

Impacts of Investments and Livelihood Strategies in Less Favored Areas: Evidence from Asia, East Africa and Central America



John Pender, IFPRI

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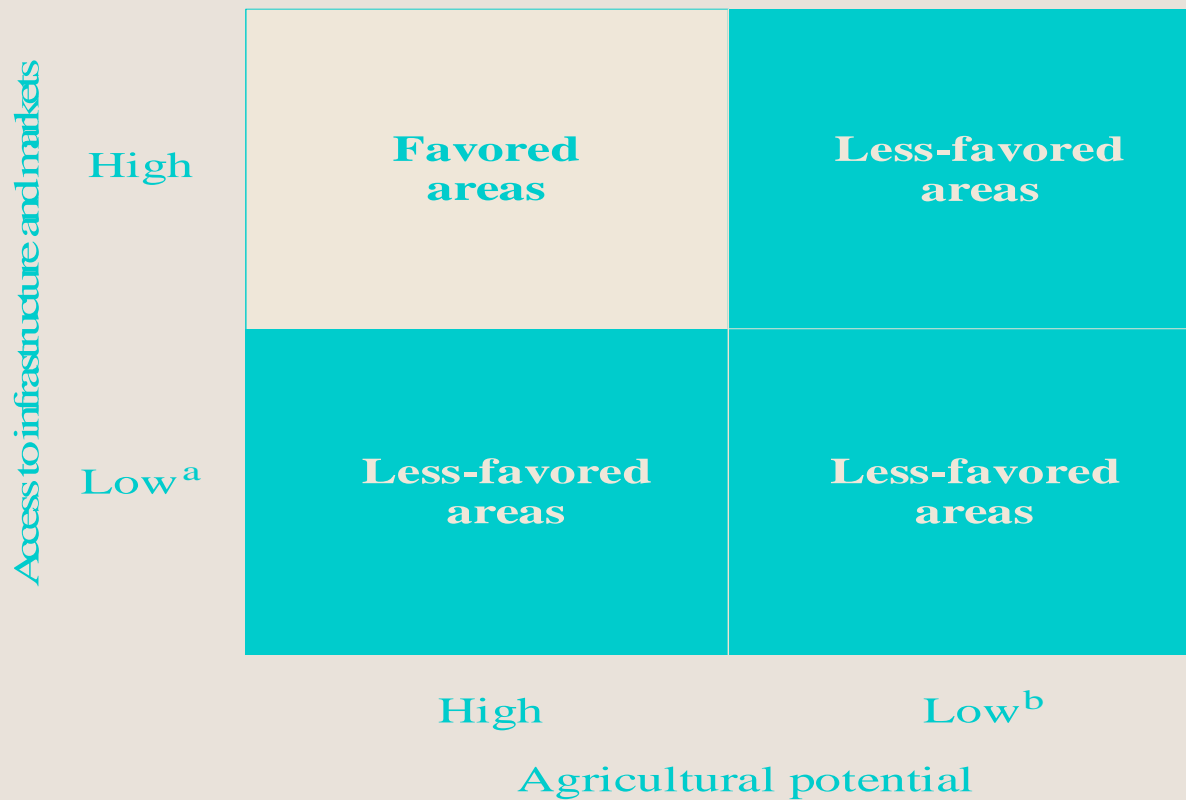
Outline

- Background and rationale
 - ◆ What are less-favored areas (LFA's)?
 - ◆ Why be concerned about them (or not)?
- Returns to investment in LFAs
 - ◆ India
 - ◆ China
 - ◆ Uganda
- Impacts of investments and livelihoods on production, income, land degradation in LFAs
 - ◆ Ethiopia
 - ◆ Uganda
 - ◆ Honduras
- Conclusions and implications

What are “less-favored areas”?

- Less-favored areas are less favored by nature or by man, including areas with
 - ◆ low agricultural potential, due to limited rainfall, poor soils, steep slopes, etc. (biophysical constraints); or
 - ◆ limited access to infrastructure (e.g., roads and irrigation) and markets (socioeconomic constraints)

CLASSIFICATION OF FAVORED AND LESS-FAVORED AREAS



^a Socioeconomic constraints.

^b Biophysical constraints.

- Less-favored areas include most of
 - ◆ semi-arid and arid tropics of Asia and Africa
 - ◆ mountain areas of Asia, Latin America and Africa
 - ◆ hillside areas in Central America and Asia
 - ◆ forest margins of humid and sub-humid tropics of Africa, Latin America and Asia

Why be concerned about less-favored areas?

