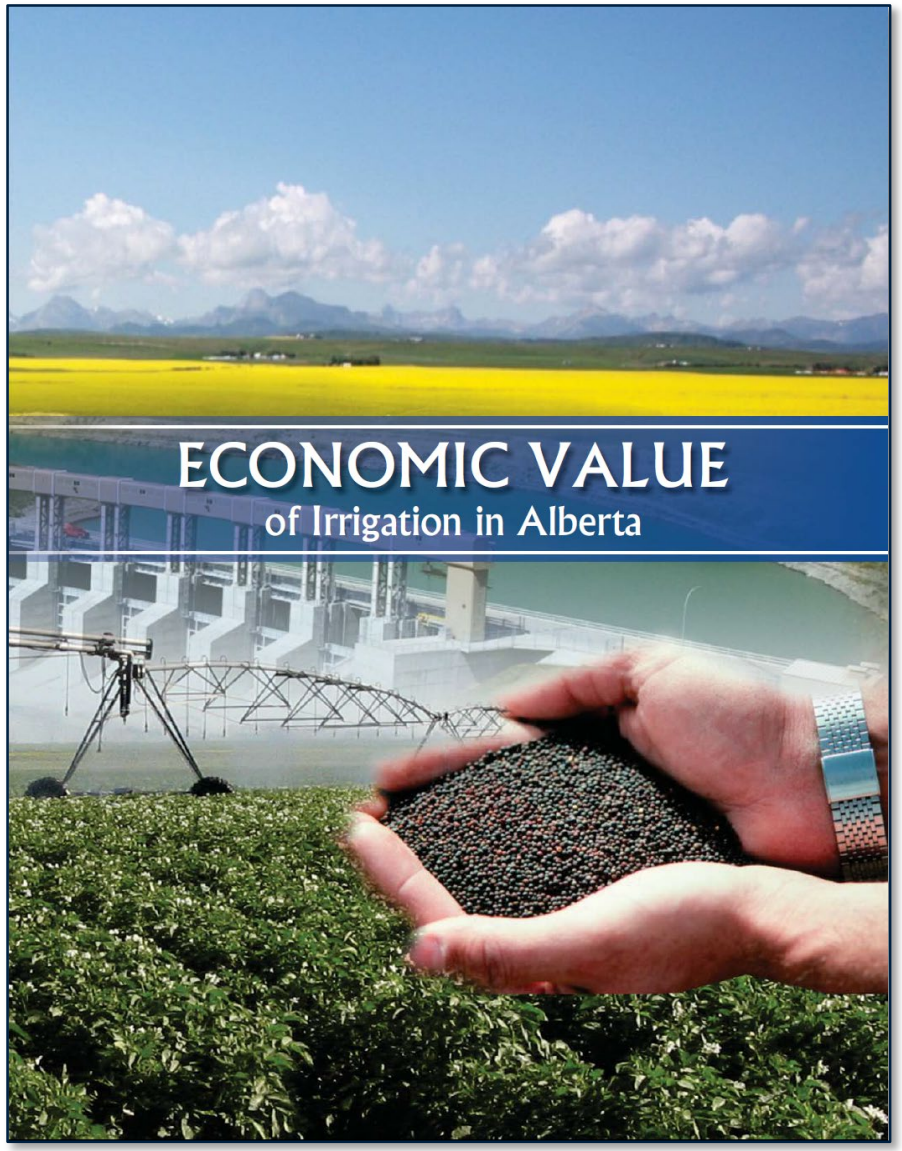
Impact	Employ-ment	Labour Income	Total Val. Added	Gross
Direct		2,131.8	3,307.8	7,083.7
Indirect	13,550	529.4	1,070.6	1,938.6
Induced	17,672	643.2	1,150.4	1,947.1
Total	31,221	3,304.4	5,528,8	10,969.4

EXAMPLE: IRRIGATION IN ALBERTA

- Alberta Irrigation Projects Association (2015)

Findings:

- Irrigated ag. 20% of ag. GDP, 4.7% of ag. land.
- ~90% of GDP impact in province, 10% to producers.
- $1.00 of irrigation ag. sales, $2.54 GDP impact, and $1.64 labour income impact.
- 39 jobs per $1.0 million irrigated ag. sales.
- $3.00 GDP impact and $2.00 labour income impact for each cubic meter water delivered.
- 3:1 return to government investment in irrigation.
    - Economic benefit from investment, not revenue benefit to government.

