

Table 6.4.2-A7 Sensitivity Analysis: Construction Delayed for 1 year (FIRR)

(Unit: 10³ US\$)

| Year in Order | Cost | | | | Benefit | | | Present Value | |
|---------------------|----------------|-----------------------|----------------|----------------|------------------|-----------------|------------------|---------------|---------------|
| | Const. Cost | Replace- ment Cost | O/M Cost | Total | Irrigation | Soil Consav. | Total | Cost | Benefit |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 119 | 0 | 0 | 119 | 0 | 0 | 0 | 95 | 0 |
| 3 | 3,399 | 0 | 0 | 3,399 | 0 | 0 | 0 | 2,188 | 0 |
| 4 | 34,683 | 0 | 0 | 34,683 | 0 | 0 | 0 | 17,909 | 0 |
| 5 | 40,292 | 0 | 0 | 40,292 | 0 | 0 | 0 | 16,691 | 0 |
| 6 | 14,391 | 0 | 1,117 | 15,508 | 7,387 | 73 | 7,460 | 5,154 | 2,479 |
| 7 | 0 | 0 | 3,195 | 3,195 | 21,119 | 236 | 21,355 | 852 | 5,694 |
| 8 | 0 | 0 | 4,817 | 4,817 | 31,840 | 426 | 32,266 | 1,030 | 6,902 |
| 9 | 0 | 0 | 5,612 | 5,612 | 37,097 | 576 | 37,673 | 963 | 6,465 |
| 10 | 0 | 0 | 5,839 | 5,839 | 38,598 | 725 | 39,322 | 804 | 5,414 |
| 11 | 0 | 0 | 5,839 | 5,839 | 38,598 | 820 | 39,418 | 645 | 4,354 |
| 12 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 517 | 3,494 |
| 13 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 415 | 2,803 |
| 14 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 333 | 2,249 |
| 15 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 267 | 1,804 |
| 16 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 214 | 1,448 |
| 17 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 172 | 1,161 |
| 18 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 138 | 932 |
| 19 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 111 | 747 |
| 20 | 0 | 1,500 | 5,839 | 7,339 | 38,598 | 835 | 39,433 | 112 | 600 |
| 21 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 71 | 481 |
| 22 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 57 | 386 |
| 23 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 46 | 310 |
| 24 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 37 | 248 |
| 25 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 30 | 199 |
| 26 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 24 | 160 |
| 27 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 19 | 128 |
| 28 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 15 | 103 |
| 29 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 12 | 83 |
| 30 | 0 | 2,500 | 5,839 | 8,339 | 38,598 | 835 | 39,433 | 14 | 66 |
| 31 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 8 | 53 |
| 32 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 6 | 43 |
| 33 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 5 | 34 |
| 34 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 4 | 27 |
| 35 | 0 | 1,500 | 5,839 | 7,339 | 38,598 | 835 | 39,433 | 4 | 22 |
| 36 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 3 | 18 |
| 37 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 2 | 14 |
| 38 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 2 | 11 |
| 39 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1 | 9 |
| 40 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1 | 7 |
| 41 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1 | 6 |
| 42 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1 | 5 |
| 43 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1 | 4 |
| 44 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 0 | 3 |
| 45 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 0 | 2 |
| 46 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 0 | 2 |
| 47 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 0 | 2 |
| 48 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 0 | 1 |
| 49 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 0 | 1 |
| 50 | 0 | -500 | 5,839 | 5,339 | 38,598 | 835 | 39,433 | 0 | 1 |
| Total | 92,884 | 5,000 | 254,140 | 352,024 | 1,679,954 | 35,427 | 1,715,381 | 48,976 | 48,976 |

F. B / C = 1.00001
 FNPV = 0.34509
 FIRR = 24.64700

Table 6.4.2-A8 Sensitivity Analysis: Construction Delayed for 1 year (FNPV and F.B/C)

(Unit: 10³ US\$)

| Year in Order | Cost | | | | Benefit | | | Present Value | |
|---------------------|----------------|-----------------------|-------------|---------|------------|-----------------|-----------|---------------|---------|
| | Const. Cost | Replace- ment Cost | O/M Cost | Total | Irrigation | Soil Consav. | Total | Cost | Benefit |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 119 | 0 | 0 | 119 | 0 | 0 | 0 | 108 | 0 |
| 3 | 3,399 | 0 | 0 | 3,399 | 0 | 0 | 0 | 2,809 | 0 |
| 4 | 34,683 | 0 | 0 | 34,683 | 0 | 0 | 0 | 26,058 | 0 |
| 5 | 40,292 | 0 | 0 | 40,292 | 0 | 0 | 0 | 27,520 | 0 |
| 6 | 14,391 | 0 | 1,117 | 15,508 | 7,387 | 73 | 7,460 | 9,630 | 4,632 |
| 7 | 0 | 0 | 3,195 | 3,195 | 21,119 | 236 | 21,355 | 1,803 | 12,054 |
| 8 | 0 | 0 | 4,817 | 4,817 | 31,840 | 426 | 32,266 | 2,472 | 16,558 |
| 9 | 0 | 0 | 5,612 | 5,612 | 37,097 | 576 | 37,673 | 2,618 | 17,575 |
| 10 | 0 | 0 | 5,839 | 5,839 | 38,598 | 725 | 39,322 | 2,476 | 16,677 |
| 11 | 0 | 0 | 5,839 | 5,839 | 38,598 | 820 | 39,418 | 2,251 | 15,197 |
| 12 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 2,047 | 13,821 |
| 13 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1,860 | 12,565 |
| 14 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1,691 | 11,422 |
| 15 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1,538 | 10,384 |
| 16 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1,398 | 9,440 |
| 17 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1,271 | 8,582 |
| 18 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1,155 | 7,802 |
| 19 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 1,050 | 7,092 |
| 20 | 0 | 1,500 | 5,839 | 7,339 | 38,598 | 835 | 39,433 | 1,200 | 6,448 |
| 21 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 868 | 5,861 |
| 22 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 789 | 5,329 |
| 23 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 717 | 4,844 |
| 24 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 652 | 4,404 |
| 25 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 593 | 4,003 |
| 26 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 539 | 3,640 |
| 27 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 490 | 3,309 |
| 28 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 445 | 3,008 |
| 29 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 405 | 2,734 |
| 30 | 0 | 2,500 | 5,839 | 8,339 | 38,598 | 835 | 39,433 | 526 | 2,486 |
| 31 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 335 | 2,260 |
| 32 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 304 | 2,054 |
| 33 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 277 | 1,868 |
| 34 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 251 | 1,698 |
| 35 | 0 | 1,500 | 5,839 | 7,339 | 38,598 | 835 | 39,433 | 287 | 1,544 |
| 36 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 208 | 1,403 |
| 37 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 189 | 1,276 |
| 38 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 172 | 1,160 |
| 39 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 156 | 1,054 |
| 40 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 142 | 958 |
| 41 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 129 | 871 |
| 42 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 117 | 792 |
| 43 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 107 | 720 |
| 44 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 97 | 655 |
| 45 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 88 | 595 |
| 46 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 80 | 541 |
| 47 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 73 | 492 |
| 48 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 66 | 447 |
| 49 | 0 | 0 | 5,839 | 5,839 | 38,598 | 835 | 39,433 | 60 | 406 |
| 50 | 0 | -500 | 5,839 | 5,339 | 38,598 | 835 | 39,433 | 50 | 370 |
| Total | 92,884 | 5,000 | 254,140 | 352,024 | 1,679,954 | 35,427 | 1,715,381 | 100,167 | 231,028 |

F. B / C = 2.30644
 FNPV = 130862
 F I R R = 10.00000

**Table 6.4.2-A9 Disbursement Schedule of the Project Cost: for Phase I only
(Financial Price)**

(Unit: 10³ US\$)

| Year Order | 1st Year | | 2nd Year | | 3rd Year | | 4th Year | | 5th Year | | 6th Year | | Total | |
|---------------------------------------|----------|-------|----------|-------|----------|--------|----------|--------|----------|--------|----------|-------|---------|--------|
| | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local | Foreign | Local |
| I. Construction Phase I | | | | | | | | | | | | | | |
| Land Acquisition | 0 | 0 | 0 | 1,311 | 0 | 3,934 | 0 | 3,934 | 0 | 0 | 0 | 0 | 0 | 5,245 |
| Construction Works | 0 | 0 | 0 | 0 | 3,606 | 20,430 | 4,375 | 24,795 | 1,194 | 6,764 | 1,194 | 6,764 | 9,175 | 51,989 |
| Sub-total | 0 | 0 | 0 | 1,311 | 3,606 | 24,364 | 4,375 | 24,795 | 1,194 | 6,764 | 1,194 | 6,764 | 9,175 | 57,234 |
| II. Construction Phase II | | | | | | | | | | | | | | |
| Land Acquisition | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction Works | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sub-total | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| III. O/M Equipment Procurement | | | | | | | | | | | | | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 385 | 19 | 0 | 0 | 385 | 19 |
| IV. Administration | | | | | | | | | | | | | | |
| | 0 | 0 | 0 | 84 | 0 | 251 | 0 | 336 | 0 | 336 | 0 | 167 | 0 | 1,174 |
| V. Consultant Service | | | | | | | | | | | | | | |
| | 0 | 0 | 0 | 0 | 739 | 394 | 326 | 322 | 444 | 364 | 311 | 311 | 1,820 | 1,391 |
| Total | 0 | 0 | 0 | 84 | 739 | 1,957 | 3,932 | 25,021 | 5,203 | 25,514 | 1,505 | 7,242 | 11,380 | 59,818 |
| VI. Physical Contingency (10%) | | | | | | | | | | | | | | |
| | 0 | 0 | 0 | 8 | 74 | 196 | 393 | 2,502 | 520 | 2,551 | 150 | 724 | 1,138 | 5,982 |
| Grand-total | 0 | 0 | 0 | 92 | 813 | 2,152 | 4,326 | 27,523 | 5,724 | 28,066 | 1,655 | 7,967 | 12,518 | 65,800 |
| TOTAL | | | 92 | 2,965 | 31,849 | 33,789 | 9,622 | 78,318 | | | | | | |

Irrigation area (17,409/22,360ha) 0.77858

Table 6.4.2 - A10 Flow of Financial Cost and Benefit: for Phase I only (FIRR)

| Year in Order | Cost | | | | Benefit | | | Present Value | |
|---------------------|----------------|-----------------------|-------------|---------|------------|---------|-----------|---------------|---------|
| | Const. Cost | Replace- ment Cost | O/M Cost | Total | Irrigation | Soil | | Cost | Benefit |
| | | | | | | Consav. | Total | | |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 92 | 0 | 0 | 92 | 0 | 0 | 0 | 72 | 0 |
| 3 | 2,965 | 0 | 0 | 2,965 | 0 | 0 | 0 | 1,803 | 0 |
| 4 | 31,849 | 0 | 0 | 31,849 | 0 | 0 | 0 | 15,097 | 0 |
| 5 | 33,789 | 0 | 1,020 | 34,809 | 6,746 | 73 | 6,818 | 12,866 | 2,520 |
| 6 | 9,622 | 0 | 2,678 | 12,300 | 17,701 | 236 | 17,937 | 3,545 | 5,169 |
| 7 | 0 | 0 | 3,847 | 3,847 | 25,430 | 426 | 25,856 | 864 | 5,810 |
| 8 | 0 | 0 | 4,416 | 4,416 | 29,192 | 576 | 29,767 | 774 | 5,215 |
| 9 | 0 | 0 | 4,546 | 4,546 | 30,051 | 725 | 30,776 | 621 | 4,204 |
| 10 | 0 | 0 | 4,546 | 4,546 | 30,051 | 820 | 30,871 | 484 | 3,288 |
| 11 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 378 | 2,565 |
| 12 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 294 | 2,000 |
| 13 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 230 | 1,560 |
| 14 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 179 | 1,216 |
| 15 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 140 | 948 |
| 16 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 109 | 739 |
| 17 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 85 | 576 |
| 18 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 66 | 449 |
| 19 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 52 | 350 |
| 20 | 0 | 1,170 | 4,546 | 5,716 | 30,051 | 835 | 30,887 | 51 | 273 |
| 21 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 31 | 213 |
| 22 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 24 | 166 |
| 23 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 19 | 130 |
| 24 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 15 | 101 |
| 25 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 12 | 79 |
| 26 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 9 | 61 |
| 27 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 7 | 48 |
| 28 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 5 | 37 |
| 29 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 4 | 29 |
| 30 | 0 | 1,950 | 4,546 | 6,496 | 30,051 | 835 | 30,887 | 5 | 23 |
| 31 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 3 | 18 |
| 32 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 2 | 14 |
| 33 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 2 | 11 |
| 34 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1 | 8 |
| 35 | 0 | 1,170 | 4,546 | 5,716 | 30,051 | 835 | 30,887 | 1 | 7 |
| 36 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1 | 5 |
| 37 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1 | 4 |
| 38 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 3 |
| 39 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 2 |
| 40 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 2 |
| 41 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 1 |
| 42 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 1 |
| 43 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 1 |
| 44 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 1 |
| 45 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 1 |
| 46 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 0 |
| 47 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 0 |
| 48 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 0 |
| 49 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 0 | 0 |
| 50 | 0 | -390 | 4,546 | 4,156 | 30,051 | 835 | 30,887 | 0 | 0 |
| Total | 78,317 | 3,900 | 202,898 | 285,115 | 1,341,228 | 36,262 | 1,377,489 | 37,851 | 37,851 |

F. B / C = 1.00000
 FNPV = 0.0
 FIRR = 28.25231

Table 6.4.2 - A11 Flow of Financial Cost and Benefit: for Phase I only (FPNV and F.B/C)

(Unit: 10³ US\$)

| Year in Order | Cost | | | | Benefit | | | Present Value | |
|---------------------|----------------|-----------------------|----------------|----------------|------------------|-----------------|------------------|---------------|----------------|
| | Const. Cost | Replace- ment Cost | O/M Cost | Total | Irrigation | Soil Consav. | Total | Cost | Benefit |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 92 | 0 | 0 | 92 | 0 | 0 | 0 | 84 | 0 |
| 3 | 2,965 | 0 | 0 | 2,965 | 0 | 0 | 0 | 2,450 | 0 |
| 4 | 31,849 | 0 | 0 | 31,849 | 0 | 0 | 0 | 23,929 | 0 |
| 5 | 33,789 | 0 | 1,020 | 34,809 | 6,746 | 73 | 6,818 | 23,775 | 4,657 |
| 6 | 9,622 | 0 | 2,678 | 12,300 | 17,701 | 236 | 17,937 | 7,637 | 11,137 |
| 7 | 0 | 0 | 3,847 | 3,847 | 25,430 | 426 | 25,856 | 2,172 | 14,595 |
| 8 | 0 | 0 | 4,416 | 4,416 | 29,192 | 576 | 29,767 | 2,266 | 15,275 |
| 9 | 0 | 0 | 4,546 | 4,546 | 30,051 | 725 | 30,776 | 2,121 | 14,357 |
| 10 | 0 | 0 | 4,546 | 4,546 | 30,051 | 820 | 30,871 | 1,928 | 13,092 |
| 11 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1,753 | 11,908 |
| 12 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1,593 | 10,826 |
| 13 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1,449 | 9,841 |
| 14 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1,317 | 8,947 |
| 15 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1,197 | 8,133 |
| 16 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 1,088 | 7,394 |
| 17 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 989 | 6,722 |
| 18 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 899 | 6,111 |
| 19 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 818 | 5,555 |
| 20 | 0 | 1,170 | 4,546 | 5,716 | 30,051 | 835 | 30,887 | 935 | 5,050 |
| 21 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 676 | 4,591 |
| 22 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 614 | 4,174 |
| 23 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 558 | 3,794 |
| 24 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 508 | 3,449 |
| 25 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 462 | 3,136 |
| 26 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 420 | 2,851 |
| 27 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 381 | 2,592 |
| 28 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 347 | 2,356 |
| 29 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 315 | 2,142 |
| 30 | 0 | 1,950 | 4,546 | 6,496 | 30,051 | 835 | 30,887 | 409 | 1,947 |
| 31 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 261 | 1,770 |
| 32 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 237 | 1,609 |
| 33 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 215 | 1,463 |
| 34 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 196 | 1,330 |
| 35 | 0 | 1,170 | 4,546 | 5,716 | 30,051 | 835 | 30,887 | 224 | 1,209 |
| 36 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 162 | 1,099 |
| 37 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 147 | 999 |
| 38 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 134 | 908 |
| 39 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 122 | 826 |
| 40 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 110 | 751 |
| 41 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 100 | 682 |
| 42 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 91 | 620 |
| 43 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 83 | 564 |
| 44 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 75 | 513 |
| 45 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 69 | 466 |
| 46 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 62 | 424 |
| 47 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 57 | 385 |
| 48 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 52 | 350 |
| 49 | 0 | 0 | 4,546 | 4,546 | 30,051 | 835 | 30,887 | 47 | 318 |
| 50 | 0 | -390 | 4,546 | 4,156 | 30,051 | 835 | 30,887 | 39 | 289 |
| Total | 78,317 | 3,900 | 202,898 | 285,115 | 1,341,228 | 36,262 | 1,377,489 | 85,572 | 201,210 |

