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# INDIAN JOURNAL OF AGRICULTURAL ECONOMICS

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The sample surveys will have to be carried out every year to know the demand for the ensuing year. This may be found perhaps a cumbersome process. Our study indicates that it is possible to use the parameters obtained from the farmer's survey to predict the demand for the ensuing season provided reliable information is available on the estimate of the prospective buyers. Since the rate of adoption of hybrid seed is changing every year and is sometimes disturbed significantly by political, social and natural factors, it is difficult to assume that the adoption of seed would follow a normal distribution curve though many studies have indicated that the adoption rate of a new idea/commodity follows a normal curve. We believe that the agency of VLW could be used for estimating the number of prospective buyers for each season. This would be a quick, cheap and more practical method.

The price-demand relationship indicates that the demand for hybrid bajra is elastic and more elastic in the case of late adopters.

The hybrid seed enterprise is an induced growth of the High-Yielding Varieties Programme. The Government has taken indeed a leading role in getting it organized. This new enterprise in the agricultural sector is being developed as a large scale enterprise as is done in the Gujarat State. Apart from the fact whether this large scale industry is operated in co-operative, public or private sectors, its development would need application of modern management practices. The application of demand estimate technique is only one of the many tools in the kit of management science. What we want to emphasize is that the developing seed industry in the country would need help of the management science. The managerial skills and abilities could be developed by an organized effort of management training for the executives and administrators in the seed industry.

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# ECONOMICS OF CULTIVATION OF HYBRID BAJRI CROP IN DHULIA DISTRICT (MAHARASHTRA)*

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The total area under cereal crops in Maharashtra was 252.4 lakh acres which forms 54.9 per cent of the total cropped area. The staple food crops in Maharashtra are jowar (147.3 lakh acres), bajri (44.4 lakh acres), paddy (32.68 lakh acres) and wheat (22.63 lakh acres).[1] Maize was grown only on 71,000 acres of land. The programme of growing hybrid varieties on field scale has been undertaken

* The paper is based on a report submitted to AGRESCO, May, 1968, by the Agricultural Economics Section, College of Agriculture, Dhulia. Mr. E. K. Verma and G. B. Gharate from the Section helped in the collection and compilation of data.

1. Basic and Current Agricultural Statistics of Maharashtra State, Government of Maharashtra, 1964.

in the State from the year 1966-67. The hybrid varieties are generally dwarf and respond well to heavy doses of fertilizers without showing any signs of lodging. They mature early and excepting the jowar varieties, others are not much susceptible to pests and diseases. The introduction of hybrid varieties has opened a new era in achieving self-sufficiency of food. The target for 1968-69 in the Maharashtra State was to grow hybrids on 3 lakh acres under rice, 7.5 lakh acres under bajri, 22 lakh acres under jowar, 2 lakh acres under maize and 5 lakh acres under irrigated wheat. Supplies and services are arranged effectively and attention is being concentrated in growing them in the Intensive Development Blocks, where the conditions are better suited for achieving the goal. This is quite a revolutionary change and it is worthwhile to have several cross-sectional studies to reveal the extent of economic benefits likely to be accrued through the introduction of the hybrid variety. It is also necessary to see how for the recommendations regarding cultivation are adopted, modifications necessary to suit the local conditions and the difficulties faced by the farmers under field cultivation of the crops.

With the above objectives in view, a random sample of 66 cultivators from seven villages in the Dhulia district growing hybrid bajri was studied by personal interview method. A pre-tested questionnaire was used for this purpose.

## BACKGROUND OF FARMERS UNDER STUDY

### *Age Composition*

The distribution of farmers according to age-group showed that 21 per cent farmers (14) belonged to the age-group below 30 years and 26 per cent of them (35) were over 50 years, while the rest (35), *i.e.*, 53 per cent belonged to the middle age-group of 31 to 50 years.

### *Education and Literacy*

The percentage of literacy is increasing and the number of illiterate farmers is only six which formed hardly 9 per cent of the group. About 11 per cent of the selected farmers had high school education and the rest, over 80 per cent had primary school education ranging from fourth to seventh grade. The high percentage of literacy among the selected farmers is an indication of better adopters. The introduction of hybrid bajri is an improved technology and all the cultivators have not accepted it so far.