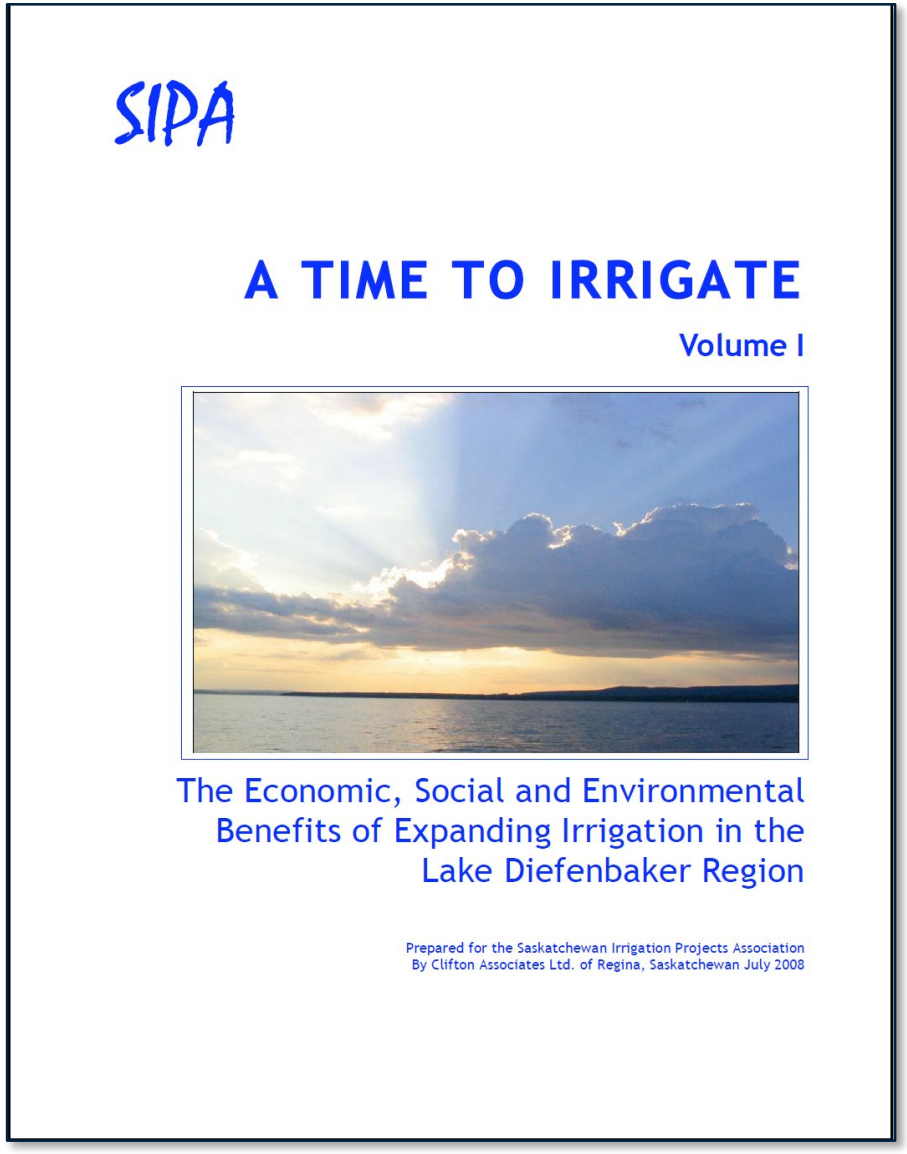


EXAMPLE: DIEFENBAKER LAKE, SASKATCHEWAN

- Saskatchewan Irrigation Projects Assoc. (2008)

Findings:

- Increase irrigation from lake by ~500,000 acres.
- Total economic impact $60 billion
- $12 billion total household income impact, 80% captured locally, 80% in Sask. and Canada.
- 4:1 benefit cost ratio using 5% discount rate on value of agricultural output, 14:1 for fully diversified economy.
- Environmental benefits (increased wetlands, …).
- Recreational values.
- Water security for communities in face of climate change.

