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AGRICULTURAL PRODUCTIVITY IN DERAS COMMAND - A CASE STUDY

PRABHAKAR NANDA

RABINDRA KUMAR PANDA

WATER TECHNOLOGY CENTRE FOR EASTERN REGION
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PRABHAKAR NANDA
Scientist (Agril. Economics)
and
RABINDRA KUMAR PANDA
Scientist (Soil & Water Cons. Engineering)

WATER TECHNOLOGY CENTRE FOR EASTERN REGION (ICAR)
BHUBANESWAR - 751016

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Er. B.K. James
Director (Acting)
Water Technology Centre For Eastern Region (ICAR)
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Edited by :

Dr. Ravender Singh,
Pr. Scientist and
Dr. D.K. Kundu,
Sr. Scientist
WTCER, Bhubaneswar

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FOREWORD

Water management in canal commands has remained a problematic issue for planners and administrators ever since canal system started functioning in the country. The canal commands in the country have been most productive segments where water supply is assured. It is a well known fact that in the absence of assured and timely supply of water to the farmers under the canal commands, crop productivity and crop diversification suffers considerably. Non utilisation of created potential and unscientific crop husbandry by the command area farmers are the matter of concern for the scientists. Absence of field channels and non maintenance of channels below the outlets is responsible for lag in potential created and utilized. It leads to over irrigation at the head ends and under irrigation at the tail end there by creating resentment and dissatisfaction among the farmers at the tail end who are charged equal price with others. Thus not only creation but also timely maintenance of field channels down the outlets is vital for the success of canal water management. Once water is made available, use of other vital inputs such as fertilizer, HYV seeds, FYM, pesticides and above all farmer entrepreneurship get momentum for crop husbandry. Predictability, equitability and reliability are the factors which not only influences the crop production and productivity in the canal commands but also imparts enthusiasm and vigor to the farmers for sustainable agricultural production.

This bulletin addresses to some of the above stated factors through an in-depth case study of Deras minor reservoir irrigation system in Orissa. This is an out come of intensive research conducted by Mr. P. Nanda and Er. R.K. Panda during the study period 1993 to 1995. The bulletin will help in assessing the functioning of canal system and the productivity of paddy crop under minor irrigation system.

(Er. B.K. James)
Director
Water Technology Centre
for Eastern Region
Bhubaneswar

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(AUTHORS)

1. INTRODUCTION

Irrigation is the most important input for production of Rabi (winter season) paddy and also for the Kharif (rainy season) crop when there is a dry spell during the monsoon. Even in high rainfall areas like the eastern region with predominant paddy crop in monsoon season, irrigation plays productive and protective role during the dry spells. It maintains favourable soil moisture and salinity regime in the root zone which are vital for crop production. Irrigation thus is vital for increasing productivity of any crop. Productivity of paddy crop in a canal command largely depends on the pattern of water release, operation and distribution of water along with other inputs. Timely irrigation to the crops in water scarce regions induces use of other vital inputs like chemical fertiliser, HYV seeds and improved farming practices.

Irrigation contributes to crop production in three ways(Pal,1985): first, it raises yield per unit area by inducing the use of other complimentary yield raising inputs, viz. fertiliser, pesticides, HYV seeds, etc. Secondly, it leads to an expansion of gross cropped area by making double and multiple cropping possible. Thirdly, for a given set of out put and input prices, irrigation may raise production by enabling farmers to allocate their lands to high yielding and high valued crops.

In several canal commands of the eastern region, release of water from canals does not match with the crop water requirements. There is need to improve the pattern of release, operation, and distribution of water in the irrigation commands for increased crop production, better social equity and economic benefits. An irrigation system (Singh etal.1992), based either on surface or ground water resources, comprises of (i) capture subsystem, (ii) conveyance and distribution subsystem, (iii) field application and farm subsystem, and (iv) excess water removal subsystem. The capture element in surface water based systems is a reservoir and its catchment; in ground water based systems it is a well, spring or any other abstraction structure and the surrounding aquifer. In any surface water based irrigation system, it is necessary that (i) the reservoir subsystem should have at least the designed life, (ii) the conveyance and distribution subsystem should be hydraulically efficient to maintain intended (designed) hydraulic head and discharge at different points of the supply, (iii) hydrology of the command and the larger tract be favourable to ecosystem, and (iv) the agricultural production be sustainable.

2. DESCRIPTION OF THE COMMAND AREA

The Deras Minor Irrigation Project in Bhubaneswar Block of Puri District was constructed by the Irrigation & Power Department in the year 1947 (Plate 1 and 2).

In the year 1962, it was transferred to the Department of Rural Engineering. The catchment area of the rivulet (nalla) at the project site is 31.56 square kms. Average monsoon rainfall in the locality is about 1143 mm. The earth dam has a length of 457.2 m and maximum height of 16.46 m from the deepest bed level (Appendix 1). The dam has been designed for giving irrigation to 985 acres in kharif and 300 acres in Rabi. The right main canal which has got a length of 4.72 km caters to the needs of three farms of Government Organisations, and private cultivators in the surrounding villages of Mendhasal namely: Kalajhara, Haridamada, Haripur, Giringaput and Bhagabatipur (Fig.1).

In the beginning, the project supplied water to the State owned Agriculture Seed Farm and the Horticulture Wing of Agriculture Department who were growing different fruit trees. Consequently upon the establishment of the Water Technology Centre for Eastern Region in the year 1988, a part of the government farm, about 157 acres, has been transferred to it. Besides providing irrigation facility to the three research farms of 603 acres, the project provides Kharif irrigation to 482 acres and Rabi irrigation to about 250 acres in the above five villages.

