# EVALUATION STUDY OF LAND DEVELOPMENT IN THE COMMAND AREA OF GIRNA PROJECT JALGAON DISTRICT MAHARASHTRA STATE

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## INTRODUCTION:

The Girna irrigation project consists of the main dam and two pick-up weirs on the Girna river. The Girna main dam is located near Panzan village about 26 kilometers from the Nandgaon Railway Station. The total catchment area of the Panzan dam is 1826 sq.miles and its storage, around 21,500 m.c.ft. The water from the dam is let in to the Girna river and two canals take off from the two pick-up weirs, one located at Jamada in the Chalisgaon taluka, and the other at Dahigaon, in the Pachore taluka.

The Jamada weir is a masonary construction founded entirely on a sound sheet rock. The old Jamada weir and its canal system has been replaced by a new weir down stream. The old left bank canal is also remodelled to take higher discharge and is lengthened to 35 miles. Being a pick-up weir, the water is supplied to it from Panzan dam and it has no storage capacity of its own. The water from Jamada weir is distributed through right and left bank canals. The capacity of discharge of this canal is 105 cusecs and the proposed area of irrigation is 3620 hectares. The length of the Jamada left canal is about 35 miles and that of the Parola branch is 13 miles. The irrigable area under the command of the Jamada left bank canal is about 40,983 hectares. The Dahigaon weir is also a masonary weir with concrete coping. The length of the main canal from this weir is around 28 miles. The proposed area of irrigation is around 36,483 hectares. Thus, the water from the Girna Irrigation Project is mainly used for irrigation through the three main canals i.e. Jamada left and right bank

canals and the Girna lower canal which starts from the Dahigaon weir.

Under the Jamada left bank canal, 76 villages are benefitted, of which 3 are from Chalisgaon taluka; 31 from Bhadgaon taluka; 29 from Erandal taluka and 13, from Parola taluka. The gross command area of these 76 villages adds up to 41,464 hectares, out of which 75 per cent is culturable and 45 per cent is irrigable area. The Jamada right-bank canal is provided for 22 villages, of which 3 are from Chalisgaon taluka and 19 from Bhadgaon taluka. The gross command area of these villages is 7,325 hectares, of which nearly 50 per cent is irrigable. The lower Girna canal benefits 122 villages, of which 94 are from Erandol taluka and 28 from Amalner taluka. The gross command area of these villages came to 57,799 hectares, of which nearly 60 per cent is irrigable.

Topography of the Command Area:

The command area under the Girna project is gently slopy. There are numerous natural drainage sources on account of which disposal of rain water by surface drainage is fairly quick except some ravines and cut-up lands on the banks of the Girna river. The Topographical survey of the culturable command area in the 228 villages benefitted by the project, shows that about 80 per cent of the total culturable area is flat land having a gradiant of one per cent and low. The soils of the entire command area are wholly derived from the trap or basalt but they differ from the rest of the Deccan trap soil area in that they are mostly alluvial in origin having been transported from mountain ranges. The command area of the Girna left bank

canal comprises predominantly of medium and light soils. As against this, a large proportion of the area under the lower Girna canal is of deep soils having large stretches of alluvium deposits with about 8 feet of soil cover. The entire command area under the Girna project belongs to the agro-climatic zone IV-B of "Assured rainfall with kharif-cum-rabi cropping". The annual rainfall in the zone ranges from 25" to 30" which is favourable for cultivation of both kharif and rabi crops. The analysis of the cropping pattern conforms to the types of soil belts in the command area. The command area in the Amalner and Erandol talukas with predominently heavier soils has preponderance of rabi crops as compared to the command area in the south-west talukas of Parola, Bhadgaon and Chalisgaon. Cereals, pulses and oil seeds occupy a major proportion of the cropped area in the command lands in the Amalner and Chalisgaon taluka. Cotton appears to be the major crop in Amalner and Erandol talukas.

Objectives of the Scheme:

In Maharashtra State, the Government has introduced a number of measures to maximize the utilization of irrigation potential created by the various river valley projects. Judicious use of water is one of the important aspects to be taken care of. A changeover from dry cultivation to irrigated cultivation through the adoption of appropriate cultural practices and revised cropping patterns is not an easy task. The preparation and shaping of the lands in the command area for taking water from the outlets provided by the distributory system of the canal is a prime necessity. The Irrigation Department takes up the work of

construction of distributory system simultaneously with the construction of the main canals. The Irrigation and Power Department undertakes the construction of distributory system upto a discharge of 1.5 cusec. The responsibility of delivering water from this outlet the individual property is vested in the Department of Agriculture. Lands have to be prepared for receiving irrigation water properly so that the available water can be judiciously utilised. It is also necessary to provide drains for allowing surface runoff as well as excess sub-soil water. Till recently all these works were left to the individual owners of the lands. This has resulted in unplanned and uneconomic use of water and has created a number of problems either due to excessive watering resulting in water-lagging or in some cases non-utilisation of water for a number of years even after the creation of the irrigation potential. There has been a considerable waste of water causing damage to lands for want of water courses carrying water to the farthest holdings and their development in order to receive irrigation water. It was therefore, considered necessary to suitably develop the command area of the irrigation project to facilitate the desired, economic and optimal utilization of irrigation water. For this purpose, the Department of Agriculture prepared a detailed technical plan for the Girna project alongwith other projects and undertook the work of land development in the command area of the Girna canals. It was argued by the Department that the beneficiary farmers might not be able to meet the total expenditures on land development as envisaged in the scheme, from their own resources. It was, therefore, proposed to make available necessary finance to the beneficiary farmers as per the plans and estimates prepared by the Land Development

Agency. The work would be carried out as per plans and estimates by the Land Development Agency and final demand statements would be furnished by that Agency to the Land Development Bank for reimbursement. In short, the principal objective of the scheme was to develop the culturable command area of the Girna project to receive irrigation water and make available necessary financial assistance by way of long term loans to the beneficiary farmers.

Scope of the Land Development Work:

Land Development work consists of the following items and is divided into two parts according to priorities:

Part I
1) Land utilization and soil survey of the command area.
2) To take consents of the beneficiary farmers for the work of land development for incurring the expenditures on the work and taking up mortgage bonds for the loan assistance etc.
3) Construction of water courses.
4) Providing the division or turn-out-boxes, suitable drop structures and crossings on water courses.
5) Construction of field drains to collect and carry over the run-off water and also to keep the root zones clear from water-logging and construction of diversion drains to divert run-off water from the uncommand area.
6) Construction of suitable drops and cut-fall ends, as well as crossings required on drains and on water courses and construction of syphons along the water courses.
7) Construction of graded bunds with suitable grass

or stone waste-weirs to remove surplus run-off water from the inter-terraced areas.

Part II 1) Land shaping in the areas having 0 to 1 per cent slope and 1 to 2 per cent slope.

2) Land grading in the areas having slopes of 2 to 3 per cent and above 3 per cent.

3) Land levelling for growing paddy.

4) Providing borders along land strips.

The land development works under Part I are obligatory for proper distribution of water to all the fields in the command area. If individual cultivators object to this work being done in their fields, they would be coming in the way of irrigation benefits to other farmers. These items therefore, have to be made compulsory. Items of Part II could, however, be executed with the consent of the cultivators. If any cultivator opted to undertake them on his own, he would be allowed to do so under the supervision of Maharashtra Land Development Corporation or their agents.

The rates for Part I and Part II works are calculated for individual items such as Field Channels, Division Boxes, Drops for field channels, crossings on field channels, outlets to graded bunds, Field drains, Crossings on field drains etc. To the total cost of the above stated items additional 10 per cent charge is added for contingencies and for price escalation. Besides this, 25 per cent is added for the Establishment charges of the Land Development Agency and 5 per cent for Maharashtra Land Development Corporation.

It was decided that on behalf of the Maharashtra Land Development Corporation, the work of "on farm" development of

irrigation schemes should be entrusted to the Land Development Agency, - a special organization formed by the Government of Maharashtra. The procedure of notifications, objections from individual land owners etc., as per Bombay Land Improvement Schemes Act, 1942, were to be followed by the Maharashtra Land Development Corporation before undertaking field execution.

The entire cost of land development i.e. Part I and Part II is to be paid by the beneficiaries. The land development work was to be done out of the institutional finance. The amount of loan was to be given to the Maharashtra Land Development Corporation, on the basis of consents being obtained from the beneficiaries, and the money was to be kept at the disposal of Land Development Agency, for carrying out the developmental work. Since the works of Part I were of a common nature, they were to be executed by the Land Development Agency. However, in respect of Part II works, the beneficiary was to be allowed to carry out the work himself if he so desired. In that case the money was not to be disbursed to MLDC and the MLDC would not come in the picture at all. If the works under Part-II were carried out by the Land Development Agency, the recovery of the total cost incurred was to be done from the beneficiaries of the work done for them. The recovery would be done by the lending bank according to the agreed arrangement entered between the lending bank and the MLDC.

Land Development Work at Girna:

The land development work in the Command area of the Girna Project commenced in 1965 and was completed in 1976. The details of the completed work and the total outlays for

developing the entire culturable command area are given in Table 1.1. It may be noted from the table that the total area developed under the command of the Girna Project came to 82,200 hectares and the total amount incurred on the developmental work of this area was to the extent of Rs.474 lakhs. Out of this total work, the works which were completed during the period of 40 months from 29.3.1972 to 31.7.1975 and which were in conformity with the norms and specifications previously approved, were refinanced by the ARDC. The total expenditure already incurred by the Government of Maharashtra on the land development work during the above stated period was to the tune of Rs.106.38 lakhs. Of this Rs.84 lakhs were refinanced by the ARDC. The total area of land developed during the period was around 42,015 hectares. The itemwise details of the land developmental work done during the period from 29.3.1972 to 31.7.1975 are given in Table 1.2. The present study is undertaken to evaluate the work of land development done during this period and which was financed by the ARDC.

The objectives of the study may be stated as follows:

1) To assess the implementation of the land development scheme in the Girna command;

2) Estimation of incremental production, income from, and financial and economic rates of returns on investments and comparison of these magnitudes with those expected at appraisal. Analysis of the factors responsible for divergence, if any, between expectations and achievements were such divergence is significant;

3) Assessment of the repayment performance of the farmers and suggestions for the needed revisions in the

Table 1.1: Total Outlays for the Development of the Command Area

| Sr. No. | Item of work | Completed work | |
|---|---|---|---|
| | | Quantity | Amount |
| | | | Rs. |
| 1. | Survey planning | 82200 ha | 411000 |
| 2. | Survey construction | 82200 | 1315200 |
| 3. | Water courses | 2055000 $m^3$ | 3699000 |
| 4. | Division Boxes | 20550 Nos. | 3904500 |
| 5. | Drops on water courses | 3401 Nos. | 646190 |
| 6. | Crossings on water courses | 2740 Nos. | 863100 |
| 7. | Dressing of bunds | 4603190 m | 230160 |
| 8. | Outlet to graded bunds | 50142 Nos. | 300852 |
| 9. | Field drains | 3616800 $m^3$ | 7233600 |
| 10. | Drops on field drains | 1028 Nos. | 195320 |
| 11. | Crossings of field drains | 2055 Nos. | 647525 |
| 12. | Graded bunds | 4603180 m | 1603180 |
| 13. | Cost of ploughing | 10993 ha | 1265880 |
| 14. | Scrapping | 299601 $m^3$ | 4494013 |
| 15. | Land plaining | 82200 ha | 7390000 |
| 16. | Land grading | 2564640 $m^3$ | 5898500 |
| | | Total | 43105902 |
| | Contingencies 10% + | | 4310590 |
| | | | 47416492 |
| | Eligible for loan 75% + | | 35562369 |
| | Say | | 35554000 |

Table 1.2: Land Development Work done During the Period of 29.3.72 to 30.9.75

| Sr. No. | Outlets No. | Area notified in the gazatte (hect.) | Date of publication 9(2) | Date of publication 5(2) | Whether land grading is to 2% or better specification | Agency for notification Dist. | Field channel (hect.) | Field drains (hect.) | Graded bunds with outlets (hect.) | Masonary works (hect.) | Land grading/levelling (hect) | Work cost upto 30-9-73 | Total no.of beneficiaries under the blocks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Upper Girna | 512 | 21,475.39 | - | - | 2% | - | 21,310.19 | 21,269.54 | 21,182.65 | 21,143.33 | 30,763.90 | 60,09,834.63 | 11548 |
| 2 Lower Girna | 364 | 20,539.60 | - | - | 2% | - | 20,512.85 | 20,155.97 | 20,352.37 | 17,554.53 | 19,861.79 | 46,28,936.11 | 14525 |
| | 876 | 42,014.99 | - | - | | - | 41,823.04 | 41,425.51 | 41,535.02 | 38,697.86 | 40,625.69 | 1,06,38,770.74 | 26073 |

1. Name of District — Jalgaon
2. District-wise work const. — 1,06,38,770.49
3. Districtwise Estt. cost — 83,11,947.79

Sd/-
Divisional Soil Cons. Officer
(L.D.), Chalisgaon.

lending terms, taking into account the time lag for reaching full development;

4) Drawing conclusions for future project planning and management in the light of the findings of the evaluation.

5) Suggestions for improving evaluation methodology.

Methodology:

The main task of land development in an area commended by a major or medium irrigation project is two-fold: (a) to design and construct channels from the distributory or minor upto the field level; and (b) to level and shape the land to receive irrigation water for crop production. It has been the experience that inadequate provision on these counts has resulted in wastage of irrigation water and less than full utilization of the total irrigation potential. Until recently the farmers were expected to undertake these works on their own; their failure to do so has resulted in devising special measures at the Governmental level, to get these works attended to and recover the cost from the farmers in instalments.

Our first task in the Girna Survey, therefore, would be to ascertain how much of the work has in fact been completed. It is possible that incomplete execution of the work would lead to failure of full development of irrigated farming on the lands. If, for example, the first type of works mentioned above is completed and the second type is largely left to the cultivators to execute, the benefits many not follow and the additional expenditure may become infructuous. We, therefore, propose to examine on the ground and collect relevant information of the actual work

completed by the agency and the work, if any carried out by the farmer, and the suitability of the lands for irrigated farming. This would help us in clearing one major aspect of evaluation.

A related question would be the time involved in developing the land for irrigation. This would be relevant in judging the repayment performance of the cultivators.

Further more, the change in the cropping pattern and the extra income generated from the lands made fit for irrigation, will provide the basis for estimating the repaying capacity of the beneficiaries.

The information on these aspects has been collected from the sampled land development blocks and the farmers cultivating the land in it.

Besides these, it would be necessary to collect information on the extension of irrigation made possible in the whole system by the implementation of these land development measures. These data had to be collected from the records of the concerned irrigation authorities, supplemented by information relating to the blocks sampled for survey.