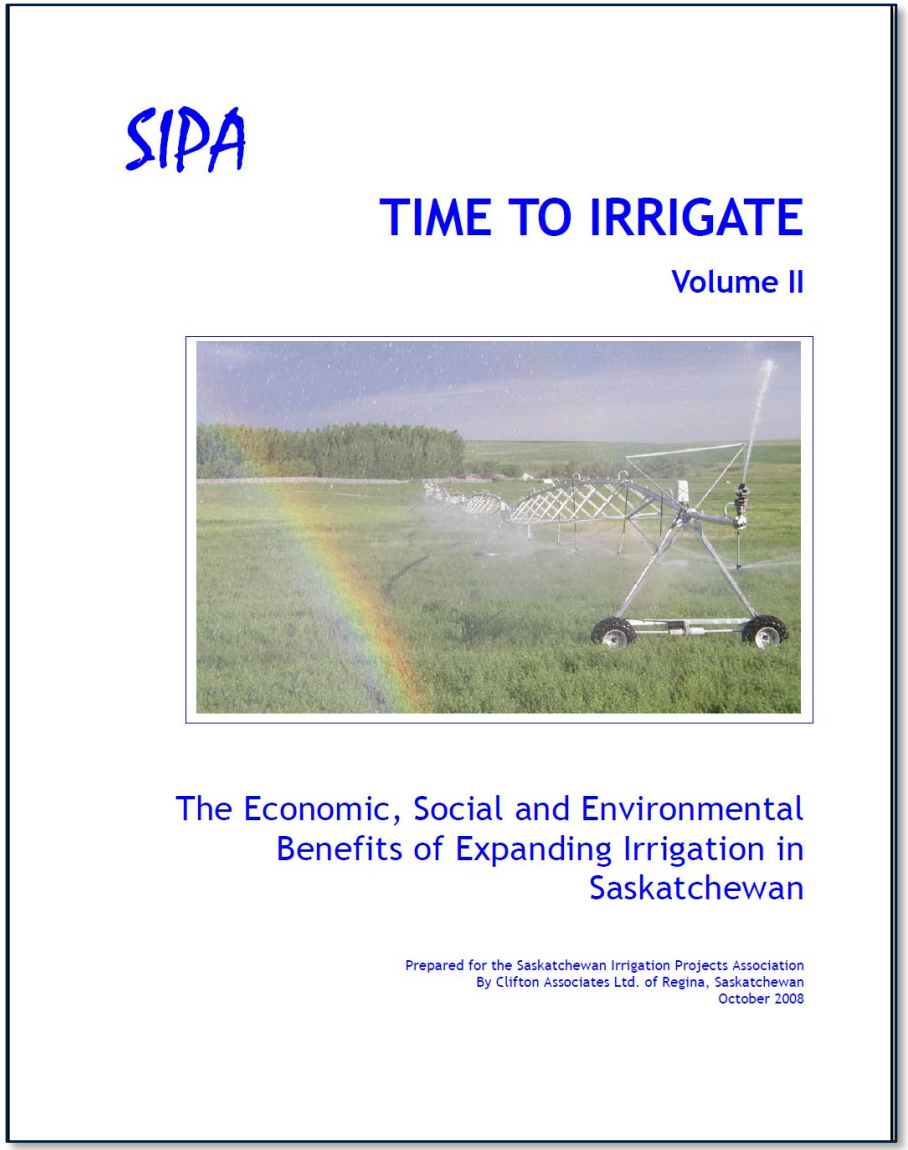


EXAMPLE: EXPANDING SASKATCHEWAN IRRIGATION

- Saskatchewan Irrigation Projects Assoc. (2008)

Findings:

- $3 billion investment.
- $1 billion per year benefit to agriculture, over 20 years.
- $35 billion GDP benefit, $13 billion household income, 326,000 person years of employment, over 40years.
- Agriculture benefit cost ratio of 4.28:1 and 15:1 benefit for agriculture value chain.
- Environmental, social, water security benefits discussed but not quantified.

