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greater than average area in wheat and gram. The effect of June-September rainfall on yields of *rabi* crops was somewhat smaller, on the order of 6 per cent greater yield for 10 per cent greater than average rainfall. Winter rainfall had a small effect on wheat and gram yields, but none on the yields of other crops. July and August rainfall influenced acreage and yield of *kharif* crops and cotton. Sugarcane area was affected by March-May rainfall in the year previous, a reasonable result since that is when the sugarcane is planted.

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## ECONOMICS OF LOCAL AND HIGH-YIELDING VARIETIES OF PADD AND WHEAT IN PANAGAR VILLAGE OF MADHYA PRADESH

The introduction of high-yielding varieties (HYV) of various crops has opened new hopes and aspirations for increasing agricultural production, to make the country self-sufficient in food and raw materials for agro-industries. We have enough experience of working with these new varieties but their relative advantage over the traditional ones under specific agro-climatic conditions is not known much. We have tried to specify the monetary gains of growing high-yielding varieties over the local varieties in Panagar village of Jabalpur district of Madhya Pradesh. The village is located on the road side at a distance of nine miles from Jabalpur city. The economics of growing high-yielding varieties of paddy and wheat has been worked out on the basis of the practices followed by the cultivators.

*Objective*

The basic objective of this study was to compare the relative cost and returns from the local and high-yielding varieties of paddy and wheat.

*Methodology*

The selection of this village was a purposive one keeping in view the resources at hand and the objectives in mind. In all 37 farmers growing local and high-yielding varieties of paddy and wheat were selected for investigation. Only those farmers were included in this study who had an area of one acre or more under each crop/variety. Input-output data were recorded on the basis of actual plot size which were then converted into per acre basis. The relevant data were collected by cost accounting method pertaining to the

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TABLE I—PER ACRE COST OF CULTIVATION OF PADDY AND WHEAT AT PANAGAR (JABALPUR): 1968-69

*(in Rs.)*

| Sr. No. | Items of Cost | Paddy | | | | Wheat | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Local | | HYV | | Local | | HYV | |
| | | Cost | Percentage of total operating cost | Cost | Percentage of total operating cost | Cost | Percentage of total operating cost | Cost | Percentage of total operating cost |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| A. | Labour cost | | | | | | | | |
| | 1. Field preparation | 44·63 | 15·87 | 40·97 | 8·83 | 31·21 | 13·31 | 55·91 | 12·53 |
| | 2. Manuring | 3·34 | 1·19 | 12·55 | 2·70 | 1·64 | 0·71 | 7·24 | 1·62 |
| | 3. Sowing/transplanting | 39·17 | 13·92 | 36·25 | 7·80 | 20·41 | 8·70 | 32·62 | 7·32 |
| | 4. Irrigation | 29·94 | 10·64 | 12·68 | 2·73 | 47·25 | 20·15 | 23·25 | 5·21 |
| | 5. Interculture | 36·82 | 13·08 | 20·32 | 4·37 | 3·37 | 1·43 | 2·83 | 0·63 |
| | 6. Plant protection | — | — | 4·81 | 1·03 | — | — | 0·71 | 0·15 |
| | 7. Harvesting | 36·44 | 12·96 | 25·43 | 5·47 | 27·62 | 11·79 | 26·25 | 5·88 |
| | 8. Threshing and winnowing | 39·57 | 14·07 | 45·31 | 9·76 | 47·01 | 20·05 | 47·57 | 10·68 |
| | Total labour cost (1 to 8) | 229·91 | 81·73 | 198·32 | 42·69 | 178·51 | 76·14 | 198·38 | 43·97 |
| B. | Material cost | | | | | | | | |
| | 9. Seed | 35·54 | 12·63 | 15·00 | 3·23 | 38·67 | 16·50 | 48·77 | 10·92 |
| | 10. Fertilizers | 1·80 | 0·63 | 178·15 | 38·39 | 5·06 | 2·15 | 150·00 | 33·63 |
| | 11. Manures | 8·31 | 2·95 | 30·83 | 6·63 | 3·33 | 1·41 | 23·79 | 5·32 |
| | 12. Insecticides/pesticides | — | — | 16·68 | 3·59 | — | — | 6·70 | 1·50 |
| | 13. Electricity | 5·82 | 2·06 | 25·41 | 5·47 | 8·93 | 3·80 | 20·85 | 4·67 |
| | Total material cost (9 to 13) | 51·47 | 18·27 | 266·07 | 57·31 | 55·99 | 23·86 | 250·11 | 56·04 |
| | Total operating cost (A+B) | 281·38 | 100·00 | 464·39 | 100·0 | 234·50 | 100·00 | 446·39 | 100·00 |
| C. | Fixed cost | | | | | | | | |
| | 14. Depreciation | 13·50 | — | 11·34 | — | 13·14 | — | 12·21 | — |
| | 15. Interest | 24·74 | — | 43·58 | — | 19·31 | — | 40·17 | — |
| | Total fixed cost (14+15) | 38·24 | — | 54·92 | — | 32·45 | — | 52·38 | — |
| | Grand total of operating and fixed cost (A+B+C) | 319·62 | — | 519·31 | — | 266·95 | — | 498·77 | — |

year 1968-69. The significance of the difference between the net returns per acre of local and high-yielding variety was tested by applying t test.[1]