Selection of Sample:

As mentioned earlier, during the period 29.3.1972 to 31.7.1975, an area of 42,015 hectares was developed in order to receive irrigation water from the Girna Canals. Of this total area, 21,475 hectares and 20,540 hectares belonged to the Upper Girna and the Lower Girna Projects respectively. The total developed area belonged to 26,073 cultivators (11,548 cultivators in Upper Girna and 14,525 cultivators in Lower Girna) from 204 villages coming under the jurisdiction of

the following eight sub-divisions of the Soil Conservation (Land Development) Department at Jalgaon: (1) Chalisgaon, (2) Erandol-I, (3) Bhadgaon, (4) Parola, (5) Amalner, (6) Dharangaon, (7) Jalgaon and (8) Erandol-II. The first four subdivisions constitute the Upper Girna Project and the latter four sub-divisions, the Lower Girna Project. Of the 204 villages in which land development work was carried out 93 villages belonged to the Upper Girna Project and the remaining 111 villages, to the Lower Girna Project.

Considering the difficulties in undertaking a field investigation of such a large number of cultivators, their developed land and the spread of the developed land over the eight sub-divisions we had decided to confine the survey to the villages in the Upper Girna Project only. The sample of blocks covered about 3 per cent of the total developed area under the IDA Peoject in the Upper Girna i.e. about 600 hectares out of 21,475 hectares.

Villagewise information pertaining to improved area in hectares, total number of cultivators whose land was developed under the scheme and the total amount of expenditure on Part-I and Part-II works (corresponding to itmes (a) and (b) in our earlier paragraphs) has been obtained from the Maharashtra State Land Development Corporation (MLDC) Pune. Similarly, a list of developed blocks and the area under each block in each village for the IDA Project period has also been obtained from the District Soil Conservation (Land Development) Office, Jalgaon.

In order to select a representative sample from the Upper Girna Project area, the 93 villages of the Upper Girna were first arranged in an ascending order according to the

per hectare expenditure of Part-II works in each village. As it was noticed that the per hectare expenditure on Part-II works varied widely from one village to another, the villages so arranged in an ascending order were grouped into five segments of more or less equal size, each segment having a developed area of about 4,000 hectares. From each of these five segments, two villages were selected at random, such that the developed area in each of the selected village was around 60 hectares; i.e. 3 per cent of the total developed area of the segment. In other words, the final sample would cover about 600 hectares of the developed area i.e. regularly 12 developed blocks. All the cultivators cultivating lands in the selected blocks were to be surveyed. It would mean a detailed investigation in so far as their developed lands under the selected blocks were concerned and some overall information about their total farming.

The relevant data of the sixteen developed blocks from the ten selected villages in the Upper Girna area are presented in Table 1.3. Of the sixteen sample blocks, seven blocks comprising an area of 186.80 hectares of the developed land were situated at the head of different distributories; four blocks having 197.78 hectares, were at the middle of distributories and the remaining five blocks, claiming about 253.83 hectares, were at the tail end of different distributories in the Upper Girna region. It may be noted that the supply of water varied from block to block, depending upon its location on the distributory. Thus, the blocks situated at the head of the distributory had plenty of water supply while those blocks at the tail-end were completely dry. The relevant data about the blocks situated at the head, middle and tail points of the distributories are

presented in Tables 1.3 to 1.5. It may be noted from the three tables that out of the total 334 cultivators from the 16 sample blocks, 110 cultivators had 186.80 hectares of their land in the seven blocks situated at the head of the distributories; 86 cultivators had 197.78 hectares of their lands in the four blocks situated at the middle of the distributories; and 138 cultivators had 253.83 hectares of their lands in the five sample blocks situated at the tail-end of the distributories. It may be noted here that more than 80 per cent of the total area of the lands cultivated by the cultivators in the 16 sample Blocks, came under the command area of the Upper Girna Project. (See Table 1.7) The rest, about 19 per cent was not covered by the Project. The proportion of the command area to the total, however, varied from block to block. It may be seen from the table that the variation was as wide as 31 per cent in Block No.8 of the Shindi village to 100 per cent in Block No.6 of the Wadaji village and in Block No.4 of the Anturli village. It is interesting to note that the proportion of the command area to the total was comparatively lower in the group of Blocks situated at the head of the distributory (72 per cent) than those groups of Blocks situated at the middle and at the tail of the distributory (82 and 81 per cent respectively) (See Tables1.8 to 1.10). The proportion of the command area to the total in the group of blocks at the head of distributory appears low, mainly because of the Block No.8 at the Shindi village where the command area was as low as 31 per cent of its total area. In all other blocks of this group the command area was higher, its proportion to the total varying between 71 to 91 per cent. In the groups of Blocks situated at the middle and tail of the distributories the

Table 1.3: Selected Villages and Blocks in the Command Area of the Girna Project

| Segment No. | Selected village | Block No. | Name of Block | No. of Cultivators | Developed land in hectares |
|---|---|---|---|---|---|
| I | Devhari | 2 | Devhari | 16 | 30.86 |
| | " | 5 | Devhari | 17 | 33.62 |
| II | Bhatkhanda | 2 | Bhatkhanda | 20 | 55.04 |
| | Nipane | 4 | Nipane | 74 | 87.76 |
| | Pimperkhed | 3 | Pimperkhed | 29 | 65.61 |
| III | Bhatkheda | 6 | Bhatkheda | 15 | 44.78 |
| | Tekawade kd | 2 | Tekawade | 35 | 59.90 |
| IV | Anturli | 4 | Anturli | 19 | 54.17 |
| | " | 12 | Anturli | 10 | 12.08 |
| | Shindi | 4 | Shindi | 4 | 15.64 |
| | " | 6 | Shindi | 14 | 16.93 |
| | " | 7 | Shindi | 11 | 17.18 |
| | " | 8 | Shindi | 13 | 12.67 |
| V | Wadji | 6 | Wadji | 30 | 53.81 |
| | " | 11 | Wadji | 2 | 7.13 |
| | Karab | 9 | Karab | 25 | 71.23 |
| | Total | 16 Blocks | | 334 | 638.41 |

Table 1.4: Blocks Situated at the Head of the Distributories

| Segment No. | Selected villages | No.of Block | Name of Block | No. of Cultivators | Developed Land |
|---|---|---|---|---|---|
| I | Devhari | 2 | Devhari | 16 | 30.86 |
| | Devhari | 5 | Devhari | 17 | 33.62 |
| III | Takawade kd | 2 | Tekawade | 35 | 59.90 |
| IV | Shindi | 4 | Shindi | 4 | 15.64 |
| | Shindi | 6 | Shindi | 14 | 16.93 |
| | Shindi | 7 | Shindi | 11 | 17.18 |
| | Shindi | 8 | Shindi | 13 | 12.67 |
| | Total | 7 Blocks | | 110 | 186.80 |

Table 1.5: Blocks Situated at the Middle of Distributories

| Segment No. | Selected Villages | No.of Block | Name of Block | No. of Cultivators | Developed Land |
|---|---|---|---|---|---|
| II | Pimperkhed | 3 | Pimperkhed | 29 | 65.61 |
| V | Wadji | 6 | Wadji | 30 | 53.81 |
| | Wadji | 11 | Wadji | 2 | 7.13 |
| | Wadji | 9 | Tongaon-Karab | 25 | 71.23 |
| | | 4 Blocks | | 86 | 197.78 |

Table 1.6: Blocks Situated at the Tail-end of Distributories

| Segment No. | Selected Villages | No.of Block | Name of Block | No. of Cultivators | Developed Land |
|---|---|---|---|---|---|
| I | Bhatkhanda | 2 | Bhatkhanda | 20 | 55.04 |
| II | Nipane | 4 | Nipane | 74 | 87.76 |
| III | Bhatkheda | 6 | Bhatkheda | 15 | 44.78 |
| IV | Anturli | 4 | Anturli | 19 | 54.17 |
| | Anturli | 12 | Anturli | 10 | 12.08 |
| | | 5 Blocks | | 138 | 253.83 |

Table 1.4: Blocks Situated at the Head of the Distributories

| Segment No. | Selected villages | No.of Block | Name of Block | No. of Cultivators | Developed Land |
|---|---|---|---|---|---|
| I | Devhari | 2 | Devhari | 16 | 30.86 |
| | Devhari | 5 | Devhari | 17 | 33.62 |
| III | Takawade kd | 2 | Tekawade | 35 | 59.90 |
| IV | Shindi | 4 | Shindi | 4 | 15.64 |
| | Shindi | 6 | Shindi | 14 | 16.93 |
| | Shindi | 7 | Shindi | 11 | 17.18 |
| | Shindi | 8 | Shindi | 13 | 12.67 |
| | Total | 7 Blocks | | 110 | 186.80 |

Table 1.5: Blocks Situated at the Middle of Distributories

| Segment No. | Selected Villages | No.of Block | Name of Block | No. of Cultivators | Developed Land |
|---|---|---|---|---|---|
| II | Pimperkhed | 3 | Pimperkhed | 29 | 65.61 |
| V | Wadji | 6 | Wadji | 30 | 53.81 |
| | Wadji | 11 | Wadji | 2 | 7.13 |
| | Wadji | 9 | Tongaon-Karab | 25 | 71.23 |
| | | 4 Blocks | | 86 | 197.78 |

Table 1.6: Blocks Situated at the Tail-end of Distributories

| Segment No. | Selected Villages | No.of Block | Name of Block | No. of Cultivators | Developed Land |
|---|---|---|---|---|---|
| I | Bhatkhanda | 2 | Bhatkhanda | 20 | 55.04 |
| II | Nipane | 4 | Nipane | 74 | 87.76 |
| III | Bhatkheda | 6 | Bhatkheda | 15 | 44.78 |
| IV | Anturli | 4 | Anturli | 19 | 54.17 |
| | Anturli | 12 | Anturli | 10 | 12.08 |
| | | 5 Blocks | | 138 | 253.82 |

Table 1.7: Command and Uncommand Areas in the Sample Blocks

| Name and No. of Block | No.of cultivators | Command Area | | Uncommand Area | | Total Area | |
|---|---|---|---|---|---|---|---|
| | | Hectares | % | Hectares | % | Hectares | % |
| Devhari 2 | 15 | 85.40 | 86.83 | 12.95 | 13.17 | 98.35 | 100.00 |
| Devhari 5 | 16 | 110.25 | 86.98 | 16.50 | 13.02 | 126.75 | 100.00 |
| Shindi 4 | 4 | 33.71 | 91.03 | 3.32 | 8.97 | 37.03 | 100.00 |
| Shindi 6 | 16 | 56.89 | 76.48 | 17.50 | 23.52 | 74.39 | 100.00 |
| Shindi 7 | 10 | 37.00 | 83.15 | 7.50 | 16.85 | 44.50 | 100.00 |
| Shindi 8 | 12 | 36.07 | 31.12 | 79.85 | 68.88 | 115.92 | 100.00 |
| Tekawade kd 2 | 33 | 200.11 | 71.40 | 80.14 | 28.60 | 280.25 | 100.00 |
| Wadaji 6 | 30 | 159.92 | 77.06 | 47.60 | 22.94 | 207.52 | 100.00 |
| Wadaji 11 | 2 | 17.83 | 100.00 | - | - | 17.83 | 100.00 |
| Karab 9 | 25 | 195.98 | 87.69 | 27.50 | 12.31 | 223.48 | 100.00 |
| Pimperkhed 3 | 27 | 117.75 | 78.68 | 31.90 | 21.32 | 149.65 | 100.00 |
| Anturli 4 | 16 | 164.30 | 100.00 | - | - | 164.30 | 100.00 |
| Anturli 12 | 9 | 54.14 | 44.41 | 67.78 | 55.59 | 121.92 | 100.00 |
| Bhatkheda 6 | 14 | 109.08 | 74.41 | 37.52 | 25.59 | 146.60 | 100.00 |
| Bhatkhanda 2 | 20 | 149.72 | 97.72 | 3.50 | 2.28 | 153.22 | 100.00 |
| Nipane 4 | 72 | 417.18 | 79.64 | 106.66 | 20.36 | 523.84 | 100.00 |
| | 321 | 1945.33 | 80.59 | 540.22 | 19.41 | 2485.55 | 100.00 |

proportion of the command area was more than 74 per cent of the total except one Block (No.2) in the Anturli village. In this Block the proportion of the command area was as low as 44 per cent of its total area.

Sample Cultivators:

As mentioned earlier all the farmers cultivating their lands in the selected sample Blocks formed the sample for the present study. The total number of such farmers came to 334. Of these, 321 were amenable to our interrogation and the remaining 13 refused to supply any information about the land development work carried out in their lands. The Blockwise distribution of the sample cultivators alongwith their total land, and the command and uncommand areas are presented in Tables 1.8 to 1.10. In Table 1.11 we give the distribution of the sample cultivators according to size of their land holdings in all the sixteen Blocks taken together. It may be seen from the table that of the total sample of 321 cultivators, 36 were small cultivators having less than two acres of land each. The total area of their cultivated land was around 53 acres, and their entire land came under the command area of the Girna Project. The uncommand area was reported only by those, having more than two acres of land each and by and large it went on increasing as the land holding increases. Thus, in the last group of the sample cultivators, having more than 15 acres of land each, about one third of their total land was not covered by the Girna Project. It may be noted from the table that more than half of the sample cultivators (50.47 per cent) were medium sized cultivating 2 to 7.50 acres of land each. More than one-third of the total cultivators (38.32 per cent) were large, cultivating more than 7.50 acres of land each. All

Table 1.8: Command and Uncommand Areas in the Sample Blocks at the Head Zone of the Distributories

| Name and No. of Block | No. of cultivators | Command Area | | Uncommand Area | | Table Area | |
|---|---|---|---|---|---|---|---|
| | | Hectares | % | Hectares | % | Hectares | % |
| Devhari 2 | 15 | 85.40 | 86.83 | 12.95 | 13.17 | 98.35 | 100.00 |
| Devhari 5 | 16 | 110.25 | 86.98 | 16.50 | 13.02 | 126.75 | 100.00 |
| Shindi 4 | 4 | 33.71 | 91.03 | 3.32 | 8.97 | 37.03 | 100.00 |
| Shindi 6 | 16 | 56.89 | 76.48 | 17.50 | 23.52 | 74.39 | 100.00 |
| Shindi 7 | 10 | 37.00 | 83.15 | 7.50 | 16.85 | 44.50 | 100.00 |
| Shindi 8 | 12 | 36.07 | 31.12 | 79.85 | 68.88 | 115.92 | 100.00 |
| Tekawade 2 | 33 | 200.11 | 71.40 | 80.14 | 28.60 | 280.25 | 100.00 |
| Total | 106 | 559.43 | 71.98 | 217.76 | 28.02 | 777.19 | 100.00 |