F. B / C = 2.35135
 FNPV = 115638
 FIRR = 10.00000

Table 6.4.3-A1 Cash Flow of Investment and Repayment Schedule

(Unit: 10³ US\$)

| Year Order | Foreign Loan | Govern. Finance | Total Invest. | Accumulated Foreign Loan | Capital Repayment | Balance F. Loan | Interest Payment | Annual Total Repayment |
|--------------|---------------|-----------------|----------------|--------------------------|-------------------|-----------------|-------------------------------|------------------------|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 95 | 32 | 126 | 95 | 0 | 95 | 3 | 3 |
| 3 | 2,785 | 928 | 3,714 | 2,880 | 0 | 2,880 | 86 | 86 |
| 4 | 29,277 | 9,759 | 39,037 | 32,157 | 0 | 32,157 | 965 | 965 |
| 5 | 35,032 | 11,677 | 46,709 | 67,189 | 0 | 67,189 | 2,016 | 2,016 |
| 6 | 12,887 | 4,296 | 17,183 | 80,077 | 0 | 80,077 | 2,402 | 2,402 |
| 7 | | | | | 0 | 80,077 | 2,402 | 2,402 |
| 8 | | | | | 0 | 80,077 | 2,402 | 2,402 |
| 9 | | | | | 0 | 80,077 | 2,402 | 2,402 |
| 10 | | | | | 0 | 80,077 | 2,402 | 2,402 |
| 11 | | | | | 0 | 80,077 | 2,402 | 2,402 |
| 12 | | | | | 4,004 | 76,073 | 2,282 | 6,286 |
| 13 | | | | | 4,004 | 72,069 | 2,162 | 6,166 |
| 14 | | | | | 4,004 | 68,065 | 2,042 | 6,046 |
| 15 | | | | | 4,004 | 64,061 | 1,922 | 5,926 |
| 16 | | | | | 4,004 | 60,057 | 1,802 | 5,806 |
| 17 | | | | | 4,004 | 56,054 | 1,682 | 5,685 |
| 18 | | | | | 4,004 | 52,050 | 1,561 | 5,565 |
| 19 | | | | | 4,004 | 48,046 | 1,441 | 5,445 |
| 20 | | | | | 4,004 | 44,042 | 1,321 | 5,325 |
| 21 | | | | | 4,004 | 40,038 | 1,201 | 5,205 |
| 22 | | | | | 4,004 | 36,034 | 1,081 | 5,085 |
| 23 | | | | | 4,004 | 32,031 | 961 | 4,965 |
| 24 | | | | | 4,004 | 28,027 | 841 | 4,845 |
| 25 | | | | | 4,004 | 24,023 | 721 | 4,725 |
| 26 | | | | | 4,004 | 20,019 | 601 | 4,604 |
| 27 | | | | | 4,004 | 16,015 | 480 | 4,484 |
| 28 | | | | | 4,004 | 12,011 | 360 | 4,364 |
| 29 | | | | | 4,004 | 8,008 | 240 | 4,244 |
| 30 | | | | | 4,004 | 4,004 | 120 | 4,124 |
| 31 | | | | | 4,004 | 0 | 0 | 4,004 |
| Total | 80,077 | 26,692 | 106,769 | | 80,077 | | 40,305 | 120,382 |
| | | | | | | | Total Repayment / Loan | 150% |

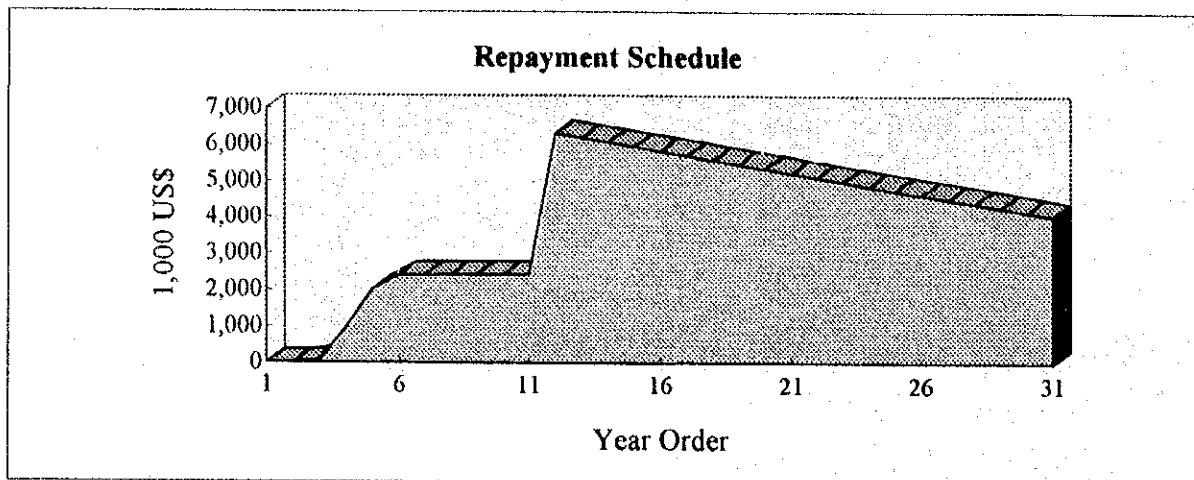


Table 6.4.3-A2 Budget of 1995 by the Ministry of Finance

| Item | million Lei | thou. US\$ (Lei 2,000 / US\$) | million Yen (100Yen/\$) | Remarks |
|-------------------------|-------------|----------------------------------|----------------------------|----------------------------|
| GDP | 70,100,000 | 35,050,000 | 3,505,000 | 1,540.0 per capita in US\$ |
| Revenues | 14,664,000 | 7,332,000 | 733,200 | 20.9 % / GDP |
| Spending | 16,616,000 | 8,308,000 | 830,800 | |
| Budget deficit | -1,952,000 | -976,000 | -97,600 | |
| Ministry of Agriculture | 1,559,080 | 779,540 | 77,954 | 9.4 % / Budget |
| Investment infl. | 36,500 | 18,250 | 1,825 | 2.3 % / Minist. |
| Irrigation | 16,900 | 8,450 | 845 | 46.3 % / Invest. |
| Ruginesti-Pufesti | 390 | 195 | 19.5 | 2.3 % / Irrigat. |

Note: The draft budget for next year by the Ministry of Finance at 1st November 1994.

Table 6.5.3 - A1 Total Agricultural Labor Required in the Irrigation Study Area

| Classification | (Unit: man/day) | | | | With-Without |
|--------------------------|----------------------|----------------|-------------------|------------------|----------------|
| | Without Project | | With Project | | |
| | (without irrigation) | | (with irrigation) | | |
| | per ha | total | per ha | total | |
| Agricultural Land | | | | | |
| Arable Land | | 408,984 | | 768,538 | 359,555 |
| (without irrigation) | Table (2) | 408,984 | | | -408,984 |
| (with irrigation) | | | Table (2) | 768,538 | 768,538 |
| Pasture | 25.0 | 12,500 | 2.5 | 1,250 | -11,250 |
| Vineyard | | 543,200 | | 448,800 | -94,400 |
| (without irrigation) | 135.8 | 543,200 | | | -543,200 |
| (with irrigation) | | | 176.0 | 448,800 | 448,800 |
| Total | | 964,684 | | 1,218,588 | 253,905 |

Total Agricultural Labor Required in the Arable Land

| Crop | (Unit: man/day) | | | | With-Without |
|----------------|----------------------|----------------|-------------------|----------------|----------------|
| | Without Project | | With Project | | |
| | (without irrigation) | | (with irrigation) | | |
| | per ha | total | per ha | total | |
| Wheat | 7.1 | 20,912 | 7.4 | 17,521 | -3,391 |
| Barley | 1.5 | 1,171 | 1.5 | 891 | -280 |
| Maize | 22.3 | 291,508 | 3.2 | 28,182 | -263,326 |
| Bean seeds | 4.0 | 74 | | | -74 |
| Sunflower | 2.1 | 1,327 | 2.1 | 1,061 | -266 |
| Sugar beet | 2.2 | 245 | 2.8 | 277 | 32 |
| Beans | | | 2.6 | 12,891 | 12,891 |
| Potato | 16.0 | 3,867 | 33.1 | 6,557 | 2,690 |
| Maize for silo | | | 2.5 | 1,486 | 1,486 |
| Vegetables | Table (3) | 89,414 | Table (3) | 699,622 | 610,208 |
| Annual pasture | 25.0 | 465 | 2.5 | 50 | -415 |
| Total | | 408,984 | | 768,538 | 359,555 |

Total Agricultural Labor Required for the Vegetables

| Vegetable | (Unit: man/day) | | | | With-Without |
|--------------|----------------------|---------------|-------------------|----------------|----------------|
| | Without Project | | With Project | | |
| | (without irrigation) | | (with irrigation) | | |
| | per ha | total | per ha | total | |
| Cabbage | | | | 208,778 | 199,799 |
| Medium | 96.6 | 8,979 | 155.4 | 46,177 | 37,198 |
| Late | | | 205.2 | 162,600 | 162,600 |
| Cauliflower | | | | 144,841 | 144,841 |
| Medium | | | 113.3 | 33,667 | 33,667 |
| Late | | | 140.3 | 111,174 | 111,174 |
| Cucumber | | | | 128,547 | 128,547 |
| Early | | | 149.7 | 29,656 | 29,656 |
| Late | | | 124.8 | 98,892 | 98,892 |
| Onion | 163.6 | 21,289 | 180.9 | 35,836 | 14,547 |
| Garlic | | | 116.8 | 23,138 | 23,138 |
| Green pepper | | | 192.0 | 38,035 | 38,035 |
| Egg plant | | | 221.5 | 43,879 | 43,879 |
| Carrot | | | 108.4 | 30,064 | 30,064 |
| Tomato | | | | 46,504 | 30,145 |
| Medium | 110.0 | 16,359 | 177.1 | 26,313 | 9,953 |
| Late | | | 135.9 | 20,191 | 20,191 |
| Others | 109.6 | 42,787 | | | -42,787 |
| Total | | 89,414 | | 699,622 | 610,208 |

Table 6.5.3-A2 Agricultural Labor Required on without Project Condition

| Farm type | Crop | (Unit: man/day/ha) | |
|-----------|----------------|--------------------|-----------|
| | | Labor | (Average) |
| Indiv. | Wheat | 7.2 | 7.1 |
| Assoc. | Wheat | 6.8 | |
| All | Barley | 1.5 | |
| Indiv. | Maize | 27.5 | 22.3 |
| Assoc. | Maize | 1.5 | |
| Indiv. | Bean seeds | 4.6 | 4.0 |
| Assoc. | Bean seeds | 1.6 | |
| Indiv. | Sunflower | 2.1 | 2.1 |
| Assoc. | Sunflower | 2.1 | |
| All | Sugar beet | 2.2 | |
| All | Potato | 16.0 | |
| All | Cabbage (M) | 96.6 | |
| All | Onion | 163.6 | |
| All | Tomato (M) | 110.0 | |
| All | Others | 109.6 | |
| Indiv. | Annual pasture | 25.0 | 25.0 |
| Assoc. | Annual pasture | 25.0 | |
| All | Pasture | 25.0 | |
| Indiv. | Vineyard | 135.8 | 135.8 |
| Assoc. | Vineyard | 135.8 | |

Note: Proportion of cropping area; Individual : Association is 79.9 :

Table 6.5.3-A3 Agricultural Labor Required on with Project Condition

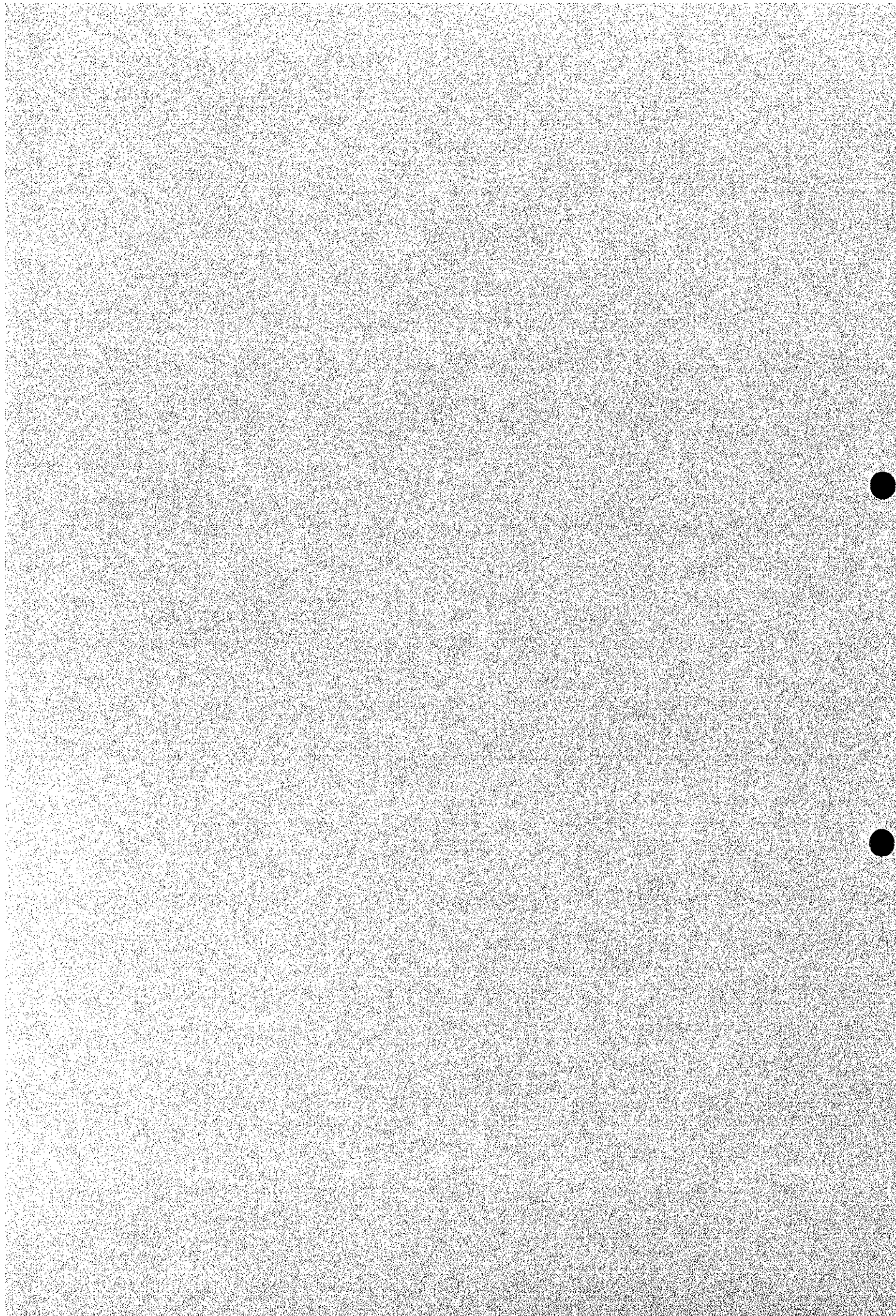
| Farm type | Crop | (Unit: man/day/ha) | |
|-----------|-----------------|--------------------|-----------|
| | | Labor | (Average) |
| Indiv. | Wheat | 8.0 | 7.4 |
| Assoc. | Wheat | 7.2 | |
| All | Barley | 1.5 | |
| Indiv. | Maize | 9.3 | 3.2 |
| Assoc. | Maize | 1.5 | |
| Indiv. | Sunflower | 2.3 | 2.1 |
| Assoc. | Sunflower | 2.1 | |
| All | Sugar beet | 2.8 | |
| Indiv. | Bushbean | 5.2 | 2.6 |
| Assoc. | Bushbean | 1.9 | |
| All | Soybean | 1.9 | |
| All | Potato | 33.1 | |
| All | Maize for silo | 2.5 | |
| All | Cabbage (M) | 155.4 | |
| All | Cabbage (L) | 205.2 | |
| All | Cauliflower (M) | 113.3 | |
| All | Cauliflower (L) | 140.3 | |
| All | Cucumber (E) | 149.7 | |
| All | Cucumber (L) | 124.8 | |
| All | Onion | 180.9 | |
| All | Garlic | 116.8 | |
| All | Green pepper | 192.0 | |
| All | Egg plant | 221.5 | |
| All | Carrot | 108.4 | |
| All | Tomato (M) | 177.1 | |
| All | Tomato (L) | 135.9 | |
| Indiv. | Annual pasture | 2.5 | 2.5 |
| Assoc. | Annual pasture | 2.5 | |
| All | Pasture | 2.5 | |
| Indiv. | Vineyard | 176.0 | 176.0 |
| Assoc. | Vineyard | 176.0 | |

Note: Proportion of cropping area; Individual : Association is 21.3 :

Table 6.6.1-A1 Environmental Impact of the Project

| | | INITIAL STATE | IMPACT ELEMENTS OF THE PROJECT | | |
|----------------------|---------------------------|--|---|--|--|
| | | ENVIRONMENTAL CONDITIONS OF THE INITIAL STATE | IMPACT OF CONSTRUCTION OF IRRIGATION WORKS | IMPACT OF IRRIGATION ACTIVITIES | IMPACT OF AGRICULTURAL DEVELOPMENT |
| MAJOR IMPACT SOURCES | | <ul style="list-style-type: none"> Existing irrigation civil works like the Main Canal and the Calimanesti dam Upstream industrial sources of water pollution | <ul style="list-style-type: none"> Secondary canals for irrigation and drainage | <ul style="list-style-type: none"> Irrigation water is periodically contaminated by industrial pollutants; method of irrigation (sprinkler) | <ul style="list-style-type: none"> Use of water for industrial and domestic purpose; increased wastewater and solid waste; Increased use of agrochemical; development of commercial activity (bee breeding activity) |
| NATURAL ENVIRONMENT | GROUND-WATER | <ul style="list-style-type: none"> Shallow groundwater in river corridors and plain; Discharge in Siret river down-stream of the Study Area | <ul style="list-style-type: none"> Irrigation canals are a pathway for contamination of groundwater by industrial pollutants; However this mainly concerns the main canal, with underground passages at level of Siret tributaries; effect of secondary works is minor | <ul style="list-style-type: none"> Ground infiltration of contaminated water through irrigation of crop fields might induce severe degradation of groundwater quality; it is the major impact of the Project on environment | <ul style="list-style-type: none"> increased use of groundwater for satisfying new industrial and domestic demand; effects on water table; increased rate of contamination by surface pollution sources |
| | WATER QUALITY | <ul style="list-style-type: none"> Water quality seems acceptable from yearly average, but is not complying with required irrigation criteria in several cases (industrial pollutants); Trends toward better quality due to policy, legislation, and present economic circumstances | <ul style="list-style-type: none"> Ground infiltration of contaminated water through conveyance of irrigation water; eutrophication of main canals; sedimentation of drainage canals; transport of nutrients in water downstream | <ul style="list-style-type: none"> Contamination of groundwater on site due to the use of irrigation water and agrochemical; pollution of surface water downstream, directly (irrigation) or indirectly (groundwater discharge); | <ul style="list-style-type: none"> Impairment of water quality due to new industrial / domestic pollution sources on site Effects increased downstream due to low dilution of pollutants (increased use of water sources upstream) |
| | MORPHOLOGY / SOILS | <ul style="list-style-type: none"> Soil losses due to wind and mainly pluvial erosion; sheet erosion in plain, gully erosion in hills; Climatic aggressivity | <ul style="list-style-type: none"> Risk of waterlogging and sedimentation / erosion if drainage is not adapted to local situations | <ul style="list-style-type: none"> Irrigation might induce sheet erosion through increased humidity of soils (slopes more than 2 - 3%); contamination of soil by heavy metals | |
| | NATURAL ECOSYSTEMS | <ul style="list-style-type: none"> Natural land is mainly degraded land (pasture, erosion) and riverbeds of Siret tributaries; In existence of protective areas within the Study Area; Calimanesti dam might be a new habitat for birds; Siret river is an important corridor for migration of birds (only passage); Fishes affected by water pollution; Mammals of forest habitat and small mammal species on site | <ul style="list-style-type: none"> Irrigation Project concerns interfluvial land in the cultivated plain area; planned secondary works will not have effects on natural habitats | <ul style="list-style-type: none"> Irrigation exclusively deals with agricultural land and has no predictable effects on surrounding (mainly upstream) natural environment | <ul style="list-style-type: none"> Agricultural development is more likely to induce effects on natural environment through waste disposal siting |
| | WILDLIFE | <ul style="list-style-type: none"> At initial state, main canal could be a major obstacle between Siret and hills for mammal species; Effects of the Project through remaining works is negligible | | <ul style="list-style-type: none"> Possible contribution to impairment of aquatic wildlife downstream by direct / indirect contamination of surface water | <ul style="list-style-type: none"> Possible contribution to impairment of aquatic wildlife downstream by direct / indirect contamination of surface water |
| SOCIAL ENVIRONMENT | USE OF RESOURCES | <ul style="list-style-type: none"> Use of groundwater sources; problem of water scarcity in upper hills villages; forest managed by ROMSILVA | x | x | <ul style="list-style-type: none"> Increased risk of water shortage / conflicts; drastic increase of cost of water supply; water resources development |
| | LAND USE | <ul style="list-style-type: none"> Land intensively used for human settlements and agriculture; vineyards | <ul style="list-style-type: none"> Main canal might be an obstacle for movements of people (initial state); remaining works have no effect | <ul style="list-style-type: none"> Increased productivity | x |
| | SANITATION | <ul style="list-style-type: none"> General use of septic tanks, with probable contamination of phreatics; Non sanitary landfill sites (organic matter) | x | <ul style="list-style-type: none"> Possible health effects through impairment of groundwater quality | <ul style="list-style-type: none"> Increased health risk due to contamination of drinking water; more generally due to increased quantity of waste, and development of agro-industry |
| | USE OF AGRO-CHEMICALS | <ul style="list-style-type: none"> Use of natural fertilizers in small quantities; Agrochemical almost in existent except in vineyards (small quantities) | x | <ul style="list-style-type: none"> Inclusion of vineyards in irrigation area might induce an increased use of pesticides in a zone with high vulnerability of groundwater | <ul style="list-style-type: none"> Increased use of agrochemical |
| | LANDSCAPE CULTURAL ASSETS | <ul style="list-style-type: none"> Memorial monuments in the cultivated plain along roads; majestuous landscapes in hilly zone (Putna); wine products | x | <ul style="list-style-type: none"> Irrigation of vineyards increases quantity but decreases quality of wine products | <ul style="list-style-type: none"> Water resources development or siting of industry for water might induce loss of landscape value (Putna valley in particular) |