- Over 1 billion people live in such areas
- These areas were largely bypassed by the Green Revolution
- Problems of low agricultural productivity, poverty, and natural resource degradation severe and worsening in many such areas
- Problems in these areas give rise to conflict, emigration to other areas, negative environmental consequences

The Conventional Wisdom

- Emphasize public investments in agricultural R&D, infrastructure, etc. in favored areas where returns are higher
- Benefits of increased food production, income and foreign exchange from favored areas will spread through lower food prices and migration to favored areas
- Resources improve due to reduced pressure on fragile resources in less-favored areas

Challenges to the Conventional Wisdom

- Rapid population growth continues in less-favored areas
- Problems of poverty and resource degradation getting worse in many cases
- Evidence of diminishing returns to investment and increasing environmental problems in favored areas
- Evidence of higher or comparable returns to investments in less favored areas in some countries, and greater impact on poverty (“win-win” strategies)
- Some evidence suggests possibility of “win-win-win” strategies benefiting the environment alongside economic growth and poverty reduction

Returns to investments in LFA's

Evidence from three countries (Fan and colleagues)

- India
- China
- Uganda

Returns to Investments in India – Impacts on Agricultural Production (Fan and Hazell 1999)

Investment	Units	Irrigated areas	High potential rainfed areas	Low potential rainfed areas
HYV's	Rps/ha	63	243	688
Roads	Rps/km	100,598	6,451	136,173
Canal irrigation	Rps/ha	938	3,310	1,434
Private irrigation	Rps/ha	1,000	-2,213	4,559
Electrification	Rps/ha	-546	96	1,274
Education	Rps/ha	-360	571	902

Returns to Investments in India – Impacts on Poverty Reduction (Fan and Hazell 1999)

Investment	Units	Irrigated areas	High potential rainfed areas	Low potential rainfed areas
HYV's	Persons/ha	0.00	0.02	0.05
Roads	Persons/km	1.57	3.50	9.51
Canal irrigation	Persons/ha	0.01	0.23	0.09
Private irrigation	Persons/ha	0.01	-0.15	0.30
Electrification	Persons/ha	0.01	0.07	0.10
Education	Persons/ha	0.01	0.23	0.01

Returns to Investments in China – Impacts on Rural GDP (Fan, et al. 2004a) (yuan/yuan inv.)

Investment	Coastal	Central	Western
R&D	5.54	6.63	10.19
Irrigation	1.62	1.11	2.13
Roads	8.34	6.90	3.39
Education	11.98	8.72	4.76
Electricity	3.78	2.82	1.63
Telephone	4.09	4.60	3.81

Returns to Investments in China – Impacts on Poverty Reduction (persons/10,000 yuan inv.)

Investment	Coastal	Central	Western
R&D	3.72	12.96	24.03
Irrigation	1.08	2.16	5.02
Roads	2.68	8.38	10.03
Education	5.03	13.90	18.93
Electricity	2.04	5.71	7.78
Telephone	1.99	8.10	13.94

Returns to Investments in Uganda – Impacts on Agricultural Production (Fan, et al. 2004b)

(Ush/Us invested)

Investment	Central	East	West	North
Ag. R&D	12.49	10.77	14.74	11.77
Education	2.05	3.51	3.80	2.10
Feeder roads	6.03	8.74	9.19	4.88
Murram roads	n.s.	n.s.	n.s.	n.s.
Tarmac roads	n.s.	n.s.	n.s.	n.s.
Health	1.37	0.92	0.96	0.37

Returns to Investments in Uganda – Impacts on Poverty Reduction (persons/million US\$ inv.)

