TABULATION

ARIZONA INDIAN PROJECTS

By P. Greisinger, U.S.D.A.

(Brought by Mr. Greisinger to the Los Angeles Irrigation District Office, June, 1944)

WR 5147

## CLASSIFICATION OF PROJECTS

The proposals for irrigation are classified as to feasibility. Projects for irrigation which are being developed and those authorized for development are listed and classified only as to time of development. These classifications are based on the following definitions.

Class A. No apparent disqualifying limitations to feasibility.

- A1. Proposals sufficiently investigated to show evidence of feasibility.

Class B. Minor limitations to feasibility or available information is inadequate to give sufficient evidence of feasibility or lack of it.

- B1. Proposals for which feasibility is conditional upon "short-term" factors.
- B2. Proposals which lack sufficient investigation to give convincing evidence of feasibility but which appear to be worthy of more.
- B3. Proposals which have not received sufficient investigation to determine whether detailed study is warranted but which should have reconnaissance examination to determine advisability of detailed study (to classify in B2 or C2).

Class C. Major limitations to feasibility, or superseded by other proposals, or abandoned.

- C1. Proposals with "long-term" limiting factors and apparent lack of feasibility.
- C2. Proposals inadequately investigated and for which available information does not justify further investigation under present conditions.

Class D. Authorized or under development.

- D1. Projects which are being developed or which have been authorized and development is expected to begin promptly.
- D2. Projects which have been authorized but development is being delayed, apparently for some considerable time.

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Footnotes are not shown on tabulation.

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Footnotes:

1/ Plan of work on active projects includes construction of dams, diversion dams, distribution systems, rehabilitation of irrigation systems, subjugation of land, and protection of land from floods. Proposed projects are principally in the survey and investigational stages. For some latter projects, determinati of costs and feasibility remain to be made.

2/ One feature of this proposal includes extending the boundary of the Navajo Indian Reservation to embrace lands proposed for irrigation.

3/ This plan involves the building of canal structures, water crossings, turn outs, and flood protection work along the creek and surveying and mapping irrigable land.

4/ Installation of concrete pipes to conserve water and of additional pumping plants to develop water for lands now unirrigated are desired.

5/ Extension of main canal and subjugation of land are proposed provided Indians indicate their willingness to operate additional land.

6/ Subjugation of land, conserving water by lining main canals and installing concrete pipes are the major features of the proposed work.

7/ Improvement of the irrigation system and development of new wells are desired in order to provide supplemental water.

8/ Development of these lands through drainage and by providing new wells is to be accomplished by means of development leases, now to Whites. When this development work is completed, the land will be available to settlement by Indian farmers

9/ Improvement of diversion dams and distribution system and the development of new wells are desired.

10/ It is proposed to develop one unit with ground water. If the irrigation enterprise is successful, additional units can be completed after 1950.

11/ Ground water investigations are proposed in order to provide supplemental water.

12/ Three small areas offer limited low to high cost opportunities for irrigation development.

13/ Development of this area is most likely to occur after the completion of Davis Dam. Gravity wather than pump water could be provided to the larger part of Mohave Valley. A rising river channel above Lake Havasu due to silt deposition caused by back pressure in the Colorado River will reduce irrigable acreage on account of water logging. Detailed studies will probably be deferred until the Colorado River is more or less stabilized.

14/ Hydrologic studies by the Bureau of Reclamation are now in progress to determine the availability of water from storage on Chevelon and Clear Creeks for the

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possible irrigation up to a maximum of 5,000 acres of land southeast of Leupp for Indians and 3,000 acres or more west and north of Winslow for Whites.

15/ Development of project dependent upon budget approval.

16/ Extension of Mission Ditch is proposed to cover additional land in what is known as Seven mile canyon.

17/ Major work includes the development of additional irrigated land by the Mexican system of "bolsas." In this system the floodwater is impounded by dykes upon the area to be farmed. Crops are planted after the water has seeped into the ground. Crops are raised without further irrigation except as may come from unpredictable floods. Some canal and dam work are included in the program.

18/ The extension of the concrete pipe system and the eventual installation of more wells are planned.

19/ Areas with shallow-lift which are susceptible of being irrigated from wells may be developed through improvement leases.

20/ Completion of the irrigation system, installation of concrete pipe to conserve water, and subjugation of land are the major features proposed. Shortage of irrigation since the inauguration of the project indicates that development should be delayed on most of the presently unirrigated land. Construction of the Buttes Dam at an estimated cost of approximately $76 per acre would reduce siltatio of the San Carlos Project land, increase the use of flood flows from the Gila and San Pedro Rivers, and develop some hydroelectric power.

21/ Installation of concrete pipe and subjugation of land are indicated.

22/ This is primarily a rehabilitation project.

23/ Development of this area will be gradual over a period of years as required for the establishment of new Indian farms.

24/ A survey is desired to determine the agricultural possibilities, to make estimates of the land that should be subjugated, and to estimate the cost of such work.

