**CARRYING CAPACITY PUERTO RICO**

**BY ANGEL M. RIOS**

**THIS PROGRAM WAS DESIGNED TO CALCULATE CARRYING CAPACITY FOR PUERTO RICO USING EMPIRICAL DATA UNDER ASSUMPTIONS THAT WILL BE SPECIFIED ABOVE.**

**CARRYING CAPACITY PUERTO RICO**

**THESE CALCULATION WILL BE USED TO MAKE AN ANALYSIS OF THE DEVELOPMENT POLICIES INVOLVED AND ITS IMPACT ON THE ENVIRONMENT AND RESOURCE CONSERVATION.**

**DIMENSIONING**

**CARRYING CAPACITY IS DEFINED HERE AS THE NUMBER OF PEOPLE THAT CAN BE SUSTAINED BY AN AREA BASED ON ITS AGRICULTURALLY PRODUCTIVE LAND RESOURCE.**

**THESE CALCULATION WILL BE USED TO MAKE AN ANALYSIS OF THE DEVELOPMENT POLICIES INVOLVED AND ITS IMPACT ON THE ENVIRONMENT AND RESOURCE CONSERVATION.**

**1980**

**I WILL START BY PROJECTING LAND USE DATA BASED ON EMPIRICAL EVIDENCE. LAND USE IS PROJECTED BASED ON FOUR ASSUMPTIONS, FOUR SCENARIOS. THE FIRST ONE (FARLAN1(YR)) ASSUMES THAT THERE IS NO CHANGE IN AGRICULTURAL LAND USE SINCE 1980. THIS ASSUMPTION WILL SERVE TO EVALUATE THE POSSIBILITY OF FARMING FARMLAND LOST FURTHER THAN THAT OF 1980.**

**THE SECOND SCENARIO ASSUMES THE ANNUAL REDUCTION IN FARMLAND IS EQUAL TO THE AVERAGE ANNUAL REDUCTION OF FARMLAND BETWEEN 1950-1987, 9699 HA PER YEAR.**

**THE THIRD SCENARIO ASSUMES A CONTINUATION OF THE AVERAGE ANNUAL RATE OF CHANGE OBSERVED IN THE LAST 25 YEARS.**

**CENSUS PERIOD, 1982-1987, 6,119 HA PER YEAR. THE FOURTH SCENARIO ASSUMES THAT FARMLAND REDUCTION WILL OCCUR AT THE AVERAGE LOWEST RATE OF CHANGE OBSERVED FOR A CENSUS PERIOD SINCE 1950, 3360 HA/YEAR (1959-64).**