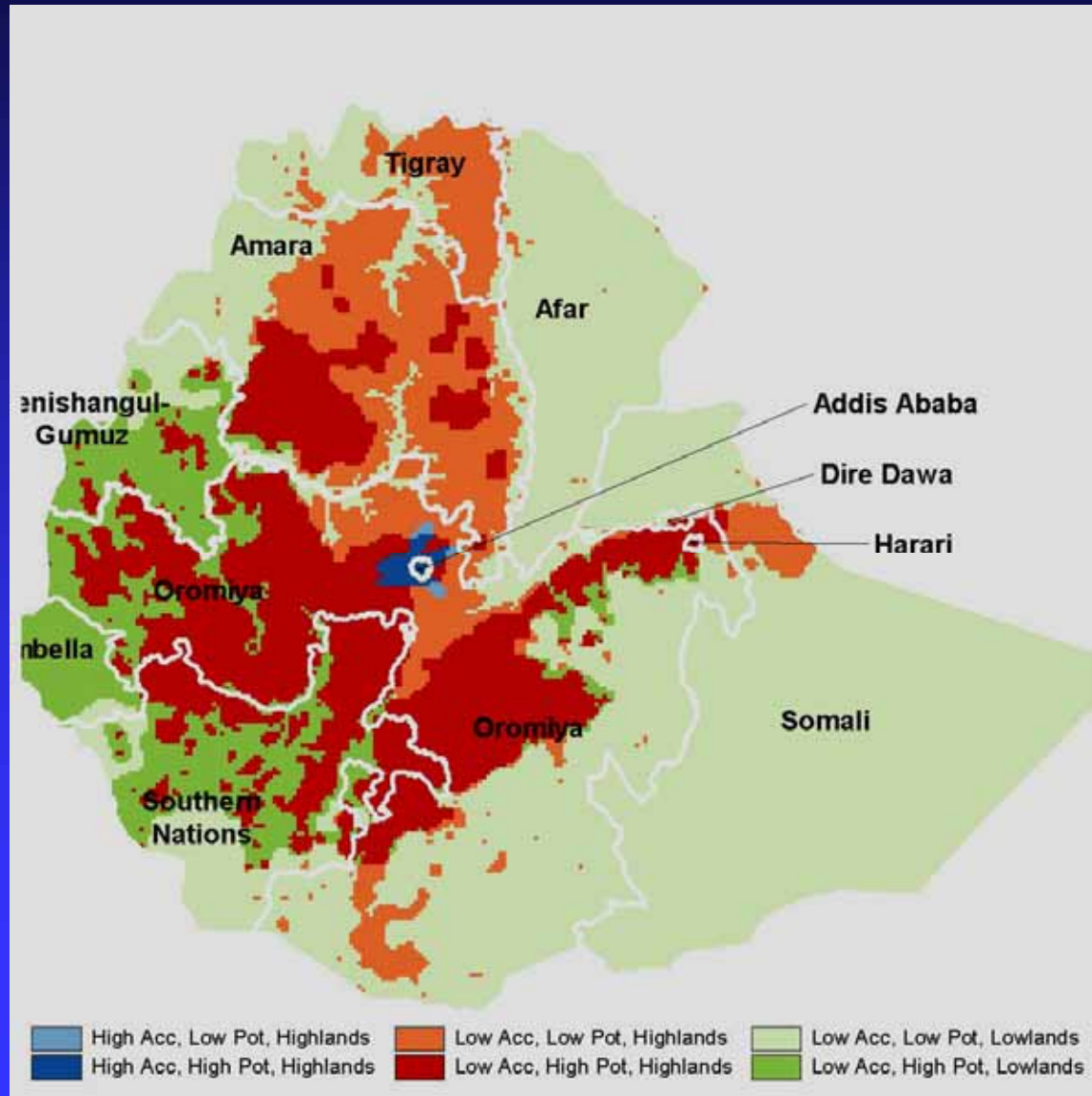
Investment	Central	East	West	North
Ag. R&D	21.75	66.31	48.91	175.52
Education	3.57	21.60	12.62	31.38
Feeder roads	10.51	53.85	30.49	72.82
Murram roads	4.08	11.88	9.77	14.80
Tarmac roads	2.58	13.12	9.39	62.92
Health	2.60	6.15	3.46	5.95

Impacts of Investments and Livelihoods on Production, Income, and Land Degradation in LFA's

Evidence from three countries (Pender and colleagues)

- Ethiopia – highlands of Tigray and Amhara
 - ◆ Surveys of 934 households in 198 highland villages
- Uganda
 - ◆ 451 households in 107 villages
- Honduras hillsides
 - ◆ 385 households in 95 villages in 19 municipalities

Ethiopia – Tigray and Amhara Study Regions



Selected Determinants of Crop Production, Income and Erosion in Tigray Highlands (Pender and Gebremedhin (2004))

Variable	Crop Production	Income per capita	Soil erosion
Stone terrace	+	0	-
Number of cattle (other than oxen)	+	+	0
Walking time to town	-	-	0
Education	+	0	0
Contact with extension	-	0	-
Use of formal credit	0	0	0
Participation in marketing cooperative	+	+	0

Variable	Crop Production	Per capita income	Soil erosion
Secondary income source. (cf. none)			
- Cereals	0	+	0
- Perennials	+	0	-
- Cattle	-	+	0
- Other livestock/beekeeping	0	+	0
- Food for work/farm work	0	+	0
- Salary employment	0	+	-
- Trading	0	+	+
- Food/other assistance	+	+	0
- Other nonfarm	0	+	0