As the reservoir is quite small, its management is very crucial for the success of crop production in its command. If the discharge is regulated scientifically, it is expected to irrigate sizable area of the command. It has been observed that the water is released in the canal irrespective of the demand by the users, resulting in colossal waste of the precious resource. Non-scientific canal operation makes the reservoir empty during early months of the Rabi season. Consequently, crop production suffers due to lack of water during critical crop growth period. In addition, profuse growth of weed in the canal bed has adverse effect on the flow of water. Keeping the aforesaid in view, this study was undertaken to evaluate the Deras canal irrigation system employing agricultural productivity as a performance parameter during Rabi, with the following objectives:

OBJECTIVES

(i) Study of agricultural production, productivity and returns to farmer in the Deras command during Rabi.

(iii) Analysis of irrigation and other farming practices in the command during Rabi.

3. METHODOLOGY

While developing a frame work for evaluating the performance of an irrigation project, we need to use a set of "performance assessment parameters" to quantify

the level of fulfillment of the objectives of the project. Each subsystem of the project has some intended plausible goal. The indicators should be able to measure the extent to which the "intended" objectives have actually been achieved. The main purpose of an irrigation project is to enhance crop yields by maintaining favourable soil moisture and salinity regime in the root zone. Thus, while evaluating the performance of an irrigation system, water availability and water use efficiencies, crop production and factors of productivity are important assessment parameters in this regard.

3.1. Collection of primary data through farmers interview method

3.1.1. Data on land holdings, input use and irrigation practices

Format of questionnaire for collection of information from the farmers regarding canal operation, water supply, input and yield in the Deras Command was prepared. The command area of the Deras Minor Irrigation Project in kharif and rabi seasons are 985 and 300 acres respectively. Hence, collection of data from about 50 percent (about 165 acres) of the command during Rabi 1992-93 was considered sufficient for analytical purpose. Using the prepared questionnaire and through personal interview data related to crop production and input use like varieties, irrigation, fertilizer, labour and energy were collected from 155 farmers from the villages Mendhasal, Kalajhara, Haridamada, Haripur and Bhagabatipur.

Farmers of the command area cultivate paddy in both kharif and Rabi season as it suits favorably to the agro-climatic conditions. Data collected from the farmers was processed for tabulation and analysis. A computer program was developed to calculate average use of fertilizer, and yields from the irrigated areas for each variety of crops. This program also determined areas distributed under different doses of nitrogen, phosphorus and potash, and number of irrigations applied.

3.1.2. Calculation of nutrient application

Farmers applied FYM and chemical fertilizers to supplement nutrient supply of the soil. In general, they applied Urea, Diammonium Phosphate (DAP), Single Super Phosphate (SSP), Muriate of Potash (MOP), Gromor (28:28:0) as inorganic chemical fertilizers. On an average the farm yard manure contains 0.5, 0.2 and 0.5 percent nitrogen, phosphorus and potash, respectively. One cart-load of FYM amounts to about 200 kg.

