Country	Acreage (hectares)	Development Cost per Hectare (dollars per hectare)	Cost per Family (dollars per family)	Total Cost (millions of dollars)
Kenya[1]	12,000	2,432	—	29.2
Morocco[2]	—	1,430	—	—
Ceylon[3]	—	767	—	—
Sudan[4]	36,000	545	3,270	19.6
Nigeria[5]	—	285	8,400	—
Guatemala I[6]	98,800	227	4,527	22.2
Guatemala II[7]	98,800	80	1,617	8.1
United States[8]	402,800	1,520	—	—

[1]Kano Plain Irrigation Project. Includes dams, reservoirs, canals, flood control, land preparation, power distribution. Source: U.S. Bureau of Reclamation, preliminary draft of Kano Plain Reconnaissance Study, April and May 1966.

[2]Lower Moulouya Irrigation Project. Includes dams, canals, power, pumps, distribution, drainage, land preparation. Source: USAID, Preliminary Project Lower Moulouya Irrigation Project, Washington, D.C.

[3]Project unknown. Irrigation 490 dollars per hectare; clearing 277 dollars per hectare. Excludes domestic water, sanitation, fencing, homes. Source: B.H. Farmer, *Pioneer Peasant Colonization in Ceylon: A Study in Asian Agrarian Problems* (London: Oxford University Press, 1957), p. 387.

[4]Kasha-el-Guba Settlement. Includes dams, canals, laterals, infrastructure. Source: USAID, Sudan Desk File, Washington, D.C.

[5]Source: O. O. Okediji, "Some Socio-Cultural Problems in the Western Nigeria Land Settlement Scheme: A Case Study," *Nigerian Journal of Economics and Social Studies* 7, no. 3 (November 1965), pp. 301–310.

[6]Sebol-Chinaja. Includes surveying, drainage, roads, houses, population nuclei, family transportation. Source: United Nations draft document, based on Government of Guatemala estimates.

[7]Ibid. Includes surveying, drainage, and roads only.

[8]Garrison Diversion, Missouri River. Includes storage, canals, drainage, roads for providing irrigation water to currently cultivated land. Source: U.S. Bureau of Reclamation.

Figure 4-28 Sample land development costs
Source: PSAC 1967, vol. 2, p. 436.

On a global scale, the development costs increase as a larger fraction of the land is brought under cultivation. The first hectares of land developed require very low development investments. But as less convenient areas come into cultivation, clearing becomes more and more difficult and costly; and when natural precipitation is no longer sufficient, additional investments are needed for irrigation. At the extreme, when only very little land is available, the development cost will be heavy and the land supply will be highly inelastic. In other words, "the long run supply curve would be affected by the ease or difficulty of clearing and draining land. Not all land can be cleared with equal ease. The least cost land would be cleared first" (Hoover 1970). Technological change tends to shift the entire cost curve, making land development less expensive, but it does not change the curve's basic characteristic: increasing costs as the stock of potentially arable land steadily decreases.

The current real-world average development cost has been very roughly estimated at 1,000 dollars per hectare (PSAC 1967, vol. 2, p. 461), this average cost occuring at a point when 56 percent of the total potentially arable land remained uncultivated. Current average development costs in the United States are estimated at 1,500 dollars per hectare, with about 49 percent of the potentially arable land stock still undeveloped. Australia, with only 2 percent of its potentially arable land currently under cultivation, has recently completed two projects at a cost of around 60 dollars per hectare. Using those figures as a guideline, we hypothesized the relationship shown in Figure 4-29. For constant technology, the cost curve represents the assumption that the cost of development will be on the order of 100,000 dollars per hectare as the potentially arable land PAL approaches zero.* A higher value was not chosen because, at such high development costs, the distinction between potentially arable land and land judged unsuitable for cultivation is not very sharp.


```
DCPH.K=TABHL(DCPHT,PAL.K/PALT,0,1,.1)                    97, A
DCPHT=1E5/7400/5200/3500/2400/1500/750/300/150/75/  97.1, T
  50
    DCPH   - DEVELOPMENT COST PER HECTARE (DOLLARS/
             HECTARE)
    TABHL  - A FUNCTION WITH VALUES SPECIFIED BY A TABLE
    DCPHT  - DCPH TABLE
    PAL    - POTENTIALLY ARABLE LAND (HECTARES)
    PALT   - POTENTIALLY ARABLE LAND TOTAL (HECTARES)
```

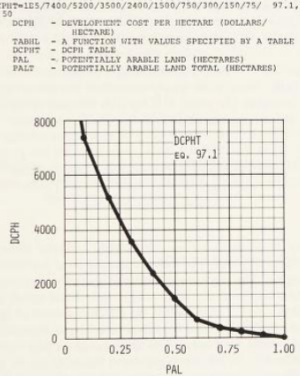

Figure 4-29 Development cost per hectare table

*Under certain extreme circumstances the funds allocated for land development may be sufficient to pay the finite cost (100,000 dollars per hectare) of repeatedly developing the last remaining hectares of potentially arable land PAL. That will occur when total agricultural investment TAI reaches extremely high values and when the fraction of investment allocated to land development FIALD is nonzero. Thus potentially arable land PAL may go negative. This problem is easily eliminated by increasing the first entry in the table of development costs per hectare DCPHT.