### *Size of Holding*

Classifying the farmers on the basis of operational areas, it is noted that a small proportion of 9.2 per cent possessed land holdings below 5 acres; 16.6 per cent had holdings between 5–10 acres. Another group of 33 per cent of farmers belonged to the middle class of land holders; the rest, 40.9 per cent of farmers accepting cultivation of hybrid bajri belonged to the class of comparatively large holders. The average area held by the farmer under study came to 22.5 acres. The farmers accepting the new improvement practices, therefore, belong to somewhat larger size-group of holdings.

*Irrigation Facilities and Area under Irrigation*

This is another indication of the fact that the farmers having larger holdings and assured irrigation facilities will be in a position to take the risk of introducing a new technique like the use of hybrid seed. The irrigated crops of the farmers under study ranged from 1.2 acre to 38 acres. On an average, 9.94 acres were under irrigated crops.

The source of irrigation is invariably the wells. Oil engines have become a popular source of lifting water and 43 farmers were using them. The electric motors were taken up by seven farmers and the rest of them would seek the first opportunity to shift to electric pumps when the supply of power will be made available to them. The use of country moth for lifting water is vanishing fast. Only 18 farmers used this water lift and one of them has already purchased an oil engine.

*Implements*

The implements like ploughs, harrows, hoes, etc., required for cultivation of hybrid bajri are available with almost every farmer. Iron ploughs were owned by 66 per cent of them. The plant protection equipment is however lacking and only 12 per cent of them had hand pumps. The seed drills for sowing bajri at a distance of 46 to 60 c.m. were not available with any farmer.

## CULTIVATION OF HYBRID BAJRI

How far the farmers have adopted the various aspects of cultivation is worthwhile to discuss before we consider the economic aspects of growing the crop. The variety recommended is H. B. 1 and all the farmers under study have used it. There was great demand for the seed and only the farmers having the real desire could get it after considerable efforts.

*Preparatory Tillage*

Ploughing the soil upto a depth of 15 c.m. and 3-4 harrowings are recommended to get good tilth. Excepting 2 cultivators, the rest gave one ploughing each to the land. The number of harrowings varied from 2 to 6. The average number of harrowings was 3. Two to four harrowings therefore seem to be common and nearly fifty per cent farmers have given three harrowings each.

*Seed Rate and Sowing*

The seed rate recommended by the Department is 1 to 1.5 kg. per acre and the distance between two lines should be 45 c.m. to 60 c.m. and between two plants in a line 15 c.m. A very large majority, *viz.*, 81 per cent of farmers from the sample used the standard seed rate of 1.5 kg., while 15 per cent used 1 kg. per acre and only 4 per cent farmers used more seed rate. Excepting one farmer who dibbled the seed, the rest had sown the seed by a seed drill at a distance of 30 c.m.

As recommended, thinning of seedlings was done by 64 out of 66 cultivators.

*Interculturing and Weeding*

Two interculturings for this crop seem to be a common practice as taken up by 55 farmers out of 66. Only two of them had one interculturing and the rest (8) had 3. As regards weeding, only one weeding was given by 48 farmers under study and the rest had done it twice. Two farmers in the whole lot had not given any weeding for the crop. These operations done by them are also as per recommendations of the State Department of Agriculture.

*Manures and Fertilizers*

The use of farmyard manure, or compost ranging from 5 to 10 cart-loads as a basal dose at the time of preparatory tillage is recommended for hybrid bajri crop. It is observed that nearly 25 per cent farmers from the sample did not apply any basal dose of manures. The rest of the farmers applied either compost or farmyard manure. Two of them applied compost, one at 10 cart-loads and another at 15 cart-loads per acre. The rest who applied farmyard manure used the basal dose ranging from 6 to 25 cart-loads. A majority (31) of them used the basal dose of manures up to 10 cart-loads per acre, 16 farmers used 11-15 cart-loads and 3 farmers used over 15 cart-loads per acre. The average for the whole group of users came to nearly 11 cart-loads per acre. This seems to be quite an adequate dose.