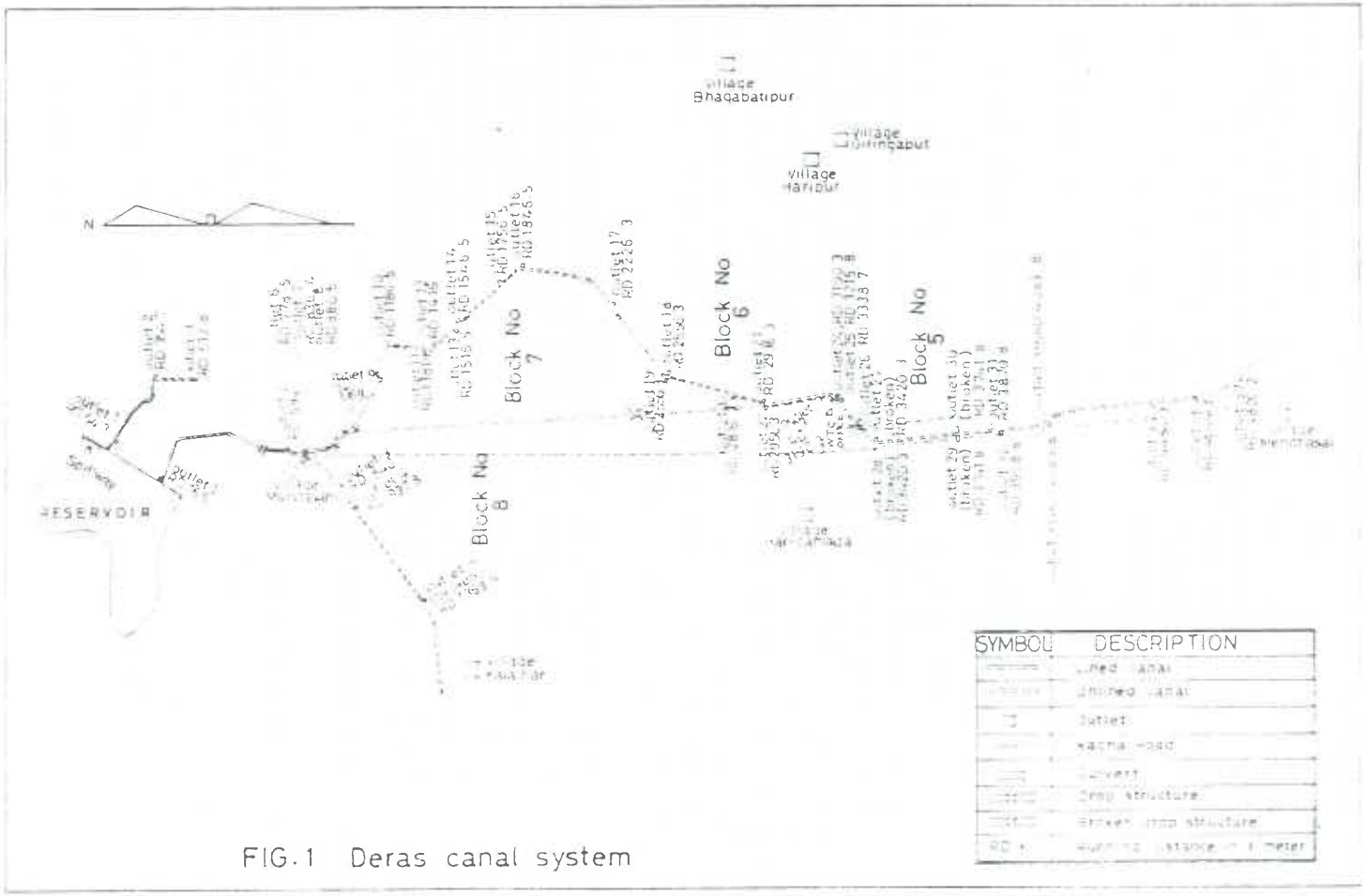

FIG.1 Deras canal system

Thus,

Total nutrient applied = nutrient applied through FYM + nutrient applied through chemical fertilizer

Average nutrient applied = $\Sigma (F_i * A_i) / A_i$

Where F_i = i^{th} species of nutrient applied in area A_i
A_i = i^{th} area

This way the average application of nitrogen, phosphorus, potash, and FYM were computed. Weighted average yields of different paddy varieties were also computed employing similar approach.

Soils of the Deras command are of lateritic type and acidic in nature. Its bulk density is about 1.65 gm./c.c.

3.1.3. Presentation of study results

Tabular and graphic methods of presentation of results have been followed. The results are presented under different heads of crop production parameters in the following chapter.

4. RESULTS AND DISCUSSION

Total command area for which data has been collected was 66.56 ha. Actual area for which irrigation was available was 55.32 ha. (88.52%). Thus the farmers paid water tax for 11.24 ha. without irrigation facility. Compulsory water tax for every hectare of irrigated paddy was Rs 90 during rabi 92-93. The farmers grow paddy in this area with minimal inputs.

4.1 Distribution of land holding in the command

Distribution of land holdings of 155 farmers interviewed is shown in Table 1. Maximum and minimum holding size of the farmers in the command was 5.00 and 0.25 hectare respectively . Average holding in the command was 0.84 hectare. The total land holding (sum of irrigated, unirrigated, fallow, structure, garden etc.) was 130.18 ha. Total cultivable land of respondents under Deras command in rabi was 66.56 ha. Table 1 shows distribution of land holding by size in the command. Majority of the farmers were either small or marginal having land holding less than 1.0 ha. ,19.35 percent of farmers were medium where as only 10 percent were large farmers in terms of total land holding.

Table 1 : Distribution of land holding by size .

Holding size(ha.)	No. of holding	% Total holdings	Area(ha) owned	%Total area
0.0 < 0.5	48	30.96	17.88	13.75
0.5 < 1.0	62	40.00	42.56	32.69
1.0 < 2.0	30	19.35	30.70	23.58
2.0 < 4.0	14	09.03	34.64	26.61
4.0 < 10.0	01	00.64	04.40	03.37

In terms of distribution of cropped area (Fig.2), 81.93 percent of farmers were marginal having cumulative cultivated area of 32.88 ha. (59.43%) of total cropped area surveyed (55.32 ha). The percentage of small farmers was 15.48 and they had 30.58% of reported area under Rabi paddy. No. of medium farmers was only 4 (2.58%) but 10 per cent of total cropped area belonged to them. From the above figures, it is clear that marginal farmers constitute around 82% of total farmers cultivated 60% of the area. It reflects that there was inequitable distribution of cropped area among different size class of farmers during Rabi. In terms of cropped area, there was no large farmer in this study. The total cropped area included the leased in land during the Rabi under study .

4.2. Area under paddy crop of different duration.

As evident from data provided in Table 7, cent percent of cropped area was under high-yielding rice varieties of medium duration (ranging from 110-135 days). This is in sharp contrast to the observation made during Kharif 1990, when most of the farmers in the command had gone for long duration traditional rice varieties. This difference may be due to farmers ability to control inputs and better management of it during Rabi.

4.3. Rice crop establishment method :

Data in Table 2 show that around 90 percent of farmers interviewed had transplanted their fields, where as only 10 percent went for direct sowing during Rabi 1992-93. As the puddling in rabi ensures less water consumption, farmers go for transplanting in Rabi which is contrary to our observations in Kharif in the command. Around 49 ha. (about 89 %) of the area was under transplanted rice and rest was under direct sowing in the Rabi.

The transplanting/sowing of paddy started in 44th week and ended as late as the 3rd week of January. Fig.3 shows area transplanted or sown in different weeks. It is observed that most of the farmers had transplanted or sown rice between 47th and 49th week.

Table 2 : Method of establishing rice crop

Method	Frequency	% Total farmer	Area (ha.)	% Total area
Direct sowing	16	10.32	06.20	11.2
Transplanting	139	89.68	49.12	88.8

4.4 Application of inputs

4.4.1. Ploughing for seed bed preparation, transplanting and beushening

Data in Tables 3 and 4 below give no. of ploughings used for rice cultivation during Rabi 1992-93 in the Deras command. The maximum and minimum number of ploughings done in the command during Rabi was 14 and 1 respectively for transplanting. It is observed that beushening is done even in Rabi due to perpetual waterlogging through leakages from the canal in some lands.