Impacts of Selected Investments in Tigray Highlands – Simulation Results

Variable	Scenario	Value of Crop Prod.	Per Capita Income	Erosion
Stone terraces	All plots terraced	+13.8%	+14.5%	-41.9%
Cattle	1 additional cow	+6.2%	+3.3%	+1.4%
Education	3 years minimum	+17.6	23.4%	-10.1%
Agricultural extension	Universal participation	-14.0%	+7.6%	-28.8%
Road access	1 hour closer	-1.2%	+2.9%	-4.3%
Market access	1 hour closer	+6.8%	+5.6%	-0.4%
Marketing cooperative	Universal participation	+45.5%	+48.7%	-4.7%

Rates of return to selected household investments in highlands of Tigray

■ Stone terraces

- ◆ 34% (Pender and Gebremedhin 2004)
- ◆ 50% (Gebremedhin, et al. 1998)

■ Tree planting

- ◆ 20% to over 100% (Jagger and Pender 2003)

■ Fertilizer

- ◆ -14% (Pender and Gebremedhin 2004)

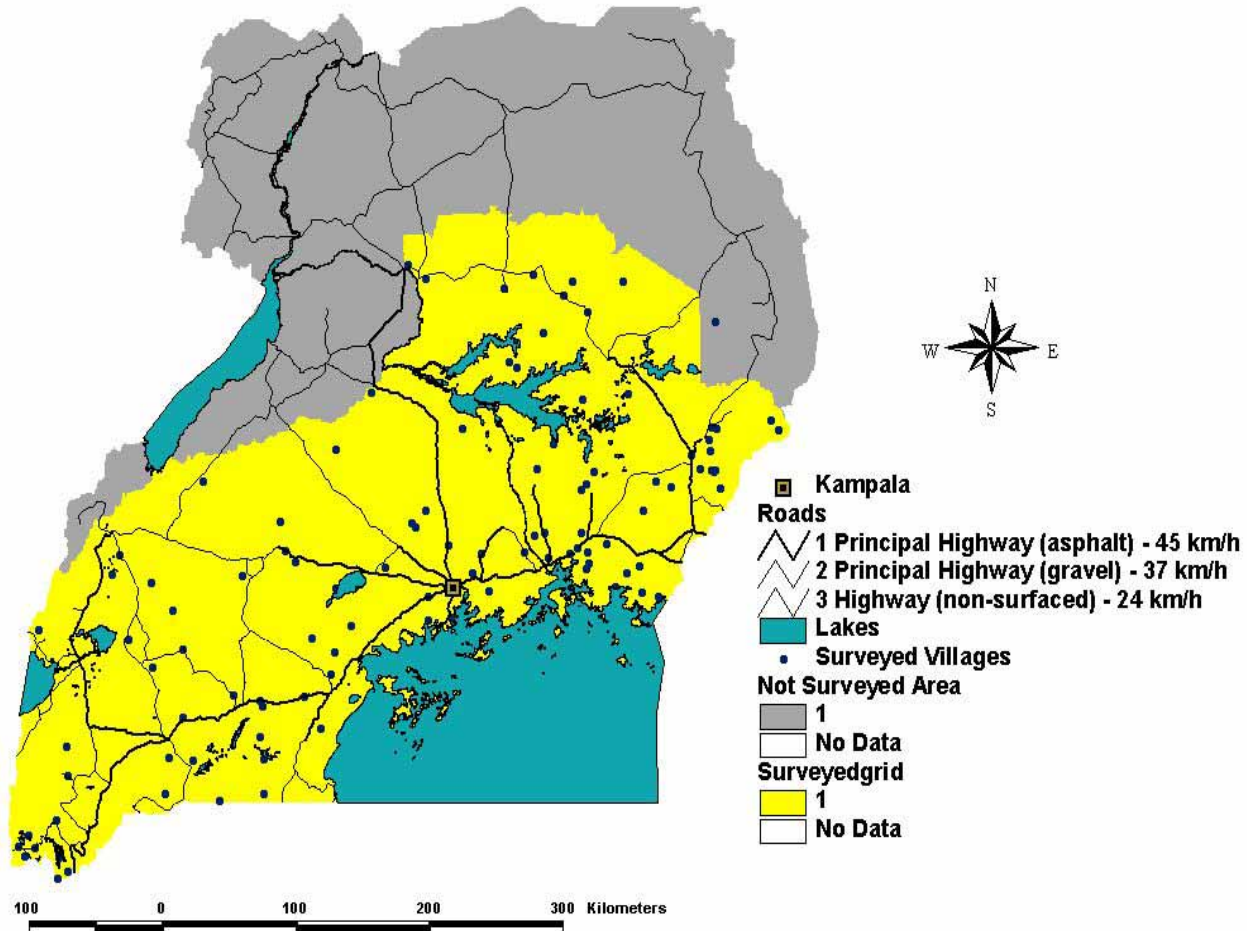
■ Livestock (Pender, et al. 2002)

