L19 Land Reforms: Evidence

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Ec320 Lecture 19, Boston University

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Outline

- Empirical evidence concerning farm size-productivity relationship
- Estimated effects of recent land reforms in India, S Africa, Brazil
- Also discuss political and administrative problems in implementing land reforms within a democratic society
Testing Farm Size - Productivity Relationship More Carefully

- Estimate productivity variations with respect to:
  - scale
  - mode of cultivation (owner/hired labor/sharecropping tenant/fixed rent tenant)

- Control for possible omitted variables and reverse causation
Econometric Concerns

- **Omitted Variables:** What if small farms are more productive because they happen to have better soil quality? Better access to irrigation? Less fragmented?

- **Reverse Causation:** Maybe more productive soils generate higher income, higher population pressure, greater subdivision of lands, smaller farm size? Small farmers are better farmers?
Possible Measurement Errors

- Productivity measure: yield/per acre, excludes cost of inputs
- What if higher yields are arising from greater application of inputs per acre? Which inputs?
- How are inputs and outputs measured? Reporting/cultivation survey errors?
- Unit of analysis: state, district, village or farm?
Step 1: Separate Scale Effects from Mode of Cultivation in Indian FMS Data (Sen (1981), Table 12.5 in text)

<table>
<thead>
<tr>
<th>Acres</th>
<th>OC/HL</th>
<th>Sharecropped Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>1313</td>
<td>604</td>
</tr>
<tr>
<td>3-5</td>
<td>1044</td>
<td>709</td>
</tr>
<tr>
<td>5-8</td>
<td>960</td>
<td>676</td>
</tr>
<tr>
<td>8-12</td>
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<td>604</td>
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<tr>
<td>12-</td>
<td>624</td>
<td>604</td>
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</table>
Step 2: Check for Omitted Variables Bias: Soil and Irrigation

- Bhalla and Roy (1988) control for possible variations in soil quality and (state provided) irrigation infrastructure across small and large farms.
- Use farm level data for large sample of farms all over India (Fertilizer Demand Survey), with 21,500 farms in 1975-76 and 1976-77.
- Unusually rich description of soils (color, type (sand/clay/loam), depth, salinity), irrigation source.
Step 2, contd.

- Bhalla-Roy control for exogenous characteristics of soil (color/type/depth), irrigation (canals/tanks/village wells), fragmentation of farmland
- Regress farm income per acre on farm size first without controls (version A)
- Then they add soil controls (version B) and irrigation and fragmentation controls (version C)
- Carry out analysis at different levels of aggregation (state, subzones, district)
- Separate regressions for different areas (allow for heterogeneity of scale effects across areas)
<table>
<thead>
<tr>
<th>State</th>
<th>Number of zones</th>
<th>Model A</th>
<th>Model B</th>
<th>Model C</th>
<th>Number of subzones</th>
<th>Model A</th>
<th>Model B</th>
<th>Model C</th>
<th>Number of districts</th>
<th>Model A</th>
<th>Model B</th>
<th>Model C</th>
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<td>Tamil Nadu</td>
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<td>W Bengal</td>
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<td>2</td>
<td>8</td>
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<td>1</td>
<td>14</td>
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<tr>
<td>India</td>
<td>78</td>
<td>54</td>
<td>46</td>
<td>44</td>
<td>142</td>
<td>73</td>
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<td>53</td>
<td>176</td>
<td>83</td>
<td>56</td>
<td>51</td>
</tr>
</tbody>
</table>

Notes
1. The order in which the results are reported (zones, sub-zones and districts) reflects decreasing levels of pooling/aggregation. The results for the most heterogeneous classification, the state, are reported in Table 2.
2. Models A, B and C reflect equations 3A, 3B and 3C respectively.
3. All indicators significant at the 5% level of confidence.
Importance of Level of Aggregation

MIS-SPECIFICATION IN FARM PRODUCTIVITY ANALYSIS

DISTRICTS
1. Bangalore
2. Belgaum
3. Bidar
4. Bijapur
5. Chickmagalur
6. Chitradurga
7. Dharwar
8. Gulbarga
9. Hassan
10. Kolar
11. Mandya
12. Mysore
13. Raichur
14. Shimoga
15. South Kanara

FIG. 1. Karnataka–District level regression.

