

ECONOMICS OF INTENSIVE CROPPING IN DOUBLE CROP WETLANDS

R. R. NAIR, P. N. PISHARODY and R. GOPALAKRISHNAN

Rice Research Station, Pattambi—679306

Multiple cropping means growing 3 or more crops although the calendar year employing intensive crop production techniques (Ambika Singh, 1972). With the introduction of high yielding, nonlodging and fertilizer responsive early duration rices, it has been possible to raise more than 2 crops in the traditionally double cropped wet lands. In this paper, an attempt is made to work out the economics of growing more than 2 crops of rice in multiple cropping sequence in the double crop wetlands.

Materials and Methods

A field trial was conducted during the usual cropping seasons of 1969—70 and 1970—71 at the Rice Research Station, Pattambi to investigate whether more than 2 crops could be grown successfully in the conventional double crop wet lands. The cropping season commenced by the beginning of May and terminated by the end of January of the succeeding year. The treatments comprised of 8 crop sequences with IR 8 (medium duration) and Annapoorna (early duration) as test varieties: (1). Annapoorna - Annapoorna - Annapoorna (2). Annapoorna - Annapoorna - IR 8. (3). Annapoorna - IR 8 - Annapoorna, (4). IR 8 - Annapoorna - Annapoorna, (5). IR 8 - IR 8 - Annapoorna, (6). IR 8 - Annapoorna - IR 8 (7). Annapoorna - IR 8 - IR 8 and (8). IR 8 - IR 8 - IR 8. The first crop in all the crop sequences were sown broadcast under semidry conditions in the first week of May adopting a seed rate of 80 kg/ha. The succeeding crops were transplanted at a spacing of 15 cm x 15 cm allowing an interval of 7 days for field Preparation after the harvest of the previous crop.

Both the test varieties were grown under the same fertility conditions. At planting, nitrogen, phosphorus and potash were applied at 40 kg each per ha. At panicle initiation, nitrogen was topdressed at 40 kg/ha. The transplanted crops received a basal dressing of green leaf at 5000 kg per ha, in addition to fertilizers

The soil of the experimental plot was lateritic sandy loam, acidic in reaction, relatively low in organic carbon and adequate in available P_2O_5 and K_2O . The net plot size was 14.7 m x 11.7 m. The average monthly rainfall during the first crop (May-September) was 371 mm in 1969-70 and 424 mm in 1970-71. The highest rainfall was received in the month of July. The mean monthly rain fall during the second crop season (October-January) of 1969-70 was 106.5 mm as against 89.8 mm in the following year.

The data on rainfall and temperature are presented in Table 1.

Table 1

Weather data for the crop seasons of 1969—70 and 1970—71

| Month | Rainfall (mm) | | | Mean maximum temperature (C) | | Mean minimum temperature (C) | | Total hours of bright sunshine | |
|-----------|---------------|---------|---------|------------------------------|---------|------------------------------|---------|--------------------------------|---------|
| | Normal | 1969—70 | 1970—71 | 1969—70 | 1970—71 | 1969—70 | 1970—71 | 1969—70 | 1970—71 |
| May | 190.7 | 155.6 | 278.3 | 33.2 | 32.8 | 23.1 | 24.8 | 211.7 | 207.5 |
| June | 592.6 | 581.5 | 476.1 | 30.3 | 29.8 | 21.6 | 23.4 | 104.5 | 113.3 |
| July | 714.1 | 767.6 | 675.6 | 28.8 | 28.6 | 21.2 | 23.0 | 62.5 | 55.4 |
| August | 404.1 | 165.3 | 507.3 | 30.0 | 28.5 | 21.4 | 23.0 | 205.4 | 100.0 |
| September | 213.4 | 181.0 | 182.1 | 29.7 | 29.9 | 20.9 | 23.2 | 198.3 | 212.8 |
| October | 260.7 | 191.5 | 317.7 | 31.4 | 30.5 | 21.5 | 23.1 | 177.8 | 205.2 |
| November | 138.0 | 149.5 | 41.6 | 32.0 | 31.4 | 20.3 | 22.8 | 227.4 | 218.7 |
| December | 25.9 | 84.6 | — | 32.0 | 32.3 | 20.2 | 20.0 | 234.5 | 314.3 |
| January | 0.3 | — | — | 33.6 | 33.0 | 19.4 | 21.6 | 293.5 | 286.6 |

