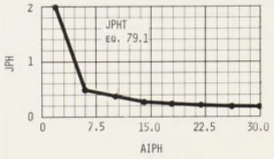

Figure 3-33 Jobs per hectare table

Implicit in our specification of JPH is the assumption that further economic development will bring displacement of labor by capital in the agriculture sector. This shift in inputs has been the historical trend, but a few countries, like Japan, have retained labor-intensive agricultural practices even with great increases in the use of agricultural capital inputs. Future patterns of development other than those in Figure 3-32 are conceivable. Figure 3-34 portrays three alternative relationships between capital and labor inputs to agriculture. With a model whose production functions explicitly included labor, it would be important to analyze the implications of alternative agricultural development strategies.

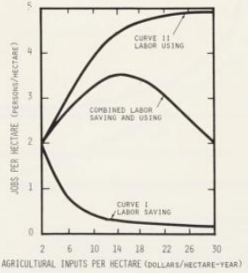

Figure 3-34 Alternative possible assumptions concerning jobs per hectare

Labor Force LF

```
LF.K=(P2.K+P3.K)*LFPF                                    80, A
LFPF=.75                                                 80.1, C
    LF    - LABOR FORCE (PERSONS)
    P2    - POPULATION, AGES 15-44 (PERSONS)
    P3    - POPULATION, AGES 45-64 (PERSONS)
    LFPF  - LABOR FORCE PARTICIPATION FRACTION
              (DIMENSIONLESS)
```

In World3 the labor force LF is defined to be the total number of people in the working-age group (15 years to 60 years) multiplied by the labor force participation fraction LFPF of 0.75. We assumed that only 75 percent of the population in the working-age group (which includes women) is actually willing or able to pursue employment.

Impact of Labor Scarcity on Capital Utilization CUF

```
LUF.K=J.K/LF.K                                           81, A
    LUF   - LABOR UTILIZATION FRACTION (DIMENSIONLESS)
    J     - JOBS (PERSONS)
    LF    - LABOR FORCE (PERSONS)

LUFD.K=SMOOTH(LUF.K,LUFDT)                               82, A
LUFDT=2                                                  82.1, C
    LUFD  - LABOR UTILIZATION FRACTION DELAYED
              (DIMENSIONLESS)
    SMOOTH - FIRST-ORDER EXPONENTIAL INFORMATION DELAY
    LUF   - LABOR UTILIZATION FRACTION (DIMENSIONLESS)
    LUFDT - LABOR UTILIZATION FRACTION DELAY TIME
              (YEARS)
```

The labor utilization fraction LUF is a measure of the degree to which the labor force LF is occupied by the available jobs. For example, if LF is twice the number of jobs J, then LUF is 0.5; if LF is half the number of jobs, LUF is 2.0. Values of the labor utilization fraction LUF greater than 1.0 indicate a labor shortage in which the number of jobs exceeds the labor force.

The capital utilization fraction CUF depends on the labor utilization fraction delayed LUFD, a two-year exponential average value of LUF. CUFT, the table function incorporating the relation between LUFD and CUF into the model, is illustrated in Figure 3-35.

```
CUF.K=TABHL(CUFT,LUFD.K,1,11,2)                          93, A
CUF=1                                                    93.1, N
CUFT=1/.9/.7/.3/.1/.1                                    93.2, T
    CUF   - CAPITAL UTILIZATION FRACTION
              (DIMENSIONLESS)
    TABHL - A FUNCTION WITH VALUES SPECIFIED BY A TABLE
    CUFT  - CUF TABLE
    LUFD  - LABOR UTILIZATION FRACTION DELAYED
              (DIMENSIONLESS)
```