- ◆ Cattle: 36%
- ◆ Poultry: 32%
- ◆ Beekeeping: 44%

Uganda – Study Region

Source: Ruecker, 2002

Selected villages for community resource survey and mapping



Selected Determinants of Crop Production, Erosion and Income in Uganda (Nkonya, et al. 2004)

Variable	Crop Production	Erosion	Income
Value of Livestock	+	0	0
Education of Household Head (cf. none)			
- Primary	0	0	+
- Secondary	0	+	0
- Higher	0	+	+
Participation in Technical Assistance			
- Ag. Training	+	0	0
- Ag. Extension	+	+	+
- Ag/env. Organizations	0	-	0

Variable	Crop Production	Erosion	Income
Income Strategy (primary income source)			
- Wages/salary	0	0	0
- Nonfarm activities	+	0	0
- Livestock	+	0	+
- Cereals	+	0	0
- Legumes	+	0	0
- Horticulture	+	0	0
- Bananas	0	0	0
- Coffee/export crops	+	0	0

Impacts of Selected Investments in Uganda – Simulation results

Scenario	Crop Production	Erosion	Income
Universal Primary Education	-7.7%	+8.2%	24.5%
Higher education for people with secondary ed.	-0.7%	+0.3%	14.2%
Agricultural training for all households	+12.2%	+2.5%	-1.5%
Agricultural extension for all households	+13.7%	+11.5%	+61.2%
All households participate in ag./environment NGOs	-8.7%	-23.1%	-27.2%

Honduras: Study Sites



Selected Determinants of Crop Production and Income in Hillsides of Honduras – Preliminary Results (Jansen, et al. 2005)

Variable	Annual Crop Production/ha	Perennial Crop Prod./ha	Income/capita
Soil fertility	0	+	+
Machinery/equipment	0	+	+
Education	0	+	0
Agricultural training	0	-	+
Livelihood strategy (cf., basic grains producer)			
- Livestock producer	0	0	+
- Coffee producer	-	-	0
- Basic grains/farmworker	-	0	+
-Basic grains/livestock/farmworker	0	0	0

Impacts of Selected Land Management Technologies on Crop Productivity

Technology	Ethiopia			Uganda	Honduras - Annuals
	Tigray	Amhara- Low Pot.	Amhara- High Pot.		
Stone terrace	+17%	+20%	I	NA	NA
Trees planted	+41%	NA	NA	I	I
Manure/compost	+15%	I	I	I	+58%
No burning	+48%	NA	NA	I	I
Reduced tillage	+57%	I	I	NA	I
Contour plowing	+25%	I	I	NA	NA
Incorporate crop res.	NA	-27%	I	I	I
Crop rotation	NA	I	I	-18%	NA
Inorganic fertilizer	+13%	I	+70%	I	+32%

Conclusions/Implications

- High returns to many public investments in LFA's and greater impact on poverty in India, China, and Uganda
- There are investments/livelihoods that can increase crop production, income, and/or reduce land degradation in less-favored areas; e.g.
 - ◆ Tigray: stone terraces, reduced tillage and burning, manure, alternative livelihoods, market development
 - ◆ Uganda: livestock production, other livelihood strategies
 - ◆ Honduras: manure, fertilizer, machinery/equipment, livestock production
- But trade-offs are often apparent; e.g.
 - ◆ Effects of technical assistance in Uganda and Honduras
 - ◆ Effects of education in Uganda
 - ◆ Effect of farm work in Honduras

Conclusions/Implications (2)

- Impacts of interventions/investments are context dependent, linked to local comparative advantages:
 - ◆ Low returns to cereals in Tigray and low potential Amhara → low returns to fertilizer, extension, credit
 - ◆ Higher returns to livestock, beekeeping, tree planting, nonfarm activities in Tigray
 - ◆ High returns to cereals and fertilizer in high potential Amhara
 - ◆ Higher returns to bananas, livestock in highlands of Uganda
- Development strategies for less-favored areas should take local comparative advantages and disadvantages into account