4.4.2. Varieties of rice grown

Table 7 shows area under different rice varieties in the command during Rabi 92-93. It is observed that 100 percent of farmers surveyed had used HYV varieties reflecting improved farming practices during Rabi. The HYVs used by farmers were of medium duration varieties. The variety most commonly used by farmers in the command during rabi 92-93 was Samrat followed by Parijat and Lalat covering an area of 41.84 ha. (76%), 7.22 ha. (13%) and 2.12 ha. (4%) respectively. The other HYVs used were Pratap, Pathara, CR-90, Culture, Sarathi and IR-36.

Table 3 : Distribution of Ploughing at the time of transplanting.

Number of ploughing (per ha.)	Frequency (No. of farmers)	% Total farmers	Area (ha.)	% Total area
1	04	2.58	0.44	0.79
2	29	18.70	9.02	16.23
3	22	14.19	5.2	9.35
4	26	16.77	6.96	12.52
5	20	12.90	6.6	11.87
6	13	8.38	4.4	7.91
7	05	3.22	1.84	3.31
8	13	8.38	6.68	12.03
9	07	4.51	3.16	5.68
10	01	0.64	0.4	0.71
11	01	0.64	0.64	1.15
12	04	2.57	4.24	7.62
13	03	1.93	2.64	2.69
14	03	1.93	2.0	3.58

Table 4 : Distribution of ploughing at the time of puddling.

Number of ploughing (per ha.)	Frequency (number of farmers)	% Total farmers	Area (ha.)	% Total area
01	26	16.77	4.86	8.86
02	60	38.70	15.36	28.02
03	25	16.12	10.76	19.63
04	17	10.96	8.48	15.47
05	03	1.93	2.0	3.64
06	01	0.64	0.96	1.75
08	03	1.93	2.8	5.10
09	01	0.64	0.8	1.45
12	01	0.64	2.0	3.64

4.4.3. Application of FYM

From Fig.4, it is evident that 5 to 10 cart-loads of FYM per ha. was applied in 32.21 percent of area and 4.12 percent of area had up to 5 cart-load FYM per ha. Area that was put to 10 to 15 cart-loads FYM per ha. was 27.54 percent. So around 60 percent of area was put to 5 to 15 cart loads of FYM per ha. FYM application varied from 0 to 45 cart-loads per ha. On an average, 17.22 cart-loads of FYM per ha. was applied in the command during Rabi 92-93. It was observed that the use of FYM was more in Rabi than in Kharif season. Some farmers used neither FYM nor any other fertilizer. The most common dosage of FYM was in the range of 5.0 to 15.0 cart loads per ha. in 77.46% of area.

4.4.4. Use of fertilizer

4.4.4.1. Application of Nitrogen (N)

Use of Fertilizer nitrogen in the command varied from 0 to 200 kg per ha (Fig.5). Around 65% of the area was put under Nitrogen varying from 40 to 100 kg per ha. It is observed that use of fertilizer N @ 70 to 80 kg per ha. had maximum number of farmers covering an area of 6.24 ha (11.27%). About 30 percent of area received nitrogen ranging from 70 to 100 kg per ha. The use of fertilizer nitrogen was apart from the application of FYM in the fields. It may be noted that fertilizer N use in Rabi is relatively higher in comparison with Kharif in the command. More over, the farmers in general use more nitrogenous fertiliser. In comparison to application of other fertilizers like potash and phosphorous, the use of nitrogen is excessive which reflects the ignorance of farmers about right doses of fertilizers.

4.4.4.2. Application of Phosphorous (P)

The distribution of phosphetic fertilizer application in the command area is reported in Fig.6. The data show that around 24 percent of area received on an average 35 kg of phosphorous per ha. The maximum phosphorous applied was 95.00 kg per ha. in contrast to some farmers who did not apply any fertilizer in their field. About 37 percent of area received phosphorous ranging from 10 to 30 kg per ha.

4.4.4.3. Application of Potassium (K)

A perusal of Fig.7 indicates the quantum of potassium applied during rabi 92-93 in the Deras command. The range of potassium application varied from nil to as high as 200 kg per ha. Around 74 percent of area received potassium ranging from 20 kg per

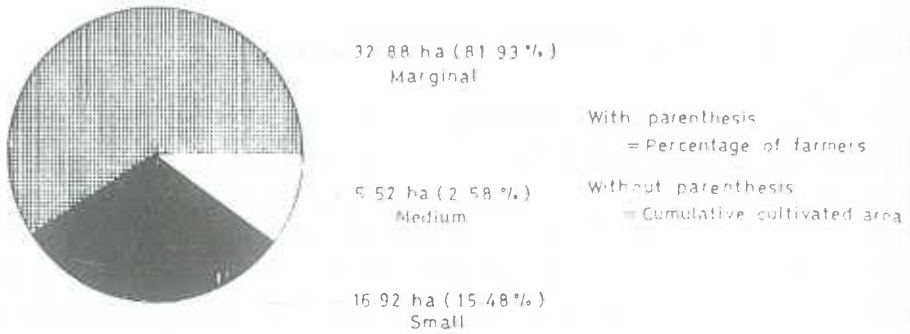

FIG. 2 Distribution of cropped area.

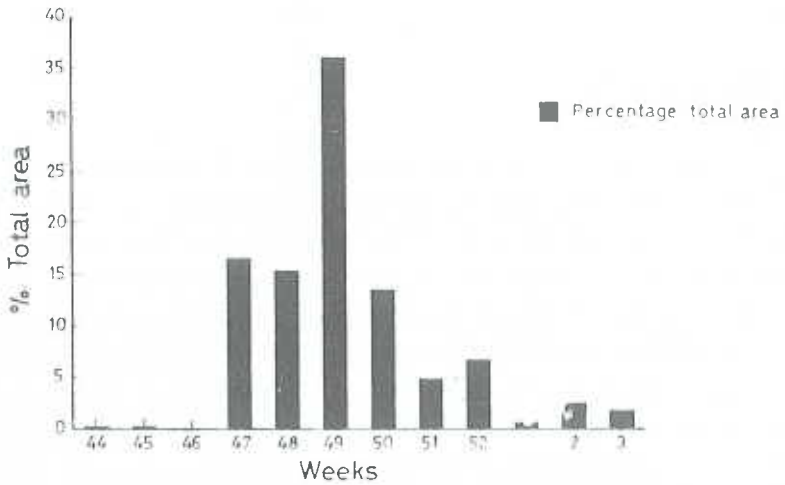

FIG. 3 Distribution of transplanting/sowing in the command.

