

2 REM *****
 5 REM CARRYING CAPACITY PUERTO RICO
 8 REM BY ANGEL M. RIOS
 10 REM THIS PROGRAM WAS DESIGNED TO CALCULATE CARRYING CAPACITY FOR PUERTO RICO
 50 REM USING EMPIRICAL DATA UNDER ASSUMPTIONS THAT WILL BE SPECIFIED ABOVE
 20 REM CARRYING CAPACITY PUERTO RICO
 25 REM THESE CALCULATION WILL BE USED TO MAKE AN ANALYSIS OF THE DEVELOPMENT POLICIES INVOLVED AND ITS IMPACT ON THE ENVIRONMENT AND RESOURCE CONSERVATION.
 30 REM *****DIMENSIONING*****
 32 DIM FARLAN1(40), FARLAN2(40), FARLAN3(40), FARLAN4(40)
 34 DIM FALAOT1(40), FALAOT2(40), FALAOT3(40), FALAOT4(40)
 36 DIM KCALSP1A(40), KCALSP2A(40), KCALSP3A(40), KCALSP4A(40)
 38 DIM KCALSP1B(40), KCALSP2B(40), KCALSP3B(40), KCALSP4B(40)
 39 DIM KCALSP1C(40), KCALSP2C(40), KCALSP3C(40), KCALSP4C(40)
 40 DIM KCALSP1D(40), KCALSP2D(40), KCALSP3D(40), KCALSP4D(40)
 42 DIM KCALDB1A(40), KCALDB2A(40), KCALDB3A(40), KCALDB4A(40)
 44 DIM KCALDB1B(40), KCALDB2B(40), KCALDB3B(40), KCALDB4B(40)
 46 DIM KCALDB1C(40), KCALDB2C(40), KCALDB3C(40), KCALDB4C(40)
 48 DIM KCALDB1D(40), KCALDB2D(40), KCALDB3D(40), KCALDB4D(40)
 50 DIM KCAL1B(40), KCAL2B(40), KCAL3B(40), KCAL4B(40)
 52 DIM CARCAP1A(40), CARCAP2A(40), CARCAP3A(40), CARCAP4A(40)
 54 DIM CARCAP1B(40), CARCAP2B(40), CARCAP3B(40), CARCAP4B(40)
 56 DIM CARCAP1C(40), CARCAP2C(40), CARCAP3C(40), CARCAP4C(40)
 70 REM *****
 73 REM CARRYING CAPACITY IS DEFINED HERE AS THE NUMBER OF PEOPLE THAT CAN BE SUSTAINED BY AN AREA BASED ON ITS AGRICULTURALLY PRODUCTIVE LAND RESOURCE
 75 REM THESE CALCULATION WILL BE USED TO MAKE AN ANALYSIS OF THE DEVELOPMENT POLICIES INVOLVED AND ITS IMPACT ON THE ENVIRONMENT AND RESOURCE CONSERVATION.
 78 REM YR 1=1980 YR 40 = 2020
 80 REM 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
 81 REM SINCE 1980. THIS ASSUMPTION WILL SERVE TO EVALUATE THE POSSIBILITY OF FREEZING FARMLAND LOST FURTHER THAN THAT OF 1980.
 82 REM 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.
 85 REM THE THIRD SCENARIO ASSUMES A CONTINUATION OF THE AVERAGE ANNUAL RATE OF CHANGE OBSERVED IN THE LAST
 86 REM CENSUS PERIOD, 1982-1987, 6,119 HA PER YEAR. THE FOURTH SCENARIO ASSUMES THAT FARMLAND REDUCTION WILL OCCURE AT THE AVERAGE LOWEST RATE OF CHANGE OBSERVED FOR A CENSUS PERIOD SINCE 1950, 3360 HA/YEAR (1959-64)
 103 REM YR 1=1980 YR 36 = 2015
 110 REM I WILL PROJECT ESTIMATES OF FARMLAND FROM YEAR 1980 TO YEAR 2015
 115 REM FARLAN1(YR) = LAND USE PROJECTION IF FARMLAND IS MAINTAINED AT 1980 LEVEL
 120 REM FARLAN2(YR) = LAND USE PROJECTION IF FARMLAND DECREASES AT A RATE OF 9699 HA/YR
 130 REM FARLAN3(YR) = LAND USE IF FARMLAND DECREASES AT A RATE OF 6119 HA/YR