FIGURES



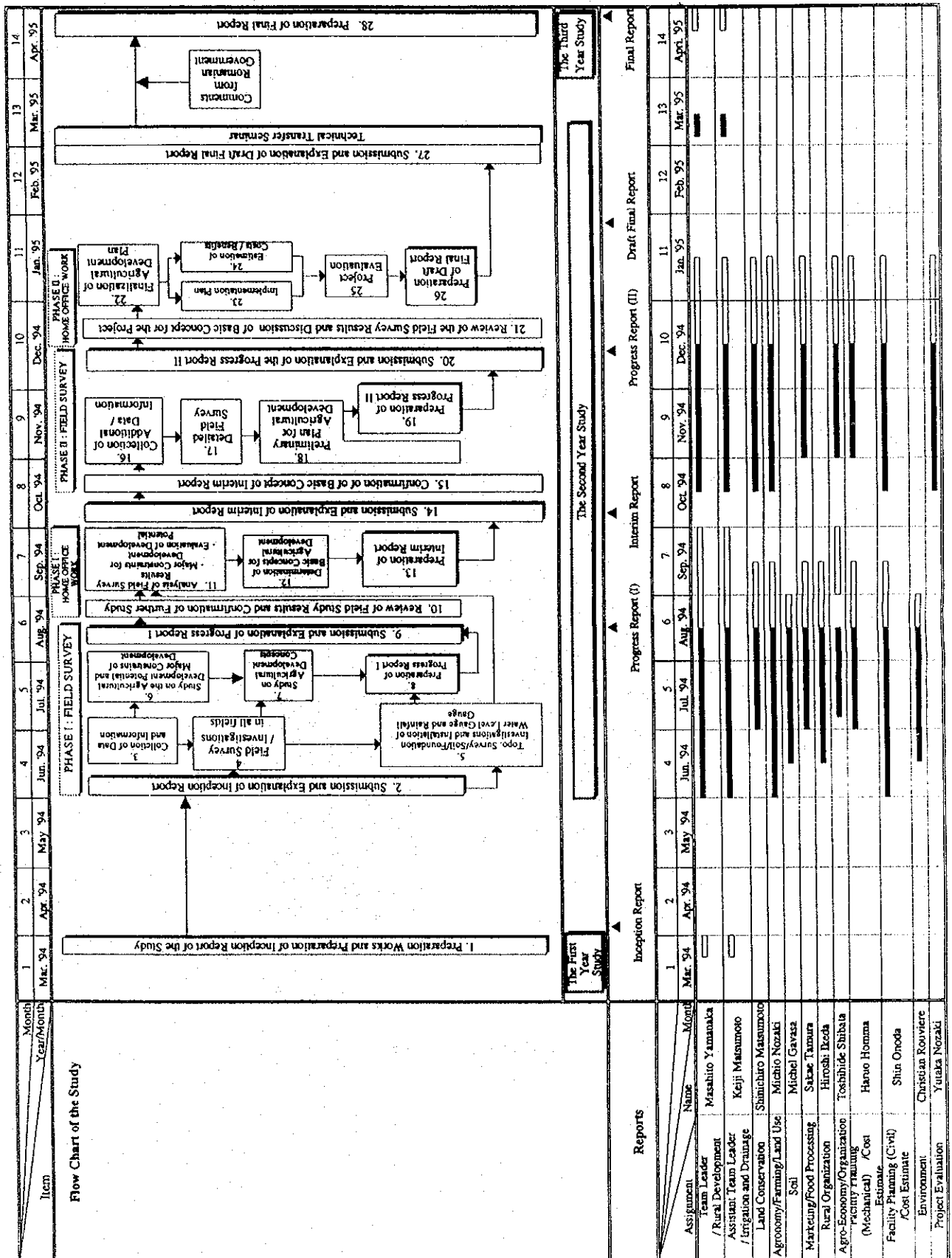


Fig 1.2.1-A1 Flowchart of the Study

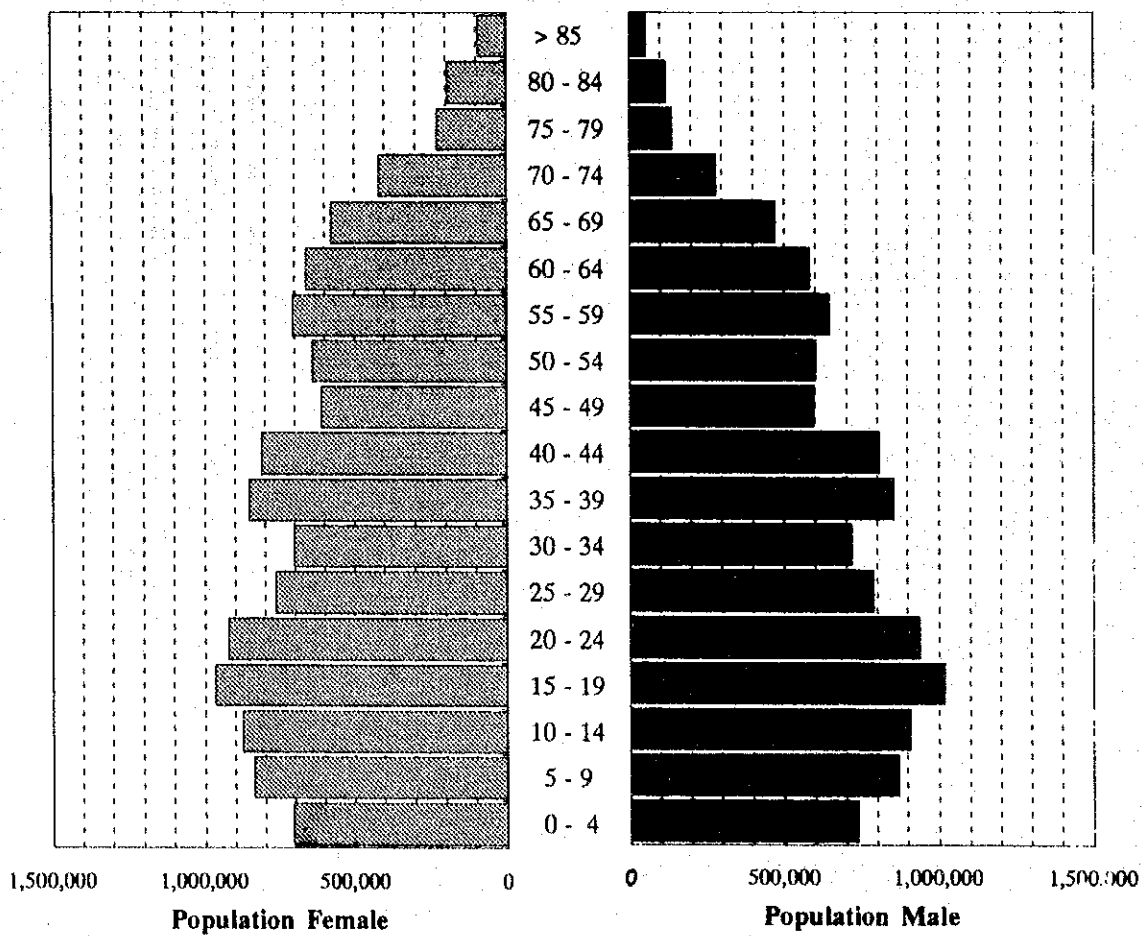


Fig 2.1.1-A1 Population Pyramid in Romania (1992)

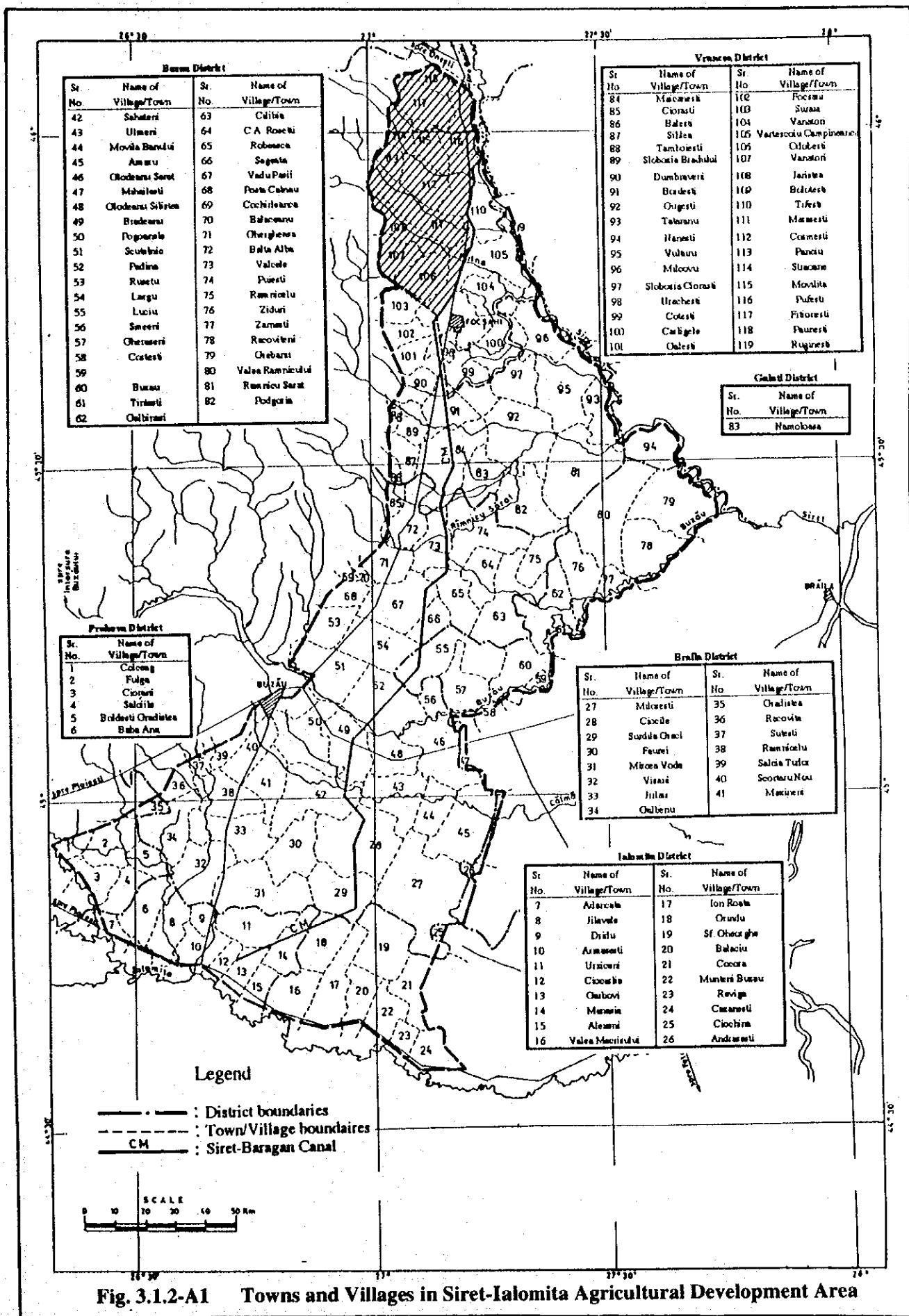
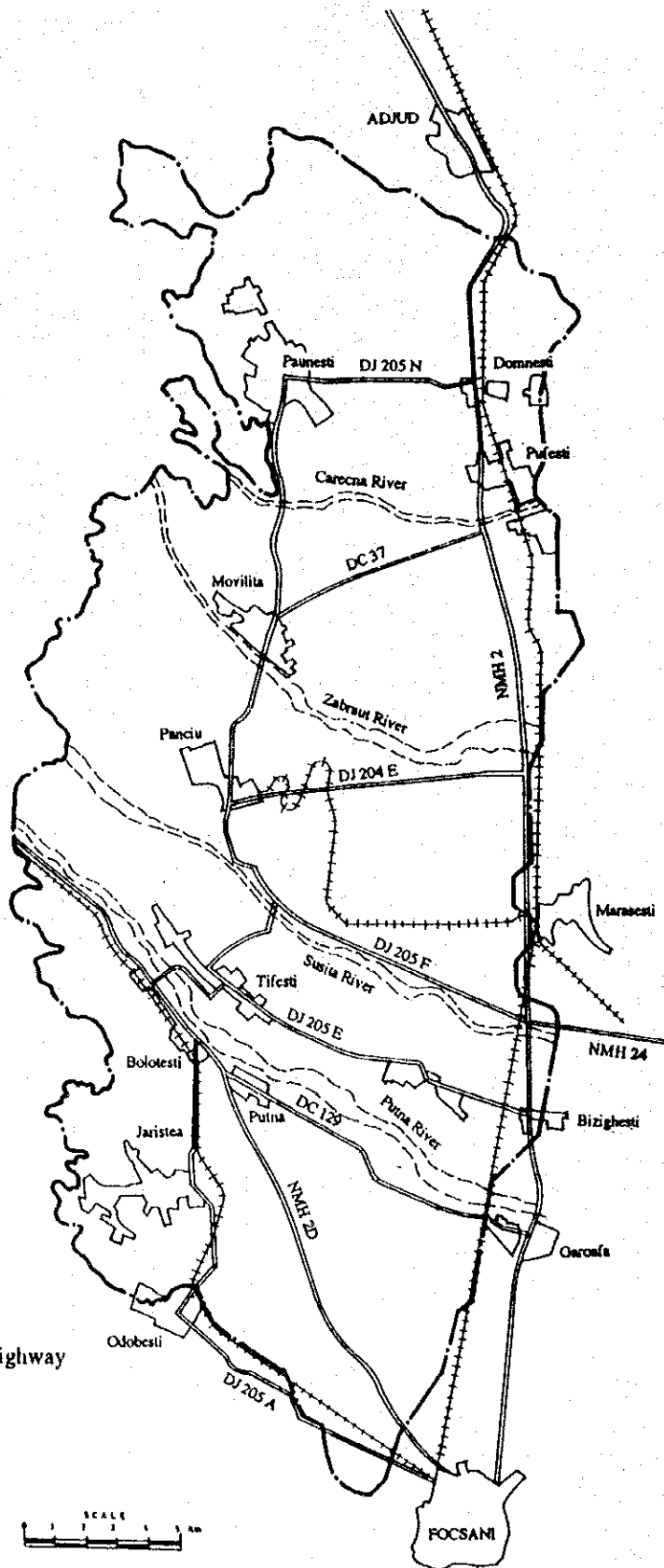


Fig. 3.1.2-A1 Towns and Villages in Siret-Ialomita Agricultural Development Area



Legend

- NMH : National Motor Highway
- DJ : District Road
- DC : Community Road
- + + + + + : Railway