Table 1.9: Command and Uncommand Areas in the Sample Blocks at the Middle Zone of the Distributories

| Name and No. of Block | No. of cultivators | Command Area | | Uncommand Area | | Table Area | |
|---|---|---|---|---|---|---|---|
| | | Hectares | % | Hectares | % | Hectares | % |
| Wadaji 6 | 30 | 159.92 | 77.06 | 47.60 | 22.94 | 207.52 | 100.00 |
| Wadaji 11 | 2 | 17.83 | 100.00 | - | - | 17.83 | 100.00 |
| Karab 9 | 25 | 195.98 | 87.69 | 27.50 | 12.31 | 223.48 | 100.00 |
| Pimperkhed 3 | 27 | 117.75 | 78.68 | 31.90 | 21.32 | 149.65 | 100.00 |
| Total | 84 | 491.48 | 82.12 | 107.00 | 17.88 | 598.48 | 100.00 |

Table 1.10: Command and Uncommand Areas of the Sample Blocks at the Tail-end of the Distributories

| Name and No. of Block | No. of cultivators | Command Area | | Uncommand Area | | Total Area | |
|---|---|---|---|---|---|---|---|
| | | hectares | % | hectares | % | hectares | % |
| Anturli 4 | 16 | 164.30 | 100.00 | - | - | 164.30 | 100.00 |
| Anturli 12 | 9 | 54.14 | 44.41 | 67.78 | 55.59 | 121.92 | 100.00 |
| Bhatkheda 6 | 14 | 109.08 | 74.41 | 37.52 | 25.59 | 146.60 | 100.00 |
| Bhatkhanda 2 | 20 | 149.72 | 97.72 | 3.50 | 2.28 | 153.22 | 100.00 |
| Nipane 4 | 72 | 417.18 | 79.64 | 106.66 | 20.36 | 523.84 | 100.00 |
| Total | 131 | 894.42 | 80.59 | 215.46 | 19.41 | 1109.88 | 100.00 |

Table 1.11: Distribution of the Farmers in the Sample Blocks According to the Size of Their Land Holdings

| Size of cultivated holdings | No. of cultivators | Total cultivated land (acres) | Area under command | % | Uncommand Area | % |
|---|---|---|---|---|---|---|
| Upto 1.00 acre | 7 | 5.08 | 5.08 | 100.00 | - | - |
| 1.01 to 2.00 acres | 29 | 47.56 | 47.56 | 100.00 | - | - |
| 2.01 to 3.00 " | 31 | 76.69 | 69.94 | 91.13 | 6.75 | 8.87 |
| 3.01 to 4.00 " | 36 | 126.50 | 117.00 | 92.49 | 9.50 | 7.51 |
| 4.01 to 5.00 " | 42 | 190.84 | 166.84 | 87.41 | 24.00 | 12.59 |
| 5.01 to 7.50 " | 53 | 326.13 | 266.51 | 81.71 | 59.62 | 18.29 |
| 7.51 to 10.00 " | 42 | 372.66 | 329.18 | 88.33 | 43.48 | 11.67 |
| 10.01 to 15.00 " | 49 | 576.05 | 439.34 | 76.27 | 136.71 | 23.73 |
| 15.01 and above" | 32 | 764.04 | 503.88 | 65.95 | 260.16 | 34.05 |
| Total | 321 | 2485.55 | 1945.33 | 78.26 | 540.22 | 21.14 |

these cultivators were contacted for the purpose of collecting information about the land development works carried out in their lands coming under the command area of the Upper Girna Project.

Schedule:

We canvassed a set of questionnaire to all the sample cultivators to elicit information, in a single visit, about the land development works carried out in their plots, its expenditures and its impact on their agricultural production. The period of reference regarding cultivation, ownership of land and returns from their developed plots was taken as April 1980 to March 1981. The field work was intended to be undertaken from October 1981 but as we were unable to get the preliminary data from the concerned official records till the end of the year we could not begin the enquiry in that year. We, therefore, began our field work in January 1982 and the same was completed by the end of June 1982.

## CHAPTER II

## DEVELOPMENT OF LAND IN THE COMMAND AREA

As mentioned in Chapter I, land development work is divided into two parts according to priorities. PartI provides for the community items of work like field channels, division boxes, field drains, crossings on field channels and drains, graded bunds and their outlets etc. Part II provides for items on individual farms such as land grading, levelling and shaping etc. The community items are common and applicable to the whole sub-catchment area and are obligatory to all farmers in the area. The expenditure incurred on them is charged to individual farmer in proportion to his land included in the command area. The individual items in Part II are not compulsory to all farmers. Those are executed only with the consent of the individual farmers in his fields and are not common to all. Its expenditure therefore, is charged to those farmers only, on whose farms such land development work has been executed.

In this chapter we propose to deal with the land development works, both Part I and II, executed in the sixteen sample Blocks of the Upper Girna. We will examine how much of the land development work is executed and completed in each Block. We will also try to assess the quality of the completed works and their present position in all the sixteen Blocks, which we had the oportunity to observe in detail.

### Need For Land Development:

A change-over from dry to wet farming is not simple. In order to introduce irrigation, land in the command area has to be prepared to receive irrigation water and to utilize

it more optimally and economically. The land has to be developed to bring it under some regularity in its shape, gradient and size in order to facilitate easy and smooth percolation of the costly water resource in the entire command area. It is also essential to have field drains to remove sub-soil water and provide of surface run-off, to forestall and prevent the occurance of problems like water-logging, soil erosion and damage to lands under command. Thus, development of land under command assumes crucial priority and has to be completed before the introduction of irrigation. As far as the Girna Project is concerned the Land utilization survey conducted by the Agricultural Department indicates that the problem of land development was not acute in the command area, as its general topography is not very slopy. It had been pointed out that about 80 percent of the total command area was level lands the slope being less than one percent. As such this area required no particular land development measures, such as land grading, levelling and graded bunding. About 15 per cent of the total land was gently slopy having gradient of 1 to 2 percent. Development of this area would not need land grading operations as well except in places where mounds or gullies were observed. Of the remaining area, about 3.20 percent was slopy from 2 to over 3 percent. Although the slopes were of a moderate to moderately steep order, these areas would need intensive land grading such as filling of gullies and cutting the ridges etc. and perhaps land levelling operations. The rest of the command area, (2.97 per cent) was found to be unfit for cultivation as it was rocky and non-erable.

In the following we will first discuss the Part I i.e.

community items of land development carried out in the sixteen sample blocks of the Upper Girna and then take up the individual items included in Part II. It is not imperative that all the land development operations in Part I and II, will be necessary for all the lands in every Block. The essential operations will mainly depend on the existing situation of the land, its gradient, the uniformity of gradients, existing state of erosion, depth of soil cover, intensity of irrigation likely to be received and proposed land use pattern. The operations of land development are finalised only after making a thorough study of all these factors and are carried out as per specifications laid down by the Department of Agriculture.

Part I : Community Items :

(1) Field Channels: The field channels are the water courses having a capacity upto 1.5 cusecs, starting either from an out-let or a reduced channel section where the section earlier carried more than 1.5 cusecs. The water courses are either aligned along ridges of the irrigating lands on one side, evidently as per the dictates of the topography. The field channels are generally taken up to the highest point in each property and the individual property holders are expected to draw water from that fixed point and irrigate their fields through an equiliser. The length of field channel is normally 70 meters per hectare approximately. As per specifications laid down by the Department of Agriculture, the water courses are constructed on a bed slope of 0.2 to 0.5 per cent in medium deep and deep black soils and 0.5 to 1 per cent in light and medium

soils. These are excavated 0.15 meters below the ground level having a bottom breadth of 30 cms. Small earthen banks on both of its sides are constructed to form a water course section of 0.45 $m^2$. The height of water course including cutting in of the ground is 45 cms. The side slopes of these courses are 1:1 in shallow and medium soils and 1.5 to 1 in medium deep and deep back soils. Soil from the 0.15 meter depth of cutting is used for construction of side banks. Any additional quantity required for building the side banks is taken from the quantity available from land grading or land shaping. Where the slope along the water course is steeper, suitable drop structures are to be provided to control the velocity of flow of water.

Equilizers are small channels constructed and maintained by the beneficiaries, from division boxes (i.e. from the highest point in the property head where water is supplied) for providing irrigation to their individual fields. These equilisers would either be permanent or temporary, being constructed at the beginning of each season. Generally, the equilisers are aligned parallel to the field channels. These are constructed by the farmers themselves according to their own plan. However, as per specifications provided by the Agricultural Department, an equiliser should have a bottom width of 20 cms. and a depth of 20 cms. (10 cms. in cutting and 10 cms. in filling with side slope 1;1). Quantity of water carried through an equiliser is generally less than 1/2 cusec. No drop structures is essential on the equilisers.

All these details about the specifications laid down

by the Department of Agriculture are important in order to examine whether those have been strictly adhered to, while executing the construction programme of the field channels in the command area. The task of such varification would have been fruitful and more accurate if it was undertaken soon after its completion. The field channels and other works of land development, as we know, have been executed and completed much before, during the years between 1965 and 1976; and a period of 7 to 18 years has already elapsed. Apparently the field channels and other developmental works were put to use during all these years and could not be expected to retain their original shape, standard and quality. Field channels, for example, have been in use for so many years that they have silted up, have changed their size, shape, slope and section and the details could not be verified during the survey with the specifications prescribed by the Department of Agriculture. It is likewise the case with field drains, graded bunds, and structures built in every block in the command area. We, therefore, feel that verification of the land development works as per specification details could not be done after the lapse of so many years. We could, however, verify, whether the field channels, drains, and bunds etc. existed as per their construction and as per their plans prepared by the Department. We could examine their present state and see how far they were maintained by the farmers in the command area. It is felt that even this type of varification would be interesting and revealing.

From the case-studies of the sixteen blocks, we found that the field channels were all constructed during the period from 1972 to 1975 and have been in use since then.

The construction work of these water courses was reported to have been done strictly as per the specifications laid down by the Department, but the same could not be varified from the present conditions of the existing field channels in the sample blocks. We could only ascertain this fact from the official records like work-sheets, work-plans and payment books etc. which showed that all the land development works were done as per the specifications and as per plans prepared by the Department of Agriculture. We found that all land development works were supervised and checked from time to time and stage by stage by the senior officers and were finally certified by the Divisional Soil Conservation Officer, that the executed works were all found correct and that they were as per the original plans prepared by the Department. However, this was all from the official records. The fact could not be ascertained on the actual field from our observations of the existing land development works. On the field, we could only verify their alignments, and their sites and ascertain their existence at their proper places as per plan or whether they have been shifted in course of time.

In the following we attempt to present our field observations about the present state of the water courses in the sixteen sample blocks. These may be categorised with reference to the following eight important points : (1) Existence of the field channels (ii) Maintenance of the existing field channels; (iii) Breakages (iv) Diversions; (v) Extensions to uncommand areas; and (vi) Use of field drains as field channels. As mentioned earlier we have classified the sample blocks into three groups : (1)Blocks located at the head region of the minor; (2) Blocks at

the middle region of the minor; and (3) Blocks at the tail region of the minor. The present condition of the field channels, and for that matter of all the land development works, differs a great deal in the three groups of the sample Blocks. We will take each of the above stated six points separately and discuss it in brief with reference to our case-studies of the sample blocks.

(i) Existence of Field Channels:

As far as the existence of the field channels is concerned we observed that large sections of these were in existence as per the original plans prepared by the Department in the first two groups of the sample blocks i.e. in the blocks situated at the head and the middle regions of the minor; while in the third group of blocks at the tail end of the minor, most of the water courses constructed under the land development scheme were wiped off by the farmers. We observed this when we visited the lands in Bhatkheda Block No.6, Bhatkhanda Block No.2 and Nipane Block No.4. In all these blocks the farmers had filled up all the field channels constructed under the scheme and had brought the land under them under field cultivation. It was reported to us that most of these farmers had not received canal water even once, since the construction of water courses in their lands. The situation in the Bhatkheda Block No.6 and Bhatkhanda Block No.2 was the worst, in the sense that canal water had never reached even to their outlets ever since they have been constructed. No single field channel was found existing in these two blocks. The farmers reported that they had waited for two to three years, had complained and made representations to the Department of Irrigation but there was no effect. They could not succeed

in getting canal water during any one of these years and had therefore levelled up the field channels and brought the lands under field cultivation. The entire expenditure on construction of the water courses thus appears to have been infructuous and wasteful aspecially in the case of these two blocks.

In the head and middle Blocks as well, some of the field channels were wiped off as the farmers did not receive canal water through them. In these cases the circumstances and the situations were however different from those observed in the tail-end blocks. The farmers received canal water satisfactorily but not from the field channals which were meant for their lands as per the prepared plans. They received canal water from other field channals laid down under the scheme or constructed by themselves according to their conveniences. For example, in Wadaji Block No. 6, we found that Fc5 was completely wiped off by the farmers, which was in fact meant to provide irrigation to their fields in Survey Nos. 256 and 259 as per plan; and they were all taking canal water from $Fc_1$ in S.No.256 and from $Fc_3$ in Survey No.259. These field channels were also laid down under the land development scheme but as per plan they were meant for other Survey Nos. in the Block. The cases of constructing water courses for themselves according to their convenience were innumerable and were found almost in every block in the head and middle regions of a minor. In Wadaji Block No. 6 itself the farmers had constructed additional field channels at many places according to their convenience and had irrigated their fields with the canal water. We found that on $Fc_1$ additional three small field channels were laid by the farmers on their own for greater convenience. Likewise

was the cases of $Fc_2$ and $Fe_3$ as well. Such cases were observed in every block where canal water was in good supply. In fact this should not have happened where supply of canal water was fairly satisfactory; but the farmers were apparently too impatient that as soon as canal water was released in field channels of their block, they wanted to flood their fields by breaking the Fcs and taking water in the water courses constructed by themselves to irrigate their own fields. This type of selfish attitude shown by the farmers was largely responsible for the wastage of canal water in the blocks situated at the head and the middle regions of the minor and also for the non-receipt of canal water by farmers in the Blocks at the tail end.

(ii) Maintenance of Field Channels:

The maintenance of field channels was the farmers' responsibility who received canal water for their fields through them. But we found that no farmer was aware of his responsibility and had strived to maintain his own water courses properly. The maintenance of field channels was important only in those blocks where those were in existence and where canal water was supplied through them. In the tail-end blocks where canal water was not received at all, problem of maintaining the field channels did not arise. They had been levelled up and the farmers had brought that portion of their lands under field cultivation. The problem of maintenance of field channels, however, existed very seriously in all the head and middle region blocks wherein canal water was supplied adequately. In such blocks we found channels were not maintained at all by the farmers even though they received canal water through them. They were looked after by no one. All the field channels were overlaid with wild grass and shrubs,

ng all over them and obstructing smooth flow of canal . Most of the field channels had silted up and had their original depth, size, slope and section. At many places, they were broken by the farmers to get canal water. Some of the field channel were reduced in their section so much that canal water overflowed from their banks continuously and had developed a problem of water logging. (Shindi Block No.7). In 'pot hissa' $\frac{1}{2}B_1$ of Survey No. 178 in this block, about five gunthas of land-strip along the $Fc_1$ has been continuously under canal water and was water-logged. The farmers could not grow any crop in this strip of land. It is surprising to observe that the farmers had allowed to run to waste their fertile lands under continuous overflow of water from the banks of $Fc_1$ but had not cared to deepen the water course and/or repaired its banks. It appears that some of the farmers were under a wrong impression that maintenance of field channels was not their responsibility and the Department of Irrigation was expected to look after their water courses. Another important point which we noticed was that there was little co-operation amongst the farmers themselves in each block and every one of them was shirking his responsibility of maintenance of the community items which were of common interest to all of them.