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Indian Irrigation Projects - Present and Prospective
Irrigation Proposals - (Indian)
Arizona

| Irrigation proposals arranged by counties and major natural surface-water supply areas | Acres proposed for irrigation development | | | | Approximate number of going farms to benefit | New farm potentialities consequent to development | | | Classification of proposals | Estimated cost per acre for work completed & proposed |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total net acreage involved | Primarily to benefit lands now irrigated | Primarily to water lands now unirrigated | | | Type of farming or principal crops suggested | Recom'd average size of farms | Likely number of new farms | | |
| | | | To benefit going farms | To provide new farms | | | | | | |
| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Apache County<br>San Juan River Drainage Basin | | | | | | | | | | |
| 1. Tes-nos-pas Project | 600 | 157 | | | | Gardens, corn, beans, squash, small grains | | | D 1 | 93 |
| 2. Todenstani Project | 200 | 21 | | | | do. | 20 | 5 | D 1 | 121 |
| 3. Tolthlakan Project | 340 | | | | | do. | 10 | 21 | D 1 | 126 |
| 4. Denehotso Project | 800 | 349 | | | | do. | 10 | 23 | D 1 | 85 |
| 5. Big Safe Mesa Project | 600 | | | | | do. | 20 | 30 | B 1 | 46 |
| 6. Tochinlini Project | 250 | 136 | | | | do. | | | D 1 | 143 |
| 7. Zilbetod Project | 300 | 34 | | | | do. | 10 | 13 | D 1 | 67 |
| 8. Lower Rock Point Project | 2,000 | 544 | | | | do. | 20 | 30 | D 1 | 181 |
| 9. Rocky Point Project | 1,500 | | | | | Pasture | | | D 2 | 25 |
| 10. Cove Project | 350 | 127 | | | | Gardens, corn, beans, squash, small grains | 15 | 6 | D 1 | 70 |
| 11. Red Rock Project | 300 | 174 | | | | do. | 15 | 2 | D 1 | 80 |
| 12. Red Rock Valley Project | 200 | 48 | | | | do. | 20 | 2 | D 1 | 122 |
| 13. Round Rock Project | 600 | 221 | | | | do. | | | D 1 | 157 |
| 14. Red House Project | 350 | 193 | | | | do. | | | D 1 | 72 |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Apache County (cont.) | | | | | | | | | | |
| San Juan River Drainage Basin | | | | | | | | | | |
| 15. Lukachukai,Tohotso & Priest Lake Project | 1,000 | 673 | | | | Gardens,corn,beans, squash,small grains | | | D 1 | 84 |
| 16. Many Farms Project | 8,460 | 1,038 | | | | do. | 30 | 187 | D 1 | 86 |
| 17. Balanced Rock Project | 100 | | | | | Pasture | | | B 1 | 214 |
| 18. Sehili-Tsailee Project | 500 | 164 | | | | Gardens,corn,beans, squash,small grains | | | D 1 | 94 |
| 19. Wheatfields Project | 1,050 | 472 | | | | do. | | | D 1 | 90 |
| 20. Chinle Project | 1,720 | 847 | | | | do. | | | D 1 | 110 |
| 21. Whiskey Creek Project | 100 | 32 | | | | do. | 20 | 3 | D 1 | 178 |
| 22. Beautiful Valley Project | 300 | 148 | | | | do. | 10 | 4 | D 1 | 121 |
| 23. Nazlini Project | 100 | 11 | | | | do. | 15 | 1 | D 1 | 351 |
| | | | | | | | | | | |
| Little Colorado River Drainage Basin | | | | | | | | | | |
| 24. Red Lake Project | 3,000 | 314 | | | | do. | 20 | 107 | D 1 | 99 |
| 25. Fort Defiance Black Creek Proj. | 510 | 135 | | | | do. | 20 | 25 | D 1 | 91 |
| 26. Ganado-Cornfields Project | 2,825 | 796 | | | | do. | 20 | 40 | D 1 | 116 |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Apache County (cont.) Little Colorado River Drainage Basin | | | | | | | | | | |
| 27. Kinlichee Project | 250 | 74 | | | | Gardens, corn, beans, squash, small grains | | | D 1 | 198 |
| 28. Natural Bridge Project | 2,000 | 10 | | | | do. | 20 | 97 | D 1 | 102 |
| 29. Klagetoh Project | 400 | 281 | | | | do. | 10 | 10 | D 1 | 76 |
| 30. Oak Springs Project | 50 | 39 | | | | do. | | | D 1 | 62 |
| 31. Houck Project | 750 | 114 | | | | do. | 20 | 7 | D 1 | 87 |
| 32. Black Creek Project | 6,675 | | | | | Alfelfa, small grains, gardens, beans | 15 | 445 | B 2 | |
| | | | | | | | | | | |
| Coconino County Colorado R. - Main Ston. & Minor Trib. | | | | | | | | | | |
| 1. Left Hand Project | 60 | | | | | Gardens, corn, beans, squash, small grains | 15 | 4 | B 1 | 137 |
| 2. Jones and Navajo Canyon Project | 100 | 44 | | | | do. | | | D 1 | 175 |
| 5. Havasupai Ind. Resn. | 240 | 175 | | | | do. | | | D 1 | 190 |
| | | | | | | | | | | |
| Little Colorado R. Drainage Basin | | | | | | | | | | |
| 3. Bagashibito Project | 200 | 68 | | | | do. | | | D 1 | 136 |
| 4. Klethla Valley Project | 250 | | | | | do. | 10 | 5 | B 1 | 85 |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Coconino County (cont.) Little Colorado R. Drainage Basin | | | | | | | | | | |
| 6. Reservoir Canyon Project | 300 | 300 | | | | Gardens,corn,beans, squash,small grains | | | D 1 | 71 |
| 7. Moenave Project | 115 | 115 | | | | do. | | | D 1 | 126 |
| 8. Moencopi-Tuba Project | 640 | 517 | | | | do. | | | D 1 | 119 |
| 9. Lower Moencopi Project | 160 | 55 | | | | do. | | | D 1 | 421 |
| 10. Black Falls Project | 600 | | | | | Pasture,gardens, corn,beans,grains | 25 | 8 | D 2 | 139 |
| 11. Natonis Project | 175 | | | | | Gardens,corn,beans, squash,small grains | | | D 1 | 168 |
| 12. Tolani Lakes Project | 220 | 70 | | | | do. | | | D 1 | 96 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Gila County Gila River Drainage Basin | | | | | | | | | | |
| 1. Cibcue Stockmans Project | 60 | 25 | | | | Gardens,corn,beans, small grains | | | D 1 | 33 |
| 2. (Middle Fork Cedar Creek Proj. | 200 | 90 | | | | do. | | | D 1 | 33 |
| (East Fork Cedar Creek Project | 480 | 205 | | | | Gardens,corn,beans, small grains,pasture | | | D 1 | 33 |
| 3. West Canyon, Chas.Shipp and Canyon Day School Projects | 120 | 50 | | | | Gardens,corn,beans, small grains | | | D 1 | 33 |