Fig 3.1.4-A1 Road and Railway Networks in the Study Area

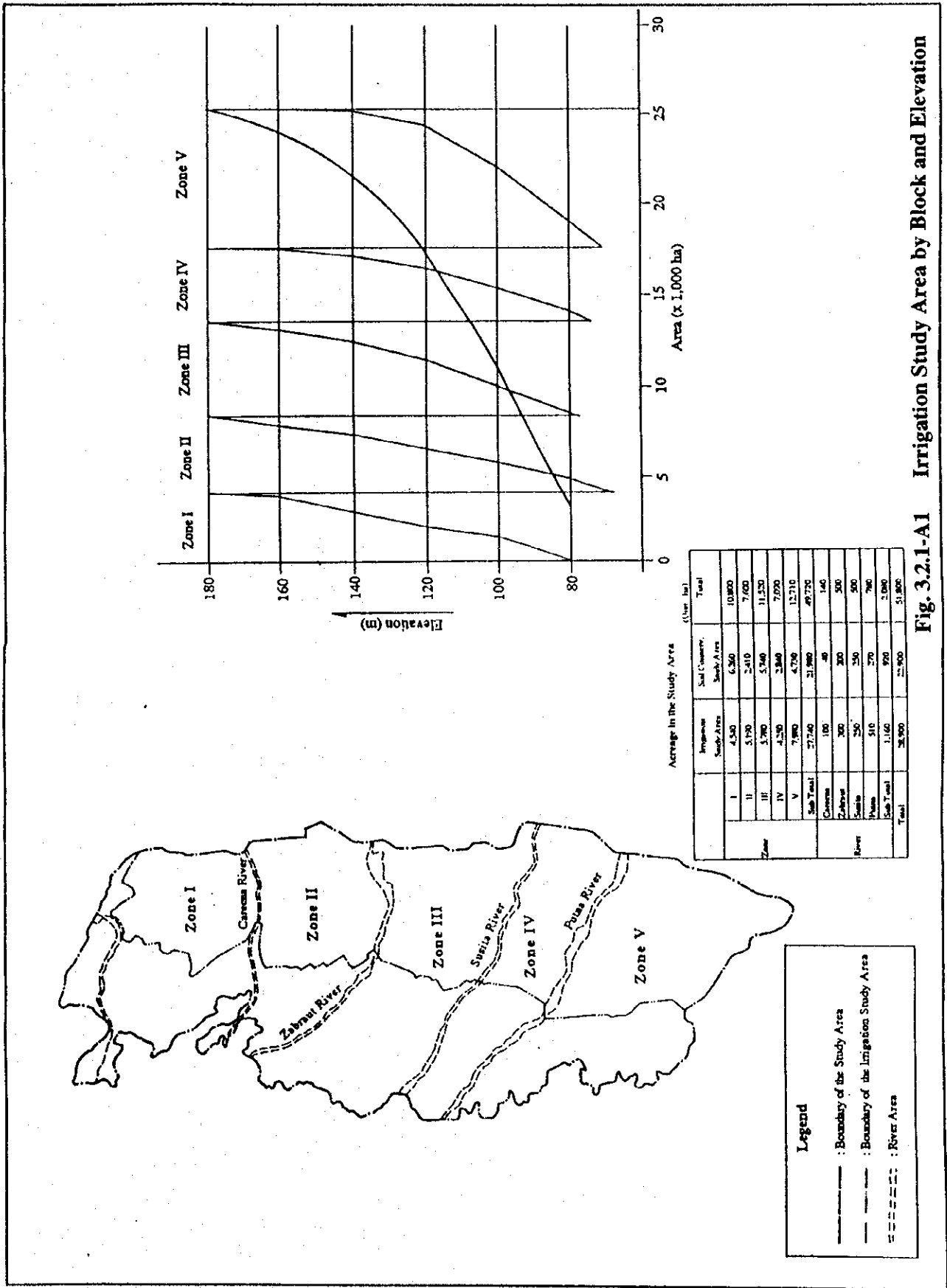


Fig. 3.2.1-A1 Irrigation Study Area by Block and Elevation

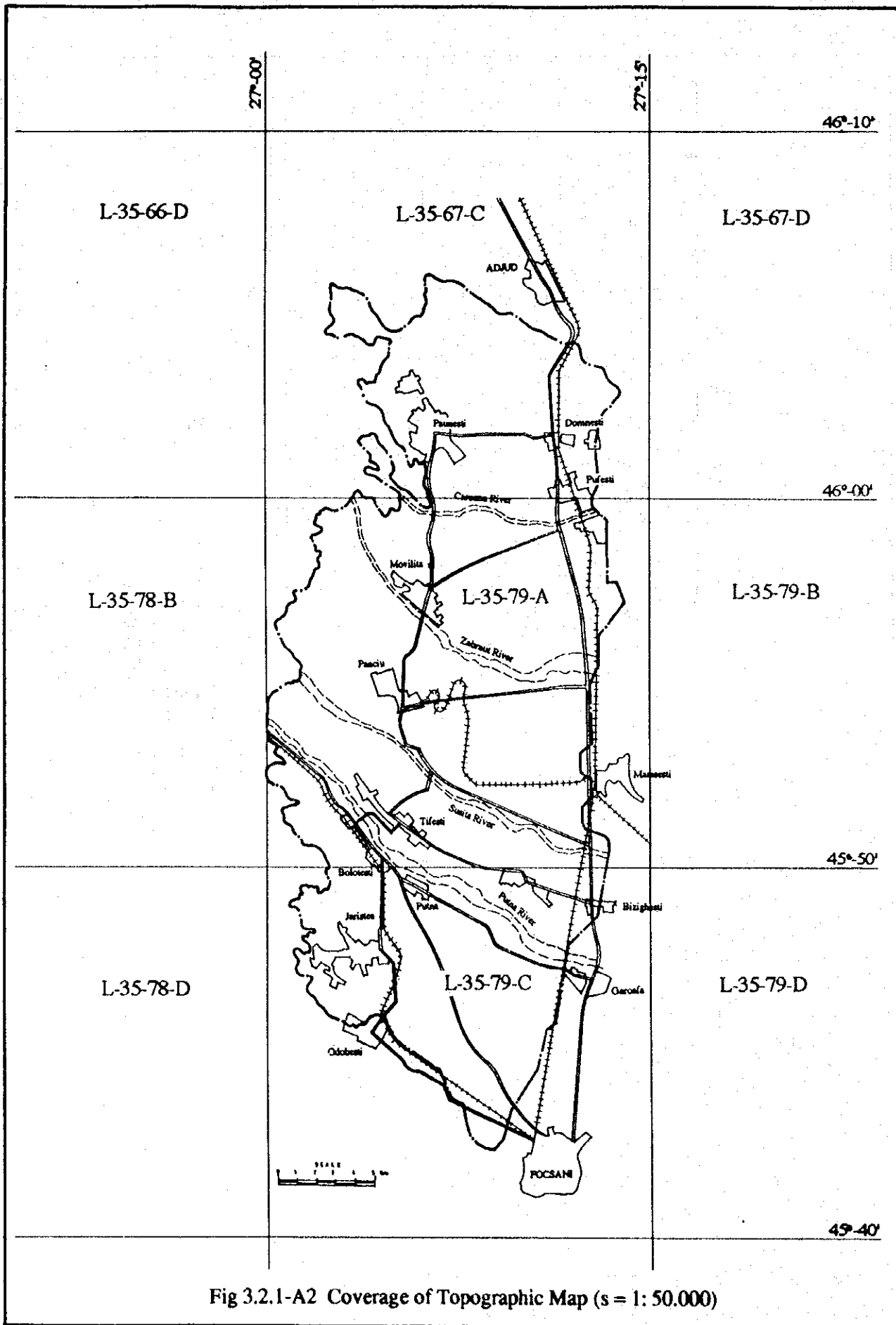
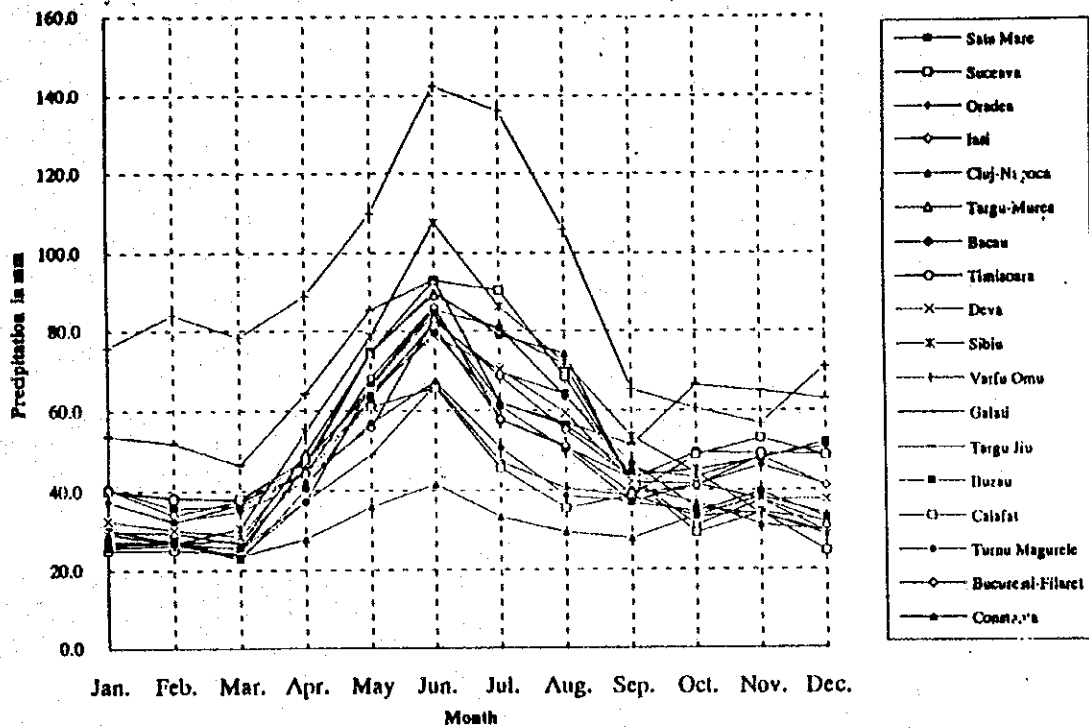
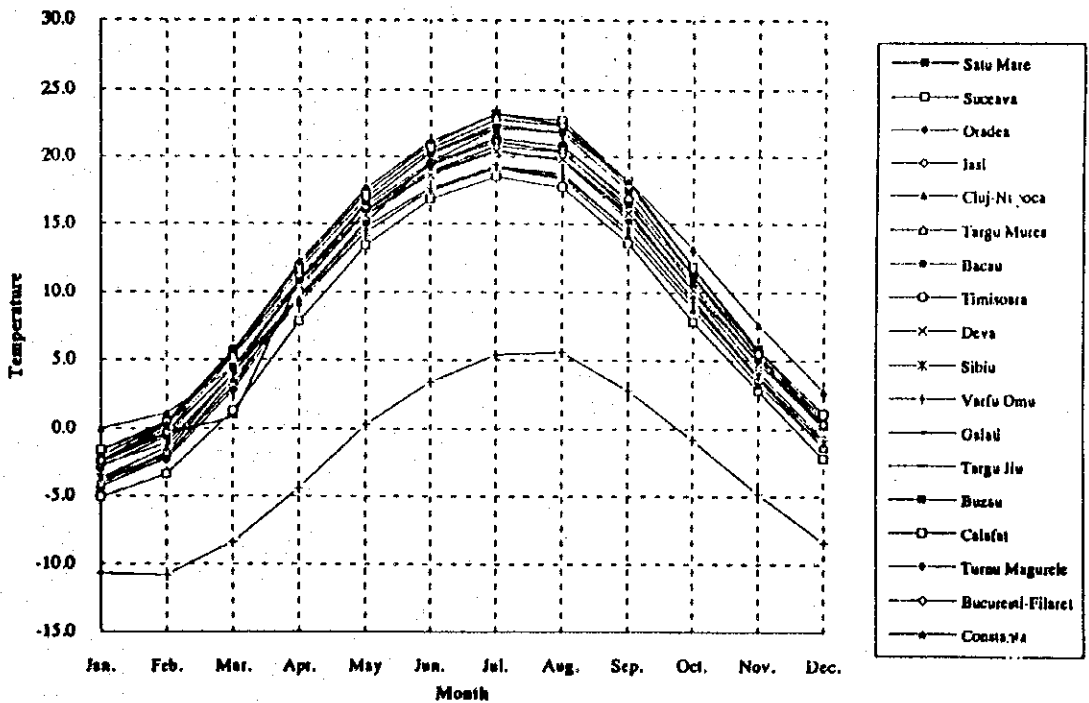


Fig 3.2.1-A2 Coverage of Topographic Map (s = 1: 50.000)



Source : Romania Statistical Yearbook 1993

Fig. 3.2.2-A1 Mean Monthly Precipitation in Romania (1901-1990)



Source : Romania Statistical Yearbook 1993

Fig. 3.2.2-A2 Mean Monthly Temperature in Romania (1901-1990)

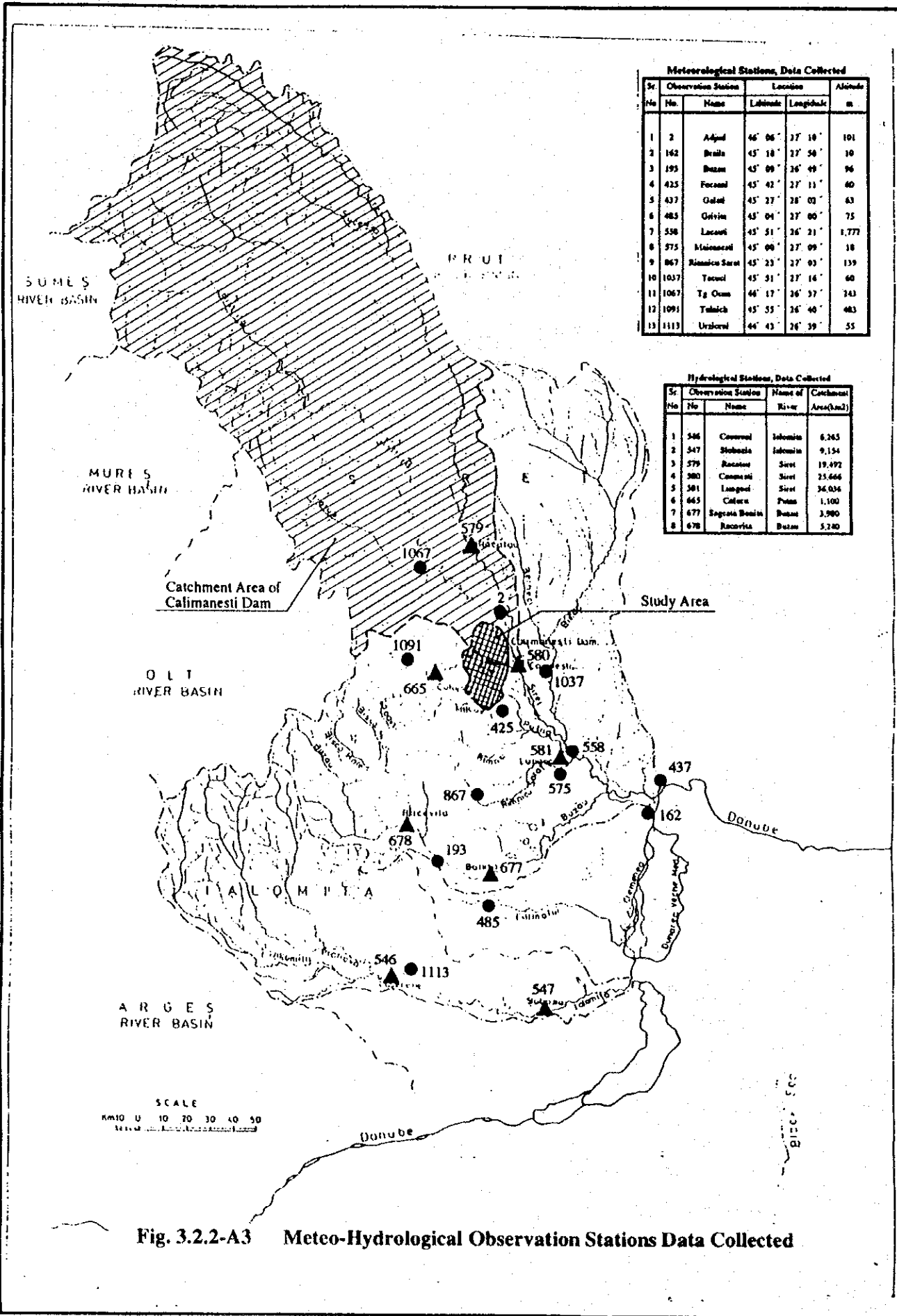


Fig. 3.2.2-A3 Meteo-Hydrological Observation Stations Data Collected

Fig 3.2.2-A4 Meteorological Data Collected (1 of 3)

1-1 Monthly Precipitation

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|------------|----------------|---------|---------|-------------|---------|---------|---------|---------|---------|--|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | | | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | Mar '48 | | | | Dec '93 | | | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | | Jan '35 | | | | | | Dec '93 | | | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | Apr '28 | Dec '29 | Feb '30 | | | | | Dec '93 | | | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | | Jan '62 | | | Dec '93 | | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | Jan '27 | | | | | | | Dec '93 | | | |
| 6 | 485 | Grivita | 45° 04' | 27° 00' | 75 | Jan '27 | | | | | | | Dec '93 | | | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | '57 '58 '60 | | '72 '78 | | Dec '93 | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | | | | | | Dec '93 | | | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | | | Jan '46 | | | | | Dec '93 | | | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | '45 | | '55 | Feb '59 | | Dec '93 | | | |
| 11 | 1067 | Tg. Oena | 46° 17' | 26° 37' | 243 | | | Jan '51 | Dec '58 | '60 | | Dec '72 | Jan '78 | Dec '93 | | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | | Feb '54 | | | Dec '72 | Jan '78 | Dec '93 | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | Jan '35 | | | | | | | Dec '93 | | | |

1-2 Monthly Maximum 24 Hour Precipitation

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|------------|----------------|---------|---------|---------|---------|---------|---------|---------|---------|--|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | | | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | Mar '48 | NOV '60 | May '61 | | Dec '93 | | | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | | | | | | | | Dec '93 | | | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | Apr '28 | Dec '29 | Feb '30 | | | | | Dec '93 | | | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | | | | | Dec '93 | | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | | | | Jan '42 | Dec '58 | Jan '60 | | Dec '93 | | | |
| 6 | 485 | Grivita | 45° 04' | 27° 00' | 75 | | | | Jan '57 | Dec '58 | '60 | Dec '72 | Jan '78 | Dec '93 | | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | Jan '48 | | | | Dec '93 | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | | | | | | Dec '93 | | | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | | | | | | | | Dec '93 | | | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | | | | | | Dec '93 | | | |
| 11 | 1067 | Tg. Oena | 46° 17' | 26° 37' | 243 | | | | Jan '52 | Feb '54 | | Dec '72 | Jan '78 | Dec '93 | | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | Jan '35 | | | | | Dec '93 | | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | | | | Jan '47 | | | | Dec '93 | | | |
| 14 | (241) | Odobesti | 45° 46' | 27° 04' | 150 | | | | Jan '50 | Sep '54 | May '65 | | Dec '92 | | | |
| 15 | (153) | Fitionesti | 45° 59' | 27° 03' | 345 | Jan '91 | Dec '91 | | Jan '49 | Dec '57 | Jan '61 | | Dec '92 | | | |
| 16 | | Nereju | | | | Jan '21 | Dec '31 | | Nov '48 | | Jan '61 | | Dec '92 | | | |
| 17 | | Panciu | | | | Jan '21 | Dec '31 | | Nov '48 | | Jan '61 | | Dec '92 | | | |