Regarding the use of fertilizers for growing hybrid bajri crop, a first dose of 10 kgs. nitrogen, 15 kgs. of phosphoric acid and 10 kgs. of potash per acre before sowing the crop and a second dose of 10 kgs. nitrogen per acre, 25 to 30 days after sowing the crop is a general recommendation. Among the selected farmers, three farmers did not use fertilizers.

Farmers are habituated to the use of ammonium sulphate. Four farmers used ammonium sulphate only. However, due to the non-availability of sulphate of ammonia, 33 farmers or 50 per cent of the total number of farmers applied fertilizers in the form of mixtures alone but the total number of farmers using mixtures was 58 (88 per cent) of which 25 farmers (38 per cent) supplemented the mixtures with ammonium sulphate. Only two farmers applied superphosphate separately. None of them had given the nitrogen in the form of urea. The mixture used has the proportion of 9:5.

As regards the actual quantity of various ingredients applied on the land by the farmers, it is observed that as against the recommended doses of 20 kgs. N, 15 kgs. P and 10 kgs. K per acre, the actual dose applied was 14.3 kgs. N, 9.2 kgs. P and 4.8 kgs. K per acre which totalled 28.3 kgs. The highest dose of nitrogen applied per acre was 28 kgs. while the application of $P_2O_5$ and $K_20$ amounted to 20 kgs. and 10 kgs. respectively. This was, however, observed only in two cases. The average quantity of fertilizers applied per acre for the whole sample was 13.7 kgs. N, 8.8 kgs. P and 4.6 kgs. K. As none of the farmers gave any irrigation, the dose of 14.3 kgs. of nitrogen seems to be adequate. The doses of phosphoric acid and potash, however, seem to be considerably below the normal recommendations.

*Plant Protection*

Only four farmers used endrine as a plant protection measure. Four others also reported that watching the crops to protect the damage from birds was necessary.

*Changes in Cropping Pattern*

The cultivation of hybrid bajri crop on 179.25 acres has been at the cost of land under some other crops. To study the shifts in cropping pattern, the area under crops in the case of the selected farmers for the years 1965-66, 1966-67 and 1967-68 may be considered. The trend in cropping pattern is indicated in Table I.

TABLE I—CROPPING PATTERN OF SELECTED FARMERS

(*in acres*)

| Sr. No. | Crop | 1965-66 | 1966-67 | 1967-68 |
|---|---|---|---|---|
| 1. | Bajri (local) .. .. .. | 477 | 490 | 340 |
| 2. | Bajri (hybrid) .. .. .. | — | 6 | 179 |
| 3. | Jowar (local) .. .. .. | 220 | 236 | 217 |
| 4. | Jowar (hybrid) .. .. .. | — | — | 3 |
| 5. | Groundnut .. .. .. .. | 280 | 253 | 232 |
| 6. | Cotton (Virnar dry) .. .. | 164 | 134 | 166 |
| 7 | Cotton (Cambodia) irrigated .. | 98 | 98 | 119 |
| 8. | Wheat .. .. .. .. | 206 | 230 | 261 |
| 9. | Chillies .. .. .. .. | 41 | 30 | 26 |
| 10. | Pulses .. .. .. .. | 45 | 49 | 67 |
| 11. | Onion .. .. .. .. | 24 | 24 | 16 |
| 12. | Miscellaneous crops .. .. | 48 | 48 | 100 |
| | Total .. .. .. .. | 1,603 | 1,598 | 1,732 |

It may be noted that the acreage grown under the local bajri, groundnut, chillies and onion has shown a decreasing trend while the area under hybrid bajri, hybrid jowar, Cambodia cotton, wheat and pulses has increased. The increase in the area under hybrid bajri was at the cost of land devoted to growing local bajri and, partly, under groundnut. A comparison of shifts in acreage under hybrid and local bajri in individual cultivator's holdings during the years 1966-67 and 1967-68 revealed that all the selected (66) cultivators increased the area under hybrid bajri, ranging from 0.5 to 12 acres, while 42 farmers reduced their acreage under local bajri, ranging from 0.5 to 22 acres with a view to making available a large area for growing hybrid bajri. It is also worthwhile to see that 9 cultivators increaed the area under both the local and hybrid bajri. The increase in area under local bajri ranged from 0.5 to 6 acres.