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### Arizona

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| Gila County (cont.) | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 4. Lower McMillan Wash Agency and School, Rice & Lower Gilson | 305 | 180 | | | | Gardens, corn, beans, small grains | | | D 1 | 210 |
| 5. Peridot Farm Units | 310 | 290 | | | | do. | | | D 1 | 210 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Graham County | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 1. Calva, Bylas & East End Units | 620 | 440 | | | | Gardens, corn, beans, small grains, pasture | | | D 1 | 210 |
| 4. Lower McMillan Wash, Agency & School, Rice & Lower Gilson | 180 | | | | | Gardens, corn, beans, small grains | | | D 1 | 210 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Maricopa County | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 1. Fort McDowell Ind.Resn. | 1,300 | 255 | | | | Cereals, grain, hay, alfalfa, gardens & improved pasture | 20 | 13 | D 1 | 103 |
| 2. Salt River Ind. Resn. | 15,000 | 1,860 | | | | Gardens, cotton, alfalfa, maize, grains, pasture | 20 | 93 | D 1 | 117 |
| 3. Maricopa Area | 2,200 | 924 | | | | Cotton, maize, grains, vegetables, alfalfa, gardens | 20 | 60 | D 1 | 4 |
| 4. (Cheatham Lease Area | 900 | 282 | | | | do. | 20 | 45 | D 1 | |
| (Broadacres Ranch Area | 6,400 | 1,250 | | | | | 20 | 320 | D 1 | |
| (Collier Lease Area | 1,686 | 486 | | | | | 20 | 85 | D 1 | |
| (Lone Butte Area | 9,250 | 1,990 | | | | | 20 | 463 | D 1 | |
| (West Chandler & West Goodyear Areas | 4,700 | | | | | | 20 | 235 | D 2 | |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Maricopa County (cont.) | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 5. Cooperative Colony, Gila Crossing, and Santa Cruz areas | 3,000 | 531 | | | | Cotton, maize, grains, vegetables, alfalfa, gardens | 20 | 204 | D 1 | 67 |
| 6. Gila Bend Ind. Resn. | 400 | | | | | do. | 10 | 40 | B 1 | 81 |
| Mohave County | | | | | | | | | | |
| Colorado River-main stem & minor trib. | | | | | | | | | | |
| 1. Kaibab Ind. Resn. | 100 | 50 | | | | Gardens | | | D 1 | 73 |
| 2. Hualpai Ind. Resn. | 170 | 40 | | | | do. | 10 | 8 | D 1 | 184 |
| 3. Fort Mohave Area | 20,000 | 100 | | | | Alfalfa, small grains, improved pastures | 40 | 233 | B 2 | |
| Navajo County | | | | | | | | | | |
| San Juan River Drainage Basin | | | | | | | | | | |
| 1. Piaute Canyon Project | 175 | 172 | | | | Gardens, corn, beans, squash, small grains | | | D 1 | 131 |
| 2. Segi Hot Sogi Project | 100 | 20 | | | | do. | | | D 1 | 292 |
| 3. Marsh Pass Project | 400 | 225 | | | | do. | | | D 1 | 253 |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Navajo County (cont.) | | | | | | | | | | |
| San Juan River Drainage Basin | | | | | | | | | | |
| 6. Chilchimbito Project | 75 | | | | | Gardens, corn, beans, squash, small grains | 10 | 7 | B 1 | 71 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Little Colorado R. Drainage Basin | | | | | | | | | | |
| 4. Cow Canyon Project | 100 | | | | | do. | 15 | 5 | B 1 | 27 |
| 5. Shonto Project | 100 | 80 | | | | do. | | | D 1 | |
| Hardrock diversion dam and 7. irrigation project | 370 | 70 | | | | do. | | | D 1 | 64 |
| Reservoir Canyon | 300 | 274 | | | | | | | D 1 | |
| 8. Demebito Project | 300 | 184 | | | | do. | 5 | 2 | D 1 | |
| 9. Hotevilla Gardens | 6 | 3 | | | | Gardens | | | D 1 | |
| 10. Kepo Gardens | 8 | 4 | | | | do. | | | D 1 | |
| 11. Talahogan Gardens | 6 | 3 | | | | do. | | | D 1 | |
| 12. Jeddito Project | 67 | 54 | | | | do. | | | D 1 | |
| 13. Phillips Farms | 43 | 43 | | | | do. | | | D 1 | 109 |
| 14. Lakasakod Project | 200 | 69 | | | | Gardens, beans, corn, squash, small grains | | | D 2 | |
| | | | | | | | | | | |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Navajo County (cont.) | | | | | | | | | | |
| Little Colorado River Drain. Basin | | | | | | | | | | |
| 15. Bita-Ho-Chee Ind. Wells Proj. | 500 | | | | | Gardens, corn, beans, squash, small grains | 25 | 8 | B 1 | |
| Little Colorado River Proj. | | | | | | | | | | |
| 16. Leupp Unit | 5,000 | | | | | Beans, corns, vegetables | 20 | 250 | B 2 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 17. Carrizo and Corduroy Creek Areas | 230 | 100 | | | | Gardens, corn, beans, small grains, pastur | | | D 1 | 33 |
| 18. Cibicue Creek Areas | 1,280 | 545 | | | | do. | | | D 1 | 33 |
| 19. Gomez Creek Project | 350 | | | | | do. | | | B 1 | 33 |
| 20. White River Areas | 1,600 | 675 | | | | do. | | | D 1 | 33 |
| 21. East Fork White River Areas | 1,250 | 530 | | | | do. | | | D 1 | 33 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Pima County | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 1. Pip Yak Irrig. Project | 40 | | | | | Gardens | 5 | 8 | B 1 | 157 |
| San Xavier Irrig. Project and 2. Extension Irrig. Project | 2,565 | 742 | | | | Small grains, beans, peas, sudangrass, gardens | | | D 1 | 129 |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Pima County (cont.) Independent Basin | | | | | | | | | | |
| 3. Sells Irrigation Project | 14 | 5 | | | | Gardens, beans, corn | | | D 1 | |
| 4. Peoic Irrigation Project | 92 | 5 | | | | do. | | | D 1 | |
| 5. Menegars Dam Irrig. Proj. | 100 | 5 | | | | do. | | | D 1 | |
| 6. Choulic Irrig. Proj. | 56 | 5 | | | | do. | | | D 1 | |
| 7. San Miguel Irrig. Project | 180 | 20 | | | | do. | | | D 1 | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Final County Gila River Drainage Basin | | | | | | | | | | |
| Santa Cruz Wash, Aller Tract, 1.Snaketown, and Sacate Areas | | | | | | | | | | |
| Santa Cruz Wash Area | 8,000 | | | | | Small grains, alfalfa, cotton, vegetables | 50 | 160 | B 2 | |
| Aller Tract Area | 4,500 | | | | | do. | 50 | 90 | B 2 | |
| Snaketown Area | 1,600 | | | | | do. | 50 | 320 | B 2 | |
| Sacate Area | 1,000 | | | | | do. | 50 | 20 | B 2 | |
| Santan Area | 2,000 | | | | | | 50 | 40 | B 2 | |