1-3 Monthly Maximum 48 & 72 Hours Precipitation

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|------------|----------------|---------|---------|---------|---------|---------|---------|---------|---------|--|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | | | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | | Jan '61 | | | May '93 | | | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | | | | | | | | Sep '93 | | | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | | | | | Jan '61 | | | | | | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | | | | | | | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | | | | | | | | | | | |
| 6 | 485 | Grivita | 45° 04' | 27° 00' | 75 | | | | Jan '61 | | | | Oct '93 | | | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | Jan '61 | Jul '72 | Jan '78 | | Jul '93 | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | | Jan '51 | | | | | | | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | | | | | | | | | | | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | | | | | | | | | |
| 11 | 1067 | Tg. Oena | 46° 17' | 26° 37' | 243 | | | | Jan '60 | | Dec '72 | Jan '78 | | Dec '93 | | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | Jan '35 | | | | | | Sep '93 | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | | | | Jan '47 | | | | | Dec '93 | | |
| 14 | (241) | Odobesti | 45° 46' | 27° 04' | 150 | | | | Jan '50 | Sep '54 | May '65 | | Dec '92 | | | |
| 15 | (153) | Fitionesti | 45° 59' | 27° 03' | 345 | Jan '91 | Dec '91 | | Jan '49 | Dec '57 | Jan '61 | | Dec '92 | | | |
| 16 | | Nereju | | | | Jan '21 | Dec '31 | | Nov '48 | | Jan '61 | | Dec '92 | | | |
| 17 | | Panciu | | | | Jan '21 | Dec '31 | | Nov '48 | | Jan '61 | | Dec '92 | | | |

Notes: 48 & 72 hours 48 hours only 72 hours only

Fig 3.2.2-A4 Meteorological Data Collected (2 of 3)

2. Monthly Temperature (Max., Mean and Min.)

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|------------|----------------|------|---------|---------|---------|---------|---------|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | Jan '50 | | | Dec '93 | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | | | Jan '35 | Jan '45 | | | Dec '93 | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | | | Jan '33 | Jan '45 | | | Dec '93 | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | | Jan '77 | Dec '80 | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | | | Jan '39 | Jan '45 | | | Dec '93 | |
| 6 | 485 | Grivita | 45° 04' | 27° 00' | 75 | | | Jan '29 | Jan '35 | | Dec '78 | Dec '87 | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | | | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | Jan '35 | Jan '55 | | | Dec '93 | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | | | | Jan '60 | Jan '73 | Jan '78 | Dec '93 | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | | Jan '61 | Jan '73 | Jan '78 | Dec '93 | |
| 11 | 1067 | Tg. Ocna | 46° 17' | 26° 37' | 243 | | | | Jan '60 | Jan '73 | Jan '78 | Dec '93 | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | | | | | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | | | Jan '35 | Jan '45 | | Dec '78 | Dec '93 | |

Notes: [Solid bar] Max., mean & min. [Dashed bar] Mean & min. [Dotted bar] Mean only

3. Relative Humidity (Monthly summary only)

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|------------|----------------|------|------|------|------|------|------|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | | '61 | | '78 | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | 1896 | | | '55 | | | | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | 1896 | | | '55 | '61 | | '78 | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | | | | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | 1896 | | | '55 | '61 | | '78 | |
| 6 | 485 | Grivita | 45° 04' | 27° 00' | 75 | 1896 | | | '55 | | | | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | | | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | | | '61 | | '78 | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | 1896 | | | '55 | | | | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | | | | | | |
| 11 | 1067 | Tg. Ocna | 46° 17' | 26° 37' | 243 | 1896 | | | '55 | | | | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | | | | | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | | | | | | | | |

4. Sunshine Duration (Monthly summary only)

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|------------|----------------|------|------|------|------|------|------|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | | | | | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | | | | | | | | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | | | | | | | | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | '51 | | '55 | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | | | | | | | | |
| 6 | 485 | Grivita | 45° 04' | 27° 00' | 75 | | | | '51 | | '55 | | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | | | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | | | | | | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | | | | '56 | | '55 | | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | | | | | | |
| 11 | 1067 | Tg. Ocna | 46° 17' | 26° 37' | 243 | | | | | | | | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | | | | | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | | | | | | | | |

Fig 3.2.2-A4 Meteorological Data Collected (3 of 3)

5. Monthly Thornthwaite Evapo-transpiration

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|---------------|----------------|---------|---------|---------|---------|---------|------|---------|--|--|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | | | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | Jan '50 | | | | Dec '93 | | | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | | | Jan '35 | | | | | Dec '93 | | | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | | | Jan '33 | | | | | Dec '93 | | | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | | | | | | | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | | | Jan '39 | | | | | Dec '93 | | | |
| 6 | 485 | Orivita | 45° 04' | 27° 00' | 75 | | Jan '29 | | | | | | Dec '93 | | | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | | | | | Dec '93 | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | Jan '35 | | | | | Dec '93 | | | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | | | | Jan '60 | Dec '71 | Jan '78 | | Dec '93 | | | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | | Jan '61 | Dec '72 | Jan '78 | | Dec '93 | | | |
| 11 | 1067 | Tg. Ocna | 46° 17' | 26° 37' | 243 | | | | Jan '60 | Dec '72 | Jan '78 | | Dec '93 | | | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | | | | | | Dec '93 | | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | | | Jan '35 | | | | | Dec '93 | | | |

6. Wind (Monthly summary of average speed and direction frequency only)

| Sr. No. | Observation Station | | Location | | Altitude m | Data Available | | | | | | | | | | Remarks |
|---------|---------------------|---------------|----------|-----------|---------------|----------------|------|------|---------|------|------|------|------|--|--|---------|
| | No. | Name | Latitude | Longitude | | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | | | |
| 1 | 2 | Adjud | 46° 06' | 27° 10' | 101 | | | | | | '61 | '78 | | | | |
| 2 | 162 | Braila | 45° 18' | 27° 58' | 10 | | | '41 | '55 | | | | | | | |
| 3 | 193 | Buzau | 45° 09' | 26° 49' | 96 | | | '41 | '43/'45 | '55 | '61 | '78 | | | | |
| 4 | 425 | Focsani | 45° 42' | 27° 11' | 60 | | | | | | | | | | | |
| 5 | 437 | Galati | 45° 27' | 28° 02' | 63 | | | | | | '61 | '78 | | | | |
| 6 | 485 | Orivita | 45° 04' | 27° 00' | 75 | | | '41 | '55 | | '61 | '78 | | | | |
| 7 | 558 | Lacauti | 45° 51' | 26° 21' | 1,777 | | | | | | | | | | | |
| 8 | 575 | Maicanesti | 45° 00' | 27° 09' | 18 | | | | | | '61 | '78 | | | | |
| 9 | 867 | Rimnicu Sarat | 45° 23' | 27° 03' | 139 | | | | | | | | | | | |
| 10 | 1037 | Tecuci | 45° 51' | 27° 16' | 60 | | | '46 | '55 | | | | | | | |
| 11 | 1067 | Tg. Ocna | 46° 17' | 26° 37' | 243 | | | '46 | '55 | | | | | | | |
| 12 | 1091 | Tulnich | 45° 55' | 26° 40' | 483 | | | | | | | | | | | |
| 13 | 1113 | Urziceni | 44° 43' | 26° 39' | 55 | | | | | | '61 | '78 | | | | |

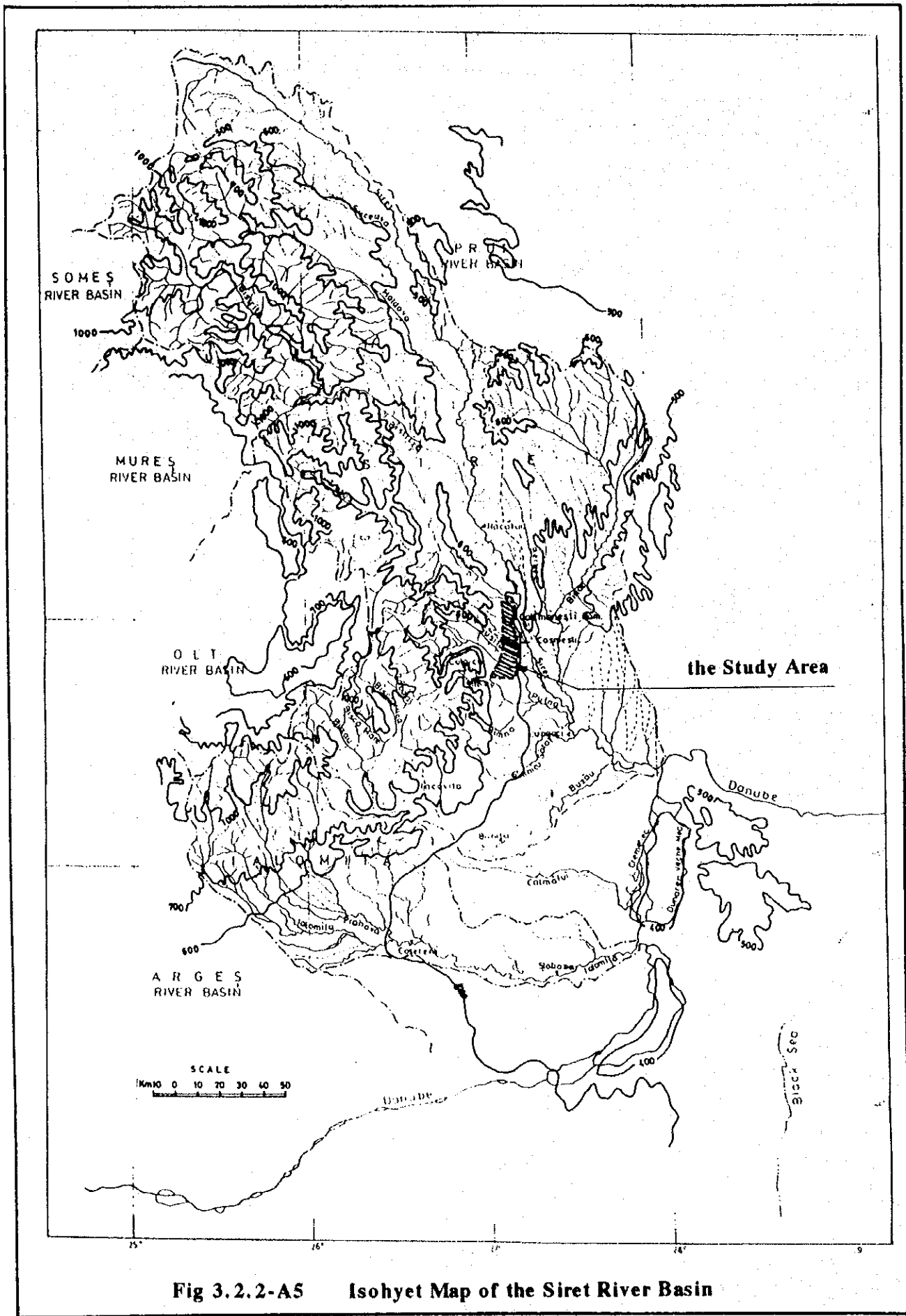


Fig 3.2.2-A5 Isohyet Map of the Siret River Basin

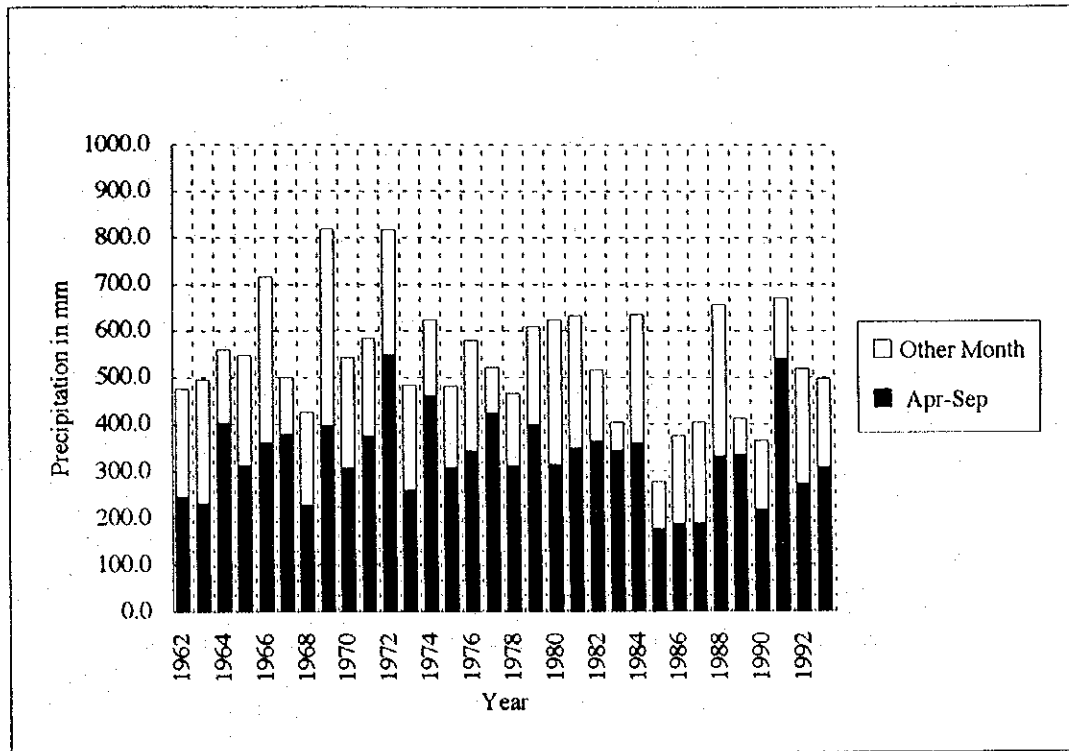


Fig 3.2.2-A6 Annual Precipitation at Focsani Station (1962-1993)

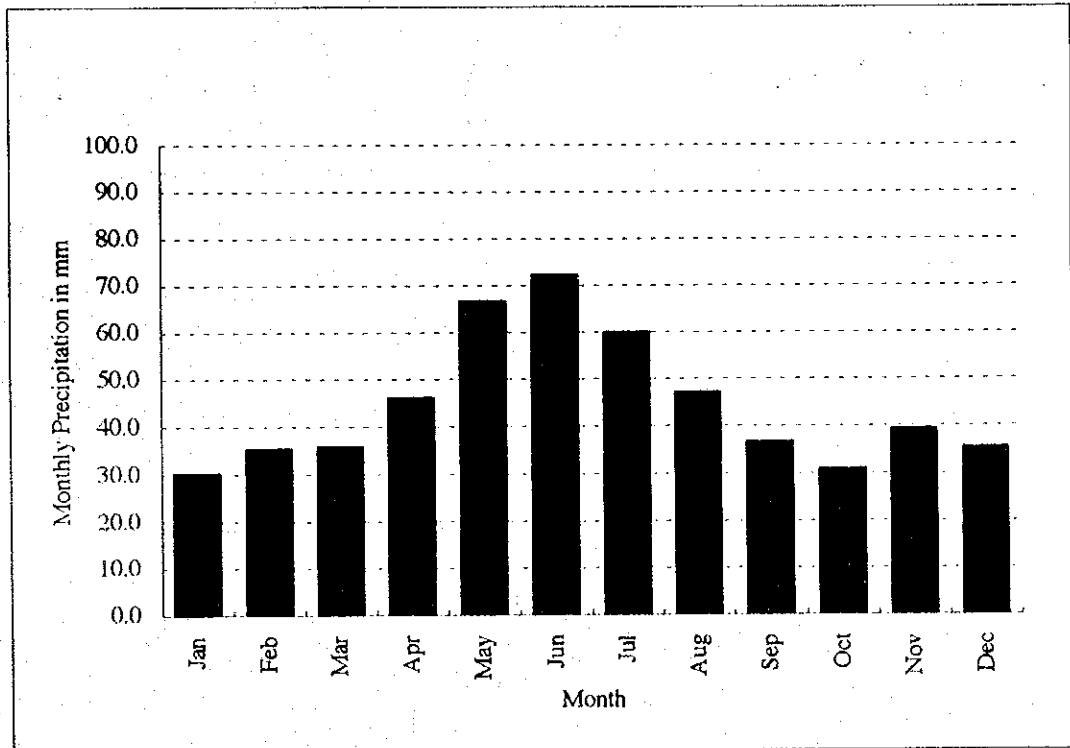
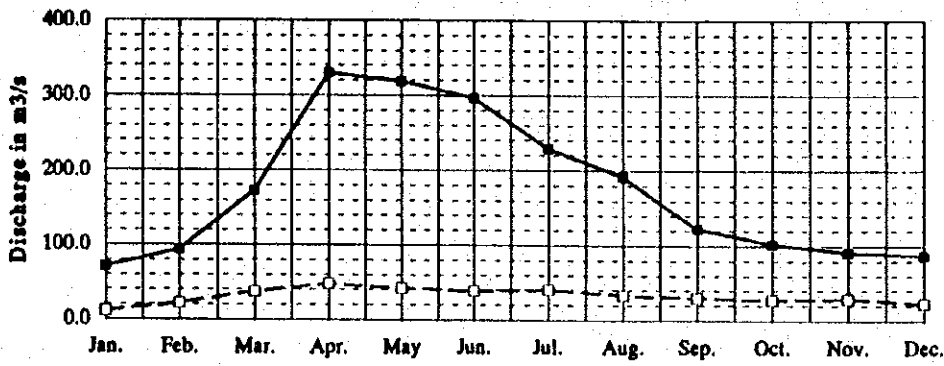
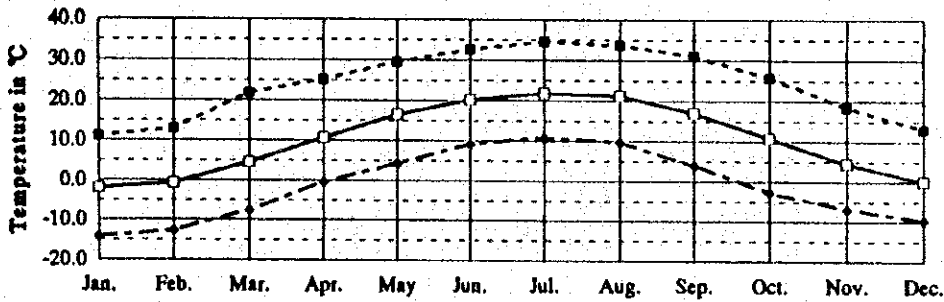