*Cultivators' Views*

The cultivators were asked to give their opinion as regards the stand and general growth of the hybrid bajri crop. None of them expressed that the crop was either poor or excellent. A very large number, *viz.*, 60 per cent of cultivators indicated that the stand and growth were good; while the rest expressed that their crop had fairly good stand. They were also requested to express their views as regards the benefits they would receive by growing this crop and the handicaps they have to face. A large majority of them (90 per cent) felt that the grain and fodder yield received from hybrid bajri was comparatively more and it is definitely profitable to grow hybrid bajri. Many of them also expressed that more careful cultivation of this crop with higher doses of manuring coupled with irrigation will definitely give still better returns. Five cultivators from the sample however were doubtful about the genuinity of seed and expressed that the seed supplied to them was not cent per cent genuine.

## COST OF CULTIVATION OF CROP

Labour requirements for hybrid bajri by the individual cultivators have been worked out. Per acre labour requirements for various operations in the seven villages under study are presented in Appendix I. It is observed that the weighted average requirements of human and bullock labour varied from village to village. The total input of labour required for different operations in the cultivation of hybrid bajri in the different villages varied from 32.46 to 69.60 days and 15.79 to 35.20 days of human and bullock labour per acre respectively and the average labour requirements were 46.31 days and 21.20 days of human and bullock labour per acre respectively. It may be noted that the average labour requirements at Chinchkhede and Mukti were quite high because the number of cases under study from these villages was less and one or two farmers have concentrated on labour intensive operations. There is also variation in labour requirements for different operations for preparatory tillage. The overall requirement of human and bullock labour per acre came to 6.86 and 9.94 days respectively. The range for human labour was from 3.79 to 12.80 days and for bullock labour 6.40 to 18.40 days. This may be due to the tendency of farmers to give harrowing operations as and when they find leisure time. Labour requirement for manuring was 4.47 days and 3.24 days respectively of human and bullock labour. In this operation, the requirements did not vary much and ranged from 3.82 to 6.18 days and 2.08 to 4.88 days for human and bullock labour respectively. The application of fertilizers and manures is restricted due to their scarcity. Hence the farmers try to apply the recommended minimum doses of basic manures and fertilizers. The sowing operation involved the use of 1.49 days of human labour and 0.99 day of bullock labour. The per acre labour requirements for sowing in different villages also varied from 0.69 to 5.13 days of human labour and 0.64 to 2.40 days of bullock labour. Human labour units required in all the villages excepting the village Kapadne varied from 0.69 to 2.60. At Kapadne, only one farmer dibbled an area of 4 acres under this crop and hence the labour requirements for his holding were 48 units of human labour. The range and average requirements of labour for sowing operation has increased to a considerable extent due to the inclusion of this family. The wide range in human labour requirement for harvesting and threshing as may seen from Appendix I may be due to the difference in the yield of crops on individual farms and also in different villages

No labour was spent on irrigation and marketing of the crop as it was grown as a dry crop and the grains were used mostly for home consumption and payment of wages, etc.

*Cost on Various Items*

The cost of various items was also worked out by grouping the cultivators villagewise. The cost of human and bullock labour was imputed on the basis of prevailing local wage rates. The seed was purchased at a standardised rate of Rs. 8 per kg. The details regarding the cost of cultivation of hybrid bajri are given in Appendix II. Among the various items of cost, labour and manure accounted for about four-fifth of the total Cost B, on an average, for the whole sample. The labour cost per acre in different villages varied from Rs. 97.60 to Rs. 183.40 and the cost on manures and fertilizers from Rs. 71.39 to Rs. 210.82. It may be mentioned that no expenditure was incurred on pest control by any farmers under study, excepting two farmers one each from Kapadne and Chinchkheda, who used the recommended doses of endrin. The cost per acre came to Rs. 9. The number of cultivators following this practice being negligible the cost per acre for the entire sample was only Re. 0.85.