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| Numbers | Acres | Acres | Acres | Acres | Number | | Acres | Number | | Dollars |
| Pinal County (cont.) | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 2. San Carlos Proj. (Ind. & White) | 100,000 | 81,000 | | | | Cotton, maize, small grains, vegetables, alfalfa, gardens | 50 | 100 | D 1 | 145 |
| 3. Ak Chin Indian Res. | 615 | 360 | | | | Wheat, maize, cotton, garden, corn, beans | | | D 1 | 352 |
| 4. Chiu Chui Irrig. Project | 1,115 | 455 | | | | do. | | | D 1 | 222 |
| Chiu Chui Irrig. Proj.-Extension | 4,000 | | | | | do. | 50 | 80 | D 1 | 222 |
| 5. Cockleburr Irrig. Proj. | 161 | 145 | | | | do. | | | D 1 | 265 |
| 6. Kahotk Irrig. Proj. | 400 | | | | | do. | 50 | 8 | B 1 | 222 |
| Yavapai County | | | | | | | | | | |
| Gila River Drainage Basin | | | | | | | | | | |
| 1. Camp Verde Ind. Res. | 425 | 105 | | | | Gardens, small grains, alfalfa, beans, corn | | | D 1 | 83 |
| Yuma County | | | | | | | | | | |
| Colorado River Main Stem & Minor Trib. | | | | | | | | | | |
| 1. Colorado River Ind. Resn. | 100,000 | 7,900 | | | | Cotton, alfalfa, small grains, maize, rice, gardens | 40 | 1,588 | D 1 | 182 |
| | | | | | | Pasture, rice, grains | 100 | 162 | D 2 | |
| 2. Cocopah Ind. Resn. | 379 | 130 | | | | Alfalfa, small grains, gardens | 10 | 25 | D 2 | |

Navajo - Many Farms Project - $230,000 (Reimbursable).

The Budget request for Navajo Irrigation funds for fiscal year 1941 was $400,000. The Budget allowance was $50,000, and the amount in the Interior Bill as passed by the House is $50,000.

Additional information in regard to the urgent need for and the possibilities of additional irrigation development for the Navajos has been received since the original presentation to the Bureau of the Budget. It is believed that this information is of such import that a request for a supplemental appropriation is justified. This supplemental request will be confined to the proposed Many Farms Project in the Chinlee Valley the total estimated cost of which, including subjugation, is $505,000; the irrigable area 8,000 acres; the per acre construction cost $63.00; the estimated annual per acre returns after full development $25.00; and the total average amount returns $120,000. Approximately $55,000 has been expended on this project to date, $230,000 is required for fiscal year 1941, $40,000 for fiscal year 1942 - $30,000 per year for fiscal years 1943 to 1948 inclusive. In order that the urgent need for this project may be fully understood the following detailed discussion is presented.