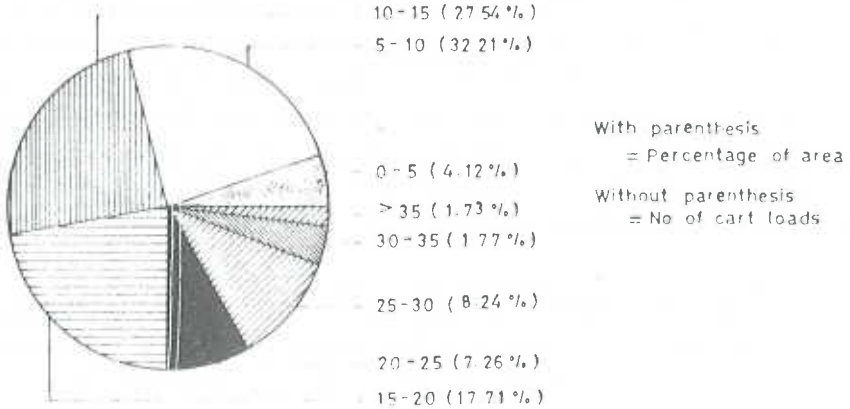

FIG. 4 Distribution of FYM application in the command

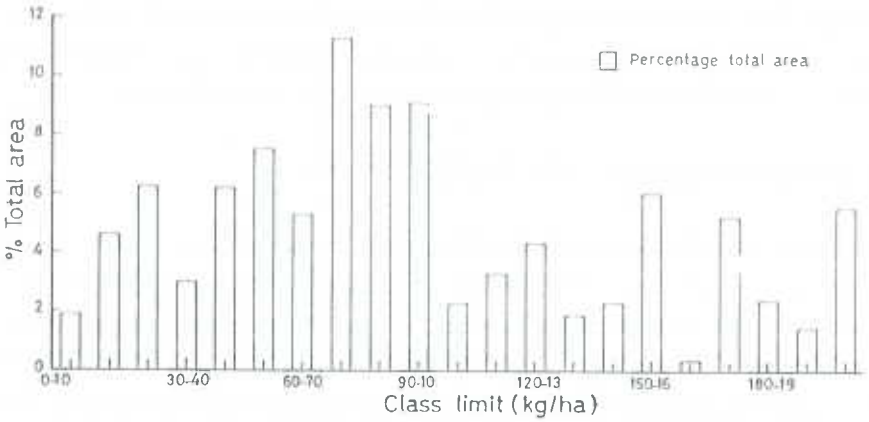

FIG. 5 Distribution of Nitrogen (N) application.

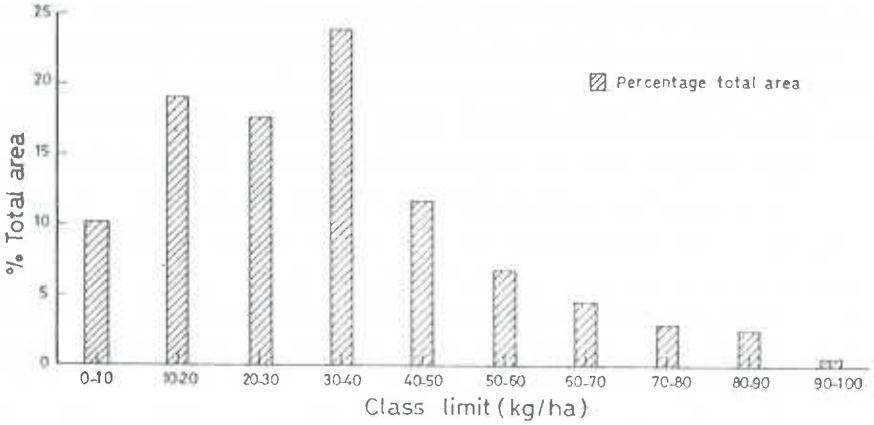

FIG. 6 Distribution of Phosphorous (P) application.

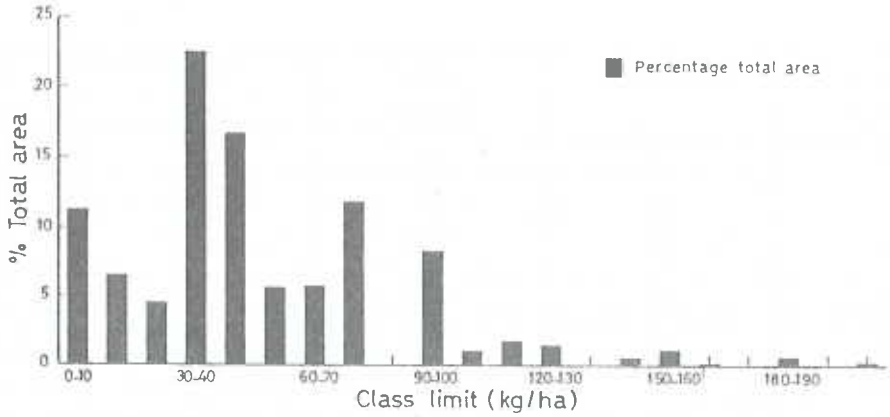

FIG. 7 Distribution of Potassium (K) application.

ha. to 80 kg per ha. Twenty two percent of respondents applied on an average 35 kg of potassium per ha. covering an area of 12.5 ha. (around 23%). Around 50 percent of cropped area received potassium ranging from 20 to 50 kg per ha.