Results and Discussion

In the first year of the trial, 3 crops or Annapoorna were successfully raised in tandem sequence in the usual cropping span of 9 months (May to January). The treatment 4 (IR 8 Annapoorna Annapoorna) was also completed successfully, but the total crop period extended upto February, 1970. The third crop in this treatment, however, received 3 irrigations in the month of February to maintain the soil under field capacity. This is not at all possible under usual rice growing conditions. In crop sequences 5,6,7, and 8, the third crops were severely affected by drought. In the following year (1970-71) the third crops in all the treatments except 1 (Annapoorna - Annapoorna - Annapoorna) failed owing to nonreceipt of monsoon rains in the month of november, 1970. This is not an unusual phenomenon in the pattambi area.

Crop Duration

Marked variation was observed in the growth duration of the two test varieties, when they were raised in multiple cropping sequence during the 2

Table 2

Grain yield (kg./ha) as influenced by crop sequences in 1969-70 and 1970-71

| Year | Crop season | Treatment | | | | | | | |
|---------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | | 1 A-A-A | 2 A-A-I | 3 A-I-A | 4 I-A-A | 5 I-I-A | 6 I-A-I | 7 A-I-I | 8 I-I-I |
| 1969—70 | First | 2933 | 2955 | 2989 | 3961 | 4005 | 3976 | 2944 | 4008 |
| | Second | 1916 | 1577 | 3855 | 2216 | 3906 | 2860 | 3905 | 4100 |
| | Third | 3638 | + | + | | + | + | + | + |
| | Total | 8487 | 4532 | 6844 | 6177 | 7911 | 6836 | 6849 | 8108 |
| 1970—71 | First | 3223 | 3040 | 3190 | 3977 | 3948 | 3731 | 2989 | 3872 |
| | Second | 2721 | 2566 | 4194 | 2762 | 3888 | 2606 | 4285 | 3905 |
| | Third | 2707 | | + | + | + | + | + | + |
| | Total | 8661 | 5606 | 7384 | 6739 | 7836 | 6337 | 7274 | 7777 |
| | Grand Total | 17148 | 10138 | 14228 | 12916 | 15747 | 13173 | 14123 | 15855 |
| | Mean | 8574 | 5069 | 7114 | 6458 | 7874 | 6587 | 7062 | 7943 |

A, Annapoorna, I, IR 8; could not be taken because of drought.

years (Table 3) The total duration of Annapoorna ranged from 92 days to 99 days while that of IR 8 varied between 116 days and 130 days. IR 8 reached maturity in 128-130 days in the first crop season but it took only 116 days in the second crop season when it was transplanted. This is attributable to the moderate photo-period sensitivity of the test variety.

Grain Yield

The medium duration variety, IR8 recorded higher yields over the early duration rice, Annapoorna, in all the crop sequences which were successfully completed. The performance of Annapoorna was not quite satisfactory when it was raised in the second crop season.

Growing 3 crops of Annapoorna in tandem sequence as in treatment 1 resulted in the maximum aggregate production of 8487 kg per ha. in 1969—70

and 8661 kg per ha. in 1970—71. The treatment involving 2 crops of IR 8 ranked second registering a combined yield of 8108 kg per ha. in the first year (treatment 8) and 7943 kg per ha. in the second year (treatment 7).