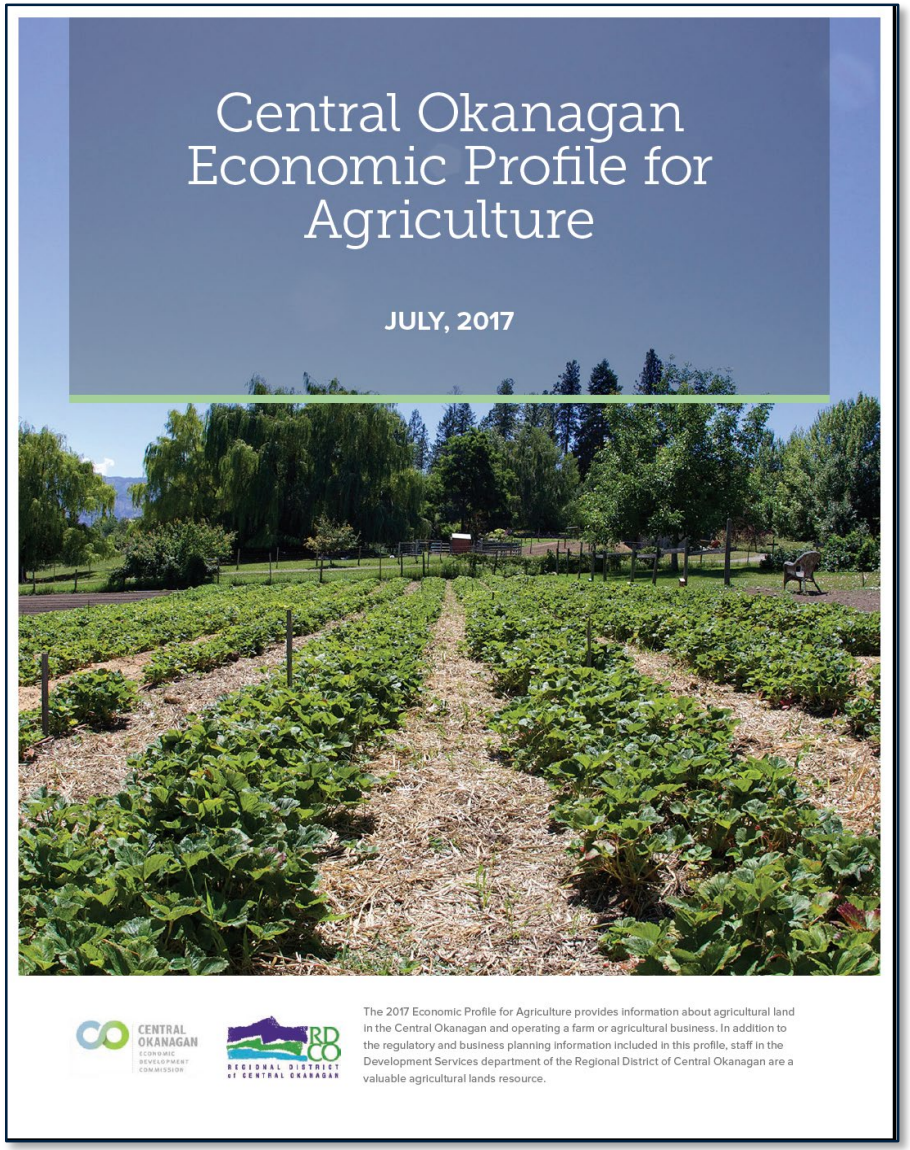


CENTRAL OKANAGAN – BACK OF ENVELOPE

Central Okanagan Facts:

- 23,461 ha, 5,621 ha irrigated
- Total gross farm receipts: $120,147,514
- Divide receipts between irrigation and dry.

Revenue Ratio	5:1	10:1	20:1
Rev. / Acre			
Irrigation	13,075	16,225	18,447
Dryland	2,615	1,623	922
Difference	10,460	14,602	17,525
Without Irrigation			
Lost farm revenue	58,795,660	82,077,842	98,508,025
Lost GDP (3:1)	176,386,980	246,233,526	295,524,075