During our field investigation we found that only nine farmers from five sample blocks (three from the head and two from the middle regions) had cleaned the water courses in their fields in the year of enquiry i.e. 1981-82. (See Table 2.1). Out of the total 321 farmers in the sample blocks only nine had undertaken the operation of cleaning the water courses in 1981-82 and had incurred expenditures between Rs. 100 to 150 each. Some of them had reported that they undertake the operation of cleaning the field channels in

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their own field almost every year. These nine farmers appear to be the only exceptional cases in the sample blocks. In general, the field channels were neglected by almost all the farmers in the sample blocks, even though all of them received canal water through them.

(iii) Breakages of Field Channels?

We found during our field visits that in six of the sample blocks, the existing field channels were broken and the farmers had taken canal water directly from them instead of taking it through the division boxes provided for the purpose. The blocks were (i) Devhari-Nimbhora Block No.5; (ii) Wadaji Block No.6 (iii) Anturli Block No.4 and 12; (iv) Tonagaon-Karab Block No.9 and (v) Pimperkhad Block No.3. It was observed that in Devhari-Nimbora Block No.5 $Fc_1$ was bŏpken in the compartment No.1 of the Survey No. 52 to take canal water to the uncommand area in Survey No.53 to the western side of the block. It was surprising to note that the existing field channel was broken to irrigate the uncommand area outside the block. Because of this breach in the field channel and also because of the obstructions of stones and farm waste materials kept in it, canal water could not be provided to the command area in the western region of the block. Thus, the command area in the block had to go without canal water and the uncommand area outside the block was irrigated by breaking the field channel. The officials from the Department of Irrigation were aware of this fact but had not taken any action against the concerned farmers. We observed that in the same block, $Fc_2$ was also borken on both of its sides and water was released to irrigate the western and eastern portion of Survey No.49. In this case, however, the field channel was broken to

irrigate the command area of the block. In Tongeon-Karab Block No.9 and the Pimperkhed Block No.3, a number of breakages to the existing field channels were observed but all these were for the purpose of irrigating the command areas in the block. At some places we found that the division boxes were in total disorder and the farmers were unable to acquire a proper flow of water to irrigate the entire area of their fields. They, therefore, resorted to breaking the field channel in their fields and irrigate their areas instead of getting water from the division boxes which were either non-existent or not working properly. In some cases the division boxes were not located at the requisite places and hence it was inconvenient for the farmers to irrigate the entire area of their fields. They also found it easier to break open the existing field channel passing from the ridge portion of the fields and irrigate all the area. We observed that the breakages in field channels had disturbed the entire programme of irrigating the total areas of the block with the result that the smaller ones have to go without water.

(iv) Diversions of Field Channels:

Diversion of the existing field channels within the command area of a block was almost a common feature in almost all the sample blocks, particularly in the head and middle regions of a minor where canal water was in adequate supply. Such cases were a few in the tail-end blocks like Anturli Block No.4 and 12, and Nipane Block No.4, where some field channels existed but water was in short supply. We observed that diversions of the field channels were mostly done by the big farmers who had comparatively larger areas to irrigate. Whenever water was released in the field channels

they rushed to divert as much water as possible and flood their farms immediately. They reported that they had to do so principally because they could not safely rely on the time schedule of water release followed by the Department of Irrigation. They were not sure that canal water would be provided at regular intervals and in adequate supply. They were of the opinion that if canal water was released at regular intervals and in adequate supply, the diversions of water courses would not occur on a such a large scale.

For a revealing example of diversion of field channels one may refer to the Bhindi-Kolgaon Block No.6. In this Block, the field channel No.2 was diverted at two points in its course; first in Survey No.198 on the border line of "pot-hissa" Nos.1 and 2B; and second, in Survey No.166. According to the original plan the $Fc_2$ was to turn towards north in Survey No.198, but actually it had been turned in the opposite direction and joined to the field drain No.1. This field drain was used by the farmers as their field channel wherein canal water from $Fc_2$ was released and was used to irrigate the 'hissa' Nos. 1A and 1B of Survey Nos. 168 and 167 respectively. Its second diversion was seen in Survey No.166 where it was diverted to carry water from the existing well at the central place of Survey No.166. In Pimparkhod Block No.3 and Anturli Block No.4, a number of diversions and breakages of the existing field channels were noted during our field visits. In these two blocks almost all the Fcs were broken and were diverted by the farmers as per their convenience to irrigate the entire area of their fields in the shortest possible time. In Tongeon Karab Block No.9, however, we found a genuine case of diversion in the sense that it was essential to irrigate

the entire area of the Survey No.58 wherein the original field channel was wrongly laid down. It was noticed that in Survey No. 58 of the block the original $Fc_3$ laid down according to the plan did not suit the area and was not convenient to irrigate the ridge portion in the middle of survey No.58. Canal water released in $Fc_3$ could not reach the middle section of the Survey Number and it could not be irrigated. The farmers, therefore, had diverted the $Fc_3$ from its division box itself and had taken it through the ridge portion of the Survey Number so that canal water released from it could irrigate the entire land on both of its sides. This was the only diversion which appeared genuinely warranted as the original field channel was wrongly put and was not convenient to irrigate the entire area of Survey No.58 in the block. All other diversions of field channels in the other sample blocks were without any genuine need for regular and proper irrigation but had been laid down by the farmers only to quicken the operation of watering and to appropriate as much water as possible.

(v) Extensions of Field Channels:

Extension of field channels are different from their diversions which we have discussed earlier. Diversions are within the command area of the block itself; while extensions are those where the water courses are stretched beyond the block either to irrigate uncommand area or the command area in the adjoining block. Such extensions of the field channels were noticed in five sample blocks; viz. (1) Wadaji Block No.11; (ii) Shindi Block No.7; (iii) Pimperkhed Block No.3 (iv) Anturli Block No.4; and (v) Devhari-Nimbhora Block No.5. A clear case of extension of the field channel could be seen in Wadaji Block No.11. In this block we noticed that the only existing field channel

was extended by the farmers along the southern border of Survey No.71 and canal water was taken beyond the eastern boundary of the present block to irrigate the command area of the adjoining block on the east. We found that about five to six acres of land from the adjoining block was irrigated by extending the field channel from Wadaji Block No.11. The case of field channel No.2 in Shindi Block No.7 also was similar. We noticed here that the existing $Fc_2$ was extended along the southern border of the block and turned towards north beyond the eastern boundary of the block to irrigate the areas from Survey No.153, 184 and 185 which in fact were in the command area of the Shindi Block No.4 on the east. We observed that about fifteen acres were irrigated from this extension. In Devhari-Nimbhora Block No. 5, we found that the existing field channel No.1 was choked up by filling it with stones and farm waste materials for raising the water level. It was breached and the water was extended to Survey No.53 through a R.C.C. pipe line. This extension of $Fc_1$ from the compartment No.1 of the Survey No.52 was laid by the farmers to irrigate the uncommand area in Survey No.53 to the western side of the block. Because of this extension of $Fc_1$ and its intentional choke-up, canal water could not flow to the northern portion of lands in the western region of the block. We were surprised to know that officials from the Department of Irrigation were aware of the breakage and extension through pipe line of Fc1 to irrigate the uncommand area but had not taken any action against them and the illegal and unauthorised irrigation of the uncommand area was allowed to continue for several years.

Extension of field channels from the sample blocks to their adjoining blocks was one side of the story. Its

reverse could and did occur. The field channels from the adjoining blocks might have been extended to the sample blocks to irrigate their command areas. Such cases were noticed in Wadaji Block No.6 and in Shindi Block No.4. It may be seen from Wadaji Block No. 6 that the farmers had broken the minor in the adjoining Block No. 4 on the northern side, had put up a R.C.C. pipe road crossing under the Parola-Bhadgaon road and had released canal water in the Field channel No. 2 of the present block to irrigate its command areas in Survey Nos. 236 and 235. It is important to note that the farmers did not care to be mindful of even breaking open the minor or the distributary running on the northern side of the block, parallel to the Parola-Bhadgaon road, to bring canal water to their own lands in the present block. The case of Shindi Block No.4 is referred to earlier in connection with its adjoining Shindi Block No.7. We have seen that the field channel No.2 from the Shindi Block No.7 was extended and brought to Shindi Block No.4 to irrigate its command areas in Survey Nos. 153, 184, and 185. We observed that about 15 acres of land from these three Survey nos. was irrigated by the extension of $Fc_2$ from Shindi Block No. 7.

(vi) Field Drains as Field Channels:

It appears that the farmers in the sample blocks could do and undo anything to get hold of canal water to irrigate their lands as suited to their own convenience. They appeared neither to have any qualms; nor any faith in following the plan executed under the land development scheme for proper irrigation of the area in the block. We have noted so far that they had gone to the extent of breaking open the field channels, even the minor, and divert and

extend them as per their will in order to carry canal water to their fields. They could also convert field drains in to field channels wherever it was convenient for them. Such cases were observed in two sample blocks, viz. ¶:(1) Shindi-Kolgaon Block No.6 ; (2) Shindi Block No.7. Both the cases have been referred earlier. It may be seen, however, that in Shindi-Kolgaon Block No.6 field channel No.2 was completely diverted by the farmers towards south and joined to field drain No.1. As per plan, the field channel was to turn towards north and then towards east to irrigate the eastern section of the block. In point of fact it was diverted in the opposite direction and joined to field drain No.1 which was used as field channel to irrigate the 'pot hissa' Nos. 2B and 2A1 of Survey No.198 and "hissa" Nos. 1A and 1B of Survey No. 168 and 167 respectively. The farmers reported that field drain No.1, which was silted up and had lost its original depth was more convenient as it had a good bed slope, to carry canal water to the areas of Survey Nos. 168 and 167. The field channel meant for these two Survey Nos. had been levelled up, and had no road-crossing on the Kolgaon-Shindi road and as such the canal water could not be taken to the eastern side of the road to irrigate the areas in Survey No. 167 and 168. In the existing circumstances it was convenient and less expensive to the farmers to divert the field channel towards south and join it to field drain No.1 so that canal water flowed towards eastern side of the block and reached the areas of Survey Nos. 168 and 167 more easily through the existing road crossing. In Shindi Block No.7 also, we observed a similar case. In this block the farmers reported that the division box No.4 on field channel No.2 was not properly constructed and the supply of canal water through it was

not adequate to irrigate the area of Survey No. 179. Besides, the land in this property was not properly levelled and as it was an elongated strip, the canal water supplied through division box No. 4 did not reach its northern portion. The farmers, therefore, had dismantled division box No.4 and canal water from field channel No.2 was released in field drain No.2 which runs straight from south to north. For more than half of its total length this field drain was used as field channel and canal water coming through it was used to irrigate the area of Survey No. 179. The northern half of the field drain in the northern section of the block was, however, retained as a drain, presumably because canal water released in it could not cover its entire length. From these two cases our general impression, that the farmers had not realised the importance of providing field drains in the blocks got confirmed. They were concerned only with providing canal water to their lands and had used field drains as well for this purpose. The ill-effects of excess water did not bother them. It appears that they were not much worried about the serious problems of water logging which were bound to arise if the drains provided in the fields are not kept properly and if those were used as field channels.

(2) Field Drains :

Field drains are open surface sewers provided to drain off excess water from the irrigated lands quickly and safely. The excess water could either be from irrigation let in or surface run-off due to rainfall. The field drains could also serve to carry away the excess of percolation. Generally the field drains are aligned along the valley lines on grade of 0.2 to 1 percent. They are designed as per Mannings formula according to the discharge expected

to be carried away by them. Depth of field drains is from 0.45 meter upto 0.75 meter according to the requirement to clear the root zone of excess moisture. They are connected with natural drains in the area. Their side slopes are kept 1:1 in 'murum' and 1.5 to 1 in black soil. The spoil from the excavated drains is put on both sides of the drains to protect their side banks. The length of field drains is generally 60 ft. per acre and its depth is never less than 2 ft.

As pointed out earlier all field drains in the sample blocks were constructed under the land development scheme during 1972 to 1975. Their construction work was reported to have been done as per the specifications laid down by the Department of Agriculture, but we could not verify those from the present state of the existing field drains as these had undergone a considerable change in the course of time since their construction. During our field visits, we could verify only their alignments, their predetermined sites and examine whether they existed at their original sites as per the prepared plans or had been shifted in course of time. Our observations about the present state of field drains in the sample blocks may be presented under two sections; viz. (1) Existence of the constructed field drains, and (2) Maintenance of the existing field drains.

(i) Existence of Field Drains:

As in the case of field channels, the present state of field drains as well differed from block to block depending upon the supply of canal water. In the blocks having adequate supply of canal water we found that a large section of field drains were existing; while in the blocks where canal water was scarce or not available at all, field drains were all wiped off by the farmers. A noteworthy

example about the existence of field drains could be seen in Devhari-Nimbhora Block No.5. It may be seen from this block and its plan, that there was a clear cut division of the block into two regions-western and eastern- the dividing line being the Nimbora-Devhari road. In the Western region where canal water was adequately supplied, all field drains (Nos. 1,2,5 and 7) laid down under the land development scheme, existed and were intact; while in the eastern region where canal water could not reach at all, field drains (Nos. 3,4 and 6) were non-existent. All these field drains were levelled off by the farmers, and land under them was brought under cultivation. The farmers reported that as canal water was not available to their lands, the problem of draining out excess water did not arise at all and all field drains laid down under the scheme had become redundant. They, therefore, preferred to remove all field channels and field drains from their lands and had brought that area under field cultivation. The case was identical with all the tail-end blocks like Bhatkheda Block No.6; Bhatkhande Block No.2; Nipane Block No.4 and Anturli Block Nos. 4 and 12. In all these blocks canal water was scarce or was not available and hence the problem of draining off excess water from irrigation could not arise. The farmers, therefore, thought that field drains constructed under the scheme were not essential for their fields and so they levelled them and brought that portion of their lands under field cultivation.