## WHY THE NAVAJOS NEED THE MANY FARMS

### DEVELOPMENT

On the Navajo Reservation located in Northeastern Arizona, Southern Utah, and Northwestern corner of New Mexico there live nearly 50,000 Indians. If early records from Spanish Colonials approximate conditions the Navajo population has increased 10 times over what it was 150 years ago when the eastern seaboard first became the United States. The population is now at least four times as great as it was at the close of the Civil War some 75 years ago.

There was a time when these people were highly prosperous in sheep, cattle and horses. Then, they had nearly limitless range and their numbers were fewer. In those days agriculture was perfunctory and incidental to sheep raising. Why bother with the drudgery of the plow and the hoe when a generous nature provided an abundance of grasslands.

But times have changed. The rapid increase in humans and livestock have brought staggering problems. They are more staggering when one considers the major social and economic problems posed by continued projection of such a trend on a limited land area.

Sooner or later both land and people must seriously suffer. The time comes when animals eat the grass faster than it will grow. Wind and water then carry away the bare soil and bring permanent destruction to the land resources. Increasing humans eventually have less and less to eat. Health is impaired, and unless radical adjustments are made, either on the spot or by migration to other lands, the society in a frenzy and despair becomes hopeless and demoralized.

Facts and figures gathered in the past four years make it evident that the Navajo people are on the brink of such a catastrophe. The United States Government must now make the choice as between direct food and clothing relief and its consequent demoralization of the society, or it can choose an agricultural development program that will provide for a measure of economic independence by making it possible for them to farm to support themselves.

For years, the government, traders, missionaries and others associated with the Navajos have encouraged them to increase their flocks. Only during the past decade has there grown an awareness that all was not well. The precise nature of the problem and the steps necessary for a way out have become clear, however, only in the light of recently gathered scientific data. There can be only limited support gained from livestock. The balance of the population, none of which is easily assimilated, must find its livelihood in industry and in agriculture.

Because there were real and pressing problems facing the government in its administration of the Navajo Reservation there has taken place here one of the most complete series of technical surveys of all time, anywhere in the United States.

The thoroughness of the field surveys, and the scope of the problems, physical and human, which were recognized as requiring scientific study stand on their own merit in tribute to the Bureau of Indian Affairs, and to the Soil Conservation Service who jointly conducted the studies. Among other things, these surveys have discovered agricultural opportunities, not heretofore known, that offer a new hope to the Navajo people. One such opportunity is the Many Farms Project. There are others to be presented.

## NEW HOPE FOR THE NAVAJOS

New hope for the hundreds of Navajo boys and girls who are turned out annually from the schools to exist on land now overpopulated with people and livestock. New hope for parents who see the forces of overgrazing and erosion destroying their livestock economy.

The future of the Navajo is stored in water reservoirs just as surely as the west was won by water.

## EXISTENCE PRECARIOUS GAMBLE

The drought of the past year wiped out somewhere between a half and three quarters of Navajo crop income, a serious inroad into their subsistence economy. To relieve the suffering that resulted, the government during the year supplied approximately $150,000 of relief money and surplus commodities. This large subsidy prevented starvation and acute suffering but failed by several thousands of pounds of flour, corn and other crop necessities of supplying even a minimum livelihood of satisfactory content. Water scarcity and climatic fluctuations each year make Navajo existence a precarious gamble, and the odds against winning increase as population pressure and over use put additional strain on the land. So long as such conditions continue--too little water in some years, poorly timed or poorly distributed supplies in others, resulting in flood damage--the government must stand ready to assume a large relief burden. Every chance to improve or stabilize Navajo subsistence farming must be taken advantage of and the proposed Many Farms Project is designed for that purpose.

## NAVAJOS NOT NOMADIC

Navajos are popularly regarded as a nomadic shepherd people who weave colorful rugs and make beautiful silver and turquoise jewelry. Their arts and crafts contribute only a minor share to their annual income, while farming, which is rarely thought of in connection with Navajo life, is nearly as important as livestock in their economy.

The semi-desert climate necessitates grazing over an expanse of country to provide forage and water for their livestock, but only in this limited sense can the Navajos be thought of as nomadic. The average Navajo family has permanent homes, fields and a recognized grazing territory. Many Navajo families remain in the same locality the year 'round, others make winter and summer movements within circumscribed areas with their livestock. These movements, are, however, well-regulated habitual events which are repeated each year.

The Navajo, in his time, has made many adjustments. He is now making the adjustment from a nearly total dependence on livestock to that of a dual economy. He is rapidly becoming a farmer.

On irrigated acreages his income per acre compares favorably with that of the Pueblo Indians and is, in many instances, greater than that of the surrounding white communities. There is no greater fallacy than the popular belief that "the Navajo is not a farmer."

## PRECIOUS WATER WASTED

As in many other parts of the Southwest, irrigation water on the Reservation is the limiting factor in agriculture. Vast quantities of water annually leave or pass by high grade farm land which only needs this wandering moisture to become highly productive. Not all of this precious liquid escapes for some of it, even now, has been put to good use. At present some 15,000 acres of Indian land are raising crops by regular irrigation farming. In addition to this, another 25,000 acres are semi-irrigated by flood waters. Strictly dry farming accounts for a smaller acreage, located largely in the mountainous areas where the precipitation is greater.