Fig 3.2.2-A7 Average Mean Monthly Precipitation at Focsani Station (1962-1993)

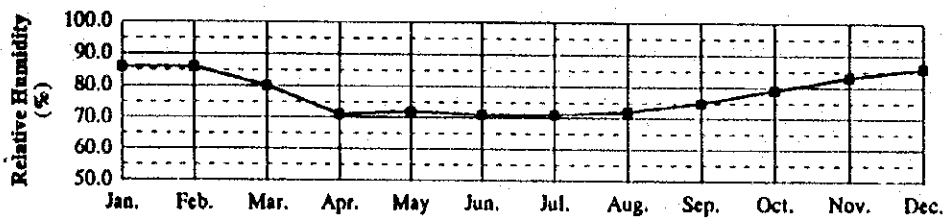
Mean Monthly Discharge of the Siret at Cosmesti (1950 - 1993)



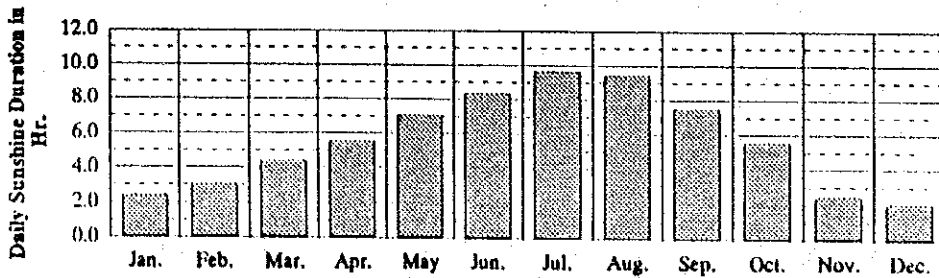
Max., Min. and Mean Monthly Temperature in Focsani (1977-1992)



Relative Humidity in Adjud (1961 - 1987)



Daily Monthly Mean Daily Sunshine Duration in Focsani (1951-1965)



Mean Monthly Precipitation in Focsani (1962-1993) and Adjud (1948-1993)

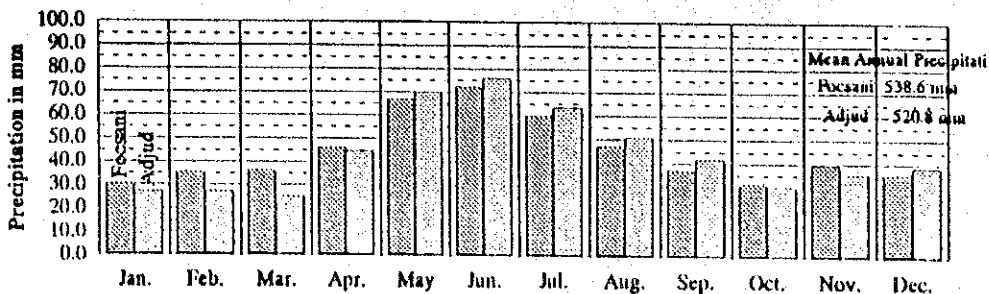


Fig. 3.2.2-A8 Summary of Meteo-Hydrological Conditions in the Study Area

| Sr. No. | Observation Station | | Name of River | Catchment Area(km ²) | Altitude m | Data Available | | | | | Remarks | |
|---------|---------------------|----------------|---------------|----------------------------------|------------|----------------|------|----------|----------|----------|----------|------------------------------|
| | No. | Name | | | | 1940 | 1950 | 1960 | 1970 | 1980 | | 1990 |
| 1 | 546 | Cosereni | Ialomita | 6,265 | | Jan. '50 | | | | | Dec. '93 | |
| 2 | 547 | Slobozia | Ialomita | 9,154 | | Jan. '50 | | | | | Dec. '93 | |
| 3 | 579 | Racatau | Siret | 19,492 | | Jan. '50 | | Dec. '75 | Jan. '78 | Dec. '85 | | |
| 4 | 580 | Cosmesti | Siret | 25,666 | | Jan. '50 | | | | | Dec. '93 | |
| 5 | 581 | Lungoci | Siret | 36,036 | | Jan. '50 | | | | | Dec. '93 | |
| 6 | 665 | Colacu | Putna | 1,100 | | Jan. '50 | | | | Dec. '83 | Dec. '93 | Max. daily for 1952-93, INMH |
| 7 | 677 | Sageata Bonita | Buzau | 3,980 | | Jan. '45 | | | | | Dec. '93 | |
| 8 | 678 | Racovita | Buzau | 5,240 | | Jan. '45 | | | | | Dec. '93 | |

Fig 3.2.3-A1 Mean Monthly Discharge Data Collected

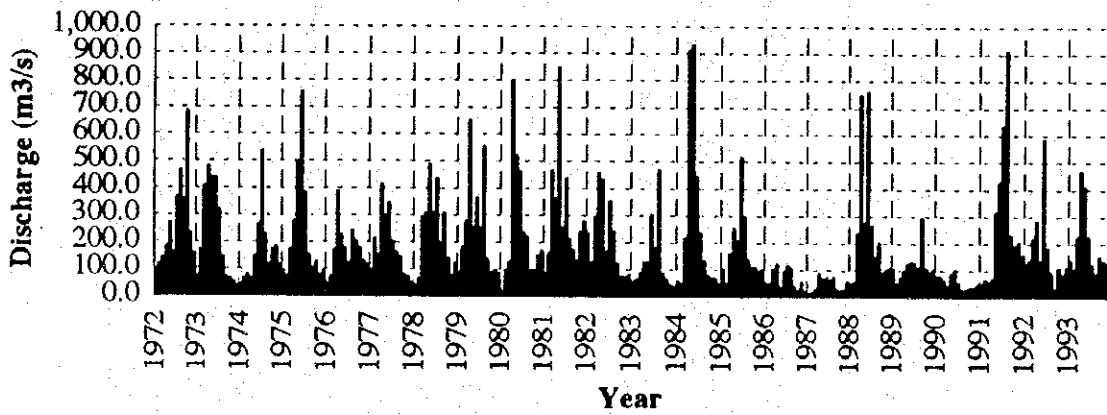


Fig 3.2.3-A2 Annual Variation of Mean Monthly Discharge of the Siret River at Cosmesti Station (1972-1993)

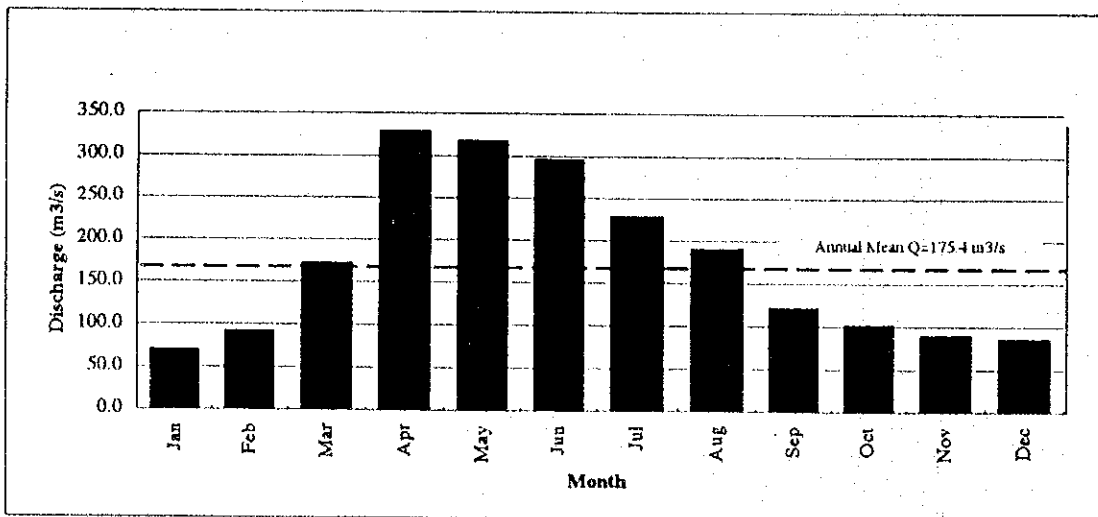


Fig 3.2.3-A3 Mean Monthly Discharge of the Siret River at Cosmesti Station (1950-1993)