*Results and Discussion*

The cropwise major findings are summarized below:

*Paddy*

(A) *Costs:* Table I shows that the cost of cultivation of the local and high-yielding variety of paddy was Rs. 319.62 and Rs. 519.31 respectively. The high-yielding variety required 62.47 per cent higher expenses over the local variety. By excluding the indirect (fixed) expenses, which were slightly more than 10 per cent of the total expenses per acre, the operating cost of the high-yielding varieties turned out to be higher by Rs. 183.01 per acre or 65.04 per cent over the local variety. The higher operating cost in the case of the high-yielding variety of paddy was due to higher expenses on fertilizers which accounted for 38.39 per cent of the operating cost as compared to only 0.63 per cent in the case of the local variety. Plan protection measures caused an additional expenditure in the case of the high-yielding variety only to the extent of 4.62 per cent of the operating cost. Moreover, it may be emphasized that the cost of material (seed, fertilizers and insecticides) in the case of the high-yielding variety was a little over three times more than that of the local variety, *i.e.*, 57.31 per cent against 18.30 per cent respectively.

The further break-up of the operating cost revealed that the local variety and the high-yielding variety required near about the same number of human labour days, *i.e.*, 75.25 and 74.16 respectively.

(B) *Returns per Acre*

TABLE II—RETURNS PER ACRE OF LOCAL AND HYV PADDY

*(in Rs.)*

| Sr. No. | Particulars | | | Local | HYV | Difference |
|---------|-------------|---|---|-------|-----|------------|
| 1. | Yield (quintals) | .. | .. | 7·56 | 20·92 | + 13·36 |
| 2. | Gross return | .. | .. | 552·51 | 1,374·60 | +822·09 |
| 3. | Total cost | .. | .. | 319·62 | 519·31 | +199·69 |
| 4. | Net return* | .. | .. | 232·89 | 855·29 | +622·40 |
| 5. | Gross return per rupee invested | | .. | 1·72 | 2·64 | + 0·92 |
| 6. | Cost of production per quintal | | .. | 42·27 | 24·82 | — 17·45 |

* After 't' test it was found that the net returns per acre obtained through HYV paddy as compared to local paddy was highly significant at 1 per cent level.

1.
$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right) s^2}}$$

$$s^2 = \frac{(\sum x^2 - n_1 \cdot \bar{x}^2) + (\sum y^2 - n_2 \cdot \bar{y}^2)}{n_1 + n_2 - 2}$$

where

$x$ = net returns per acre from local varieties,
$y$ = net returns per acre from high-yielding varieties,
$n_1$ = number of farmers who grew local varieties, and,
$n_2$ = number of farmers who grew high-yielding varieties.

It can be seen from the above table that the yield of the high-yielding variety was about three times more than that of the local variety possibly on account of their higher response to fertilizers. The gross returns per acre amounted to Rs. 552.51 in the case of local and Rs. 1,374.60 in the case of the high-yielding variety.

The net return for the high-yielding variety was about 236 per cent higher than the local, and the cost of production per quintal in the former case was lower by about 50 per cent than the latter. The same can be attributed to the higher level of yield.

*Wheat*

(A) *Costs :* Table I reveals that the cost of cultivation of the local and high-yielding variety of wheat was Rs. 266.93 and Rs. 498.77 respectively. The high-yielding variety of wheat required 86.84 per cent higher expenses over the local variety of wheat.

Considering the operating cost alone, the high-yielding variety required 90.35 per cent higher operating expenses than the local variety mainly due to high expenses on fertilizers, manures and insecticides (40.45 per cent against 3.57 per cent).

It may also be noted that the material cost was about 2 times (56.04 per cent) more in the case of the high-yielding variety as compared to that of the local variety (23.88 per cent). The details of the operating costs show that the high-yielding variety was more labour intensive than the local, *e.g.*, the total human labour days required were 60.99 and 40.94 respectively mainly because of comparatively better field preparation, fertilizers, manures and insecticides application and due to sowing by the dibbling method (Table IV).

(B) *Returns per Acre*

TABLE III—RETURNS PER ACRE OF LOCAL AND HYV WHEAT

(*in Rs.*)

| Sr. No. | Particulars | Local | HYV | Difference |
|---------|-------------|-------|-----|------------|
| 1. | Yield (quintals) .. .. .. | 7·36 | 14·14 | + 6·78 |
| 2. | Gross return .. .. .. | 846·64 | 1,507·84 | +661·20 |
| 3. | Total cost .. .. .. | 266·95 | 498·77 | +231·82 |
| 4. | Net return* .. .. .. | 579·69 | 1,009·07 | +429·38 |
| 5. | Gross return per rupee invested .. | 3·17 | 3·02 | — 0·15 |
| 6. | Cost of production per quintal .. | 36·27 | 35·27 | — 1·00 |

* After 't' test it was found that the net returns per acre obtained through HYV wheat as compared to the local wheat was highly significant at 1 per cent level.