Navajo farms are developed on a subsistence basis because the scarcity of irrigable lands permits no opportunity for commercial farming. Silently and almost tragically the present low standard of living among the Navajo Indians demands a fuller development of these latent resources to provide an increased income. Although these people have been living for many decades under this struggle to get enough to eat, and they are more or less resigned to this fate, yet the rapid increase in numbers will soon reduce the per capita income to a starvation basis unless agriculture resources are developed.

Failure of the government to recognize this responsibility will bring the long Indian night - perhaps the last. The complete destruction of the economy and consequent degeneration of the Navajos would be swift and sure.

The allocation of $230,000 toward the agricultural development of the Many Farms Project is one step toward the building of a brighter destiny for America's largest and most rapidly increasing Indian tribe.

## ENVIRONMENT IMPORTANT

Environment has played a large part in casting Navajo economy into its present mould, and the difference in environment conditions in various portions of the reservation has permitted the

development of variants in the manner in which Navajos secure their living. We can distinguish three major variants of Navajo subsistence, each exhibiting areal compactness, and co-extensive with areas possessing relatively small soil, moisture, vegetation, and related physical conditions.

The Navajos live in an environment that permits both cultivation and grazing. Generally speaking, the amount of land that may be devoted to cropping is found in small tracts widely scattered, and not all portions of the reservation are equally suited for farming purposes. Thus, we find a broad "C" shaped belt of country along the northern, western, and a portion of the southern borders of the reservation, where except in a few favored localities farming is of decided secondary importance to livestock. The environmental factors favor a predominantly livestock economy.

In most of the central and eastern portion of the reservation we find a country which presents a more favorable environment in terms of water and forage for livestock. These conditions also permit the development of considerable crop land, most of which is in small tracts conveniently located for receiving flood-waters. These more favorable environmental conditions have permitted an economy in which the relative importance of livestock and cultivation to livelihood becomes equalized.

DEPENDENCE ON FARMING

The third type of Navajo economy is that in which the major dependence is on farming with livestock playing a secondary role. Geographically this kind of economy is limited to a few restricted areas where the combination of hydrologic and soil conditions favors the intensification of farming. Shiprock, Ganado, Chin Lee, and Tuba City are localities where this type of environmental adjustment may be observed.

The recognition of these three major adjustments are of fundamental significance for meeting the present day problems of the Navajo. The already relatively dense Navajo population living within a legally constricted area must either seek an adjustment through the expansion of the range for livestock economy, or an adjustment must be sought internally. With the range already severely over-stocked with livestock, the only remaining resources, except minerals and timber, which has not reached peak exploitation is that of cultivated land. It is in this direction that any future internal adjustment must be oriented.

TOO MUCH SPENT WITH TRADER

Illustrative of the general economic condition existing on the reservation are the figures of the 1937 Human Dependency survey. In that year the Navajos sold $1,619,000 worth of livestock and other products through the trader, but bought $2,219,000 worth of trader supplied items. The difference of $600,000 was supplied by wage work, which also accounted for the large volume of purchases made in the surrounding border towns. Further breakdown of their purchases reveals the real character of Navajo subsistence. Of the things bought from traders $1,366,000 (62%) went for food of which $214,000 were spent for such items as potatoes, fruit, vegetables, hay, and cereals. $306,000 went for flour, and $846,000 went for coffee, sugar, salt, baking powder, and canned goods. In addition they spent $585,000 for clothing, $108,000 for household equipment, and $160,000 for plows, wagons, harness and tools. These figures stand for those things supplied through the traders only, and does not take into account the thousands of dollars spent with town merchants, nor the items purchased through the government.

With unlimited amounts of wage work it is possible for the Navajo to continue supplying their needs in these relative amounts, but with the gradual withdrawal of wage income during the past two years, with indications of further drastic reductions in the future, the Navajo must begin to look to their own country to supply them with the things they need. The urgent question of how may this be done must be answered.

Livestock supplied 60 per cent of their commercial income in 1937 amounting to $971,000, yet at the expense of a range overstocked by 154,000 sheep units, approximately one-third of the carrying capacity. Experiments have demonstrated that with improved sheep and changed management we may expect the per sheep unit income to increase, but it will be several years after proper stocking is achieved before the maximum livestock income will be reached. In the meantime stock reduction undoubtedly means some loss of income unless new range outside the reservation to care for present stocking is found. The chances of this latter solution appear slim.

LIVESTOCK MUST DECREASE

With proper stocking and the equal division of the range among all Navajos, living within the reservation boundaries, there would be approximately only 14 sheep units available for each person,

a significant portion of which must be in commercially unimportant horses. Such strictly equalitarian division of the range resource is impossible and inadvisable for a number of reasons. Economically, it would fail to provide sufficient resources to provide an adequate livelihood, and would crystallize poverty among all. It would also be contrary to custom, and would tend to disintegrate a society compactly organized on the basis of social status surrounding the possession of property. The final solution is not alone in the redistribution of present resources, but a more equitable distribution plus extension. Since the extension of the range resources is an impossibility, farming presents the only opportunity.