Table 3

Total durations of the test varieties and productivity per day

| Year | Sequence | Crop duration (days) | | | Total | Grain production per day. (kg/ha.) |
|---------|----------|----------------------|-------------|------------|-------|------------------------------------|
| | | 1st crop | Second crop | Third crop | | |
| 1969—70 | 1. A-A-A | 92 | 93 | 96 | 781 | 30.2 |
| | 2. A-A-I | 92 | 93 | | 185 | 24.5 |
| | 3. A-I-A | 92 | 120 | † | 212 | 32.3 |
| | 4. I A-A | 128 | 91 | † | 219 | 28.2 |
| | 5. I-I-A | 128 | 116 | † | 244 | 32.4 |
| | 6. I-A-I | 128 | 91 | † | 219 | 31.2 |
| | 7. A-I-I | 92 | 120 | | 212 | 32.3 |
| | 8. I-A-A | 128 | 116 | | 244 | 33.2 |
| 1970—71 | 1. A-A-A | 95 | 90 | 95 | 280 | 30.9 |
| | 2. A-A-I | 95 | 90 | † | 185 | 30.3 |
| | 3. A A-I | 95 | 122 | † | 217 | 34.0 |
| | 4. I-A-A | 130 | 91 | † | 221 | 30.5 |
| | 5. I-I-A | 110 | 116 | † | 246 | 31.8 |
| | 6. I-A-I | 110 | 90 | † | 220 | 28.8 |
| | 7. A-I-I | 95 | 121 | † | 216 | 33.6 |
| | 8. I-I-A | 130 | 116 | | 246 | 31.6 |

† could not be taken because of drought. A, Annapoorna; I, IR8

In terms of productivity per day, the treatments 8 and 5 (IR 8—IR 8—0) topped the others, recording on an average of the two, 32.8 kg of grain per day in the year 1969—70. During the year 1970—71, however, the treatments 3 and 7 (Annapoorna—IR 8—0) occupied respectively, the first and the second ranks in productivity (34.0 and 33.6 kg of grain per day respectively). The treatment involving two crops of IR 8 (IR 8—IR 8—0) yielded 31.7 kg of grain per day.

Straw Yield

The data on straw yield followed almost the trend of gram production during both the years with the medium duration strain giving higher yields compared to the early duration one (Table 4),

Table 4
Straw yield (kg./ha.) as influenced by crop sequences in 1969-70 and 1970-71

| Year | Crop season | Treatment | | | | | | | |
|---------|-------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | | 1 A-A-A | 2 A-A-I | 3 A-I-A | 4 I-A-A | 5 I-I-A | 6 I-A-I | 7 A-I-I | 8 I-I-I |
| 1969—70 | First | 3315 | 3100 | 4200 | 4210 | 4315 | 3200 | 4315 | |
| | Second | 2210 | 2005 | 3910 | 2010 | 3990 | 3010 | 4210 | 4300 |
| | Third | 5270 | + | + | ' | + | + | + | |
| | Total | 8685 | 5320 | 7010 | 6210 | 8200 | 7325 | 7320 | 8615 |
| 1970—71 | First | 3470 | 3210 | 3070 | 4470 | 4275 | 4000 | 3170 | 4270 |
| | Second | 2600 | 2700 | 4200 | 2900 | 4005 | 2570 | 4100 | 4170 |
| | Third | 2850 | + | + | + | + | | | 4 |
| | Total | 8920 | 5910 | 7270 | 7370 | 8280 | 6570 | 7270 | 8440 |
| | Grand Total | 17605 | 11230 | 14280 | 13580 | 16480 | 13895 | 14590 | 17055 |
| | Mean | 8803 | 5615 | 7140 | 6790 | 8240 | 6948 | 7295 | 8528 |

+, could not be taken because of drought.

Economics

The cost of production of crops in the successful crop sequences were estimated at the present wage rates and market prices of inputs like fertilizers and pesticides (Table 5).

At the prevailing (levy) price of Rs. 0.74 per kg of paddy grain and Re. 0.18 per kg of straw, the crop sequences 1 and 2 indicated financial

Table 5

Economics of successful crop sequences in 1969-70 and 1970-71

(Amount in Rs. Ps.)