Value of output / Acre (Rs. / Acre)

Farm size (acres)

Fig. 1. Karnataka–District level regression.
Controlling for Farmer, Plot Type: ICRISAT data

- Shaban (JPE, 1987) compared output per acre across sharecropped, fixed rent and OC plots for the same farmer (see text, pp 430-431)
- Utilize ICRISAT data for central India (six villages in AP, Maharashtra and Gujarat, 10 farms per village, 1975-84) with weekly data on inputs and outputs by plot collected by resident investigators
- Shaban also controlled for irrigation, type of soil, crop pattern
Shaban’s Results

- Main finding: sharecropped plots achieve 17% lower yield for the same farmer, soil type, irrigation etc. compared with OC or fixed rent tenancy
- No differences between OC and fixed rent tenancy
- However, still possible there were unobserved soil differences between plots that account for these differences
Table 3
Per-Acre Output, Land Value, and Inputs across Land Contracts

<table>
<thead>
<tr>
<th>Log per Acre</th>
<th>Without Fixed Effects</th>
<th>With Household-Period Fixed Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership dummy</td>
<td>.42**</td>
<td>.47**</td>
</tr>
<tr>
<td>Robust t-statistic</td>
<td>5.48</td>
<td>4.83</td>
</tr>
<tr>
<td>Robust standard error</td>
<td>.08</td>
<td>.10</td>
</tr>
<tr>
<td>Fixed-rent dummy</td>
<td>-.03</td>
<td>-.12</td>
</tr>
<tr>
<td>Robust t-statistic</td>
<td>-.21</td>
<td>-.95</td>
</tr>
<tr>
<td>Robust standard error</td>
<td>.15</td>
<td>.12</td>
</tr>
<tr>
<td>Dummies for village, year, and season</td>
<td>Yes</td>
<td>Dropped</td>
</tr>
<tr>
<td>Output</td>
<td>Land Value</td>
<td>Nonlabor Input</td>
</tr>
<tr>
<td>10,704</td>
<td>10,702</td>
<td>10,690</td>
</tr>
</tbody>
</table>

Note. Results are for ordinary least squares regressions with a constant term. The cluster method is used to compute robust t-statistics and standard errors; this accounts for the fact that the household, rather than the plot, is the primary sampling unit. Household-period fixed effects refer to 2,773 dummy variables generated through the iteration of codes identifying the household and the period (year and season).

** Significant at the 1% level.
Econometric evaluation of land reforms: only for more recent land reform efforts (West Bengal, S Africa, Rwanda)

These were less radical

Why?

Political and administrative problems of implementation
Political Resistance from Landed Elites

- First reason: landed elites lose source of their wealth and power, and so do everything to block land redistribution
- Why all of the large radical land reforms were associated with political revolutions or wars which destroyed power of these elites:
  - Russian, Chinese revolution
  - Mexican civil war
  - Japan, Korea: post-war reconstruction by US occupation
Political Resistance from Landed Elites, contd.

- With the spread of democracy, landed elites have the power to block/circumvent reforms.
- Many countries in S Asia, SS Africa after obtaining independence from colonial powers in 1950-60s became democracies and stated land reform as a major goal/instrument of development.
- Yet they did not succeed in implementing these reforms.
- Particularly in countries where dominant political parties still relied on rural elites (e.g., India, Pakistan, Kenya, Zimbabwe).
Administrative, Legal and Corruption Problems

- Additional reasons: many LDCs have weak administrative capacity and judicial institutions
- Loopholes in land ceiling regulations and poor land records allowed large landowners to circumvent these regulations
- Landowners filed court appeals, clogging up the legal system
- Difficulties in identifying suitable beneficiaries of land distribution
- Corruption in land distribution process
Example: Variations Across Different Indian States

- Land ceiling regulations in India passed in 1950s, implementation: responsibility of individual states
- Yet by early 1990s, less than 2% land had been redistributed in most states
- With the exception of only three states, two of which (West Bengal, Kerala) had a Left majority in state legislature
- West Bengal redistributed 6.7% land by early 1990s
Yet, the land distribution program was not very effective for a number of reasons:
- Poor quality of land
- Uneconomical size of plots (average size: 0.5 acre), owing to large number of recipients (15% of rural population)
- Corruption in distribution process: 50% of recipients already had 0.5 acres, 25% had at least 3.4 acres and 10% had 5.7 acres
West Bengal Tenancy Regulation Reform