That the Navajos do not now have sufficient cultivated land to supply their food requirements is demonstrated by the thousands of dollars spent at trading posts for products which they could grow themselves. Using present average yields as a basis, a total of 18,500 additional cultivated acres would be needed to obviate the present food imports of raw agricultural products and flour. 5,200 acres would produce the hay, grain, potatoes, fruits and vegetables which they now buy, and 13,200 acres would produce sufficient wheat for milling into flour. The provision of this acreage would eliminate the present deficit in production, but would not solve the problem of bringing hundreds of sub-subsistence families up to a satisfactory level, nor care for a rapidly increasing population.

TREMENDOUS POPULATION GROWTH

The increasing Navajo population constitutes a problem of serious proportions. They have increased nearly four-fold in sixty years, from about 10,000 in 1870 to approximately 40,000 in 1930. (Several thousand are non-reservation resident). The 1940 census should show about 50,000. Language, cultural and racial differences preclude their easy assimilation into the general surrounding population. Assuming their continued growth solution to the problem will come through resettlement or intensified development of reservation resources.

OPPORTUNITY FOR LIVELIHOOD

The proposed extension and development of an irrigation project at Many Farms in the Chin Lee valley where for an ultimate expenditure of $400,000 it is possible to construct a water storage

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and subjugate 4,000 acres during the next eight years, with the potentiality of an additional 4,000 acres, represents one opportunity for meeting for the people in one area of the reservation, the problem of livelihood. The project is located in Land Management District 10, but benefits may be expected to extend to the surrounding land management districts 4, 8, 9, and 11. It will be well, for that reason, to describe the present economic situation which obtains in these five units.

The area under consideration, lies west of the Lukachukai Mountain, including the Chin Lee drainage, Black Mesa, and the country in the vicinity of Kayenta.

This area includes examples of the three major economies of the Navajo. Its northern portion lies within the belt indicated as being primarily the area of livestock economy. In the vicinity of Canyon de Chelly and Chin Lee there are extensive farming operations and considerable concentration of population. The balanced livestock-farming economy is the dominant economy for the people living on the western slopes of the Lukachukais, portions of the southern and western drainage of the Chinle, the southern two-thirds of Black Mesa, and the valley of Laguna Creek in Land Management District 8.

The population of this region was enumerated at 10,112 persons by the Human Dependency Survey of 1936-37. It is estimated that the census of 1940 will show about 10,850, an increase approximately of 750 in three years. Figuring the same rate of increase with no loss or gain through migration, 1945 will show over 12,200 and by 1950 the population will be 13,750, a gross increase of 2,900 in ten years. The increase in numbers would not be a serious problem if the present developed resources were adequate.

TABLE I

POPULATION

| Land Management District | 1937[1] | 1940[2] | 1945[2] | 1950[2] |
|---|---|---|---|---|
| 4 | 2,422 | 2,601 | 2,929 | 3,298 |
| 8 | 1,666 | 1,789 | 2,014 | 2,268 |
| 9 | 1,830 | 1,965 | 2,213 | 2,492 |
| 10 | 2,731 | 2,933 | 3,302 | 3,718 |
| 11 | 1,463 | 1,571 | 1,769 | 1,992 |
| Total | 10,112 | 10,859 | 12,227 | 13,768 |

1. Human Dependency Survey.

2. Estimated on basis of continued present increase with no loss or gain by migration.

The people in this area had 187,175 sheep units of livestock credited to them in 1937 but the carrying capacity of the same area is only 136,000 which necessitates a reduction of about 50,000 sheep units to bring stocking to proper carrying capacity. With the exception of District 4, (Black Mesa), where overstocking is severe, much of the stock removed will be horses and other non-productive stock, but the fact remains that these people will suffer a measurable loss in their total livestock income.

The deficit in crop production indicates another gap in the self-sufficiency of Navajo economy. In 1937 $133,000 of producible foodstuffs were imported and distributed through trading posts in this area under discussion. Flour accounted for $89,000, and raw agricultural products for $44,000. On a per capita basis this amounted to $13.00. The recent completion of a flour mill at Round Rock for processing Navajo wheat provides a ready opportunity for turning wheat into flour.

TABLE II

Producible Food Imports

1937

| Land Management District | Raw Agricultural Products | | Flour | | Total | |
|---|---|---|---|---|---|---|
| | Amt. | Per Capita | Amt. | Per Capita | Amt. | Per Capita |
| 4 | $9,730 | $4.32 | $24,200 | $9.99 | $33,930 | $14.01 |
| 8 | 7,230 | 4.52 | 16,480 | 9.89 | 24,010 | 14.41 |
| 9 | 7,080 | 3.87 | 20,350 | 11.12 | 27,430 | 14.99 |
| 10 | 14,200 | 5.20 | 18,390 | 6.73 | 32,590 | 11.93 |
| 11 | 5,160 | 3.52 | 9,640 | 6.59 | 14,800 | 10.11 |
| Total | $43,700 | $4.32 | $89,060 | $8.81 | $132,760 | $13.13 |

Much of the discussion so far has been concerned with problems which are of urgent necessity such as the livestock reduction program or the increase of population, the serious consequences of which can be averted by prompt action now to supplement lost income and provide resources for future population. The gross deficiency in production manifested through food imports indicates a deficiency of farm production, for total subsistence needs. None of this information gives us the relative well-being or poverty of individual families, nor what portion of the Navajo population may be classified as having a sub-subsistence level of livelihood. Any attempt to give a minimum income figure necessary for existence among the Navajos is meaningless with our present knowledge, but we can array families on an income basis and obtain a relative statement of the minimum level of income.