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140 REM FARLAN4(YR) = LAND USE IF FARMLAND DECREASES AT A RATE OF 3360 HA/YR
150 REM
160 REM BASE YEAR (1980) FARMLAND DATA IS AN INTERPOLATION OF FARMLAND AREA FOR
CENSUS PERIOD 1974, 1978, and 1982 (USDC 1978, 1987)
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) - 9699
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 MEAS
URED 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 EXPERIME
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,
30,261 HECTARES OF FARMLAND AVAILABLE WILL BE USE TO PRODUCE RICE. THIS
ASSUMES THAT OF FARMLAND AVAILABLE THAT LAND APPROPRIATE FOR RICE GROW
380 REM IS CONSERVED. THE CONTRIBUTION TO FOOD PRODUCTION BY RICE IS CALCULATED
USING THIS FIGURE, THIS AREA IS SUBSTRACTED FROM TOTAL LAND AVAILAELE
AND THE REST IS DIVIDED BETWEEN THE OTHER TWO MAJOR CROPS.
390 REM RICE PRODUCTION IS ESTIMATED IN 8,142 LBS/HA, RICE PROVIDES APPROXIMATEL
LY 552 KCAL/LB. (FROM WYSE'S (1979) NUTRITIONAL QUALITY INDEX OF FOODS)
I CALCULATE TOTAL KCALS THAT CAN BE PRODUCED IN RICE
400 REM TOTAL CALORIES THAT CAN BE PRODUCED BY RICE GROWING EQUALS AREA IN HECTA
RES MULTIPLIED BY POUNDS OF RICE PER HA MULTIPLIED BY KILOCALORIES PER P
OUND
410 KCALRIC = 30261 * 8142 * 552
415 PRINT
420 PRINT "KILOCALORIES PRODUCED BY GROWING RICE IN 30,261 HA = ", KCALRIC
430 REM NOW I CALCULATE LAND AVAILABLE FOR OTHER CROPS AFTER USING THAT AREA TO
GROW RICE. THAT IS THE FARMLAND AREAS PREVIOUSLY CALCULATED MINUS LAND
RECOMMENDED TO GROW RICE
440 REM FALACT = FARMLAND AVAILABLE FOR OTHER CROPS

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445 REM TO CALCULATE FARMLAND AVAILABLE TO GROW CROPS I USE THE FIGURE GIVEN BY
    THE NATIONAL RESOURCE INVENTORY 1982 FOR THE CARRIBBEAN AREA (USDA SCS
    1982) THAT 44.5 PERCENT OF TOTAL LAND IS UNDER CAPABILITY CLASSES 1 TO
457 REM 6 THAT IS LAND THAT IS SUITED FOR CULTIVATION
460 FOR YR = 1 TO 36
465 FALAOT1(YR) = (FARLAN1(YR) * .445) - 30261
470 FALAOT2(YR) = (FARLAN2(YR) * .445) - 30261
475 FALAOT3(YR) = (FARLAN3(YR) * .445) - 30261
480 FALAOT4(YR) = (FARLAN4(YR) * .445) - 30261
490 NEXT
500 PRINT
510 PRINT "FARMLAND AVAILABLE TO GROW OTHER CROPS IN HECTARES"
515 PRINT "YEAR", "SCENARIO 1", "SCENARIO 2", "SCENARIO 3", "SCENARIO 4"
520 PRINT
530 FOR YR = 1 TO 36
540 PRINT YR, FALAOT1(YR), FALAOT2(YR), FALAOT3(YR), FALAOT4(YR)
550 NEXT
560 REM NOW I WILL CALCULATE THE KILOCALORIES PRODUCED IF THE REST OF THE FARMLA
    ND AVAILABLE WOULD BE PLANTED IN THE OTHER TWO CROPS CHOSEN AS REPRESENT
    ATIVE OF THE PUERTO RICAN DIET (DRY BEANS AND SWEET POTATOES)
570 REM ESTIMATES ARE MADE UNDER THREE ASSUMPTIONS, IF ALL FARMLAND AVAILABLE IS
    PLANTED WITH SWEET POTATOES(A), IF HALF OF THE FARMLAND AVAILABLE IS PLAN
    TED WITH DRY BEANS AND HALF IS PLANTED WITH SWEET POTATOES(B), AND IF ALL
580 REM 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.
590 REM AVERAGE PRODUCTION RATES FOR SWEET POTATOES IS 23,919 LBS / HA. AVERAGE
    PRODUCTION RATES FOR DRY BEANS IS 3,683 LBS PER HECTARE.
592 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.
600 FOR YR = 1 TO 36
610 KCALSP1A(YR) = FALAOT1(YR) * 23919 * 511
620 KCALSP2A(YR) = FALAOT2(YR) * 23919 * 511
630 KCALSP3A(YR) = FALAOT3(YR) * 23919 * 511
640 KCALSP4A(YR) = FALAOT4(YR) * 23919 * 511
650 KCALSP1B(YR) = (FALAOT1(YR) * 23919 * 511) * .5
660 KCALSP2B(YR) = (FALAOT2(YR) * 23919 * 511) * .5
670 KCALSP3B(YR) = (FALAOT3(YR) * 23919 * 511) * .5
680 KCALSP4B(YR) = (FALAOT4(YR) * 23919 * 511) * .5
690 KCALSP1C(YR) = 0 * 23919 * 511
700 KCALSP2C(YR) = 0 * 23919 * 511
710 KCALSP3C(YR) = 0 * 23919 * 511
720 KCALSP4C(YR) = 0 * 23919 * 511
730 KCALDB1A(YR) = 0 * 3683 * 538
740 KCALDB2A(YR) = 0 * 3683 * 538
750 KCALDB3A(YR) = 0 * 3683 * 538