- However, a different reform in West Bengal (Operation Barga) was more effective (show/explain below)

- Program provided opportunity to existing tenants to **register** their tenancy status

- Registered tenants protected from eviction, and entitled to a minimum share of 75% (akin to rent control)

- Program (1977-1995) covered 6% of cultivable land, 5% of households; avg plot size of 1.5 acres, high quality land
Changes in West Bengal Agricultural Production Growth

- Land reforms implemented 1970s onwards
- During 1960s and 1970s, West Bengal had the slowest rate of growth of foodgrains output and yields, among 17 major Indian states (less than 2% p.a.)
- From early 1980s, growth rate shot up to above 5%, accompanied by widespread diffusion of HYV rice, became the top performing state
We avoid valuing family labor at the market wage rate owing to distortions on the labor market emphasized in the classic literature on surplus labor in developing countries (e.g., Amartya K. Sen 1966; Dale W. Jorgensen 1967; Bardhan 1973). In the case of rice, we obtain similar results upon measuring yields by kilograms of rice produced per acre, as in Banerjee, Gertler, and Ghatak (2002). The advantage of using value added per acre is that it incorporates the cost of inputs, as well as allowing us to aggregate returns across different crops to form a composite measure of value added per acre in each farm-year.

The middle rows of Table 5 show the rapid growth in farm productivity. Value added per acre in rice grew much faster than value added per acre aggregated across all crops, with respective growth of 59 percent, 86 percent, 29 percent and 22 percent, 41 percent and 4.5 percent in the three panels. Since cropped area per farm did not rise much, the growth of value added per farm was comparable to that of value added per acre (except in the third panel where the former grew 9 percent as against 4.5 percent for the latter).

The wage rate of hired workers remained stationary throughout the 1980s but grew about 15 percent in the first half of the 1990s. Employment increased 15 percent, 7 percent, and 17 percent in the three panels, respectively. Hence, incomes of agricultural workers, the poorest section of the rural population, grew more slowly than incomes of farmers in the 1980s, a trend which was reversed in the 1990s.

### Table 5— Trends in Farm Productivity and Wages

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Cropped area (acres)</td>
<td>1.04</td>
<td>0.71</td>
<td>1.16</td>
<td>1.19</td>
<td>0.86</td>
<td>1.74</td>
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<td>Fraction rice area HYV</td>
<td>0.06</td>
<td>0.06</td>
<td>0.26</td>
<td>0.40</td>
<td>0.58</td>
<td>0.67</td>
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<tr>
<td>Rice value added per acre</td>
<td>936</td>
<td>1,492</td>
<td>1,557</td>
<td>2,903</td>
<td>4,191</td>
<td>5,444</td>
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<tr>
<td>Value added per acre</td>
<td>635</td>
<td>777</td>
<td>875</td>
<td>1,232</td>
<td>1,309</td>
<td>1,368</td>
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<td>Value added per farm</td>
<td>3,027</td>
<td>3,831</td>
<td>4,007</td>
<td>5,365</td>
<td>5,181</td>
<td>5,642</td>
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<td>Hired labor wage rate per hour</td>
<td>0.62</td>
<td>0.66</td>
<td>0.92</td>
<td>0.88</td>
<td>0.88</td>
<td>1.01</td>
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<td>Hired labor annual hrs/acre</td>
<td>153</td>
<td>176</td>
<td>235</td>
<td>251</td>
<td>317</td>
<td>371</td>
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</tbody>
</table>

**Notes:** All values are averaged across farms, with equal weight assigned to each farm. All rupee figures deflated by cost of living index, 1974 = 100.