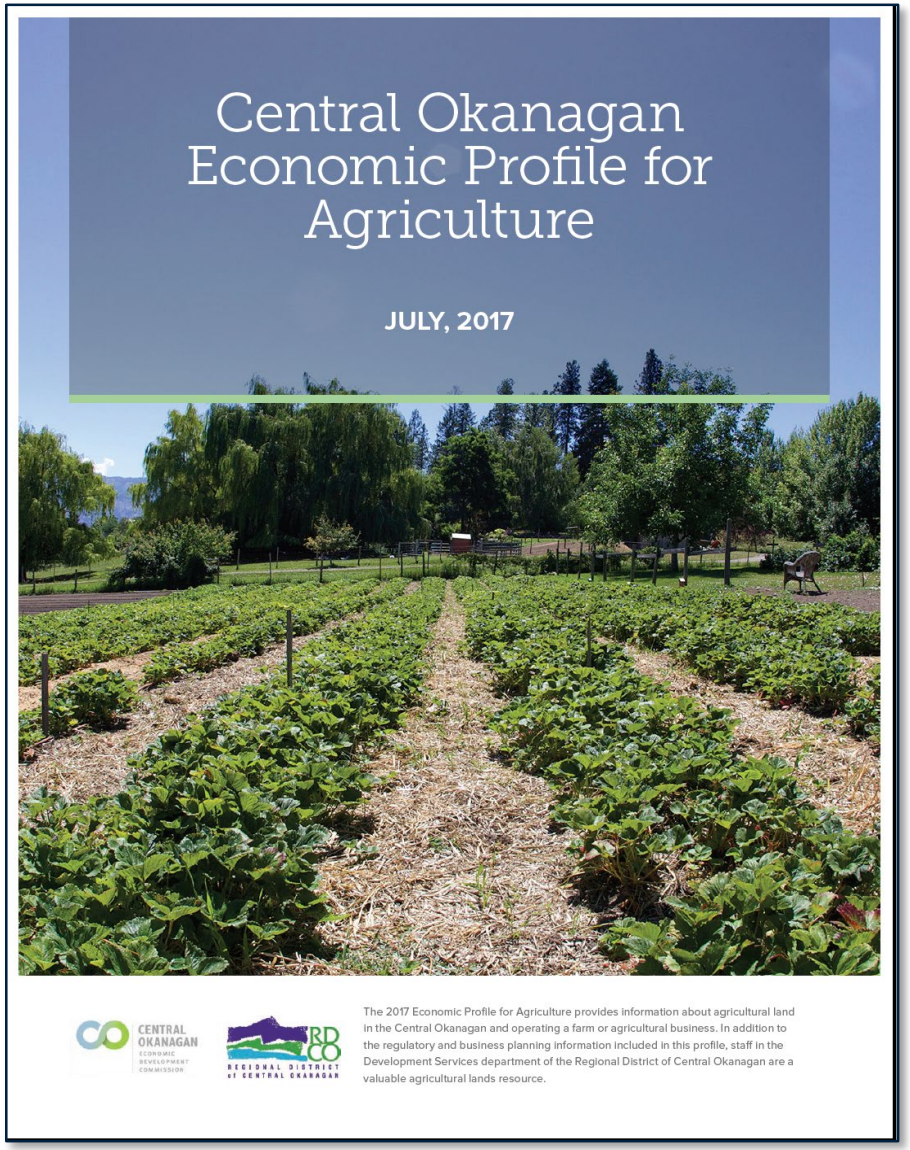


OKANAGAN – BACK OF ENVELOPE

Okanagan Facts:

- 186,234 ha, 24,294 ha irrigated
- Total gross farm receipts: $431,027,968
- Divide receipts between irrigation and dry.

Revenue Ratio	5:1	10:1	20:1
Rev. / Acre			
Irrigation	7,604	10,646	13,307
Dryland	1,521	1,065	665
Difference	10,460	14,602	17,525
Without Irrigation			
Lost farm revenue	147,791,446	232,766,600	307,116,908
Lost GDP (3:1)	443,374,339	698,299,801	921,350,725



EXTERNALITIES

Kelowna International Airport

- Gross output: $599 million
- GDP impact: $306 million
- Labour income impact: $142 million
- Tourism impact:
  - Gross: $190 million
  - GDP: $94 million
  - Labour Income: $51 million

Question:

- How would airport activities be affected if irrigated agriculture not present?