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00 KCALDB4A(YR) = 0 * 3683 * 538
01 KCALDB1B(YR) = (FALAOT1(YR) * 3683 * 538) * .5
02 KCALDB2B(YR) = (FALAOT2(YR) * 3683 * 538) * .5
03 KCALDB3B(YR) = (FALAOT3(YR) * 3683 * 538) * .5
04 KCALDB4B(YR) = (FALAOT4(YR) * 3683 * 538) * .5
05 KCALDB1C(YR) = FALAOT1(YR) * 3683 * 538
06 KCALDB2C(YR) = FALACT2(YR) * 3683 * 538
07 KCALDB3C(YR) = FALAOT3(YR) * 3683 * 538
08 KCALDB4C(YR) = FALACT4(YR) * 3683 * 538
09 KCAL1B(YR) = KCALSP1B(YR) + KCALDB1B(YR)
10 KCAL2B(YR) = KCALSP2B(YR) + KCALDB2B(YR)
11 KCAL3B(YR) = KCALSP3B(YR) + KCALDB3B(YR)
12 KCAL4B(YR) = KCALSP4B(YR) + KCALDB4B(YR)
13 NEXT
14 PRINT
15 PRINT " KILOCALORIES BY SWEET POTATOES "
16 PRINT
17 PRINT "YEAR", "1(A)", , "2(A)"
18 PFINT
19 FOR YR = 1 TO 36
20 PRINT YR, KCALSP1A(YR), KCALSP2A(YR)
21 NEXT
22 PRINT
23 PRINT "YEAR", "3(A)", , "4(A)"
24 PRINT
25 FOR YR = 1 TO 36
26 PRINT YR, KCALSP3A(YR), KCALSP4A(YR)
27 NEXT
28 PRINT
29 PRINT " KILOCALORIES BY DRY BEANS"
30 PRINT
31 PRINT "YEAR", "1(C)", , "2(C)"
32 FOR YR = 1 TO 36
33 PRINT YR, KCALDB1C(YR), KCALDB2C(YR)
34 NEXT
35 PRINT
36 PRINT "YEAR", "3(C)", , "4(C)"
37 FOR YR = 1 TO 36
38 PRINT YR, KCALDB3C(YR), KCALDB4C(YR)
39 NEXT
40 PRINT
41 PRINT "KILOCALORIES BY HALF AND HALF COMBINATION OF DRY BEANS AND SWEET POT
42 TOES"
43 PRINT
44 PRINT "YEAR", "1(B)", , "2(B)"
45 PRINT
46 FOR YR = 1 TO 36
47 PRINT YR, KCAL1B(YR), KCAL2B(YR)
48 NEXT
49 PRINT
50 PRINT

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60 PRINT YR, CARCAP3A(YR), CARCAP4A(YR)
70 NEXT
75 PRINT
80 PRINT "WHEN RICE AND DRY BEANS ARE PRODUCED"
90 PRINT
00 PRINT "YEAR", "1(C)", "2(C)"
10 PRINT
20 FOR YR = 1 TO 36
30 PRINT YR, CARCAP1C(YR), CARCAP2C(YR)
40 NEXT
50 PRINT
60 PRINT "3(C)", "4(C)"
70 PRINT
80 FOR YR = 1 TO 36
90 PRINT YR, CARCAP3C(YR), CARCAP4C(YR)
00 NEXT
10 PRINT
20 PRINT "WHEN RICE AND A COMBINATION OF RICE BEANS AND SWEET POTATOES IS PROD
ED"
30 PRINT
40 PRINT "YEAR", "1(B)", "2(B)"
50 PRINT
60 FOR YR = 1 TO 36
70 PRINT YR, CARCAP1B(YR), CARCAP2B(YR)
80 NEXT
90 PRINT
00 PRINT "YEAR", "3(B)", "4(B)"
10 PRINT
20 FOR YR = 1 TO 36
30 PRINT YR, CARCAP3B(YR), CARCAP4B(YR)
40 NEXT
50 PRINT
000 END
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