The present state of field drains in the head and middle zone blocks was somewhat different. A majority of drains constructed under the land development scheme in these blocks did exist though in an uncared and neglected condition since their construction. Some of the field drains

in these blocks as well, were levelled off, either partially or wholly by the farmers. As far as field drains from these blocks are concerned, the case of Shindi Block No.7 was rather interesting. It may be seen from the plan that in this block there were six field drains constructed under the scheme, of which two (FD1 and 3) were wholly existing; two ($FD_2$ and 4) were partially existing and the remaining two (FD5 and 6) were entirely levelled off. The first four field drains (Nos. 1 to 4) were long in their run and passed from south to north across the entire Block. They ended up in the Nallah running from west to east on the northern border of the block. It is interesting and important to note that of these four, field drain No.4, as pointed out earlier, was used as field channel for about half of its total length, to irrigate the northern section of Survey No.179. In the case of field drain No.4, we observed that its major portion was levelled off and only a small section at the northern end where it joins the Nallah existed probably because it was rather deep and could not be filled in easily. A related point was that water running through the Nallah entered field drain No.4 at its northern portion and hence it could not be levelled off. The remaining two drains (Nos. 5 and 6) were smaller in length and were laid west to east in the eastern of the block. The farmers found these two drains superfluous and not properly located to drain off excess water of irrigation. They had, therefore, levelled up these drains and the land under them was brought under field cultivation. It is important to note that levelling up of the existing field drains in the eastern section of the block had not created any problem of water-logging so far. In course of time, however, it is

certain to develop a problem of water-logging if the field drains were not restored and the existing drains were not kept clean and properly maintained. This observation is true and applicable to all the head and middle zone blocks, where canal water was in sufficient supply.

(iv) Maintenance of Field Drains:

Field drains were to be looked after by the farmers in each block, but during our field visits we observed that majority of them had failed to claim requisit up keep or maintenance. It appeared that most of the farmers were not aware of the purpose and the importance of field drains in the irrigated areas. We found that the maintenance of most of the field drains in the sample blocks had been neglected totally. The drains were all in a dilapidated state having lost their size, shape, slope and section for want of timely repairs. In point of fact they had never been repaired since their construction, nor were cleaned up annually. As a result they were found to be covered with wild grass, bushes and shrubs. We noticed that at many places farm waste materials had been dumped in them. It appeared that a number of farmers used them as compost pits to collect farm waste to be used later as farm yard manure. Consequently many of field drains in the sample blocks were so silted up as to reach surface level and threatened to lead to water-logging. We observed that in some of the sample blocks the problem of water-logging had already developed in places and cultivation of lands under them had been abandoned. The cases of Wadaji Block No.6 and Pimperkhed Block No.3 could serve as specific examples in this regard. In Wadaji Block No.6 we observed that the problem of water-logging had become very

acute and had already claimed about 25 acres of its command area. In many other places in the block, problem of water stagnation was threatening and was likely to end up in wastage of much of its land if field drains were not repaired and improved. It may be seen from the plan that $FD_1$ was the longest field drain in the block, and it ran from its western border to its eastern boundary and ended up in a Nallah. This field drain had lost its shape and size right from its starting point itself and had attained surface level in Survey No.237 where a strip of about 10 meters on both of its banks remained under water continuously. Similarly in "pot hissa" No. 3 of Survey No. 236, the land stayed under water all through the season and was likely to become water-logged. We observed that $FD_6$ in this block was completely choked up in Survey No. 247 as it had been filled up with farm waste and its drain water failed to empty itself in the Nallah on the eastern side of the block. Because of its closure in Survey No. 247, "pot hissa" No.1 was always under water and was likely to be water-logged within a short period. The Nallah running on eastern border of the block was also filled with farm waste in many places and had caused water-logging in Survey No.248. In the case of field drain No. 8, we could observe that its existing eastern portion was much silted up and its drain water, instead of flowing towards east, backlashed towards west and entered field drain No. 9 which ran north to south on the boundary line of Survey No.251 and 250. Both field drains (Nos. 8 and 9) had lost their shape and size and were smothered with wild grass and bushes. As these two field drains were not properly maintained, the area in "pot hissa" No. 1B in Survey No.250 was fully water-logged and had gone waste. In addition to the failure of these two field drains,

the distributary No. 28 in this section of the block was on an elevated level and its water percolated in the entire area of Survey No.251. We noticed that about 15 acres of land from these two Survey Nos. 250 and 251 were water-logged and had to be aboundoned altogether. The case of Pimperkhed Block No.3 was also similar. In this block as well, about 20 acres of land had already been left as wasted under water-logging as many of the field drains had been levelled up and the existing ones were not maintained at all. In other blocks located at the head or middle zones of a minor, the conditions headed towards the same calamity and much of their command area was likely to go waste unless the farmers changed their attitude towards field drains and tried to restore the levelled up drains and maintained the existing ones by deepening and cleaning them every year.

During our field enquiry we found that out of the total number of 321 farmers from the sample blocks, only five had reported some sort of repairs carried out to field drains passing through their farms. Of these, two were from Shindi Block No.7; and one each from Pimperkhed Block No.3; Wadaji Block No.6 and Tongaon-Karab Block No.9 (See table 2.2 ). The five farmers reported that they spent about Rs. 125 to Rs. 150 every year on repairs to their field drains. Mostly they cleared them of wild grass and shrubbery that obstructed the flow of drain water. It appears that they were the exceptional farmers who reportedly took some care of the existing drains in their fields. The general practice otherwise was to neglect field drains and wipe out them as far as possible. As pointed out earlier the purpose of providing field drains in the command area was not properly understood by most of the farmers in the sample Blocks.

Table 2.1 : Cleaning Field Channels done by the Individual Farmers in the Sample Blocks

| Name & No.of Blocks | No. of reporting cultivators | No. of Plots | Area | Proportion to developed area |
|---|---|---|---|---|
| **Head Blocks:** | | | | |
| Devhari 2 | 1 | 1 | 1.85 | 2.85 |
| Shindi 6 | 2 | 2 | 7.52 | 28.99 |
| Shindi 7 | 2 | 2 | 4.13 | 12.29 |
| Total | 5 | 5 | 13.50 | 3.67 |
| **Middle Blocks:** | | | | |
| Wadaji 6 | 1 | 2 | 9.30 | 12.80 |
| Karab 9 | 3 | 4 | 43.10 | 26.83 |
| Total | 4 | 6 | 52.40 | 16.31 |
| Grand Total | 9 | 11 | 65.90 | 4.84 |

Table 2.2 : Repairs to Field Drains done by the Individual Farmers in the Sample Blocks

| Name & No.of Block | No. of reporting cultivators | No. of Plots | Area | Proportion to developed area |
|---|---|---|---|---|
| **Head Blocks:** | | | | |
| Shindi 7 | 2 | 4 | 15.15 | 45.09<br>4.12 |
| **Middle Blocks:** | | | | |
| Wadaji 6 | 1 | 1 | 1.52 | 2.09 |
| Karab 9 | 1 | 1 | 15.00 | 9.34 |
| Pimperkhed 3 | 1 | 1 | 2.25 | 3.20 |
| Total | 3 | 3 | 18.77 | 5.84 |
| Grand Total | 5 | 7 | 33.92 | 2.49 |

(3) Structures:

The structures built on field channels, field drains and village roads passing through a block are of four types: (1) Outlet of a block; (2) Division boxes; (3) Drops and rapids and (4) Crossings. We will take each of these separately and discuss its present state in brief on the basis of the data collected from the sample blocks.

(i) Outlet:

An outlet is a pucca structure built to draw canal water from a minor or a distributary and to provide it to the Block. It is located at the highest point of sill level, from where canal water can be gravitationally provided to the entire command area of a block. It is generally built with pucca bricks and cement or in stones and cement, and is fixed on murum and foundation. At some places it has steel door affixed to regulate the flow of canal water released in field channels of a block. In some cases measuring units are also fixed to an outlet to measure the quantum of canal water supplied to a block. Thus the outlet comprises an important structure constructed at a starting point of the irrigation system in a block.

The general practice is that every block has to have one outlet. In the sixteen sample blocks, therefore, there should have been sixteen outlets, but we observed during our field visits that two sample blocks viz. Shindi Block No. 7 and Devhari-Nimbhora Block No.5 had no outlets as such. In two other Blocks (Wadaji Block No.6 and Tongaon-Karab Block No.9) additional outlets were provided as these two blocks were larger in area and much elongated in shape. We, therefore, found that as per the prepared plans there were 17 outlets provided to supply canal water to the command areas of the fourteen blocks. Of these seventeen outlets, two (one each

in Wadaji Block No.11 and Tekawade Block No.2) had totally disappeared. In these 2 blocks we observed that the distributary was choked up by putting in stone boulders and farm waste in order to raise the level of water for absorbing it in the field channels. Of the remaining fifteen outlets, four had crumbled down and were not functioning. These four outlets belonged to the four tail-end blocks like Bhatkheda Block No. 6 and Bhatkhande Block No.2 where canal water never reached since their construction. In the course of time they had come down but were at their proper places as per the plans. The rest of the eleven outlets in eight blocks were, however, properly maintained and were functioning satisfactorily. Of the three additional outlets, one was provided in Wadaji Block No. 6 and two, in Tongaon-Karab Block No.9. All the three were in good condition and were in use. Thus, of the seventeen outlets provided in fourteen sample blocks, eleven (eight regular and three additional) were in working order and the rest had become dilapidated and useless.

As mentioned earlier, there was not built-outlet as such in Shindi Block No.7. In this block, we observed that the minor No.12 was running at about 100 to 125 meters on its western side. The canal water from this minor was brought to the block through a R.C.C. PIPE of 9" diameter attached directly to the distributary and was connected to the field channels of the block at its south-west corner after crossing the Shindi-Kolgaon road. The road-crossing was not in proper order and much of canal water was wasted through the road gutter before entering the command area of the block. The case of Devhari-Nimbhora Block No.5 was typical in the sense that there was no fixed and built in

outlet for it, neither a gate nor a pipeline through which canal water from the minor could be received. The tail end of the distributary No.14 at the south-west corner of the block was termed as a tail outlet and canal water was released through it to the command area of the block. As there was no outlet as such there was no control over the supply of water provided to block. Whenever canal water was released for the upper outlets on the distributary No. 14, it flowed down to its tail end and entered the field channels of the block. Thus, these two cases of the blocks having no outlets as such, were typical compared to those in the other sample blocks.

(ii) Division Boxes:

These are provided to divert water from main field channel to subsidiary channels or to various parts of fields in the command area of a block. These are located in such a way that each individual owner can draw water in a controlled manner at the highest point of his field. The boxes have one inlet and two to three outlets as per necessity. The structures are either constructed in situ or by providing pre-cast R.C.F. frames. The structures are founded properly so that they do not get displaced. If necessary pitching is undertaken for a certain length near the division boxes so as to avoid out flanking.

During our field visits our count of the total number of division boxes provided in the sixteen sample blocks came to 181. We observed that, of these, 110 division boxes existed at their proper sites in the blocks when we visited them and the remaining 71, were either destroyed or had disappeared from the blocks, particularly from the tail-end blocks, like Bhatkheda and Bhatkhanda where canal water never

reached. As pointed out earlier the farmers from these blocks had levelled off all field channels from their fields as they did not receive any canal water since their inception. Along with the field channels these farmers had also dismantled the division boxes and had moved away the frames as well. Some of the division boxes from the blocks receiving canal water adequately had also been destroyed or had disappeared from their proper sites. In such cases we observed that the farmers had broken field channel wherever they found it convenient and took canal water directly from it. We found that of the 110 existing division boxes, 50 had broken and did not function properly. Much of canal water passing through them was wasted around them and at some places water had stagnated into pools. Thus, out of the total 181 division boxes provided in the sample blocks, only 60 had remained intact and functioned satisfactorily. That meant that only one-third of the total division boxes in the sample blocks were in good condition and in working order. The rest, about two-thirds were either broken or did not exist. It was surprising that the farmers did not pay adequate attention to the maintenance of even the division boxes through which they received supply of canal water. Negligence of the community items of the land development works, which were common to all farmers in a block, was noticed over all the command areas of the sample blocks.

(iii) Drops and rapids:

As mentioned earlier water courses are aligned on ridge lines and field drains in valley lines respectively on the natural ground slope. It is essential at some places to construct drops for field channels and drains to control the velocity of water and to prevent erosion of lands. The drop structures are generally constructed either with pre-fabricated

material or in Situ, if the bed slope exceeds 0.5 percent in medium deep and deep black soils and 1.0 percent in light and medium soils so that there should be no scouring effect in channels or drains and no portion of the command area is rendered uncommanded. The drops 4 on field channels are generally lined with stone-paving on bed and sides. In the case of field drains, however, the drops are lined with grass soddings on its sides and in bed.

In the sample blocks, the drop structures were provided only in one block viz. : Tongaon-Karab Block No.9. In no other sample block such structures were noticed either on field channels or on field drains. In Tongaon-Karab Block No.9, there were 14 drop structures constructed on the main field channel No.1, which ran south to north across the entire command area of the block which was long in its shape. Of the fourteen drop structures, four had been destroyed and eleven existed in good condition when we visited the block. These drop structures were all built in stone and cement morter and were stone-paved. There was no drop structure provided on any of the field drains in the block.

(iv) Crossings:

At many places, minors, field channels and field drains are required to cross village roads that passed through the command areas of different blocks. These are frequently damaged by road traffic, particularly of village bullock carts. It is, therefore, essential that suitable crossings must be provided on such roads, to allow carts, material or machinery to pass over without damaging water courses or drains. Generally the crossings are R.C.C. pipe crossings with or without head walls on both sides depending upon the location of structure. The head walls and the foundation for pipe crossing are built in stone and cement morter.

In the case of the sample blocks we observed that there were 55 crossings provided in fifteen out of the sixteen sample blocks. In one block viz. Shindi Block No.4 no crossing was required as no village road passed through its command area. Of the total crossings in the fifteen sample blocks, six were on different minors or distributaries; thirty six on field channels; and thirteen on field drains provided in the blocks. We observed that all crossings provided on the minors existed in good condition and well maintained as that was the responsibility of the Department of Irrigation. All of them were constructed with stone and cement morter and were sound in Construction. The head walls constructed on both sides of the crossings were intact and there was no leakage or seepage of canal water passing through them. The present states of the crossings on field channels and drains in the sample blocks, however, left much to be desired. We observed that of the 36 crossings provided on field channels, 22 appeared in good shape while the rest had been either destroyed or did not exist at all at their proper sites. In the case of these non-existant crossings we found that their head-walls and the R.C.C. pipes had disappeared. At present there were only ditches, large at some places, where canal water had stagnated and road traffic had to pass through slush in the ditches. We noticed much wastage of canal water from the field channels which threatened to cause water-logging in the area around. The farmers, however, did not appeared to be concerned about getting these crossings repaired presumably under the impression that their maintenance was the responsibility of the Department of Irrigation. Of the existing 22 crossings in the sample blocks, fourteen

functioned normally and the remaining eight, though in working condition did not appear to be in use. Five of these crossings existed in the tail-end blocks where there was scarce supply of canal water. We observed that some of the crossings in the tail-end blocks were under farm waste materials thrown by the farmers along the two sides of the road. For example in Nipane Block No.4 we noticed that the road gutters were used as pits for farm yard manure and farm waste was dumped in them. Because of such pits two crossings in the block were under the farm waste and were not in working condition at all. The remaining three crossings were from the head and middle zone blocks where canal water was in adequate supply. These crossings were rendered superfluous as the field channels for which these structures were built were diverted by the farmers and the remaining portion of the original field channel levelled off, keeping the crossings constructed on them unused. Thus, of the total 36 crossings built on field channels in the sample blocks, only 14 i.e. a little more than one-third were in regular use, while the rest had either been demolished, had disappeared or rendered non-functioning on account of various reasons.