4.4.5. Irrigation frequency and depth analysis

The canal water was available from first week of November onwards for rabi in the Deras command. Out of 66.56 ha. of command area reported, only 55.32 ha. received canal water. The farmers left rest of the command fallow in the Rabi 92-93. A perusal of Table 5 shows that a minimum of 4 irrigations covering around 4.5 per cent of area and a maximum of 12 irrigations was given in 7.7 percent of area by the farmers in the command area. Around 24 percent of reported area received 6 irrigations and an area of around 12 ha. (22.5%) received 8 irrigations in the command. There was a great variation in the no. of irrigations applied due to absence of control structures and lack of understanding among the farmers for water distribution. Maximum depth of water applied in the farmers' field during each irrigation given in Table 6 is an approximate value as reported by farmers. It was not measured. As per the survey result, maximum depth of water per irrigation was 15 cm and the minimum was 5 cm. About 31 ha. of area (56.5%) received irrigation varying from 10 to 15 cm and rest 43.5 percent of area was irrigated with a depth of irrigation ranging from 5 to 10 cm. Area that got irrigation water of 5 to 10 cm depth are at the tail end of the canal. So the usual tail end problems are quite evident in the study albeit the small length of the canal.

Table 5 : Distribution of irrigation frequency.

Number of irrigation	Frequency	% Total frequency	Area (ha.)	% Total area
4	9	5.8	2.36	4.41
5	9	5.8	1.96	3.67
6	43	27.74	12.34	23.1
7	17	10.96	6.6	12.35
8	29	18.7	11.93	22.35
9	0	0	0	0
10	33	21.29	15.42	28.87
11	0	0.0	0.0	0.0
12	15	9.67	3.56	7.81

Table 6 : Distribution of approximate depth of irrigation water applied.

Class limits (Cm)	Frequency	% Total farmer	Total area (ha.)	% Total area
0.0 < 5.0	0.0	0.0	0.0	0.0
5.0 < 10.0	79.0	49.67	24.01	43.55
10.0 < 15.0	76.0	47.74	31.31	56.45

4.5. Harvesting period

Harvesting of paddy in Rabi 1992-93 started as early as in the third week of January and ended in the last week of April. From Fig.8, it is evident that harvesting was done in the 13th week of the year for around 46 percent of the command under study. Almost 81 percent of cropped area was harvested between 12th and 14th week of the year . From first week of April, harvesting of Rabi paddy picked up and continued till the end of April. Major harvesting period therefore was between 1st April to 15th April in the Deras command.

4.6. Yield of paddy

Yield of paddy in Rabi 1992-93 was relatively lower in comparison with previous years in the Deras command as reported by the farmers. A perusal of Fig.9 reflects that the yield during Rabi varied from as low as 0.3 tons per ha. to as high as 6 tons per ha. It is evident from the graph that for a large chunk of area (54 %) the yield varied from 1.5 tons per ha. to 3.3 tons per ha. Of the total area, only 1.47 percent had yield more than 6 tons per ha.

4.7 Yield of paddy varieties

Yield analysis of paddy varieties (Table 7) gives interesting observations. Out of the nine different varieties used, Samrat occupied maximum area (75.81%) in the command and was followed by Parijat (13.15%), Lalat (3.92%), CR-90 (2.25%), IR-36 (1.89%), Pratap (0.94%) and Pathara (0.94%) etc. Yield of the varieties varied from 18.12 quintal per ha. for Sarathi to 45.00 quintal per ha. for Culture. For Samrat which occupied about 76% of area, the yield was around 32 quintals per ha. Parijat variety gave an yield of 27.35 quintals per ha. and occupied an area of 13.15%. The weighted average yield of all the reported varieties was 31.19 quintals per ha. Taking into consideration the Rabi potential of the command, the yields were quite low. From the personal conversation with the farmers in the command, it was inferred that the yields in the command was not upto expectations due to heavy pest attack during flowering stage.

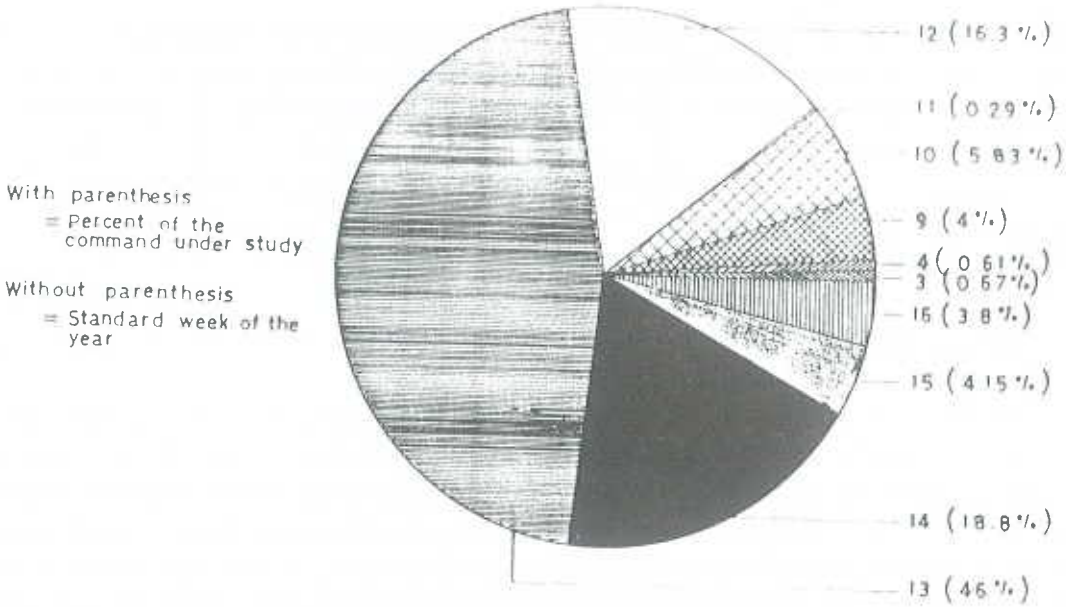

FIG. 8 Distribution of harvesting period.