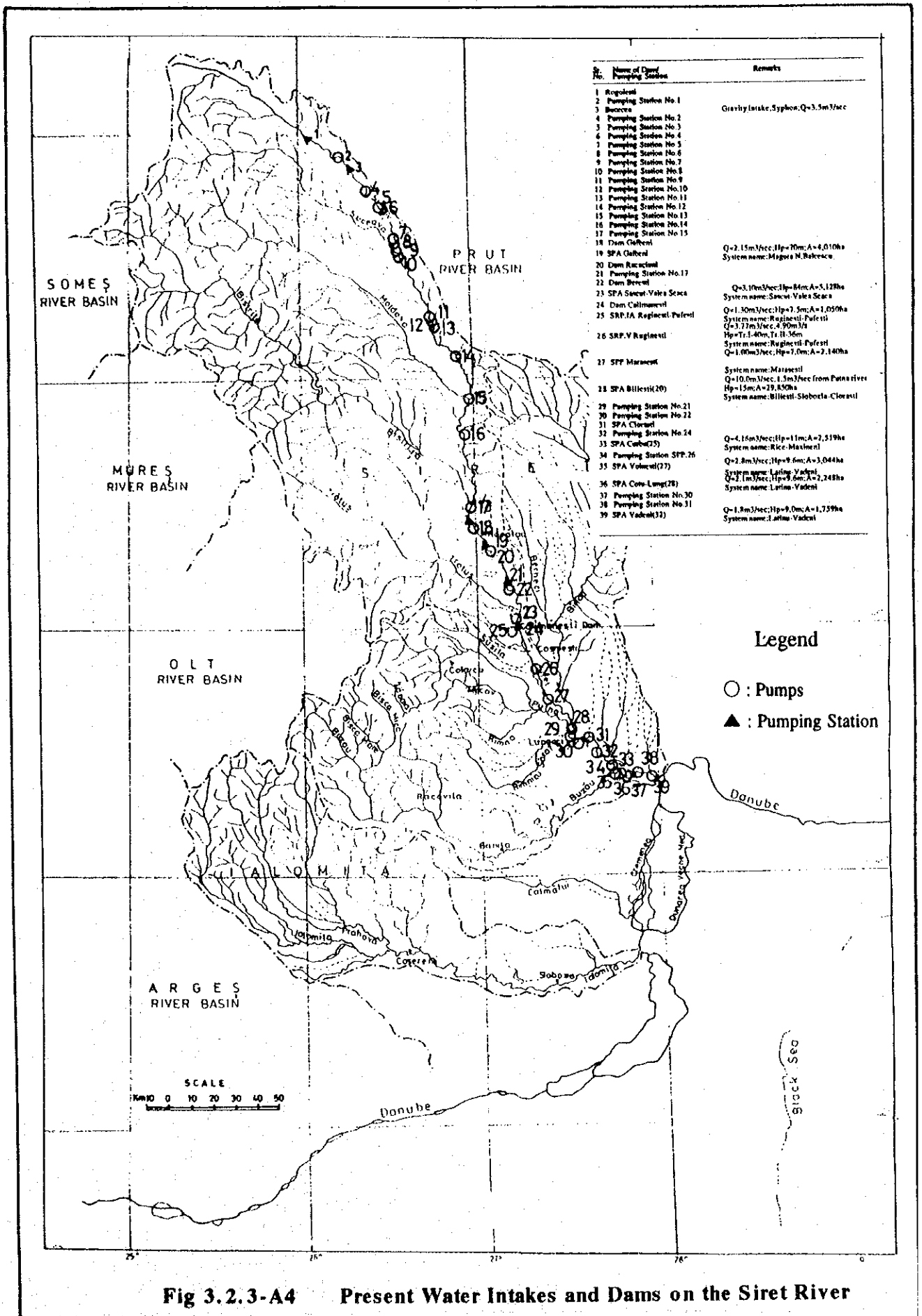


Fig 3.2.3-A4 Present Water Intakes and Dams on the Siret River

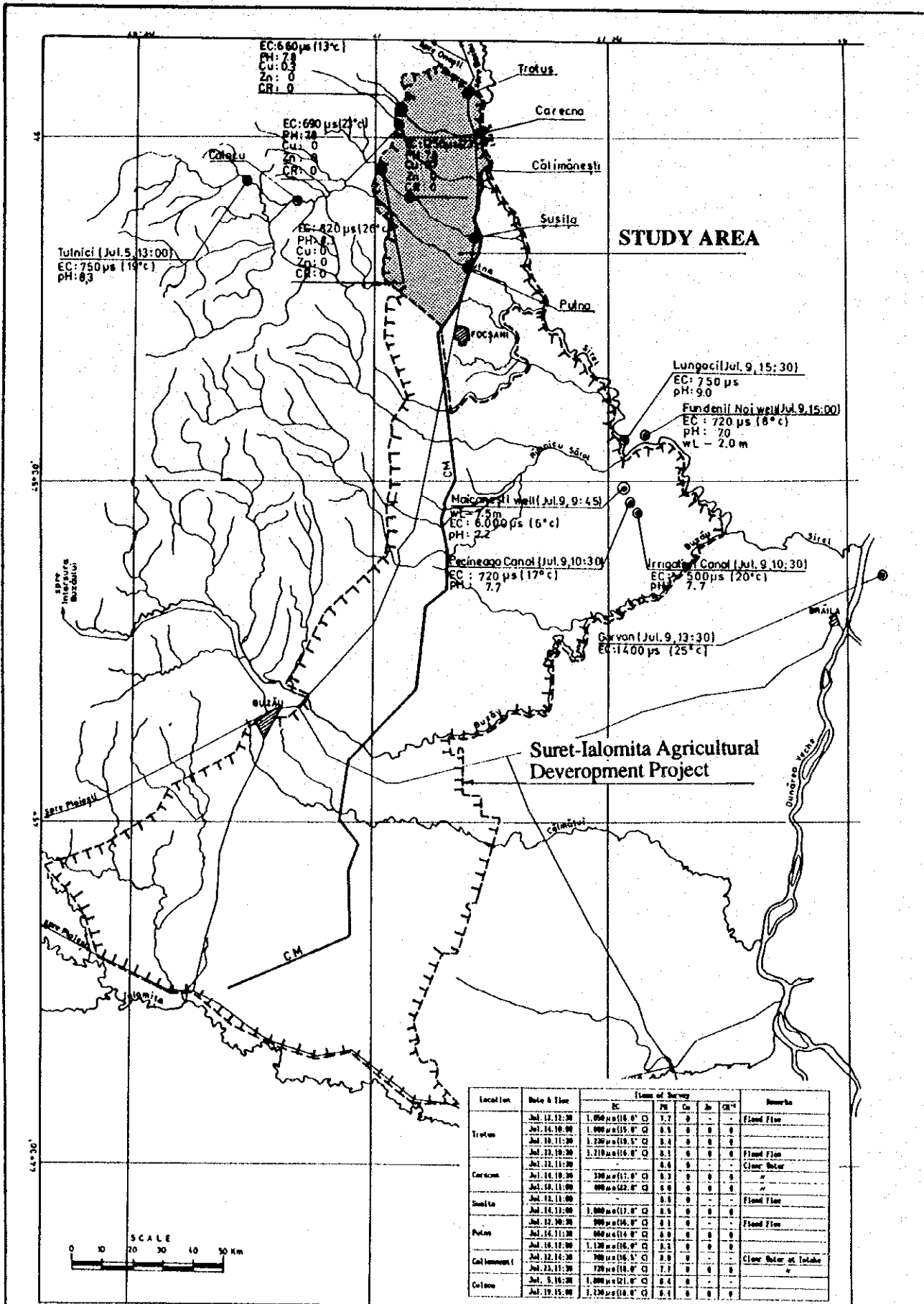


Fig 3.2.3-A5 Results of Field Water Quality Test

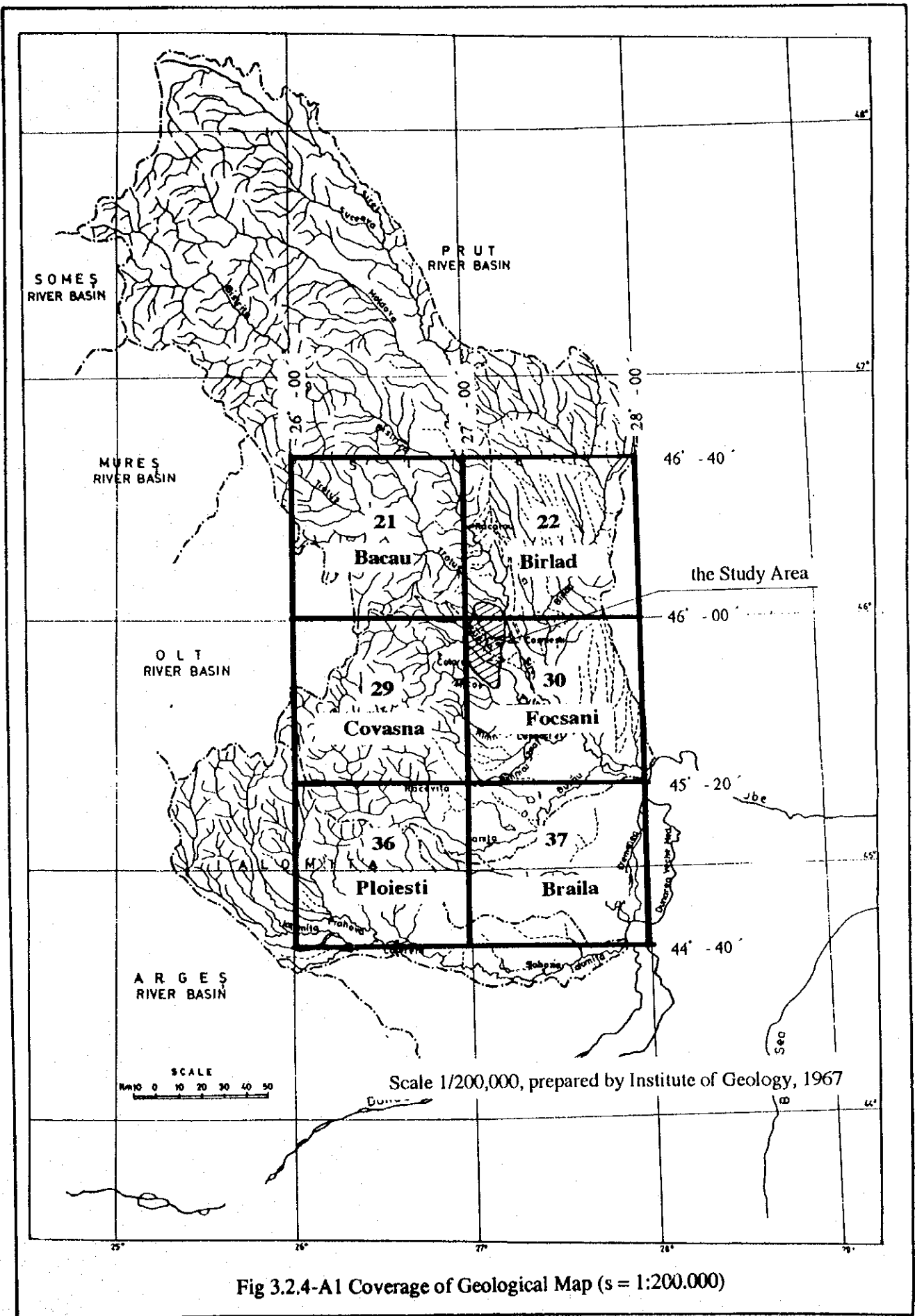
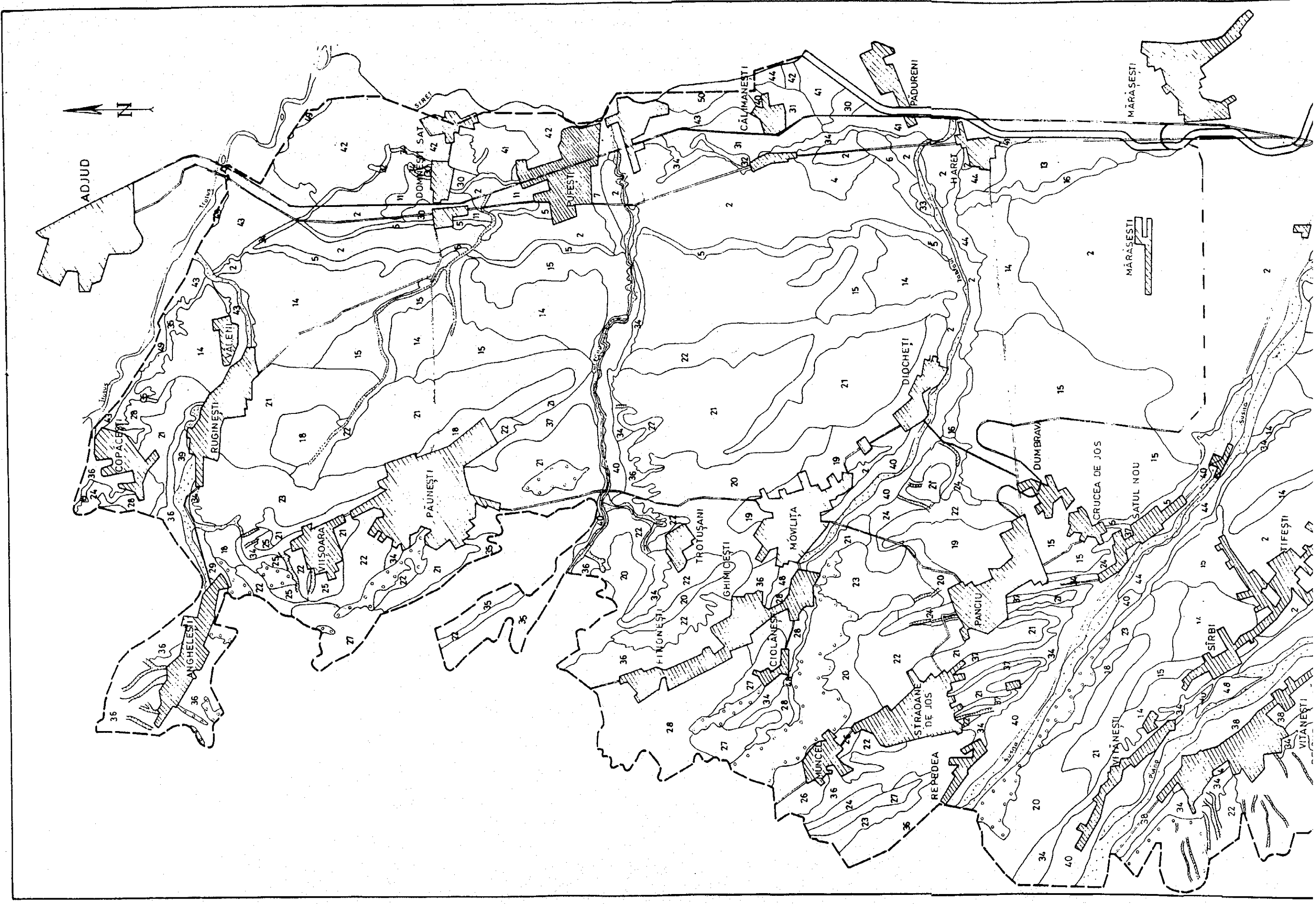


Fig 3.2.4-A1 Coverage of Geological Map (s = 1:200.000)





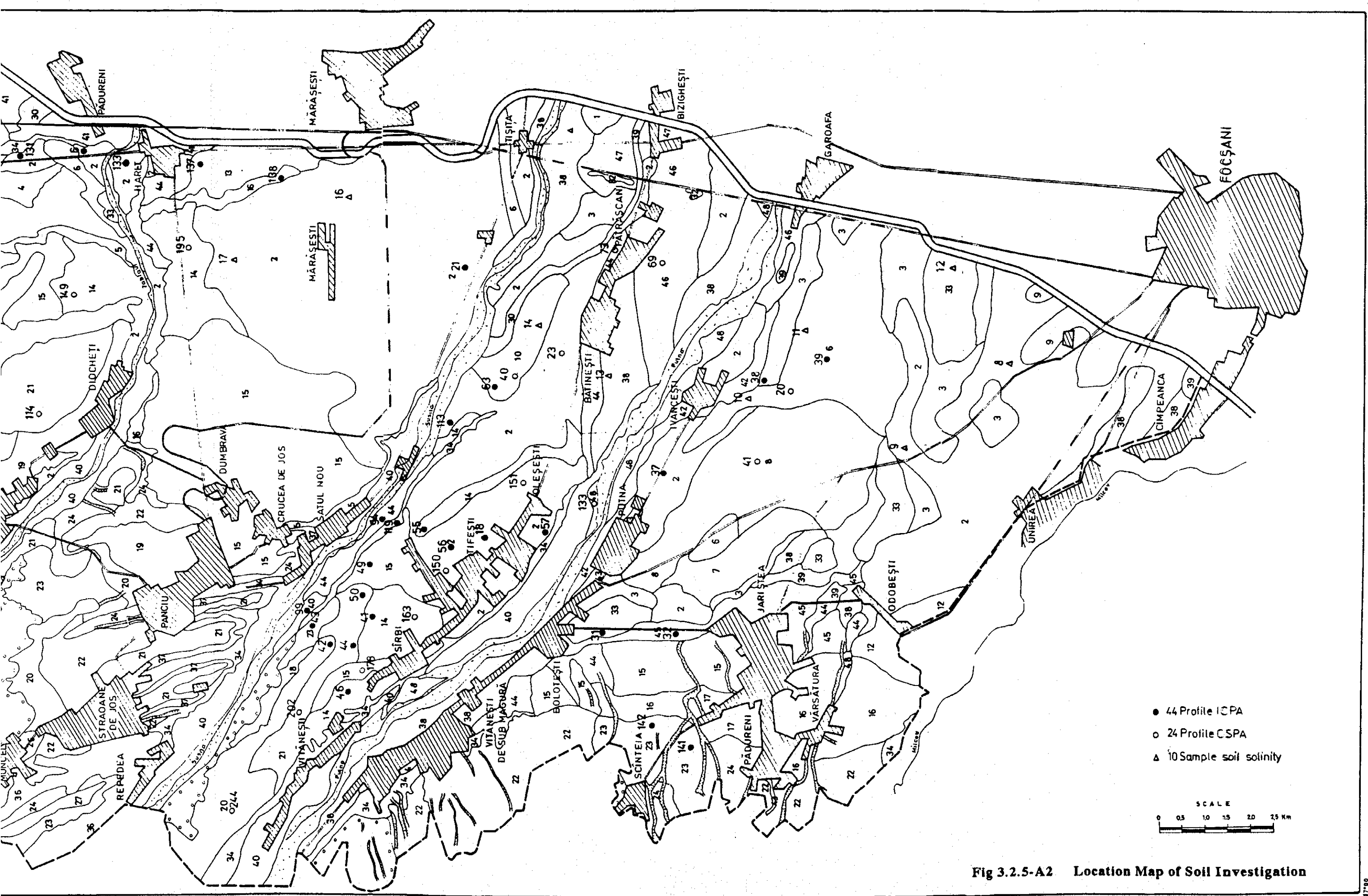
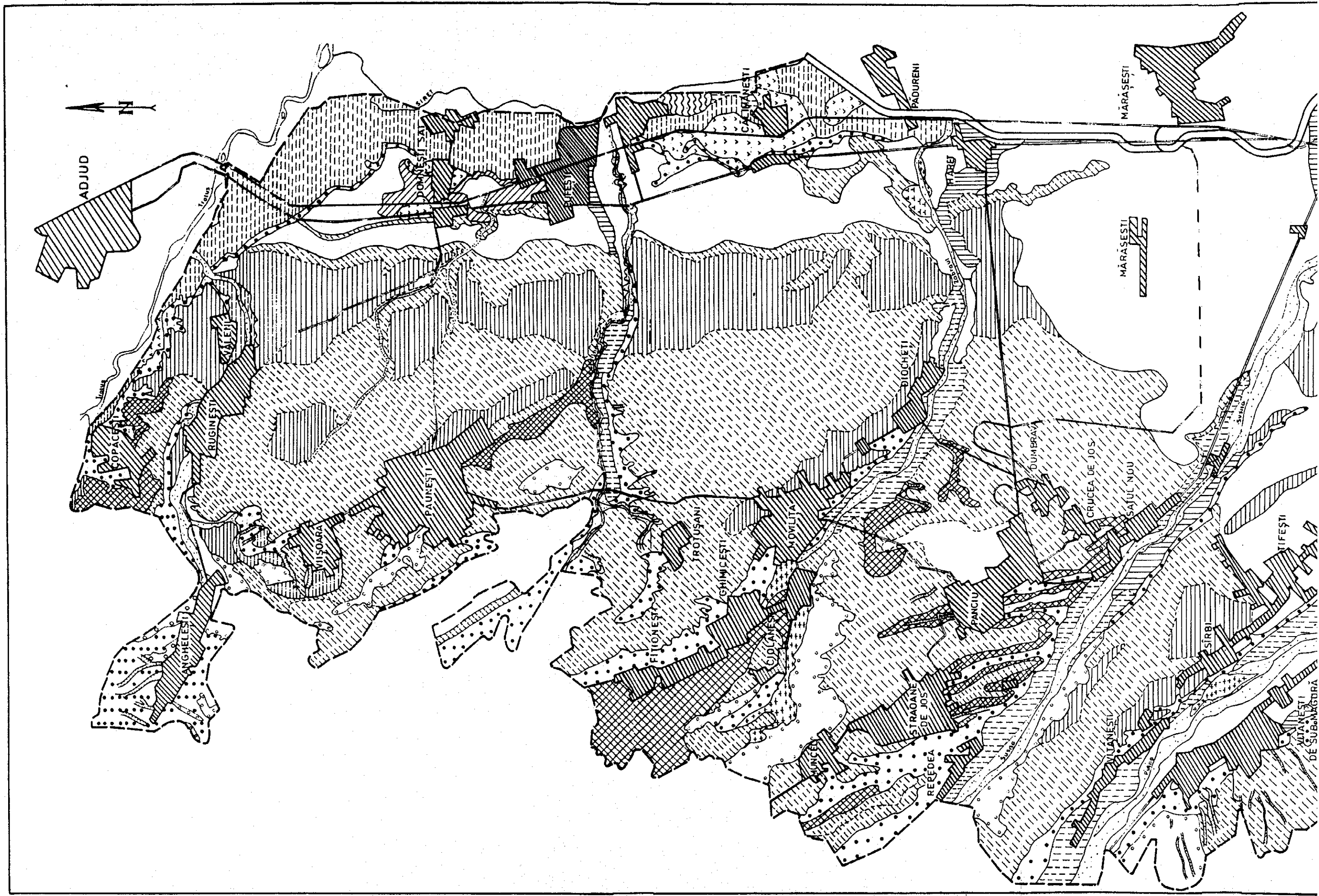


Fig 3.2.5-A2 Location Map of Soil Investigation



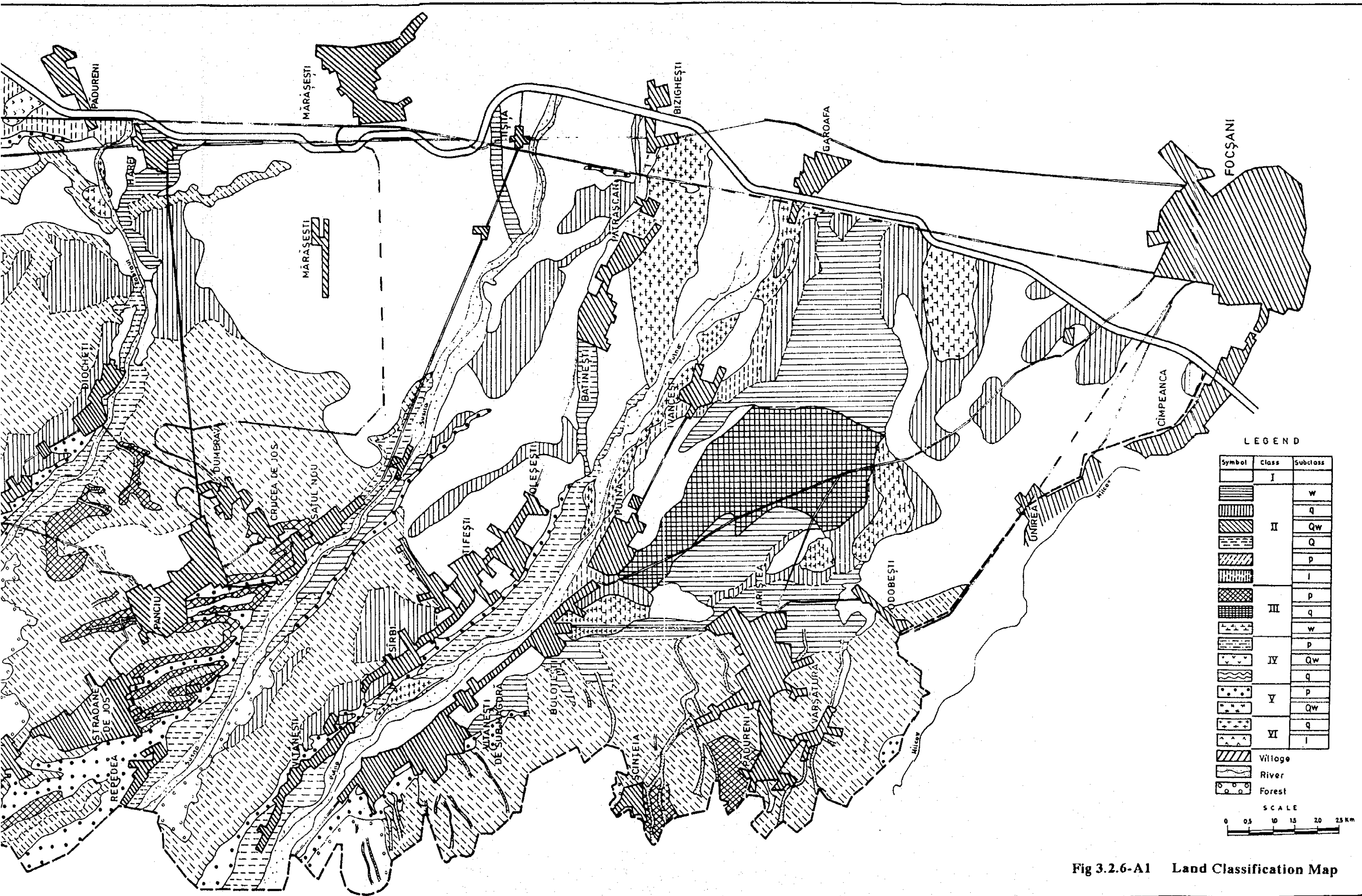
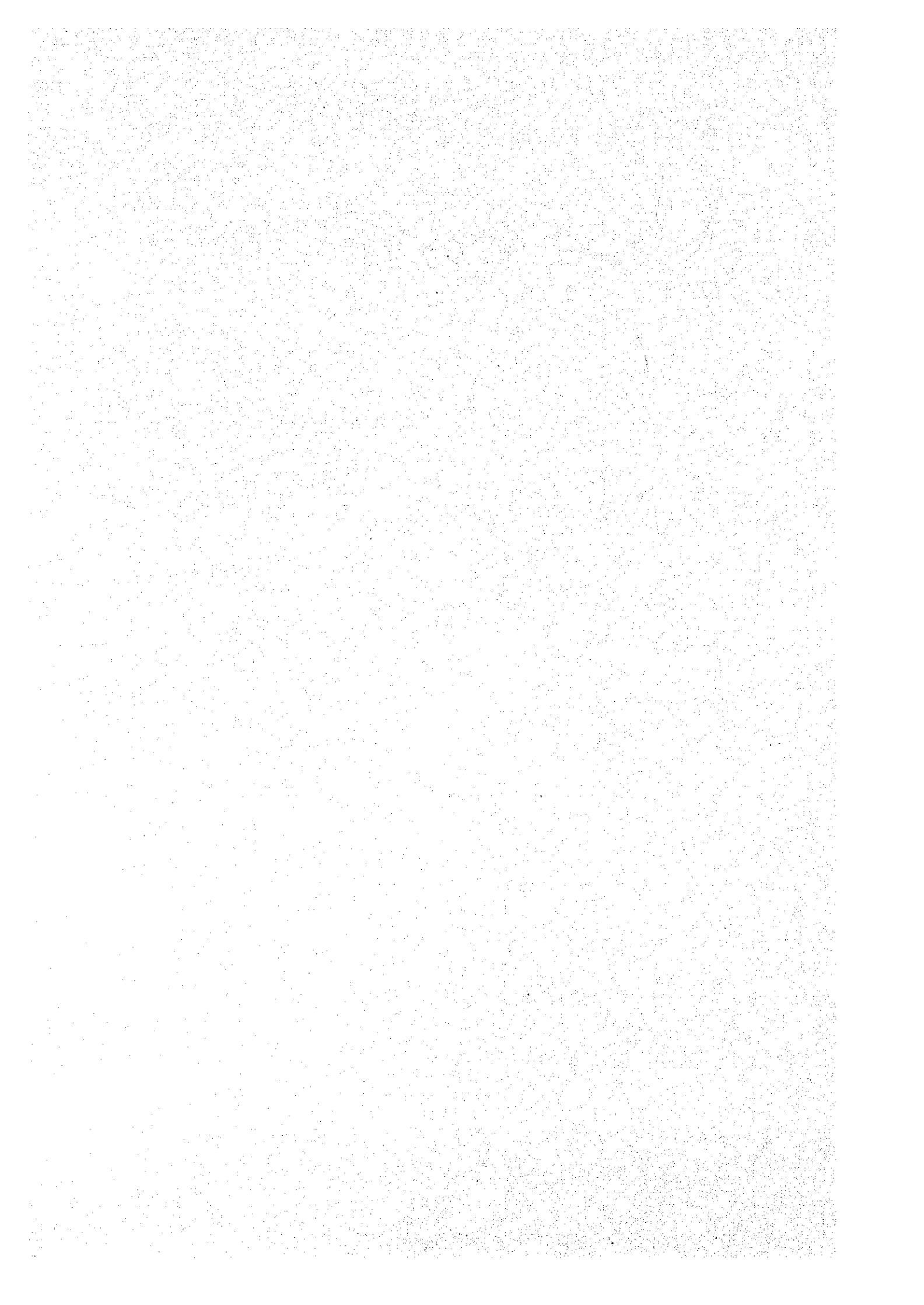