The case of the crossing built on field drains in the sample blocks was not much different. Of the thirteen such crossings, ten existed and the remaining three had either been destroyed or were not at their proper sites. We observed that the head walls had also disappeared and the R.C.C. pipes had been lifted by the farmers for use of other purposes in their fields. We could not find any trace of these crossings in the blocks, except the ditches, at times full of muddy water, passing through the field drains

and the road traffic had to pass through it. Of the ten existing crossings, seven were functioning, while the rest did not as they were rendered superfluous on account of diversions of the field channels for which they had been constructed. The crossings had been built for the field channels to cross the existing drains in the blocks. When the field channels were diverted and the rest of their portion levelled off, the crossing meant for them had been rendered meaningless. Thus, of the total 13 crossings built on the field drains, seven or slightly more than half were found functioning, though with damaged structures and breakages at many points.

The section on crossing may be concluded with the Statement that only the crossings built on minors were in proper order and maintained satisfactorily. This was so primarily because these were looked after by the Department of Irrigation. The crossings built on field channels and field drains did not receive proper attendence by the farmers. On the contrary they had been destroyed or damaged by them and their materials like R.C.C. pipes and boulder from the head walls were removed and put to private use.

(4) Graded Bunds:

Graded bunds are the small embankments of specified grade, constructed to regulate surface run-off and also to channelise irrigation spill-over. These bunds are meant to protect soil erosion due to rain water or by excessive irrigation. They are not necessary in the areas with a gradient less than 0.5 percent as the run-off does not attain erosive velocity. In the case of the areas having a slope of more than 0.5 percent, graded bunds are aligned

at a vertical interval at 0.9 meter to 1.20 meters and/or with reasonable distance of 45 to 85 meters. Cross section of the graded bund is generally 0.45 $m^2$ irrespective of soil type in which they are constructed. The graded bunds are normally aligned on a grade of 0.2 percent in shallow and medium soils and 0.3 percent in medium and deep soils. The earth required for construction of the graded bunds is generally taken from scrapped material from land shaping and land grading and as such, cutting and filling is shown as 60:40 respectively. This takes care of settling of loose scrapped material and also to fill in local depressions etc. The shrinkage extracted is about 20 percent in the case of shallow and medium soils and 25 percent in the case of medium and deep soils. It is experienced that scouring takes place in medium and deep black soils either due to irrigation water flowing in the field channels or due to rain water flowing through drains. It is difficult to maintain proper sections of these works. The cheapest method for protecting the proper sections of these works, is to provide grass sodding to the field channels, drains and bunds. The waste-weirs to graded bunds are also constructed with grass soddings or stone-pitching to protect the terminals of graded bunds and borders from erosion and for allowing smooth disposal of surface run-off into the field drains. The size of such waste-weirs depends upon the quantum of the run-off. However, generally it is 1.5 meters in length and 3 meters in width.

In the case of the sample blocks we observed that the entire command area had been covered under the programme of contour-bunding executed by the Department of Soil Conservation. In almost all the Survey numbers in the command areas

and in all the sample blocks, contour-bunds were laid down to prevent soil erosion due to surface run-off of rain water and excessive velocity of irrigation flow. The bunds were laid down as per the specifications prescribed by the Department of Agriculture in their prepared plans, but we could not varify them from the present state of the existing bunds as these had undergone a considerable change in their shape, size and section during the considerable period since their construction. We could verify only their alignments, their proper sites and examine whether they existed at their original sites as per the plans or had been shifted in course of the intervening period. During our field visits we observed that many of the bunds levelled off by the farmers as they impeded execusion of different operations of cultivation. We noticed that many of the farmers in the sample blocks were against contour bunding as such and were neither happy with the actual bunds laid down by the Department of Soil Conservation. It appeared that the farmers had not followed the main objective of soil conservation and the purpose of contour-bunding. They were under the impression that bunds should be laid down along the border lines of their farms and not in between the farms. Some of the farmers, therefore, had removed the bunds laid down following countours of the area in between the fields. They, however, had retained only those which formed the borders of their farms but did not exhibit any enthusiasm for their maintenance. We observed that in some of the cases cultivation was done on the bunds and because of the pre-and post-sowing operations that had been carried out for many years, the bunds had lost their section and size in the course of time. Repairs to bunds was apparently

the responsibility of no single individual farmer as the general rule observed by all farmers from the sample blocks was to neglect them. A few farmers, however, had reported carrying out of some repairs to existing bunds in their fields during the year of our enquiry. It may be seen from table 2.3 that only ten out of the total number of 321 farmers from the sixteen sample blocks had reported such repairs of existing bunds in their fields. Of these ten farmers, four were from Tekawade Block No.2, Three, from Nipane Block No.4; and one each from Devhari Block No.2, Devhari-Nimbhora Block No.5 and Pimperkhed Block No. 3. Together they had spent about Rs.5900, giving an average expenditure of Rs.590 each, on such repairs. It appears that these farmers were compelled to repair the bunds in their fields as the breaches developed in them were substantial and if kept unrepaired would have caused exhaustive erosion of their lands. As such the ten cases may have to be considered exceptional in that particular year. Otherwise the farmers in general appeared loath to maintain the bunds in their fields by earthen reinforcement every year to keep up their size and section in requisite order. It therefore, led us to observe that almost all the existing bunds in the sample blocks had warped in their size and section and if not repaired would be razed to surface level in course of time.

Part II : Individual Items:

As mentioned earlier the individual items of land development work are three : (1) Land grading; (ii) land levelling, and (iii) land shaping. These items of land development, however, are not compulsory to all farmers in a block and are executed only with the consent of individual farmer. It is obvious that by their nature

such works could not be common to all. The expenditure incurred on these works are, therefore, charged to the concerned farmers only. As far as the sample blocks were concerned the problem of development of individual holdings was not acute as their command area was made up of level land with a less than one percent slope. In such areas no land development measures like land grading and levelling were necessary. There was therefore, limited need for such land development works in these blocks. There were, however, a few pockets in each of the sixteen sample blocks, where the lands were uneven and steeper with a 2 to over 3 percent gradient and which needed land development measures prior to introduction of irrigation. In such areas the operation of land grading is undertaken. The longitudinal slope is provided at 0.2 percent in shallow and medium soils and 0.3 percent in medium and deep soils. The operation of land shaping is essential in areas falling within the slope group of 0-1 and 1-2 percent. Land shaping involves smoothening of land surface so as to provide one sided longitudinal slope by removing knolls and filling up rills. For uniform spread of water over the entire area, the land has to be brought under a uniform gradient. Though there were no appreciable ridges or gullies in these areas, a little levelling had to be undertaken for undisturbed movement of irrigation water. The operation of land levelling is undertaken in areas where only paddy is grown. Such areas are generally situated in the low-lying fields along the banks of Nalahs, gullies etc. The soils in these areas are clayey and premeability rate is relatively low. In the command of an outlet, levelling is generally carried out on land which has a slope below 1 percent and on levelling final slope of

0.1 percent is provided. There has to be no slope in the cross direction.

In the case of the sample blocks the land development works like land grading and land levelling were carried out with the consent of individual farmers so that uniform application of canal water over the entire command area could be achieved. It was reported that all works of land development in the sample blocks were executed during 1972 to 1975. This meant a period of eight to ten years had already elapsed since the completion of the land development works. In this period the land and the land development works in the command area have undergone considerable change and their verification as per specifications laid down by the Department of Agriculture was not possible as of even date. However we did examine whether the entire land in each survey number of the command area in a block was properly levelled and received adequate supply of canal water from the field channels prepared under the plan.

As mentioned earlier, the supply of canal water was fairly adequate in the head and the middle zone blocks like Wadaji Block Nos. 6 and 11; Shindi Block Nos.4 and 8 and Devhari Block Nos. 2 and 5. During our field visits we observed that the land development works like land grading and levelling completed in these blocks appeared satisfactory as the major portion of their command areas received canal water adequately and the farmers could grow irrigated crops like sugarcane and banana, which needed heavy and regular waterings. However, in these blocks as well, we came across some portions of the command areas where canal water could not reach even though the lands were well

levelled to receive it. In such areas the farmers were required to grow either dry crops or had to make other arrangements like digging a farm well for irrigation. Most of the farmers in these blocks had followed the second alternative. A good example of such cases is provided in the Devhari-Nimbhora Block No.5. We observed that in this block there was a clear cut division of the command area in to two sectors : the western and the eastern, the Devhari-Nimbhora Village road forming a dividing line between the two. It may be seen from the Block that its western sector received adequate supply of canal water; while in the eastern sector, canal water could not reach at all even though the lands were properly levelled and developed to receive it. It was reported that the farmers from the western sector of the block utilized all the canal water released in field channels as they were at the head of the block and prevented the canal water from flowing on to the eastern sector at the tail end of the block. The farmers reported that their portion of lands in the eastern sector did not receive any canal water for many years and led some of them to undertake digging of farm wells for irrigation. However, the land development works like land-grading and land-levelling had not gone waste as such; only the canal water could not reach this sector of the block. We observed that these works had proved helpful to the farmers in this sector also, in the sense that the well water could spread even by over their fields and helped them to grow irrigated crops even though canal water was not made available to them.

It is important to note that we came across, during

our field visits, some pockets of land in the command areas of the head and the middle zone blocks where canal water could not reach at all. These were the ridge portions of lands which were not properly levelled either by the individual farmer or by the Department of Agriculture under the land development scheme. In some of these cases the Department of Agriculture could not undertake and execute the work of land levelling as the farmers concerned did not give their consent for such work. We may see for example the Wadaji Block Nos.6 and 11. It may be noted from Wadaji Block No.11, that the ridge portion, in all the compartments in Survey No.71 of the Block, could not be levelled properly to receive canal water, as the farmers owning the land did not give their consent for land development work. The Department of Agriculture, therefore, could not undertake any work of land levelling or land grading in Survey No.71 and much of its portion situated on a higher level could not be brought within the reach of canal water. The lands in the three compartments of Survey No.71 had to be properly levelled to make for undisturbed and even irrigation of the entire area, but the farmers could not do it themselves; nor did they give their consent to the Department of Agriculture to carry out the operation of land-levelling. As a result the mounds existing in the Survey number could not be smoothened and the land could not be brought under canal irrigation. The farmers, therefore, had to grow dry crops like jowar and groundnut in these portions of the three compartments of Survey No.71. The case of Survey No.244 in Wadaji Block No.6, was similar where the two mounds existing in the two "pot hissas" (Nos.1 and 2) could not be irrigated as canal water could not reach these portions.

The farmers did not level these land properly, nor did they give their consent to the Department of Agriculture to carry out the levelling work. As a result the entire area under these two mounds could not be irrigated and the farmers had to grow dry crops in these areas. When we visited this block the entire area of the two mounds was kept fallow as there were no sufficient rains to grow any dry crop.

It is interesting to observe that in some of the pockets of land in the command areas of the sample blocks, canal water could not reach even though the land-levelling and grading operations were executed and completed by the Department of Agriculture, with the consent of the farmers concerned. Apparently the work of land-levelling was not done properly to receive canal water and the entire area in such pockets had to continue to remain without any irrigation facility. We observed such pockets of land in four sample Blocks: (1) Shindi Block No.4 (Survey Nos.184 and 185); (2) Anturli Block No.4 (Survey Nos. 144, 145, 146 149, 150 and compartment No.5 in S.No.151); (3) Anturli Block No.12 (Survey Nos.27, 28 and 29); (4) Pimperkhed Block No.3 (Survey No.78 - "Pot hissa" No.6A and 6B and Survey No.96 - Compartment Nos. 6 and 7). In all these Blocks the land development works of individual items like land-grading and land-levelling was executed and completed by the Department of Agriculture. The mounds existing in these areas could not be levelled to the extent that the entire area of the survey numbers could have easy and smooth irrigation by canal water. Presently these areas, inspite of theland levelling work carried out by the Department of Agriculture, had remained on a higher plane, where canal

water could not be provided. We found that no individual farmer had tried to level his land further in such portion in order to receive canal water. Instead of undertaking the work of land levelling on their own, some of the farmers had attempted to divert field channel to the ridge portion in his farm and release canal water from that point so that the whole area of their fields could be irrigated.

A good example of such case was observed in Anturli Block No.4. It may be seen from the Block that in Survey Nos. 154 and 145, the field channel 1 laid down under the land development scheme was diverted by the farmers as it could not provide canal water to the ridge portion in the middle of land. We observed that canal water released in FC1 could not reach the middle portion of both the S. Nos. as it was not properly levelled even though the work of land levelling was completed by the Department of Agriculture. The farmers, instead of levelling it further, had devised a short-cut method of diverting the field channel proper to the ridge portion of the land and releasing canal water from that point so that it could cover entire area of the survey numbers. It may be seen from the Block that the farmers had diverted FC1 from the division box No.2 in the South-west corner of Survey No.154 and had taken it to the ridge portion of the land in the middle. It was then turned northwards directly to the middle portion of Survey No.145 and terminated into field drain No. 10 in Survey No.146. As the diverted field channel was taken from the higher plane of land, canal water released from it could irrigate all the areas on its east and west in the two Survey numbers. The cases in the other sample blocks

were similar. In some of the blocks, the farmers, instead of diverting the field channels, had found it convenient to break them at convenient places so that most of the area of their fields could be irrigated. We found that none of the farmers who had given their consent for the individual items of land development, had undertaken further work of land levelling on his own to level his land properly in order to get natural irrigation for his entire area. However, of the farmers who had not given their consent for the land development work, twelve had carried out the work of land levelling in their sixteen plots in the sample blocks (See Table 2.4). We found that the total area of these sixteen plots which were levelled by the farmers themselves came to about 69 hectares and the total expenses incurred by them on this work were around Rs.8500 or about Rs.700/- per farmer on an average. It may be noted that the land-levelling works carried out by these farmers on their own were all done properly and canal water from the existing field channels could reach all over the fields and these farmers could grow crops like sugarcane and banana.