Rent of land is an imputed value based on the price of land. Depending upon the fertility of land and its location the land prices varied and hence the rent of land per acre ranged from Rs. 47.62 to Rs. 79.56. The implements used for growing hybrid bajri crop were mostly indigenous. The charges per acre on this item ranged from Rs. 1.22 to 2.33. The variation may be due to the variation in number of ploughings, harrowings and hoeings.

Interest on capital is also an imputed value on the basis of the expenditure incurred by the farmer for various operations up to harvesting and threshing. It varied between Rs. 6.97 to Rs. 12.19 in the different villages.

*Cost A and Cost B.*

The concept of Cost A and Cost B is the same as defined in the Farm Management Scheme of the Planning Commission of Government of India. Cost A includes expenditure in cash or kind on items of labour, seed, manures, pest control and land revenue. Cost B is arrived at by adding to Cost A, imputed values of rent of land, implement charges and interest on outlay. Cost A when considered in relation to the total value of the produce, indicates the minimum level below which the value of the produce should not fall. This is the variable cost in production and should be covered in the short run to keep the business going. Cost B includes both fixed and variable costs and the value of the produce should reach this level to keep the business going in the long run. Cost A per acre ranged from Rs. 238 to Rs. 354 and the average Cost A for the sample was Rs. 297. The average Cost B was Rs. 373 and it varied from Rs. 315 to Rs. 422 in the different villages.

*Physical and Value Product*

The main produce from bajri crop is grain and the by-product is fodder. The grain yield varied from 416 kgs. to 887 kgs. while the average yield of grain was 675 kgs. per acre. The fodder yield ranged from 1,164 kgs. to 2,250 kgs. with an overall average of 1,519 kgs. per acre. The average per acre yield of bajri in

the Dhulia district ranged from 73 kgs. to 217 kgs. during the period from 1951 to 1960. The hybrid bajri yields of the sample under study are nearly 2 to 3 times more as compared to the local strains and improved strain of bajri recommended for the locality. The fodder yields are also quite high.

Bajri was sold at rates ranging from Rs. 32 to Rs. 38 per maund or Rs. 80 to Rs. 95 per quintal. The villages under study are located 5 to 10 miles from Dhulia and hence to remove the wide variation due to the rates of grain, the value of the produce was calculated at Rs. 32 per maund for grain and Rs. 40 per 1000 kgs. for fodder. Generally the grain and fodder are kept for home consumption and hence the physical quantity of yield per acre is of more importance to the farmers.

*Profit with Cost A and Cost B*

Profit with Cost A is the surplus over the variable cost. This is of importance as it indicates the net cash that the cultivators get after incurring all cash and kind expenses. Profit after deducting Cost A from the value of produce alone ranged from Rs. 156 to Rs. 533 while the average profit per acre for the sample as a whole came to Rs. 309. The range of profit thus indicates that the crop can be considered as a money crop in the locality as it gives a good return even under dry conditions.

In terms of Cost B, profit per acre came to Rs. 232 with a range of Rs. 76 to Rs. 470. The returns to fixed factors seem to be substantially more as compared to that from the local varieties.

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## APPENDIX I

LABOUR REQUIREMENTS DAYS PER ACRE FOR DIFFERENT OPERATIONS IN HYBRID BAJRI CULTIVATION IN SEVEN SELECTED VILLAGES IN DHULIA DISTRICT