Fig 3.2.6-A1 Land Classification Map





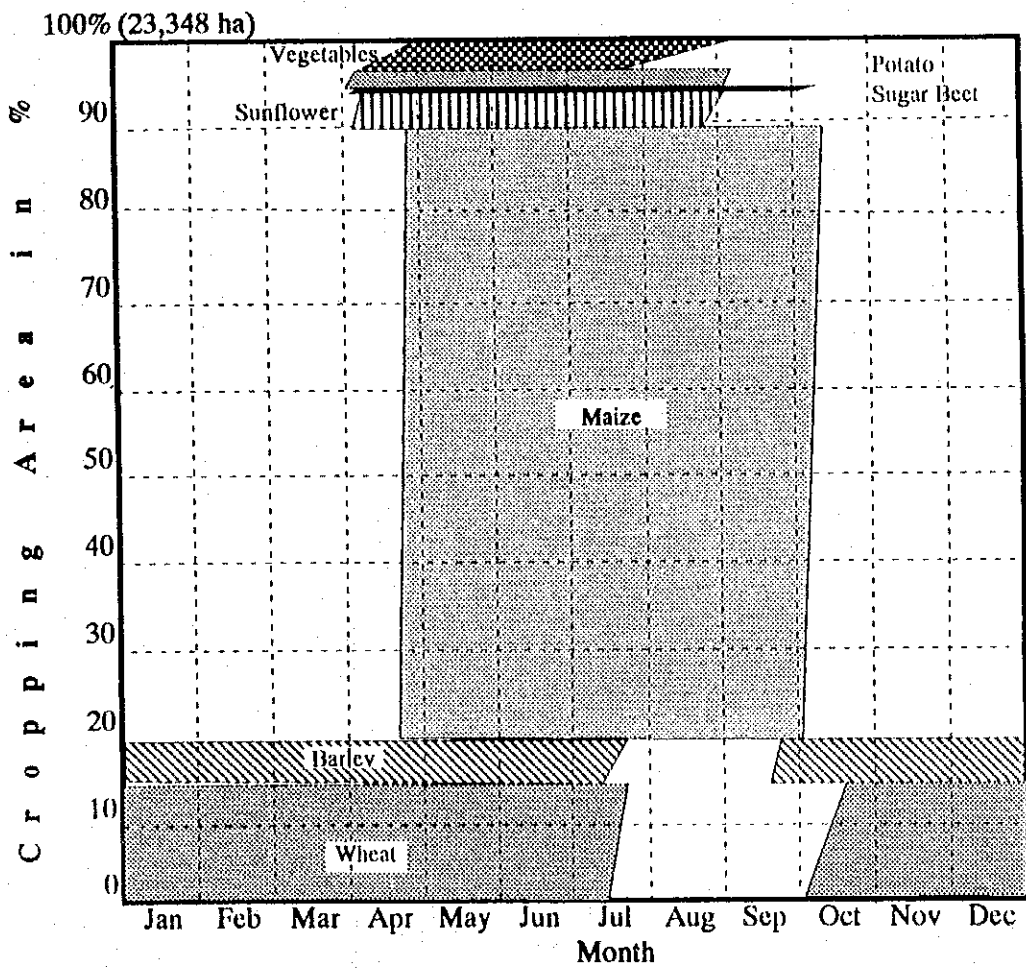
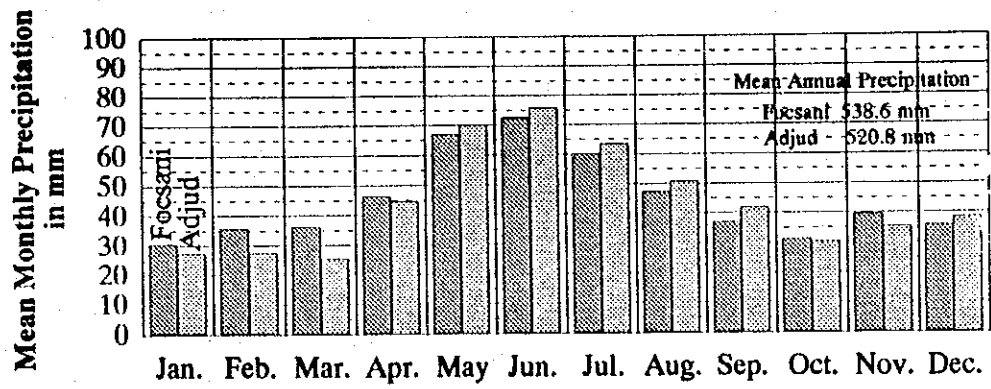
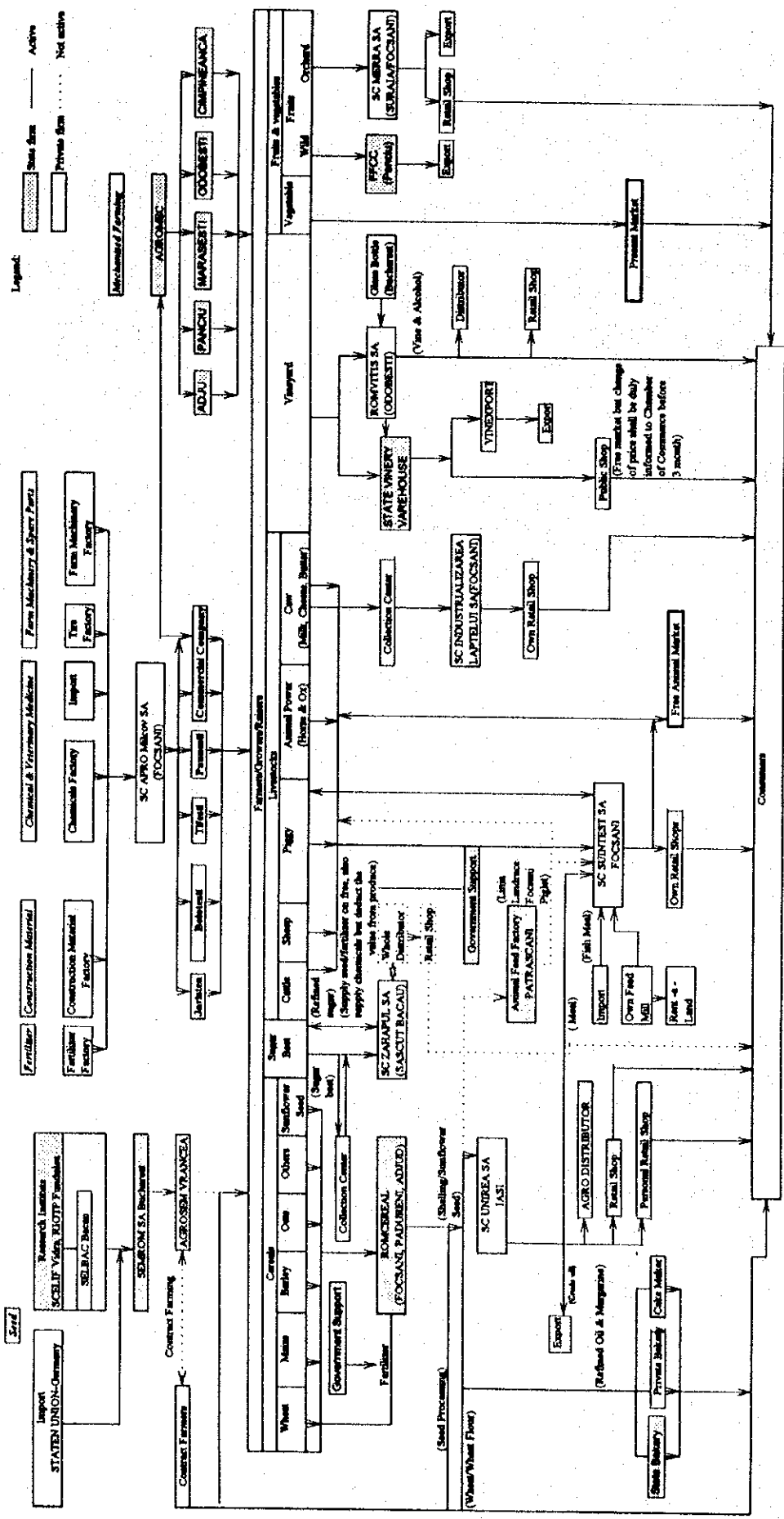


Fig 3.3.4-A1 Present Cropping Pattern in the Study Area, 1992



Source: Project Study Team

Fig. 3.3.7-A1 Current Marketing Channel of Agri-Input/Output and Related Food Processing Industry in the Study Area

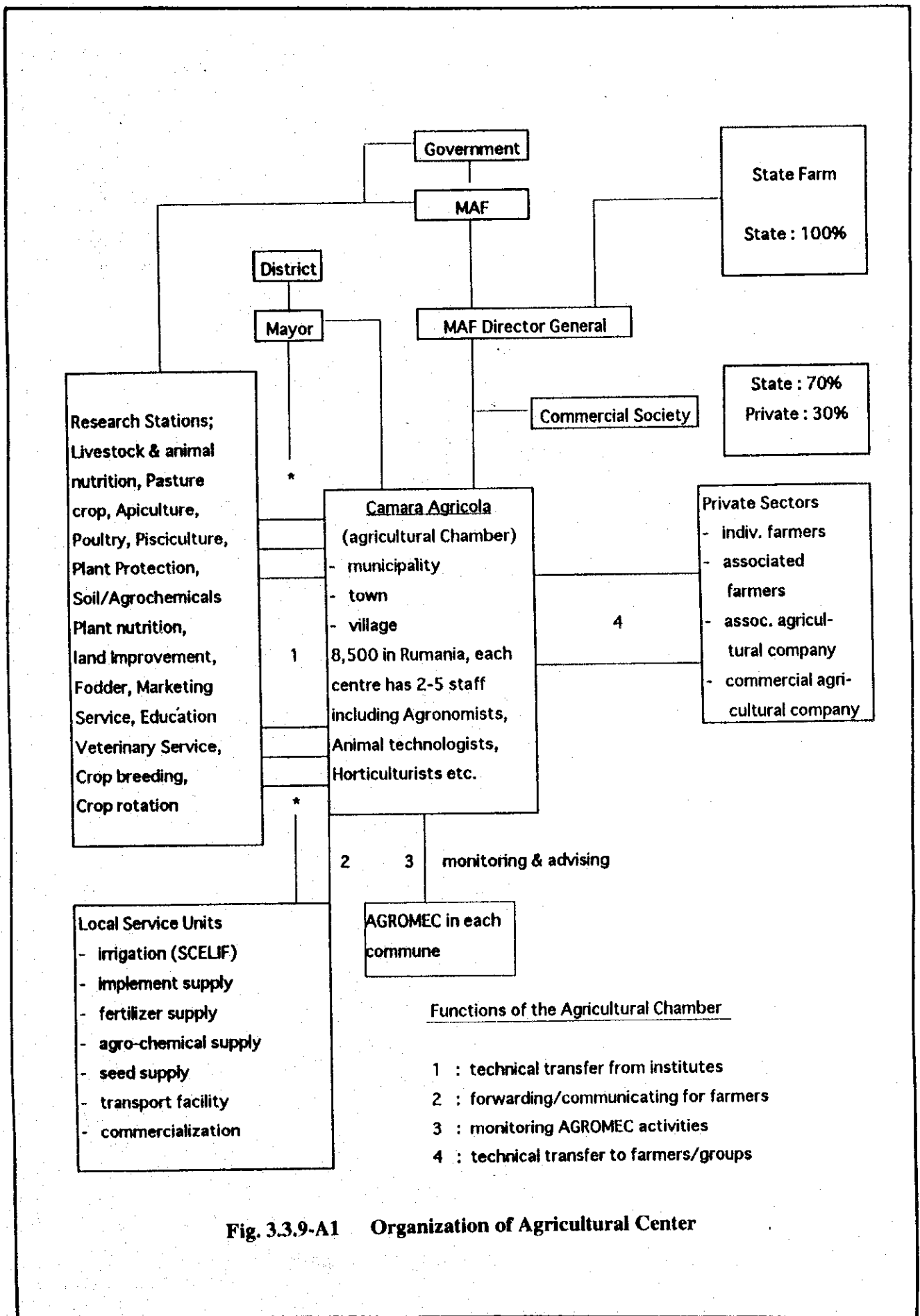
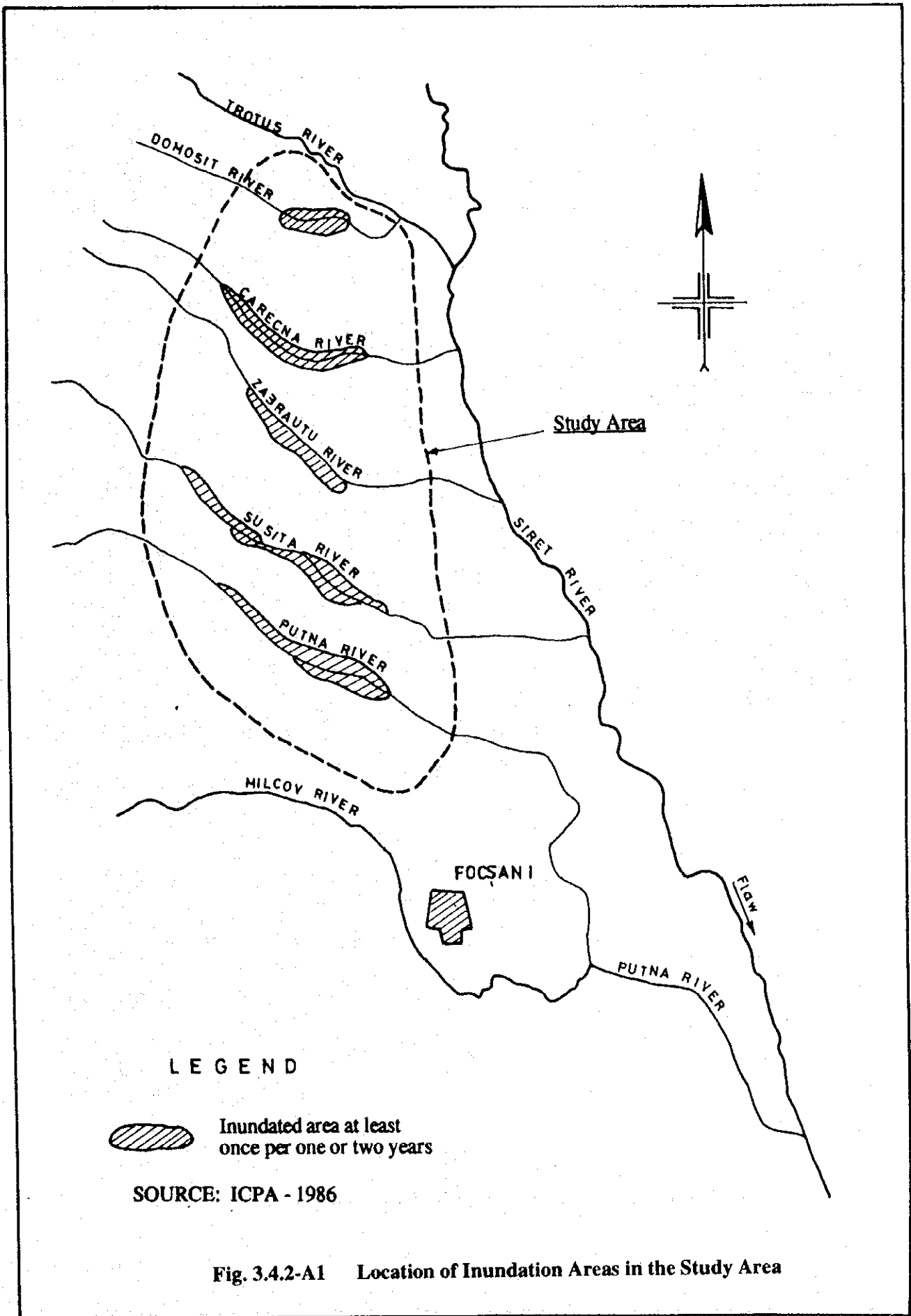



Fig. 3.3.9-A1 Organization of Agricultural Center



Fig 3.4.1-A1 Existing Putna Irrigation System



LEGEND

 Inundated area at least once per one or two years

SOURCE: ICPA - 1986

Fig. 3.4.2-A1 Location of Inundation Areas in the Study Area