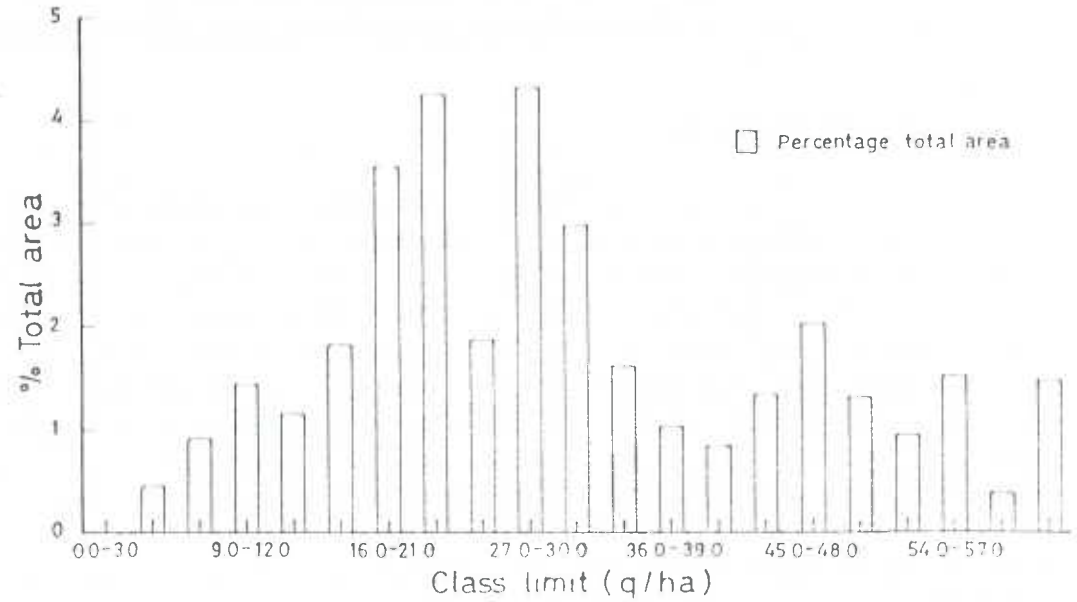

FIG. 9 Distribution of paddy yield.

Table 7 : Yield Distribution of Paddy varieties

Variety	Frequency (No of farmers)	% Total farmers	Total area (ha.)	% Total area	Yield per ha.
Samrat	112	72.24	41.84	75.81	32.05
Parijat	21	13.54	7.22	13.15	27.35
Pratap	04	2.58	0.52	0.94	40.37
Lalat	05	3.22	2.12	3.92	32.52
Pathara	03	1.93	0.52	0.94	21.62
CR-90	05	3.22	1.24	2.25	25.4
Culture	01	0.64	0.10	0.18	45.0
Sarathi	02	1.29	0.40	0.72	18.12
IR-36	02	1.29	1.04	1.89	40.85

4.8 Input use pattern in the command

Analysis of data on input use and their expenditure revealed that expenditure on labour was highest in comparison to other major inputs like fertilizer, irrigation and plant protection chemicals. It highlights that labour is the most important factor of production in the paddy cultivation. The weighted average cost of labour and other important inputs as percentage of total cost of cultivation for different categories of farmers in the command is shown in Table 8. For holding size of less than 0.25 ha., the weighted average cost on labour was around 46 percent of total cost per ha. which is highest for all the size classes taken together. For the holding sizes of 0.25 to 0.5, 0.5 to 1.0 and above 1.0 ha., the percentage of labour expenditure was around 39, 44 and 39, respectively. Coming to the cost of fertilizer, maximum and minimum percentage of expenditure was around 24 percent for the holding size 0.25 to 0.5 ha. and around 21 percent for the holding of below 0.25 ha. respectively. For the farm sizes 0.5 to 1.0 ha. and above 1.0 ha., the percentage expenditure on fertilizer was 21.5 and 23.18 percent respectively. With regard to irrigation cost in the command during the Rabi 1992-93, maximum and minimum percentage was for the groups below 0.25 ha. and more than 1.0 ha. respectively. This shows that even though the reported area per farmer was less for the size class less than 0.25 ha., the irrigation cost in terms of percentage of total cost compared to other size classes of holdings was more. The percentage cost of irrigation for other holding sizes like 0.25 to 0.5 ha., 0.5 to 1.0 ha. was 3.29 and 2.32 respectively.

4.9 Benefit-cost analysis

The benefit-cost analysis of paddy cultivation for the different categories of farmers revealed (Table 9) that the benefit cost ratio was lowest with holding size 0.5 to 1.0 ha. and highest for the holding size more than 1.0 ha. A perusal of data in the table shows that small farmers incurred less cost of production per ha. and also got less output. It was the large farmers who spent more on inputs per ha. and also reaped greater monetary benefit, as per ha. yield for them was higher. Large difference in output between small and large farmers could be explained by the large difference in the input use by the respective farmers. However, benefit cost ratio for all the groups except for holding size above 1.0 ha. remained below unity for the study period. Low benefit cost ratio for the said year was due to excessive pest infestation during flowering stage, which reduced paddy yield compared to those in normal years. The farmers did not get returns adequate to compensate the investment expenditures. B-C ratio for various holding sizes revealed that the marginal farmers were maximum loser and the farmers with holding size above 1.0 ha. lost minimum. It is inferred from the table that the B-C varied between 0.93 for holding sizes 0.5 ha. to 1.0 ha. and 1.09 for those above 1.0 ha. The benefit cost ratio was worked out taking imputed value of family labour into consideration. The imputed value of family labour was calculated at the market prices for the study year. Total revenue was calculated from the yield and converted into market prices. Revenue from straw has not been taken into account since the straw has no market in the area. If the opportunity price of straw is included there may be a marginal increase in gross benefit of the farmers.