| Year | Particulars | Crop sequences | | | | | | | |
|---------|---------------------------|----------------|-----------|---------|---------------|----------------|---------|----------------|---------|
| | | (2) | (3) | (4) | (5) | (6) | (7) | (8) | |
| | | A-A-A | A-A-O | A-I-O | T-A-O | I-I-O | I-A-O | I-A-O | I-I-O |
| 1969-70 | Receipt (grain and straw) | 7843-68 | 4311-28 | 6326-36 | 5688-78 | 7330-14 | 6377-14 | 6385-86 | 7550-62 |
| | Expenditure: | 8368-90 | 5324-10 | 5504-70 | 5683-90 | 5864-50 | 5683-90 | 5504-70 | 5864-50 |
| | Profit: | - 525-22 | - 1012-82 | 821-66 | 4-8 | 1465-64 | 693-24 | 881-16 | 1686-12 |
| 1970-71 | Receipt | 8014-74 | 5212-24 | 6772-76 | 6313-46 | 7289-04 | 5871-98 | 6691-36 | 7274-18 |
| | Expenditure: | 8368-90 | 5324-10 | 5504-70 | 5683-90 | 5864-50 | 5683-90 | 5504-70 | 5864-50 |
| | Profit: | -354-16 | -111-86 | 1268-06 | <u>629-56</u> | <u>1424-54</u> | 188-08 | 1186-66 | 1409-68 |
| | Total Profit (2 years) | - 879-38 | - 1124-68 | 2089-66 | 634-44 | 2890-18 | 881-32 | 2067-82 | 3095-80 |
| | Mean profit: | - 439-69 | - 562-34 | 1044-83 | 317-22 | 1445-09 | 440-66 | 1033-91 | 1547-90 |

O, could not be taken because of drought

N, Rs. 3.70 per kg; P₂O₅, Rs. 3.50 per kg; K₂O, Rs. 2.00 per kg; green leaf, Rs. 50.00 per ton.

Man, Rs. 8.00 per day; woman, Rs. 6.00 per day; pairs, Rs. 15.00 per day.

Seed, Rs. 2.50 per kg; paddy, Rs. 0.74 per kg; straw, Rs. 0.18 per kg.

drain on the resources of the farmer. The crop sequence 1 which registered the highest aggregate production in both the years, showed a net loss of Rs. 439.69 per ha per annum. The maximum loss was incurred on cropping sequence 2 on account of the poor performance of the early duration test variety during the second crop season. The crop sequence involving Annapoorna in the second crop season thus invariably resulted in loss or only in marginal profits. Receipts from this crop did not commensurate with the expenditure incurred on cultivation.

The crop sequences 3, 5, 7, and 8 earned reasonable profits. Relatively higher net profits were obtained from the treatments 5 and 8 which had two crops of IR 8 in succession. They yielded, respectively, Rs. 1445.09 and Rs. 1547.90 per hectare per annum. The Annapoorna—IR 8 sequence (Treatment 7), although recorded the highest productivity per day in 1970—71, registered a net profit of Rs. 1039.37 only per hectare per annum.

Raising 2 medium duration rices in succession thus proved to be the best cropping pattern for the double crop wet lands at the existing conditions

Summary and Conclusion

A field trial was conducted at the Rice Research station, pattambi during 1969—70 and 1970 -71 in order to study the feasibility of raising more than 2 crops of rice in the double crop wet lands. Eight crop sequences were tried with Annapoorna (early duration) and IR 8 (medium duration) as test varieties.

The study indicated clearly that 3 early duration rices could be raised in the double crop wet lands during the usual cropping span of 9 months from May through January. This cropping pattern, however, was not profitable at the levy price of Rs. 0.74 per kg of paddy. The study also showed that raising 2 medium duration rices in succession was the most profitable cropping pattern for the double crop wet lands under the existing soil and climatic conditions of pattambi which represent the middle laterite region of Kerala.

സംഗ്രഹം

ഇരുപ്പു നിലങ്ങളിൽ, മേയ് മുതൽ ജനുവരി വരെയുള്ള കാലയളവിൽ, ജലസേചന സഹായം കൂടാതെതന്നെ ഹ്രസ്വകാല മുപ്പുള്ള 'അന്നപ്പൂർണ്ണ' മൂന്നു തവണ തുടർച്ചയായി കൃഷി ചെയ്യാവുന്നതാണ്. എന്നാൽ, ഇന്നത്തെ കൃഷിചെലവുവച്ചു നോക്കുമ്പോൾ, ഈ രീതിയിലുള്ള ബഹുപുവൽ കൃഷി ഒട്ടും ലാഭകരമല്ല. ഇടത്തരം മുപ്പുള്ള 'ഐ ആർ 8' ഉപയോഗിച്ച് ഇരുപ്പു കൃഷി ചെയ്യുന്നതു തന്നെയാണ് ഏറ്റവും ലാഭകരം.

REFERENCE

Ambika Singh, 1972. Maintaining soil organic matter in multiple cropping. *Indian Fmg.* 22 (1) 13-15.

(M. S. received: 22-4-1977)