Yet another item of land improvement reported by the farmers in the sample blocks was the effort to improve fertility of soil by adding vergin earth in their fields. Ten farmers in the sample blocks had undertaken this operation during the year of our enquiry in eleven of their plots with an area of 55.60 hectares (See Table 2.5) The total expenses incurred by these farmers amounted to Rs.5000 or Rs.500 per farmer on an average. The farmers reported that by putting additional earth from outside they tried to improve the texture of soil existing in their

Table 2.3 : Repairs to Bunds done by the Individual Farmers in the Sample Blocks

| Name & No.of Blocks | Reporting cultivators | No.of Plots | Area | Proportion to developed Area |
|---|---|---|---|---|
| Head Blocks: | | | | |
| Devhari 2 | 1 | 1 | 3.00 | 4.06 |
| Devhari 5 | 1 | 1 | 7.18 | 7.75 |
| Tekawade 2 | 4 | 4 | 18.08 | 16.60 |
| Total | 6 | 6 | 28.26 | 7.69 |
| Middle Blocks: | | | | |
| Pimperkhed 3 | 1 | 1 | 3.00 | 4.27 |
| Total | | | | 0.93 |
| Tail-end Blocks: | | | | |
| Nipane 4 | 3 | 3 | 14.62 | 4.59 |
| Total | | | | 2.17 |
| Grand Total | 10 | 10 | 45.88 | 3.37 |

Table 2.4 : Land Levelling done by the Individual Farmers in the Sample Blocks

| Name & No.of Blocks | Reporting cultivators | No. of Plots | Area | Proportion to developed Area |
|---|---|---|---|---|
| Head Blocks: | | | | |
| Devhari 2 | 1 | 2 | 6.30 | 9.71 |
| Devhari 5 | 1 | 2 | 13.12 | 14.15 |
| Shindi 8 | 2 | 2 | 2.82 | 36.62 |
| Tekawade 2 | 3 | 3 | 16.69 | 15.32 |
| Total | 7 | 9 | 38.93 | 10.59 |
| Middle Blocks: | | | | |
| Karab 9 | 1 | 1 | 15.42 | 9.60 |
| Pimperkhed 3 | 1 | 1 | 2.93 | 4.17 |
| Total | 2 | 2 | 18.35 | 5.71 |
| Tailend Blocks: | | | | |
| Anturli 12 | 1 | 1 | 1.72 | 3.74 |
| Nipane 4 | 2 | 4 | 9.79 | 3.07 |
| Total | 3 | 5 | 11.51 | 1.71 |
| Grand Total | 12 | 16 | 68.79 | 5.05 |

Table 2.5 : Putting Additional Earth in Fields by the Individual Farmers

| Name & No.of Block | Reporting cultivators | No. of plots | Area | Proportion to developed area |
|---|---|---|---|---|
| Head Blocks: | | | | |
| Devhari 2 | 1 | 2 | 4.50 | 6.93 |
| | | | | 1.22 |
| Middle Blocks: | | | | |
| Karab 9 | 3 | 3 | 24.33 | 15.14 |
| Pimperkhed 3 | 2 | 2 | 4.55 | 6.48 |
| | 5 | 5 | 28.88 | 8.99 |
| Tailend Blocks: | | | | |
| Nipane 4 | 4 | 4 | 22.30 | 6.00 |
| Total | | | | 3.31 |
| Grand Total | 10 | 11 | 55.68 | 4.09 |

fields, which deteriorated year by year due to continuous application of fertilisers and irrigation for cultivation of crops like Sugarcane and banana. Except these two items- land levelling and putting additional earth in fields - no other work of land improvement was reported by the individual farmers in the sample blocks.

During our field visits, we observed that the land development works like land-grading and land-levelling had been completed in the tail-end blocks as well. These, however were never put to any test as canal water could not reach these blocks or could not be supplied in sufficient quantum to cover all the command areas. We, therefore, could not observe the extent of coverage of land coming under canal water in these blocks. We could not observe whether the entire command areas could get natural irrigation from the already constructed field channels. In fact, as we have mentioned earlier, most of the field channels in these blocks were levelled up by the farmers, as canal water was never supplied through them, and the entire money spent on such works appears to have been wasted. In the case of the individual items of land development, however, one could not say that the amount spent on such works was a total waste as the farmers, though they could not avail themselves with the supply of canal water, had benefitted from the land improvement works like land-levelling and land-grading carried out under the land development scheme. They could irrigate their land from their wells more efficiently and could grow crops like sugarcane and banana. Besides, soil erosion of their lands was brought under control though not stopped completely. It may be seen from the Bhatkhada Block No.6 that many of the farmers had dug wells in their fields. Many of them used field channels prepared for canal water, to carry water from their wells

to different portions of their fields. The works of land-levelling and land-grading carried out ~~kk~~ under the land development scheme had greatly facilitated their well-irrigation. We observed that many of the farmers in this block could grow crops like sugar-cane and banana and irrigate them from their farm wells. Thus in the tail-end blocks the land development works like land-levelling had benefitted the farmers to a considerable extent, even though canal water could not be supplied to them.

Summary:

Land development work is divided into two Parts according to priorities. Part I provides for the community items of work like field channels, field drains, division boxes, and crossings etc. Part II provides for items on individual farms, such as land-levelling, grading and shaping etc. The community items are common and are obligatory to all farmers in the command area of a block. The expenditure incurred on them is charged to individual farmers in proportion to his land included in the command area. The items included in Part II are not compulsory to all farmers. Those are executed only with the consent of ~~&~~individual farmer in his field. Its expenditure, therefore, is charged to those farmers only.

In the case of the Girna Project, all the land development works were executed and completed during the period from 1965 to 1976. This means that about 5 to 15 years had already elapsed and one could not expecte all the works to retain their original shape, standard and quality. All of them must have changed in course of time and their details could not be verified, after the lapse of so many

years, with the specifications prescribed by the Department of Agriculture. We could, however, verify whether the works completed existed as per their construction plan. We could also examine their present state and see how far these were maintained by the farmers in the command area. We feel that even this type of verification would be interesting and indeed revealing.

From the sixteen sample blocks we gathered, that all the farmers having their lands in the command areas had felt free to tamper with the scheme for each individual's own benefit. During our field visits to the sample blocks we noticed that the farmers had obstructed even the distributary to raise its water level and to divert its water directly into their fields. At some places they had breached the distributaries even. ~~Research~~ Breaches in the field channels in all the sample blocks in the head and the middle zones of the distributary were common. We observed that the farmers had broken and diverted, the existing field channels at a number of places convenient to them for irrigating their lands. At some places the field channels were extended to irrigate even the uncommand areas in the adjoining lands or the command areas of the adjoining blocks. Some of the field drains were also used as field channels to carry canal water to their fields. In the tail-end blocks, where canal water could not reach, field channels constructed under the scheme were levelled off and the land under them was brought under field cultivation. The structures like outlets, division boxes, and drops etc. were not maintained in order and at many places these were either broken, damaged or were completely demolished and had disappeared from their proper sites. We observed that at

many places, road crossings did not exist at all and canal water could not reach lands on the other side of crossings. The field drains in the sample blocks were the most neglected item of the land development works. It appeared that the objective and importance of providing field drains in the scheme was hardly perceived by the farmers. We found that field drains in the sample blocks had lost their section, shape and size and were overlaid by wild grass and thorny bushes. In the case of graded bunds we observed that many of them were removed by the farmers as they found that these impeded execution of different operations of cultivation. Almost all bunds in the sample blocks were reduced in section and were not maintained. The works of land-levelling and land-grading were not properly done in some pockets of land and some of the farmers instead of levelling the land further, preferred to divert field channel proper to the ridge portion of their lands and release canal water from that point to irrigate entire area of their fields. On the whole it appears that the community items of land development were just not attended to by the farmers in the command areas. The fact of the case is that it was a common responsibility of all the farmers in each block to look after and attend to the upkeep of their field channels, field drains and structures upon them but we observed that scarce attention was paid by any one as regards these items and they were the most neglected ones in all the sample blocks. Suprisingly even the minors were not properly maintained by the Department of Irrigation. As a result of all these we found that there was considerable wastage of canal water all over the command areas in the sample blocks.

# CHAPTER III

## COST BENEFIT ANALYSIS OF LAND DEVELOPMENT

In this chapter we attempt to evaluate the benefits from land development works, accrued to the sample farmers in the command area. Evaluation of land development works may be done from two points of view: (a) firstly, we are interested in the returns to the capital that the individual financial entities contribute and we determine it through financial analysis; (b) Secondly, we are also interested in the total returns to the whole society or economy of all the resources committed to the project regardless of who in the society receives the benefits. This would be the economic analysis of the project. In the following we attempt to discuss the results of both the types of analysis - financial as well as economic and compare the expost achievements with the ex-ante assumptions made at the time of the sanction of the land development scheme.

### 3.1 Command and Outside Command Area

The total land occupied for cultivation by the 321 sample farmers in the 16 sample irrigation blocks was 2486 acres. However, all the land cultivated in the villages was not covered by the Girna canal and therefore, all the cultivated land of the sample farmers was not under command of the canal system. This was because parts of the land of certain villages were topographically too high for canal water to reach there by gravity flow. Of the 2486 acres of the total cultivated land of the sample farmers, only 1945 were under command of the canal which means that the canal system was designed to be able to deliver water to this area of land. The rest of the cultivated land of the sample farmers was outside canal command though some of it may be irrigated by other sources of irrigation.

It may be noted from Table 3.1 that in most of the sample irrigation blocks, the proportion of the area under command to the total land was more than 70 per cent. In two of the sample blocks (Wadaji Block No. 11 and Anturli Block No.4), the entire land was reported under command of the canal system. As against this, in two other Sample Blocks (Shindi Block No. 8 and Anturli Block No. 12), the proportion of the area under command to the total land was as low as 31.12 and 44.41 per cent respectively. The proportion of area outside the canal command to the total land in these two Blocks was obviously quite high. Another point to be noted is that higher the size of the total land holding, higher is the proportion of area outside the canal command (see Table 3.2). In the case of the smaller land holdings of less than two acres, there was no area outside canal command reported in any of the sample blocks. The average area of the total land holding per farmer in the sample blocks was about 7.74 acres. It included command area as well as the area outside canal command. When we separated the two, the average area of the land under command per farmer came to about 6 acres, and that of the outside land, to 1.68 acres.

It is important to note that all the land occupied by the farmers for cultivation was not necessarily fit for cultivation in all the sample blocks. A small portion of the total land could not be put under any cultivation and is called in revenue paralance as permanent fallow land. Such land was not fit for any cultivation because it was too rocky or otherwise unfit for cultivation through normal methods of land development. About 48.57 acres of the total land occupied for cultivation by the sample farmers was of this type. But most of this land - 46.72

acres - was in the portion under command of Girna canal and only 1.85 acres were outside the canal command. Therefore, out of the 1945.33 acres of land of the sample farmers under canal command, 1898.61 acres were fit for cultivation under irrigation.

Before proceeding to examine the nature of irrigation of this irrigable land it is useful to note that not all blocks and all farmers had equal proportions of their cultivated land within canal command. Though about 78 per cent of the cultivated land of the sample farmers was under canal command, this proportion was somewhat less in some blocks and more in others. A more interesting feature is that the small farmers had a larger percentage of their land under canal command. Table 3.2 shows that the smallest farmers, with 2 acres or less had all their land under command; the percentage steadily increased to more than one-third (34.05 per cent) of the total land of the biggest cultivators with more than 15 acres each. Of course not all farmers in a group had equal parts of their holdings outside the command. But here also a larger proportion of the bigger farmers had some part of their land outside the command. Thus, while 16.5 per cent of the sample farmers with 2.01 to 5 acres each had some part of their holding outside canal command, in the case of the biggest size class of cultivators i.e. more than 15 acres, this percentage was 50. The reason is that the small holders are small through the process of sub-division for generations, and they have therefore land in the lower levels in the village, which must have been the first to be cultivated when the village was settled. Naturally, also those with larger holdings have a larger proportion of their land located at relatively upper levels and

Table 3.1 : Command and Outside Command Area in the Sample Blocks

| Name and No. Sampled irrigation Block | | No. of Sample farm holdings | Total area occupied for cultivation by the sample farmers | Area under command of Girna Canal | Proportion to total area | Area outside command of Girna Canal | Proportion to total area | Average size of cultivated holding | Average size of holding area under canal command | Average size of holding area outside canal command |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Devhari | 2 | 15 | 98.35 | 85.40 | 86.83 | 12.95 | 13.17 | 6.56 | 5.69 | 0.86 |
| Devhari | 5 | 16 | 126.75 | 110.25 | 86.98 | 16.50 | 13.02 | 7.92 | 6.89 | 1.03 |
| Shindi | 4 | 4 | 37.03 | 33.71 | 91.03 | 3.32 | 8.97 | 9.26 | 8.43 | 0.83 |
| Shindi | 6 | 16 | 74.39 | 56.89 | 76.48 | 17.50 | 23.52 | 4.65 | 3.56 | 1.09 |
| Shindi | 7 | 10 | 44.50 | 37.00 | 83.15 | 7.50 | 16.85 | 4.45 | 3.7 | 0.75 |
| Shindi | 8 | 12 | 115.92 | 36.07 | 31.12 | 79.85 | 68.88 | 9.66 | 3.01 | 6.65 |
| Tekawale | 2 | 33 | 280.25 | 200.11 | 71.40 | 80.14 | 28.60 | 8.49 | 6.06 | 2.43 |
| Wadaji | 6 | 30 | 207.52 | 159.92 | 77.06 | 47.60 | 22.94 | 6.92 | 5.33 | 1.59 |
| Wadaji | 11 | 2 | 17.83 | 17.83 | 100.00 | - | - | 8.92 | 8.92 | - |
| Tonagaon Karab | 9 | 25 | 223.48 | 195.98 | 87.69 | 27.50 | 12.31 | 8.94 | 7.84 | 1.10 |
| Pimperkhed | 3 | 27 | 149.65 | 117.75 | 78.68 | 31.90 | 21.32 | 5.54 | 4.36 | 1.18 |
| Anturli | 4 | 16 | 164.30 | 164.30 | 100.00 | - | - | 10.27 | 10.27 | - |
| Anturli | 12 | 9 | 121.92 | 54.14 | 44.41 | 67.78 | 55.59 | 13.55 | 6.02 | 7.53 |
| Bhatkheda | 6 | 14 | 146.60 | 109.08 | 74.41 | 37.52 | 25.59 | 10.47 | 7.79 | 2.68 |
| Bhatkhanda | 2 | 20 | 153.22 | 149.72 | 97.72 | 3.50 | 2.28 | 7.66 | 7.49 | 0.18 |
| Nipane | 4 | 72 | 523.84 | 417.18 | 79.64 | 106.66 | 20.36 | 7.28 | 5.79 | 1.48 |
| Total | | 321 | 2485.55 | 1945.33 | 80.59 | 540.22 | 19.41 | 7.74 | 6.06 | 1.68 |

Table 3.2 : Command and Outside-command Land According to Size of Cultigation Holding in the Sample Blocks

| Size of cultivated holdings | No. of sample farmers | Total cultivated area | Average area per farmer | Cultivated area under canal command | Average area under canal command | No.of farmers having cultivated land outside canal command | Area cultivated outside canal command | Average cultivated area outside canal command | Land outside command as per cent of total cultivated land |
|---|---|---|---|---|---|---|---|---|---|
| Upto 1.00 acre | 7 | 5.08 | 0.73 | 5.08 | 0.73 | - | - | - | - |
| 1.01 to 2.00 acres | 29 | 47.56 | 1.64 | 47.56 | 1.64 | - | -- | - | - |
| 2.01 to 5.00 acres | 109 | 394.03 | 3.61 | 353.78 | 3.25 | 18 | 40.25 | 2.24 | 10.21 |
| 5.01 to 7.50 acres | 53 | 326.13 | 6.15 | 266.51 | 5.03 | 15 | 59.62 | 3.97 | 18.28 |
| 7.51 to 10.00 acres | 42 | 372.66 | 8.72 | 329.18 | 7.84 | 7 | 43.48 | 6.21 | 11.66 |
| 10.01 to 15.00 acres | 49 | 576.05 | 11.76 | 439.34 | 8.97 | 19 | 136.71 | 7.20 | 23.73 |
| Above 15.00 acres | 32 | 764.04 | 23.87 | 503.88 | 15.75 | 16 | 260.16 | 16.26 | 34.05 |
| Total | 321 | 2485.55 | 7.74 | 1945.33 | 6.06 | 75 | 540.22 | 7.20 | 21.73 |

therefore run the risk of being left out of the reach of gravity flow of canals.