EXTERNALITIES

Kelowna International Airport

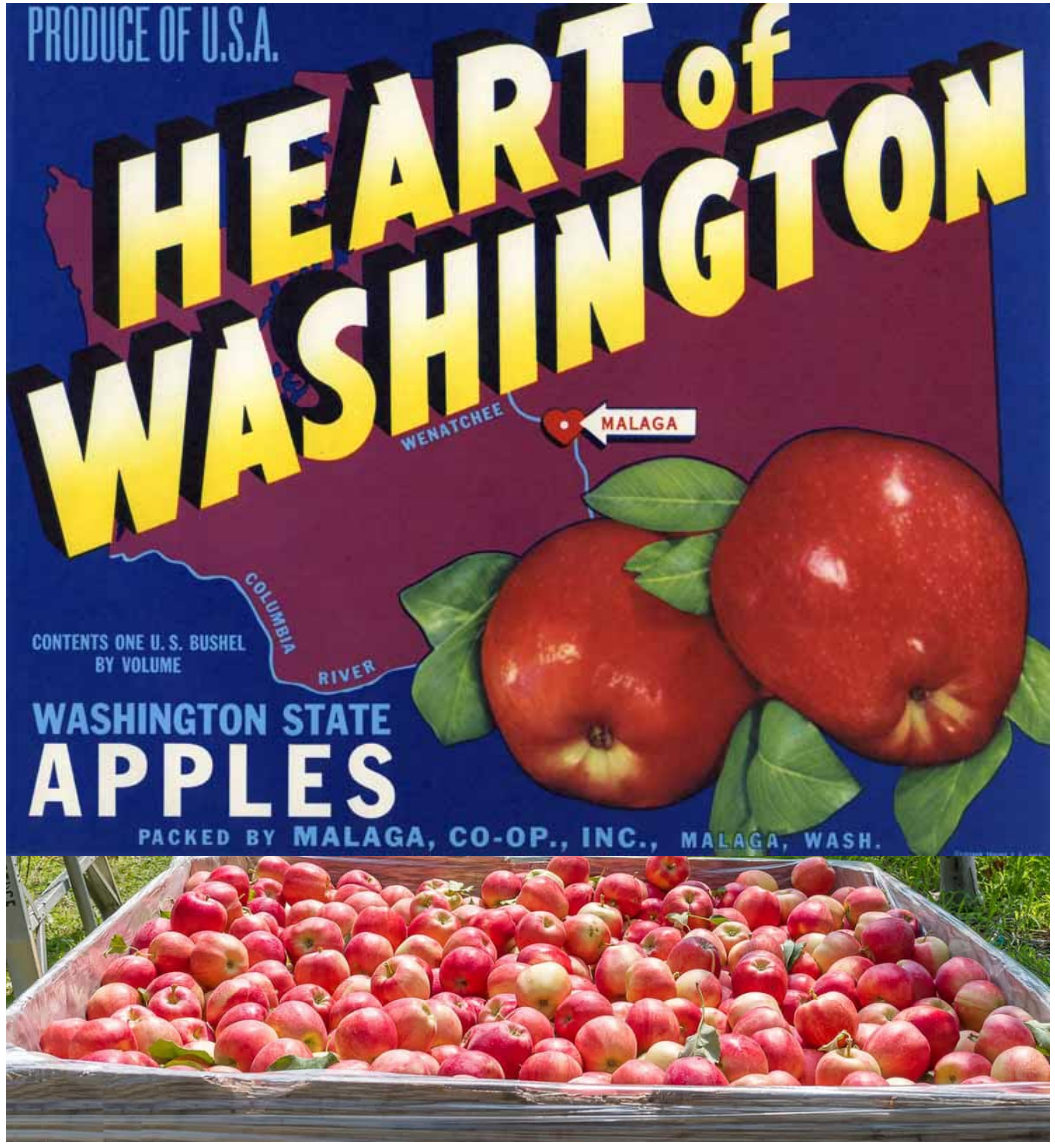
- Airport noise depresses property values in areas with noise levels < 75db by 0.8-0.9%.
  - 75db is vacuum cleaner.
- Airport noise pollution reduces property values, and limits types of development on some land.

Irrigated Agriculture

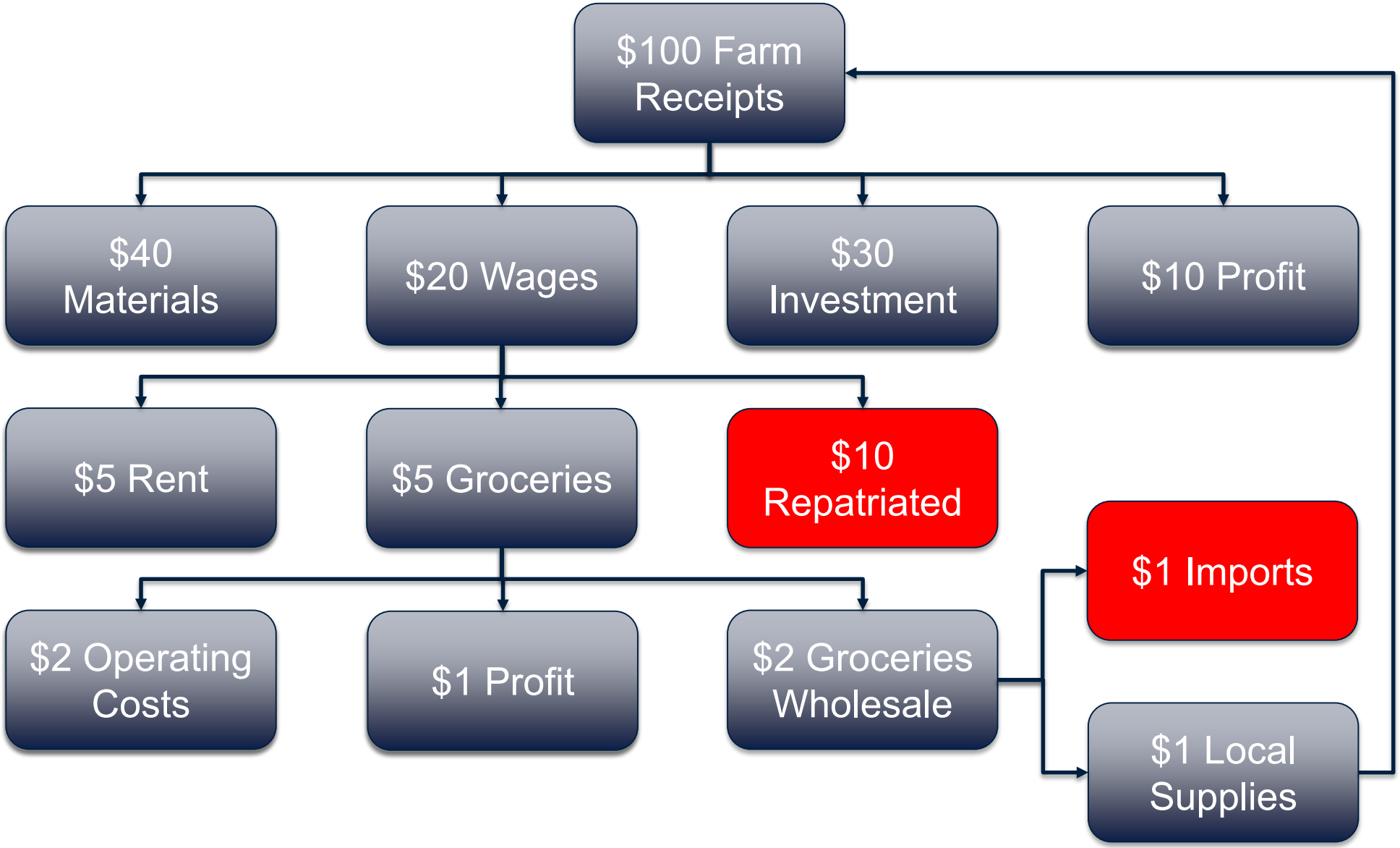
- Proximity to agricultural land increases property values by up to 5%
- Secure open space (ALR, irrigated and productive) earns larger premium.