**Source:** Cost of Cultivation Surveys
Causes of West Bengal’s Green Revolution?

- Left Front government (came to power in 1977) which stepped up implementation of the reforms
- They claimed the land reforms were responsible for the turnaround of productivity and production
- Skeptics: argued many other changes were happening at the same time (rise in irrigation, rice prices, HYV seeds availability), so role of the land reforms is not obvious

- Banerjee-Gertler-Ghatak use a WB district-level panel data set
- Regress average rice yield on rate of registration of tenants under OB across different years (1979-87)
- Use state government data
- Include controls for price of rice, real wages, rainfall, state roads, state canals, HYV share of rice area, and district fixed effects
Banerjee-Gertler-Ghatak (2002) results

Table 6

<table>
<thead>
<tr>
<th></th>
<th>Model 1a</th>
<th>Model 1b</th>
<th>Model 2a</th>
<th>Model 2b</th>
<th>Model 3a</th>
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<tr>
<td>Sharecropper registration</td>
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<td>.46***</td>
<td>.46***</td>
<td>.48***</td>
<td>.40**</td>
<td>.41**</td>
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<tr>
<td></td>
<td>(2.71)</td>
<td>(2.73)</td>
<td>(2.41)</td>
<td>(2.89)</td>
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<td>(2.29)</td>
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<td>(1.07)</td>
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<td>(.55)</td>
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<td>(-.98)</td>
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<td>.09**</td>
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<td>(2.34)</td>
<td>(2.30)</td>
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<td>Log(roads)</td>
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<td>(.82)</td>
<td>(.78)</td>
<td>(.47)</td>
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<td>HYV share of rice area</td>
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<td>.66**</td>
<td>.59*</td>
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<td>.47</td>
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<td></td>
<td>(2.14)</td>
<td>(1.77)</td>
<td>(1.45)</td>
<td>(1.34)</td>
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<td>yes</td>
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<td>South × year</td>
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<td>yes</td>
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<td>Left Front × year</td>
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<td>...</td>
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<td>yes</td>
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</table>

Note.—t-statistics are in parentheses.

* Significant at the 10 percent level.
** Significant at the 5 percent level.
*** Significant at the 1 percent level.

The impact on sharecropper productivity is obtained by solving the equation for \( g \) from eq. (11) as follows:

\[
\begin{array}{c}
\text{run} \\
\text{A}
\end{array}
/ \begin{array}{c}
\text{H11001} \\
\text{A}
\end{array}
/ \begin{array}{c}
\text{H11002} \\
\text{sdd d}
\end{array}
/ \begin{array}{c}
\text{doAs d}
\end{array}
\]

percent during this period, the share of Operation Barga in this improvement was 28 percent.

The left-hand side of this expression is the percentage change in the average productivity of sharecroppers offered registration relative to those not offered registration. Multiplying the point estimate of the effect of Operation Barga (0.36) by the take-up rate due to Operation 0.15) p 0.58.

These numbers are obtained by multiplying this number with the point estimate of the coefficient of sharecropper registration.
Banerjee-Gertler-Ghatak Estimates of Productivity Effect of Operation Barga

- BGG find significant positive effect (1% rise in registration rate associated with .4% rise in rice yields)
- Estimate is robust to inclusion of all controls
- Corroborated by comparison of changes in rice yields in West Bengal and Bangladesh during this period
- Implies that Operation Barga accounted for about one-sixth (11%) of observed rise (69%) in rice yields
Re-examination of Operation Barga Effects (Bardhan-Mookherjee (2011))

- Re-examine effects of OB: concerns that proportion of tenant farms was too low for these results to be credible
- Concerns regarding
  - level of aggregation
  - measure of productivity, land reform
  - controls for other agricultural development policies
  - data source
Re-examination of Operation Barga Effects (Bardhan-Mookherjee (2011), contd.)

- Farm level analysis: can examine Marshallian inefficiency at the source (distinguish between tenant and owner-cultivated farms); control for farmer fixed effects
- Cost of Cultivation surveys (detailed weekly survey of inputs and outputs)
- Control for other government agricultural development programs (minikits, credit, village irrigation, roads, employment programs)
Re-Examination of Operation Barga Effects, contd.

- Productivity measure: farm value added per acre, not physical yield of single crop
- Land reform measure: proportion of cultivable land area covered by land distribution and OB programs (rather than proportion of tenants registered)
III. OLS Estimates

Table 6 presents OLS estimates of the effects of minikits delivered to a village on log value added per acre of farms located in that village in subsequent years. Column 1 shows the regression estimate, which controls only for farmer and year dummies. Column 2 adds in village-level controls for rainfall, rice price, roads, and irrigation provided by the state government, and for farm size and tenancy status. Column 3 then adds in controls for the other major programs that might affect farm productivity: the two land reform programs, the IRDP credit program, and mandays of employment generated by the GP infrastructure programs. All of these generate an estimate of minikits that is statistically significant at the 1 percent level, varying between 0.42 to 0.49. Column 3 allows us to appraise the comparative effect of different development programs. The land titling program does not have a significant effect, while the