Figures giving the income for 320 of 396 consumption groups in Land Management District 10 in livestock and crops are available. They show that the average income which includes both the value of products sold and those consumed at home, amounted to $226.00 per consumption group. Although this figure appears low it is even more startling since two-thirds of all consumption groups fall below this average figure. Over three-fourths fell below an average income of $300 per consumption group of 7 persons each.

TABLE III

Distribution of Income from Livestock
and Crops by Consumption Group

Land Management District 10
(Area of proposed development)

| Range of Aver. Income Per C. G.* | Consumption Group | Total Income Livestock | Aver. per C. G. | Total Income Agric. | Aver. per C. G. | Total Income | Aver. |
|---|---|---|---|---|---|---|---|
| $1-100 | 111 | $3,406 | $31 | $2,627 | $24 | $6,033 | $54 |
| 101-200 | 87 | 8,147 | 94 | 4,172 | 48 | 12,319 | 142 |
| 201-300 | 52 | 8,783 | 169 | 3,655 | 70 | 12,438 | 239 |
| 301-400 | 27 | 5,687 | 211 | 3,722 | 138 | 9,409 | 348 |
| 401-500 | 14 | 4,682 | 334 | 1,459 | 104 | 6,141 | 439 |
| 501-600 | 5 | 1,713 | 342 | 1,046 | 209 | 2,759 | 551 |
| 601-700 | 8 | 3,420 | 428 | 1,722 | 215 | 5,142 | 643 |
| 701-800 | 3 | 1,443 | 481 | 829 | 276 | 2,272 | 757 |
| 801-900 | 3 | 2,310 | 770 | 140 | 47 | 2,450 | 817 |
| 901-& over | 10 | 11,217 | 1,121 | 2,183 | 218 | 13,400 | 1,340 |
| Total | 320 | $50,808 | $158 | $21,555 | $67 | $72,363 | $226 |

*C. G. - Consumption Group

These figures exclude income from wage work which in 1937 amounted to a considerable amount, but which is an uncertain source of annual income, as well as income from rugs, and miscellaneous items.

SUBSISTENCE TRACTS ONLY

The development of 4,000 acres would provide subsistence tracts of ten to fifteen acres each for nearly 400 families. If we figure an average family to contain 6 persons this would provide a subsistence income for 2,400 people.

TABLE IV

Expected Return by Years
From Many Farms Development[1]

| DISTRICT | 1942 | 1943 | 1944 | 1945 | 1946 | 1947 | 1948 | 1949 |
|---|---|---|---|---|---|---|---|---|
| 1st-500 Ac.Unit | $9,000 | $12,500 | $15,000 | $15,000 | $15,000 | $15,000 | $15,000 | $15,000 |
| 2nd-500 Ac.Unit | | 9,000 | 12,500 | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| 3rd-500 Ac.Unit | | | 9,000 | 12,500 | 15,000 | 15,000 | 15,000 | 15,000 |
| 4th-500 Ac.Unit | | | | 9,000 | 12,500 | 15,000 | 15,000 | 15,000 |
| 5th-500 Ac.Unit | | | | | 9,000 | 12,500 | 15,000 | 15,000 |
| 6th-500 Ac.Unit | | | | | | 9,000 | 12,500 | 15,000 |
| 7th-500 Ac.Unit | | | | | | | 9,000 | 12,500 |
| 8th-500 Ac.Unit | | | | | | | | 9,000 |
| Total | $9,000 | $21,500 | $36,500 | $51,500 | $66,500 | $81,500 | $96,500 | $111,500 |

[1]Estimated on basis of $18.00 per acre return for first year cropped, $25.00 per acre return for second crop year, and an average of $30.00 per crop acre for succeeding years.

In ten years when we expect the project to be in full production we may expect total annual income approximating $120,000 a year from 4,000 subjugated and cultivated acres. This is figured on the basis of $30.00 per acre return where an assured water supply is available. The gross amount of return will increase each year as additional units of 500 acres are brought into cultivation increasing from $9,000 the first year for 500 acres figured at $18.00 per acre return. The second year each unit should increase its production to a return of $25.00 per acre, with an expected $30.00 for all succeeding years. The accumulated 10 year total of expected income from this project would amount to $712,000, or $312,000 more than the original cost. The above expected income of $30.00 per acre is based on the income now received by the Navajos from similar projects.

SUMMARY

The development of the Many Farms project would have a four-fold purpose in terms of the economy of the Navajo. Production would provide supplementary income to counteract losses arising from livestock reduction, it would provide additional resources for present sub-subsistence population, reduce the need for present food imports, and care for a portion of expected population increase. The results from the accomplishments of these objectives include relief from present over-stocking, the partial or complete elimination of relief issues, and the stabilization of Navajo economy on a basis commensurate with their needs and the environment.

Analysis of recent surveys of soil, water, climate and related physical factors on the entire reservation are now far enough along to demonstrate the strategic importance of the Chin Lee Valley in the general reservation development. Relative to other sections it has greater potentialities of good land, water supply and impounding possibilities than are to be found elsewhere in as favorable combination.

Centrally located as the project is, settlement can probably be achieved without too severe migration disturbances and the present established exchange practiced between livestock operators and growers of farm crops will be promoted. Processing plants for the reduction of surplus crops and livestock can be maintained at efficient levels of operation and their facilities and products will be more conveniently available to a greater number of people than from any other point on the reservation.