WE ARE NOT ALONE

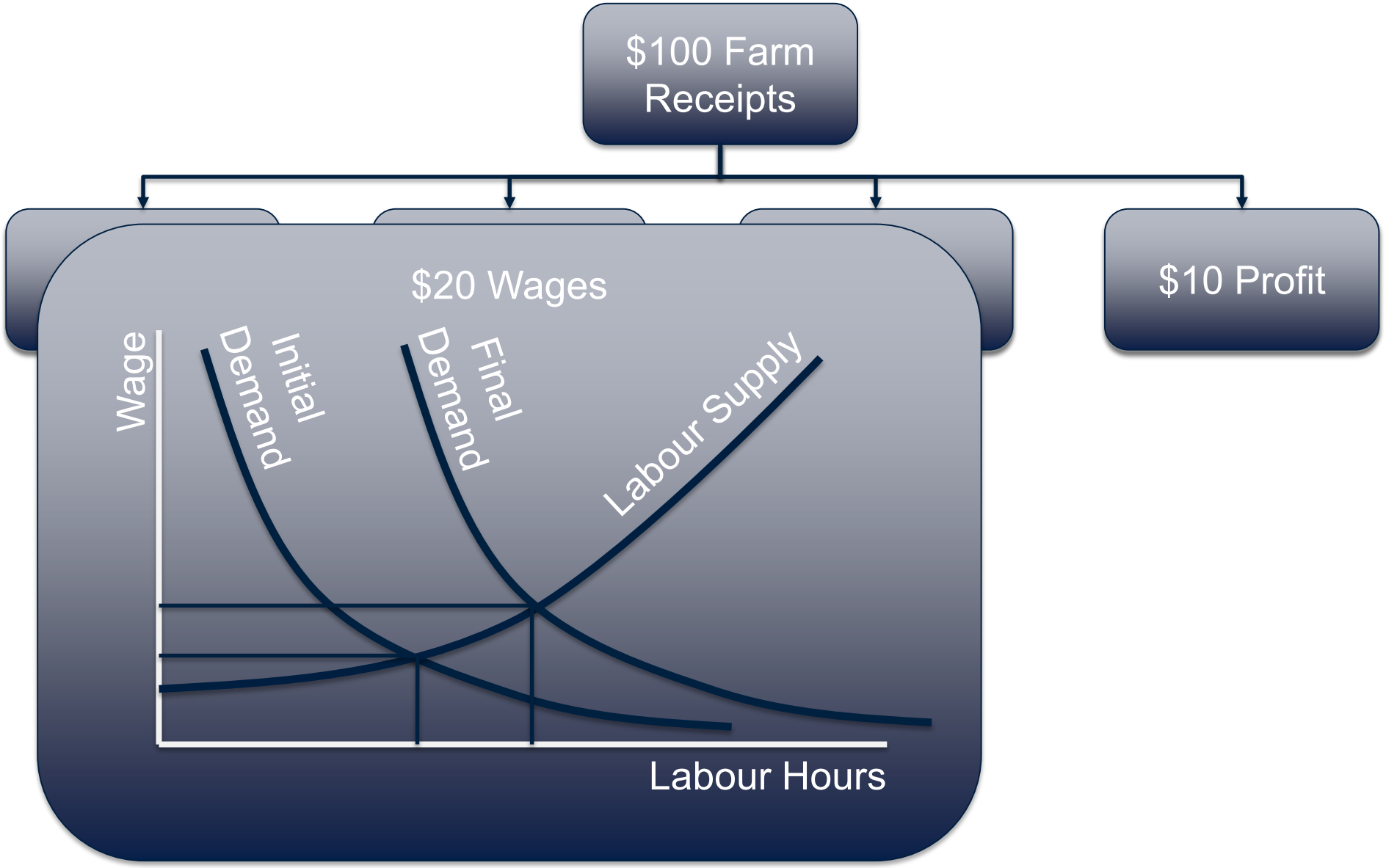
- Canada is a trading nation.
- Others, esp. USA, have heavily subsidized irrigation projects.
  - Repayment of principle only, over very long time periods (40-50 years).
  - Reductions for ‘special circumstances’ and ‘ability to pay’.
  - Project costs split by benefit shares.
    - Public benefits recognized and paid by public!
- Competitors prices reflect subsidies (water and other forms).
  - US moving to full cost recovery.
- *Source: OECD 2010*.