**I WILL PROJECT ESTIMATES OF FARMLAND FROM YEAR 1980 TO YEAR 2015.**

**FARLAN1(YR) = LAND USE PROJECTION IF FARMLAND IS MAINTAINED AT 1980 LEVEL.**

**FARLAN2(YR) = LAND USE PROJECTION IF FARMLAND DECREASES AT A RATE OF 9699 HA/YR.**

**FARLAN3(YR) = LAND USE PROJECTION IF FARMLAND DECREASES AT A RATE OF 6119 HA/YR.**
REM FARLAN4(YR) = LAND USE IF FARMLAND DECREASES AT A RATE OF 3360 HA/YR
REM
REM BASE YEAR (1980) FARMLAND DATA IS AN INTERPOLATION OF FARMLAND AREA FOR
170 FARLAN1(1) = 443204!
180 FARLAN2(1) = 443204!
190 FARLAN3(1) = 443204!
200 FARLAN4(1) = 443204!
210 REM NEXT I PROJECT BASED ON ANNUAL RATES OF CHANGE AND BASE YEAR DATA, FARML
AND FROM 1980 TO 2015
220 REM
230 FOR YR = 2 TO 36
240 FARLAN1(YR) = FARLAN1(1)
250 FARLAN2(YR) = FARLAN2(YR-1) - 9693
260 FARLAN3(YR) = FARLAN3(YR-1) - 6119
270 FARLAN4(YR) = FARLAN4(YR-1) - 3360
280 NEXT
282 PRINT " SCENARIO 1 SCENARIO 2 SCENARIO 3 SCENARIO 4"
284 PRINT "YEAR FARMLAND FARMLAND FARMLAND FARMLAND"
286 PRINT " HECTARES"
288 PRINT
290 FOR YR = 1 TO 36
300 PRINT YR, FARLAN1(YR), FARLAN2(YR), FARLAN3(YR), FARLAN4(YR)
330 NEXT
340 REM
350 REM NOW I WILL CALCULATE THE FOOD PRODUCTION CAPACITY OF THIS LAND AREAS MEA-
SURED IN KCAL FOR THREE CROPS RICE, DRY BEANS AND SWEET POTATOES, THREE
MAJOR FOODS OF THE PUERTO RICAN DIET.
360 REM THE TECHNOLOGICAL MANUAL FOR RICE PUBLISHED BY THE AGRICULTURAL EXPERI-
MENTAL STATION OF THE UNIVERSITY OF PUERTO RICO SUGGESTS THERE ARE
30,261 HECTARES OF LAND IN PUERTO RICO APPROPRIATE FOR RICE GROWING
370 REM THEREFORE I ASSUME THAT BEING RICE ONE OF THE MAIN FOODS IN THE PR DIET,
380 REM 30,261 HECTARES OF FARMLAND AVAILABLE WILL BE USE TO PRODUCE RICE. THIS
390 REM IS CONSERVED. THE CONTRIBUTION TO FOOD PRODUCTION BY RICE IS CALCULATED
USING THIS FIGURE, THIS AREA IS SUBTRACTED FROM TOTAL LAND AVAILABLE
AND THE REST IS DIVIDED BETWEEN THE OTHER TWO MAJOR CROPS.
400 REM RICE PRODUCTION IS ESTIMATED IN 8,142 LBS/HA, RICE PROVIDES APPROXIMATELY
552 KCAL/LB. (FROM WISE'S (1979) NUTRITIONAL QUALITY INDEX OF FOODS)
410 REM I CALCULATE TOTAL KCALS THAT CAN BE PRODUCED IN RICE
420 REM TOTAL CALORIES THAT CAN BE PRODUCED BY RICE GROWING EQUALS AREA IN HECT
RES MULTIPLIED BY POUNDS OF RICE PER HA MULTIPLIED BY KILOCALORIES PER P
430 REM KILOCALRIC = 30261 * 8142 * 552
440 PRINT
450 REM "KILOCALORIES PRODUCED BY GROWING RICE IN 30,261 HA = ", KILOCALRIC
460 REM NOW I CALCULATE LAND AVAILABLE FOR OTHER CROPS AFTER USING THAT AREA TO
470 REM GROW RICE. THAT IS THE FARMLAND AREAS PREVIOUSLY CALCULATED MINUS LAND
480 REM RECOMMENDED TO GROW RICE
490 REM FALACT = FARMLAND AVAILABLE FOR OTHER CROPS
REM TO CALCULATE FARMLAND AVAILABLE TO GROW CROPS I USE THE FIGURE GIVEN BY
THE NATIONAL RESOURCE INVENTORY 1982 FOR THE CARRIBEAN AREA (USDA SCS
1982) THAT 44.5 PERCENT OF TOTAL LAND IS UNDER CAPABILITY CLASSES 1 TO
REM & THAT IS LAND THAT IS SUITED FOR CULTIVATION
FOR YR = 1 TO 36
FALAOT1(YR) = (FARLAN1(YR) * .445) - 30261
FALAOT2(YR) = (FARLAN2(YR) * .445) - 30261
FALAOT3(YR) = (FARLAN3(YR) * .445) - 30261
FALAOT4(YR) = (FARLAN4(YR) * .445) - 30261
NEXT
PRINT
PRINT "FARMLAND AVAILABLE TO GROW OTHER CROPS IN HECTARES"
PRINT "YEAR", "SCENARIO 1", "SCENARIO 2", "SCENARIO 3", "SCENARIO 4"
PRINT
FOR YR = 1 TO 36
PRINT YR, FALAOT1(YR), FALAOT2(YR), FALAOT3(YR), FALAOT4(YR)
NEXT
REM NOW I WILL CALCULATE THE KILOCALORIES PRODUCED IF THE REST OF THE FARMLAND
 AVAILABLE WOULD BE PLANTED IN THE OTHER TWO CROPS CHosen AS REPRESENTATIVE OF THE PUERTO RICAN DIET (DRY BEANS AND SWEET POTATOES)
REM estimates ARE MADE UNDER THREE ASSumPTIONS, IF ALL FARMLAND AVAILABLE IS
PLANTED WITH SWEET POTATOES(A), IF HALF OF THE FARMLAND AVAILABLE IS PLANTED WITH DRY BEANS AND HALF IS PLANTED WITH SWEET POTATOES(B), AND IF ALL
FARMLAND AVAILABLE IS PLANTED WITH DRY BEANS(C). THESE CROPS PROVIDE
AN ESTIMATED 511 KCAL PER POUND FOR SWEET POTATOES AND 538 KCAL PER
POUND FOR DRY BEANS.
REM AVERAGE PRODUCTION RATES FOR SWEET POTATOES IS 23,919 LBS / HA. AVERAGE
PRODUCTION RATES FOR DRY BEANS IS 3,883 LBS PER HECTARE.
REM SCENARIOS FOR CROPS COMBINATIONS ARE REPRESENTED BY LETTERS A, B, AND C.
SCENARIOS FOR FARMLAND ESTIMATES ARE REPRESENTED BY NUMBERS 1, 2, 3, AND 4.
FOR YR = 1 TO 36
KCALSP1A(YR) = FALAOT1(YR) * 23919 * 511
KCALSP2A(YR) = FALAOT2(YR) * 23919 * 511
KCALSP3A(YR) = FALAOT3(YR) * 23919 * 511
KCALSP4A(YR) = FALAOT4(YR) * 23919 * 511
KCALSP1B(YR) = (FALAOT1(YR) * 23919 * 511) * .5
KCALSP2B(YR) = (FALAOT2(YR) * 23919 * 511) * .5
KCALSP3B(YR) = (FALAOT3(YR) * 23919 * 511) * .5
KCALSP4B(YR) = (FALAOT4(YR) * 23919 * 511) * .5
KCALSP1C(YR) = 0 * 23919 * 511
KCALSP2C(YR) = 0 * 23919 * 511
KCALSP3C(YR) = 0 * 23919 * 511
KCALSP4C(YR) = 0 * 23919 * 511
KCALDB1A(YR) = 0 * 3683 * 538
KCALDB2A(YR) = 0 * 3683 * 538
KCALDB3A(YR) = 0 * 3683 * 538
CALCULATE \( YR \) = \( 0.3683 \times 338 \)