| Sr. No. | Village | Area (acres) | Preparatory Tillage | | Manuring | | Sowing | | Inter-culturing and plant protection | | Harvesting and threshing | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | H | B | H | B | H | B | H | B | H | B | H | B |
| 1. | Ajang .. .. .. | 18.75 | 3.79 | 6.40 | 4.53 | 3.20 | 0.69 | 0.64 | 6.78 | 1.81 | 16.67 | 3.74 | 32.46 | 15.79 |
| 2. | Chinchkheda .. .. | 5.00 | 12.80 | 18.40 | 4.00 | 3.20 | 2.60 | 2.40 | 11.20 | 3.60 | 39.00 | 7.60 | 69.60 | 35.20 |
| 3. | Deobhane .. .. .. | 60.00 | 6.39 | 8.27 | 3.82 | 2.83 | 0.85 | 0.87 | 6.02 | 1.73 | 26.83 | 4.17 | 43.91 | 17.87 |
| 4. | Kapadne .. .. .. | 11.50 | 11.30 | 10.60 | 6.18 | 2.08 | 5.13 | 1.31 | 10.89 | 2.00 | 23.90 | 5.56 | 57.40 | 21.55 |
| 5. | Mukti .. .. .. | 7.00 | 8.29 | 13.43 | 5.00 | 2.86 | 1.29 | 1.14 | 12.00 | 4.00 | 33.00 | 6.86 | 59.58 | 28.29 |
| 6. | Nagaon .. .. .. | 37.00 | 7.08 | 11.10 | 4.24 | 2.60 | 1.14 | 1.10 | 7.65 | 1.95 | 27.41 | 4.97 | 47.52 | 21.72 |
| 7. | Songiv .. .. .. | 40.00 | 6.45 | 10.90 | 5.11 | 4.88 | 2.00 | 0.99 | 9.65 | 1.90 | 23.50 | 3.85 | 46.71 | 22.52 |
| | Average .. .. .. | 179.25 | 6.86 | 9.94 | 4.47 | 3.24 | 1.49 | 0.99 | 8.37 | 1.98 | 25.12 | 5.05 | 46.31 | 21.20 |

H = Human labour. B = Bullock labour.

## APPENDIX II

ITEMWISE PER ACRE COST OF CULTIVATION AND YIELD OF HYBRID BAJRI IN SEVEN SELECTED VILLAGES IN DHULIA DISTRICT

*(in rupees)*

| Sr. No. | Village | Area (acres) | Labour | Seed | Manures | Land revenue | Pest control | Cost A | Rent of land | Implement charges | Interest on capital | Cost B | Value of produce | Profit with Cost A | Profit with Cost B | Yield Grain (kgs.) | Yield Fodder (kgs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Ajang .. | 18.75 | 97.60 | 12.16 | 190.50 | 2.53 | — | 302.79 | 60.02 | 2.33 | 11.37 | 376.51 | 517.08 | 214.29 | 140.57 | 568.33 | 1,466.67 |
| 2. | Chinchkheda .. | 5.00 | 183.40 | 20.00 | 117.30 | 4.89 | 3.50 | 329.09 | 71.60 | 1.64 | 12.19 | 414.52 | 652.50 | 323.41 | 237.98 | 775.00 | 1,812.50 |
| 3. | Kapadne .. | 11.50 | 151.40 | 11.13 | 71.39 | 4.26 | — | 238.18 | 79.56 | 1.49 | 6.97 | 319.20 | 395.00 | 156.81 | 75.80 | 416.67 | 1,541.67 |
| 4. | Deobhane .. | 60.00 | 123.65 | 10.97 | 131.91 | 2.66 | 2.25 | 271.44 | 75.65 | 2.26 | 10.17 | 359.52 | 699.89 | 428.45 | 340.37 | 770.00 | 1,628.41 |
| 5. | Mukti .. | 7.00 | 117.57 | 13.70 | 140.70 | 2.07 | — | 274.04 | 53.57 | 1.22 | 8.50 | 337.33 | 807.83 | 533.29 | 470.50 | 887.50 | 2,250.00 |
| 6. | Nagaon .. | 37.00 | 129.06 | 11.09 | 210.82 | 2.65 | — | 353.62 | 54.87 | 2.01 | 11.45 | 421.95 | 594.29 | 220.67 | 152.34 | 642.86 | 1,164.28 |
| 7. | Songiv .. | 40.00 | 104.84 | 8.40 | 138.50 | 2.51 | — | 254.25 | 47.62 | 2.30 | 10.69 | 314.86 | 580.27 | 326.02 | 265.41 | 658.67 | 1,333.34 |
| | Total .. | 179.25 | 126.70 | 10.97 | 155.80 | 2.75 | 0.85 | 297.10 | 63.39 | 2.04 | 10.70 | 373.23 | 605.69 | 308.59 | 232.46 | 675.00 | 1,519.44 |

*N.B.:* On irrigation and marketing, no cost was incurred for reasons noted earlier in the text.