HOW: INPUT OUTPUT MODELS (I/O)



HOW: COMPUTABLE GENERAL EQUILIBRIUM MODELS (CGE)



HOW: I/O VS CGE

Input / Output Models:

- Need input / output tables for region being studied.
- National and provincial models exist for large industry groups.
- Regional tables often don’t exist, and not at fine industry resolution.
- Need to gather details on local industries and expenditure linkages.
- Reasonable if changes small, with little effect on prices.

Computable General Equilibrium Models:

- Need input / output tables and prices.
- Need information / assumptions about shapes of demand and supply curves.
- Same challenges as I/O models.
- Better for large changes, where prices impacted.
- More accurate measures of impacts across sectors (price and quantity effects)

WHY: POLICY

Benefit Cost Analysis

- Should public investments be made in irrigation?
- How do net benefits compare to net costs.
    - CAREFUL! Gross benefits often are double counted.

Distribution of Impacts

- How should costs of public investments be distributed?
    - Should water rates pay full costs?
    - Should all water users pay same water rate?
    - How will different taxes impact different sectors?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LINKS

- Kelowna International Airport Master Plan. https://ylw.kelowna.ca/sites/files/3/docs/masterplan/ylw_2045_master_plan_volume_1_final_0.pdf
- Airport Noise and Property Values. https://pdfs.semanticscholar.org/1028/82c73781bb43fa7cc5af4a92333d8db9b9b7.pdf
- Open Space Property Values. https://defenders.org/sites/default/files/publications/open_space_property_value_premium_analysis.pdf
- Measuring Economic Impacts. http://edrgroup.com/pdf/econ-impact-primer.pdf
- Central Okanagan Economic Profile for Agriculture. https://www.investkelowna.com/application/files/8715/0006/6559/2017_Agricultural_Profile_-_FINAL.pdf

LINKS

- Economic Value of Irrigation in Alberta. https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/irr15523/$file/economic-value-irrigation-alberta.pdf
- Economic Impact of Irrigation in Nebraska in 2012. http://www.decision-innovation.com/webres/File/docs/Nebraska%20Irrigation%20Economic%20Impact%20Study.pdf
- Irrigated vs Dryland Agriculture on the Texas High Plain. https://www.depts.ttu.edu/aaec/icac/pubs/r_and_e/r_and_e_pdfs/Irrigated_Versus_Dryland_FullPaper_08.pdf
- Economic Importance of Western Irrigated Agriculture. https://www.familyfarmalliance.org/single-post/2015/03/20/The-Economic-Importance-of-Western-Irrigated-Agriculture---2015-Update-2015

LINKS

- Agricultural Water Pricing: United States
  https://www.oecd.org/unitedstates/45016437.pdf
- Saskatchewan “A Time to Irrigate”
  http://www.irrigationsaskatchewan.com/SIPA/publications/publications-major-studies/