It can be seen from Table III that the yield of the high-yielding variety comes to as high as twice the yield of the local variety. Indeed the same could be fairly attributed to better response to fertilizer application of the high-yielding varieties.

The gross returns per acre amounted to Rs. 846.64 in the case of the local variety, while it worked out to Rs. 1,507.84 in the case of the high-yielding variety. The net returns to the high yielding variety turned out to be about 175 per cent higher than that of the local variety.

However, the cost of production per quintal does not show any significant difference between the two varieties. This phenomenon can be explained by the little difference observed in the input-output ratios of these two strains. A similar reason can also be attributed to the insignificant difference in the gross return per rupee investment.

TABLE IV—INPUTS APPLIED TO LOCAL AND HIGH-YIELDING VARIETIES OF PADDY AND WHEAT AT THE VILLAGE PANAGAR (JABALPUR), M. P. PER ACRE

| Sr. No. | Particulars | Paddy | | Wheat | |
|---|---|---|---|---|---|
| | | Local | HYV | Local | HYV |
| 1. | Input | | | | |
| | A. Labour days | | | | |
| | (a) Human | 75·25 | 74·16 | 40·94 | 60·99 |
| | (b) Bullock | 12·65 | 12·14 | 14·83 | 14·00 |
| | B. Materials | | | | |
| | (a) Seed (kgs.) | 32·72 | 15·00 | 31·82 | 19·73 |
| | (b) Manures (quintals) | 4·79 | 21·63 | 2·04 | 13·64 |
| | (c) Fertilizers (kgs.) | | | | |
| | (i) Amonium sulphate | 3·50 | 200·00 | 10·00 | 170·00 |
| | (ii) Superphosphate | — | 150·00 | — | 100·00 |
| | (iii) Muriate of potash | — | 50·00 | — | 30·00 |
| | (iv) Spartin | — | — | — | 10·00 |
| | (d) Insecticides/pesticides | | | | |
| | (i) BHC/Termex (kgs.) | — | 10·00 | — | 6·00 |
| | (ii) Endrin (CCs) | — | 380·00 | — | — |
| | (e) Power (units) | 38·00 | 169·00 | 60·00 | 136·00 |
| | Cost of major inputs in percentage per acre | | | | |
| | (a) Human labour cost | 53·74 | 29·45 | 36·21 | 26·01 |
| | (b) Bullock labour cost | 27·96 | 13·24 | 39·91 | 17·95 |
| | (c) Material cost | 18·30 | 57·31 | 23·88 | 56·04 |
| | Total : | 100·00 | 100·00 | 100·00 | 100·00 |
| 2. | Output in kilograms per acre | | | | |
| | (a) Main product | 756·00 | 2,092·00 | 736·00 | 1,414·00 |
| | (b) By-product | 1,792·00 | 2,379·00 | 1,066·00 | 1,640·00 |

Table IV indicates that the high-yielding variety of wheat was more human labour intensive requiring 50 per cent more human labour days as com-

pared to the local, whereas the high-yielding and local paddy required the same human labour days. There was practically no difference in the case of bullock labour days used for the HYV and local varieties of both the crops.

As regards the material inputs used, it was found that the seed rate of HYV was less to the extent of 55 per cent and 40 per cent as compared to the local paddy and wheat respectively. It was mainly due to the lesser number of seedlings planted per hole in the case of HYV paddy and the dibbling method of sowing followed in the case of HYV of wheat.

The quantities of manures applied to HYV were about $4\frac{1}{2}$ times and 6 times more as compared to the local paddy and wheat, respectively.

Similarly, quite a reasonable higher quantities of different fertilizers and insecticides were applied to HYV of paddy and wheat. But a negligible amount of ammonium sulphate only was applied to the local varieties of paddy and wheat. Moreover, insecticides and pesticides were also not used for the local varieties.

The HYV required $4\frac{1}{2}$ times and $2\frac{1}{4}$ times more power units for paddy and wheat respectively as compared to local ones due to higher doses of fertilizers which required comparatively more number of irrigations.

The table also clearly indicates that the HYV required as high as 57 per cent of total operating cost for material inputs only (mainly fertilizers). The yield of HYV thus obtained were near about three times and two times higher as compared to local paddy and wheat respectively.

*Summary and Conclusions*

Thus it is clear from the above discussions that the HYVs are comparatively more labour intensive and responsive to fertilizers as compared to the local. They require more expenditure per acre of which about 57 per cent forms the material cost. Yields are also comparatively higher and thus the cost of production per quintal is also less which leaves a sizable margin of profit to the producers. However, it has been observed that the high-yielding varieties were sold at a lesser rate than local.

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