Table 8 : Weighted average expenditure on important inputs .

Holding size (ha.)	Reported area (ha.)	Cost of labour (% of total cost)	Cost of fertilizer (% of total cost)	Cost of irrigation (% of total cost)
< 0.25	13.64	45.76	20.96	5.6
0.25-0.5	19.62	39.24	23.98	3.29
0.5-1.0	16.54	43.65	21.50	2.32
> 1.00	5.52	39.40	23.18	1.70

Table 9 : Benefit Cost analysis *.

Holding size (ha.)	Total number of farmers	Reported area (ha.)	Return (Rs./ha.)	Cost (Rs./ha.)	B/C ratio
< 0.25	78	13.64	2403.00	2507.00	0.96
0.25-0.5	50	19.62	3752.00	3761.00	1.00
0.5-1.0	23	16.20	5067.00	5464.00	0.93
> 1.0	04	05.52	11446.00	10446.00	1.09

** based on 1992-93 prices .*

5. SUMMARY

The study on Deras command during Rabi 1992-93 revealed that most of the farmers were marginal or small in terms of total land holding as well as reported area under cultivation. Transplanting method of rice crop establishment was more popular than direct sowing. The farmers used medium duration HYV seeds. Use of FYM and fertiliser was significantly more in the study area of the command. Around 60% of farmers used relatively more doses of chemical fertiliser. Beushening method of crop establishment was also practised by farmers some lands were perpetually waterlogged due to seepage of water from the canal. Rice variety Samrat was more popular in the command. Transplanting /sowing was mostly done between third and fourth week of November. Harvesting picked up between second and third week of April. Yield analysis revealed that weighted average yield in the command was 31.19 quintals per ha. Rice variety 'Culture' yielded maximum followed by IR-36. Samrat, the most commonly used variety gave an yield of around 32 quintals per ha. Analysis of expenditure on input use and relative share of input cost in the total cost of cultivation inferred that the labour expenditure contributed maximum to the total expenditure followed by expenditure on fertiliser and pesticides. The benefit-cost analysis of the crop raised during the study period revealed that B-C ratio as 0.97 which reflects that the crop was non-remunerative.

6. REFERENCES

1. WTCER Annual Report (1991-92).

2. Pal, S. P. (1985): Contribution of irrigation to agricultural production and productivity.

3. Shukla, Laxmi (1990): Canal irrigation management.

APPENDIX - 1

Salient features of Deras Minor Irrigation Project

(PURI DISTRICT)

1.	**LOCATION**		
	State	:	Orissa
	District	:	Puri
	Latitude	:	200-30'-0 N
	Longitude	:	870-48'-10" E
	Toposheet No.	:	73 H/11
2.	**HYDROLOGY**		
	Block	:	Bhubaneswar
	Catchment	:	12.33 sq.miles(31.93 sq.km)
3.	**RAINFALL**		
	Maximum Rainfall	:	58" (147.3 cm)
	Average Rainfall	:	45" (114.3 cm)
4.	**RESERVOIR**		
	T.B.L.	:	R.L. 250.00 ft (76.20 M)
	M.W.L.	:	R.L. 244.00 ft (74.37 M)
	F.R.L.	:	R.L. 240.00 ft (73.15 M)
	D.S.L.	:	R.L. 219.50 ft (66.90 M)
	Dead Storage Capacity	:	9.80 Mcft (0.2773 Mcum)
	Live Storage Capacity	:	86.20 Mcft (2.4395 Mcum)
	Gross Capacity	:	96.00 Mcft (2.7168 Mcum)
	Water Spread Area	:	238.00 acres (96.29 Ha.)
5.	**DAM**		
	Type of Dam	:	Homogeneous Earth Fill Dam
	Length of Dam	:	1500'-0" (457.20 M)
	Height of deepest Bed level	:	54'-0" (16.46 M)
	T.B.L. of the Dam	:	250.00 ft (76.20 M)
	Deepest Bed level of the Nalla in Dam Axis	:	R.L. 196.00 ft (59.74 M)
	Top Width of the Dam	:	15'-0" (4.57 M)

6. SURPLUS ESCAPE

Type	:	Ogee
Length	:	180'-0" (54.86 M)
Crest Level of the Spillway	:	R.L.240.00 ft (73.15 M)

7. IRRIGATION

Kharif	:	985.00 Acres (398.53 Ha.)
Rabi	:	300.00 Acres (121.38 Ha.)

8. HEAD REGULATOR

Number of Sluice	:	2 Nos.
Type	:	Hume Pipe
Sill Level	:	R.L.219.50 ft. (66.90 M)
Discharge	:	26 cusecs (0.736 cumecs)
Length of Main Canal	:	15,500'-0" (4.72 Km)
Estimated cost of the Project (as per 1947 Schedule of rates)	:	Rs. 14,00,000.00
Cost per Acre of Annual Irrigation	:	Rs. 1,090.00 (1089.49)
Year of Starting	:	1947
Year of Completion	:	1951

Plate 1: Spillway of the Deras reservoir

Broken left Bank
Canal System of the reservoir

Unmaintained Canal System