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>All farms (log value added per acre)</th>
<th>Owner-cultivated farms (log value added per acre)</th>
<th>All farms Village productivity (log value added per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kits per HH (cumulative)</td>
<td>0.417*** (0.103)</td>
<td>0.474*** (0.087)</td>
<td>0.492*** (0.164)</td>
</tr>
<tr>
<td>Land patta (cumulative % of total land)</td>
<td>0.188 (0.119)</td>
<td>0.253 (0.170)</td>
<td>-0.054 (0.144)</td>
</tr>
<tr>
<td>Land registered (cumulative % of total land)</td>
<td>0.423*** (0.126)</td>
<td>0.441*** (0.130)</td>
<td>0.349*** (0.130)</td>
</tr>
<tr>
<td>IRDP subsidy per HH (cumulative, in 1,000s)</td>
<td>0.533** (0.259)</td>
<td>0.601** (0.261)</td>
<td>0.316 (0.236)</td>
</tr>
<tr>
<td>JRY mandays per HH</td>
<td>0.049 (0.031)</td>
<td>0.043 (0.032)</td>
<td>0.046* (0.024)</td>
</tr>
<tr>
<td>Other controls</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Observations</td>
<td>2,408</td>
<td>2,193</td>
<td>2,085</td>
</tr>
<tr>
<td>Number of farms</td>
<td>616</td>
<td>570</td>
<td>539</td>
</tr>
<tr>
<td>F</td>
<td>16.170</td>
<td>10.930</td>
<td>8.63</td>
</tr>
<tr>
<td>R²</td>
<td>0.038</td>
<td>0.138</td>
<td>0.135</td>
</tr>
</tbody>
</table>

Notes: The dependent variable for all specifications is the log of value added per acre for all crops. OLS coefficients are reported with robust standard errors in parentheses. Standard errors are clustered at the village level. All specifications include farm and year fixed effects. Other controls include rainfall, GP local irrigation expenditures, GP local road expenditures, log price of rice, WB canals in district, WB roads in district, an indicator for whether the plot was leased, total acreage cropped, and the square of total acreage cropped. Specification (4) drops all households who have leased land at any point of the sample. Specifications (1) and (2) control additionally for HYV share of total rice production.

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.
Implications

- So we continue to get a significant positive effect of OB implementation on productivity at farm level.
- Estimated elasticity with respect to OB is about 0.4, just as in B-G-G!
- Other programs also had a significant positive effect, esp. minikit distribution.
- IV estimates however lower OB effect by about a half: overall, role of OB in explaining Green Revolution was small (but positive), while land distribution had zero effect.
Recent Land Reform Programs Elsewhere

- Post-apartheid South Africa: LRAD program since 2001
  - market-assisted land grants
  - grants of between 20-100K rand, required matching contributions 5-40K
  - eligibility restrictions
  - multi-stage approval process

- Brazil: land disappropriated during 1985-89 (Sarney-Color adm; 5 million ha.), then again during 1992-2003 (Franco-Cardoso adm, 10 million ha.) but moved towards ‘negotiated land reform’
S Africa LRAD Program Effects

- Estimated by Keswell and Carter (JDE, 2014) on consumption of beneficiaries
- Examine data on those who applied for the grants, and compared consumption of grant recipients with others still waiting (controlling for observable characteristics)
- Grant recipients had 28% higher monthly consumption compared with similar waiting applicants
- Dip in consumption in first year, followed by a 50% increase in subsequent years!!
Brazil 1993-2003 Land Redistribution Program Effects

- Assuncao (2006) finds no significant effect of the program on the proportion of landless households overall (negative effect only for bottom 20%)
- Increase in land inequality!
- His analysis does not provide any explanation of these findings
Conclusion

In the context of peacetime democracies, little scope for radical land redistributions.

Recent initiatives have been less radical: sharecropper regulations, land purchase grants.

Evidence on effectiveness:

- S Africa land grant program: successful in reducing poverty.
- W Bengal tenancy reform: somewhat successful in raising productivity and lowering poverty.
- Brazil land distribution: less effective.