\[
\text{KCALDB1B(YR) = (FALACT1(YR) \times 3683 \times 538) \times 0.5}
\]

\[
\text{KCALDB2B(YR) = (FALACT2(YR) \times 3683 \times 538) \times 0.5}
\]

\[
\text{KCALDB3B(YR) = (FALACT3(YR) \times 3683 \times 538) \times 0.5}
\]

\[
\text{KCALDB4B(YR) = (FALACT4(YR) \times 3683 \times 538) \times 0.5}
\]

\[
\text{KCALDB1C(YR) = FALACT1(YR) \times 3683 \times 538}
\]

\[
\text{KCALDB2C(YR) = FALACT2(YR) \times 3683 \times 538}
\]

\[
\text{KCALDB3C(YR) = FALACT3(YR) \times 3683 \times 538}
\]

\[
\text{KCALDB4C(YR) = FALACT4(YR) \times 3683 \times 538}
\]

\[
\text{KCAL1B(YR) = KCALSP1B(YR) + KCALDB1B(YR)}
\]

\[
\text{KCAL2B(YR) = KCALSP2B(YR) + KCALDB2B(YR)}
\]

\[
\text{KCAL3B(YR) = KCALSP3B(YR) + KCALDB3B(YR)}
\]

\[
\text{KCAL4B(YR) = KCALSP4B(YR) + KCALDB4B(YR)}
\]

NEXT

PRINT " KILOCALORIES BY SWEET POTATOES "

PRINT "YEAR", "1(A)", "2(A)"

PRINT

FOR YR = 1 TO 36

PRINT YR, KCALSP1A(YR), KCALSP2A(YR)

NEXT

PRINT "YEAR", "3(A)", "4(A)"

PRINT

FOR YR = 1 TO 36

PRINT YR, KCALSP3A(YR), KCALSP4A(YR)

NEXT

PRINT " KILOCALORIES BY DRY BEANS"

PRINT "YEAR", "1(C)", "2(C)"

FOR YR = 1 TO 36

PRINT YR, KCALDB1C(YR), KCALDB2C(YR)

NEXT

PRINT "YEAR", "3(C)", "4(C)"

FOR YR = 1 TO 36

PRINT YR, KCALDB3C(YR), KCALDB4C(YR)

NEXT

PRINT " KILOCALORIES BY HALF AND HALF COMBINATION OF DRY BEANS AND SWEET POTATOES"

PRINT "YEAR", "1(E)", "2(E)"

PRINT

FOR YR = 1 TO 36

PRINT YR, KCAL1B(YR), KCAL2B(YR)

NEXT

PRINT
PRINT YR, CARCAP3A(YR), CARCAP4A(YR)
NEXT
PRINT "WHEN RICE AND DRY BEANS ARE PRODUCED"
PRINT "YEAR", "1(C)", "2(C)"
FOR YR = 1 TO 26
PRINT YR, CARCAP1C(YR), CARCAP2C(YR)
NEXT
PRINT "3(C)", "4(C)"
PRINT
FOR YR = 1 TO 36
PRINT YR, CARCAP3C(YR), CARCAP4C(YR)
NEXT
PRINT "WHEN RICE AND A COMBINATION OF RICE BEANS AND SWEET POTATOES IS PROD"
PRINT "YEAR", "1(B)", "2(B)"
PRINT
FOR YR = 1 TO 36
PRINT YR, CARCAP1B(YR), CARCAP2B(YR)
NEXT
PRINT "3(B)", "4(B)"
PRINT
FOR YR = 1 TO 36
PRINT YR, CARCAP3B(YR), CARCAP4B(YR)
NEXT
PRINT
END