We now turn to the land under command of the canal. It may be seen from Table 3.2 that the total cultivated area under canal command was around 1945.33 acres, of which 1898.61 acres were irrigable. The rest about 46.72 acres were not irrigables, because of various reasons. Out of total irrigable cultivated land of 1898.61 acres, only half (938 acres i.e. 49.43 per cent) was actually receiving canal water at the time of our survey and the remaining half was unirrigated. The unirrigated area was mainly reported in the tail-end Blocks like Anturli, Nipane, Bhatkheda and Bhatkhanda. In these blocks the land development works were all completed but canal water never reached these lands. It appears that according to the capacity of the Girna reservoir canal water could be provided to the lands in these blocks and so these were included under the command of the canal water. However, the excessive use of canal water by the farmers in head blocks, canal water could not be allowed to flow down to the lands in the tail-end blocks. The lands in these blocks, therefore, have remained dry in spite of all the land development works carried out in order to receive canal water. Thus, the irrigable command area is different from the culturable command area. The culturable command area is the area that can receive irrigation water because of location vis-a-vis the canal, and canals including water courses are prepared to carry water up to the heads of all these lands. All these lands, however cannot get water every year because given the capacity and normal storage in the reservoir and the annual crop pattern expected in the area under irrigation, the total water would

be insufficient to provide irrigation to such crops on all the culturable command area in a year. Therefore irrigation facility is provided to only a pair of the culturable command area and this is called irrigable command area. The irrigable command area however, is not a physically fixed part of the culturable command area - the physical plots can change from year to year, though the total irrigable command area is given. Because of this water course land development is expected to be done on the entire culturable command area. For the Girna canals as a whole the culturable command area was around 2.19 lakh acres while the irrigable command area was about 1.53 lakh acres.

In the case of the sample blocks not all the irrigable cultivated land of all the farmers was originally fit to receive canal water from the water courses. Due to undulating surface or excess slope or gradiant some of the plots had to be levelled and developed before water from the water courses could be expected to flow freely on the entire surface of the plots. Out of the total of 1898 acres of the command land in the sample blocks, 1451 acres of land i.e. 76.4 per cent needed land development work to make land fit for flow irrigation from canal. The remainder was level enough land to receive water from the water courses without difficulty. The cultivators were expected to prepare their land on their own for the purpose. But since they did not, funds were made available by the banks as loans to cultivators but paid to the State Land Development Corporation to execute the development work on these lands and recover the loan from the farmers subsequently. The work of land development had ostensibly been completed in this area by the time of our survey in 1980-81 but the

following break up shows what had actually happened :

| | |
|---|---|
| (1) Developed and irrigated area | 668.85 acres |
| (2) Developed area not receiving canal water (i.e. in effect developed dry land) | 652.94 acres |
| (3) Command area needing land development but not developed hence unirrigated | 129.61 acres |
| Total | 1,451.30 acres |

It may be noted that of the total area of 1451 acres which needed land development works to receive canal water, 1322 acres or more than 90 per cent were developed. In these lands the works like land levelling, land shaping etc. were completed and these were made fit to receive canal water. A small area of 129 acres i.e. 9 per cent of the total, needing such land development, remained undeveloped till our survey work. In these lands land development works were not carried out either by the land owners or by the Department of Agriculture and this portion of the command area had remained without any irrigation facility. It was reported that the cultivators of these lands did not give their consent to the Government Agency to undertake the land development works in their lands. They were of the opinion that the land development work carried out through the Department of Agriculture was rather costly and not of good quality. They therefore wanted to develop their lands on their own, but had not done it till our survey work. Another important point to be noted from the above classification is that about half of the developed land, 652.94 acres or about 49.40 per cent of the total developed area in the sample blocks, had remained without irrigation facility even after completion of the land development works. As pointed out

earlier such developed lands were mainly from the tail-end blocks where canal water had never reached. It was reported that the canal water was all used/misused in the head and middle blocks and it was never allowed to flow down to lands in the tail-end blocks. We observed that there was much excessive supply of canal water to the lands in the head blocks. In fact there was large amount of waste of canal water in the head blocks, because of which we found that the streams and nallahs in these areas were flowing throughout the year and excess water from the fields ran to the lower portion of the Girna river. If the farmers in the head and the middle blocks were forced to make proper use of canal water, the developed lands in the tail-end blocks would also receive sufficient amount of water to grow irrigated crops.

## 3.2 Costs and Benefits of Land Development

We now turn to examine the benefits and costs of the specific land development measures to the farmers, in order to see if the benefits were commensurate with the cost and if they enabled the farmers to service the loans. Now the costs of land development work carried out on the lands by the Land Development Corporation are clear and specific. These costs are of two types: the Part I i.e. the communal costs included the cost of construction of water courses which take water from outlets on distributory or minor to the head of every individual field, field drains providing outlets for the excess irrigation water, and bunds constructed to check soil erosion, etc. (which were compulsory for all cultivators in the command area). The Part II costs included individual items like the work of land development levelling, grading and shaping undertaken to achieve smooth and easy spread of irrigation water on the

field. These data are presented in Table 3.3, row 1, for the 1321.79 acres of land of the sample farmers developed during the period of 40 months from 29.3.1972 to 31.7.1975. It may be remembered that the land development works completed during this period only were refinanced by the ARDC.

Table 3.3 : Cost of the Land Development Works Carried Out During 1972-75 on the Command Area in the Sample Blocks

| Item | Part I (Community) | Part II (Individual) |
|---|---|---|
| 1. Total cost incurred during 1972-75 (including establishment charges) | 1,22,322.86 | 93,694.37 |
| 2. Cost adjusted to 1980-81 wages of field labour | 2,44,645.72 | 1,87,388.74 |
| 3. Annual cost at 9% interest (Recovery period 8 years) | 52,576.37 | 40,225.27 |
| 4. Annual cost per acre of the developed land | 39.72 | 30.43 |

This cost of land development of Rs.2.16 lakhs (Rs.1.22 lakhs on Part I items and Rs.0.94 lakhs on Part II items of land development), incurred over a period of more than three years, 1972-75, does not include the interest on parts of this capital locked up without returns for different durations of the three year period. Properly speaking the actual cost of this capital work at the end of the period in 1975 would be higher than the stated figure, if this interest is calculated. But since we know nothing about the pattern of this expenditure, we shall ignore this interest part and put the total cost at the end of the period in 1975 at Rs.2.16 lakhs, valued at 1973-74 prices, the middle of the three year period.

The returns due to this capital investment should be

valued at prices comparable to the prices at which the cost is valued. This would require that either the benefits are expressed on 1973-74 prices (at which, we presume the costs are valued) or the costs are revalued at prices for the period at which the returns are to be valued. Our survey of farm costs and returns express these in 1979-80 prices. Therefore we think it more convenient to express the land development costs at 1979-80 prices in order to express the two at comparable prices. The bulk of the expense of land development work is labour cost. Therefore, we have expressed the total cost of land development at the end of 1975 at 1980-81 prices, in row 2 of Table 3.3, by using the index of wages of field labour in Bhadgaon block available in the Socio Economic Review and the Statistical Abstract of Jalgaon District.[1] These wages had reportedly doubled between 1973-74 and 1979-80.

The above calculations give us the cost of land development work carried out in our sample blocks in 1979-80 prices. This comes to Rs.2.44 lakhs for community items and Rs.1.87 lakhs for individual items of land development work. The Bank stipulated that the loan, at 9 per cent rate of interest was to be repaid over a period of ten years, out of which the first two years the bank shall not insist upon payment of any instalments of principal and interest. This grace period, however, implies that the unpaid interest will be compounded over these two years after which the Bank expects the amount to be repaid in equal annual instalments over the next eight years. This means the Bank expected that the benefits from the land development work would get stabilised within the period

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1 Socio-Economic Review and District Statistical Abstract of Jalgaon District, 1979-80: Directorate of Economics and Statistics, Government of Maharashtra, Bombay, p. 61.

of two years and the farmers would be able to repay their loans with interest from the third year onwards. The period of two years is considered as the minimum period required for stabilization of benefits accrued from the land development work and there appears to be no need to elongate this initial grace period permitted for repayments. We have no estimate of the magnitude of the benefits accrued in the prestabilization stage as we had not collected such data for the grace period of two years. But our impression is that the benefits must have been comparatively lower in this period as cultivators do require some period to set their cropping pattern after the land development work and to switch on their cultivation activity in a different gear particularly after receiving irrigation water.

It may be seen from Table 3.3 that the land development costs, calculated at 1979-80 prices after compounding at 9 per cent interest over two years of grace period are given in row No. 3 of the table. The last row of the same table (row 4) gives per acre cost of the two parts of land development work, by dividing the calculated total cost in row 3 by 1321.79 acres which was the total area over which this cost was incurred. It comes to Rs.39.72 per acre for Part I costs and Rs.30.43 per acre for Part II costs. The beneficiaries may be expected to pay these costs per acre of developed land for eight consecutive years, if repayment begins in 1982-83.

Attention may now be turned to the calculating of benefits or returns to farmers due to this land development work on their lands. Here it is necessary to remind ourselves that though the land development work was carried out to facilitate irrigated cropping on the lands,

in fact we found that half of these developed lands could not receive irrigation water. In the case of these developed but unirrigated lands the net benefit can only be the difference that land levelling and shaping would make to crop pattern and production under dry conditions. We first propose to compare the net returns per acre to the farmers on the developed unirrigated land with that on the undeveloped and unirrigated land of the sample farmers.

The data in Table 3.4 presents the total as well as per net cultivated acre cost of production, gross and net value of output per acre from the developed but unirrigated lands in the sample blocks. The methods of calculating the costs and returns are described in Appendix 3.2 to this chapter. The costs and returns relate to the year 1980-81 and are expressed in 1980-81 prices. It may be noted here that the reference year of 1980-81 was a climatically normal year. For that matter the entire area of the Girna project lies in the assured rainfall zone and as such the sensitivity of benefits of land development to variation in rainfall was minimum. It may be seen from Table 3.4 that the net income (gross value of output - total costs including family labour expenses) came to Rs.560.60 per net cultivated acre of developed dry land. From this, the estimated net income from such land under unirrigated and undeveloped conditions has to be deducted to give us the net annual incremental income that may be attributed to land development work on these lands.

We have two types of undeveloped unirrigated land in our sample: one lot of 129.51 acres is within the canal command area, needing development but not developed and

Table 3.4 : Net Returns per Acre on the Developed Dry Land in the Command Area of the Sample Blocks

| Items | Total Cost Rs. | Cost per acre |
|---|---|---|
| 1) Cost of Cultivation : | | |
| i) Hired human labour | 1,04,048.00 | 150.69 |
| ii) Bullock labour | 45,468.00 | 65.85 |
| iii) Seeds | 35,226.00 | 51.02 |
| iv) Manures | 1,00,726.00 | 145.88 |
| v) Fertilizers | 1,97,970.00 | 286.71 |
| vi) Land revenue | 3,663.00 | 5.61 |
| vii) Depreciation, repairs on agricultural implements | 4,267.00 | 6.18 |
| viii) Interest on crop loans | 1,745.00 | 2.53 |
| Total | 4,93,113.00 | 714.47 |
| ix) Family labour | 52,549.00 | 76.10 |
| Total Cost | 5,45,662.00 | 790.57 |
| 2) Value of production : | | |
| i) Main produce | 7,67,430.00 | 1111.44 |
| ii) By products | 1,65,530.00 | 239.73 |
| Total value | 9,32,960.00 | 1351.17 |
| Net Returns per acre | 3,87,298.00 | 560.60 |

not irrigated; the other is the unirrigated undeveloped land of the sample farmers outside the command area, amounting to about 542 acres. These lands are, however, by and large, of different quality. The dry undeveloped land outside command is mainly of poorer soil, while the undeveloped dry land within the command is somewhat

better land, comparable to the developed dry land in the command. This is reflected in the poor value of gross production per acre on the undeveloped dry land outside the command, Rs. 790 as against Rs.1145 worth of produce per acre on the undeveloped dry lands within the command (see Tables 3.5 and 3.6). Therefore, the proper land to compare with the unirrigated but developed land within command would be the undeveloped dry within command. The latter's cost and returns would give a fair indication of what would have been produced on the developed dry land in the absence of the land development work. The net income per net cultivated acre of undeveloped and unirrigated land within command was Rs.459.33 only at 1980-81 prices. This means that land development alone without irrigation helped to increase the net income per acre by about Rs.101, at 1980-81 prices.

As stated earlier the land development works were undertaken in order to facilitate smooth and even irrigation on the entire area under command. All the area under command could not be irrigated as the land development works were not done at all or were not properly done in certain pockets. But wherever land development works were completed and irrigation was provided the net benefits accrued to the farmers were certainly of a higher order. However, the benefits accrued due to irrigation and due to the land development works could not be separated. The total benefits of the two taken together had to be calculated as the incremental income on the developed irrigated land was the total effect of both of them. It may be noted from Table 3.7 that the net returns per acre on the developed irrigated land were higher by as high as Rs. 1711. The net returns per acre on the developed

irrigated land were higher by Rs. 566 than that on the developed unirrigated land.

### 3.3 Cost-Benefit Ratio of Land Development

The net incremental income stated above may be compared with the cost of land development calculated in the earlier section. Taking both, Part I and Part II costs of land development together, we find it is about Rs.70/- per acre. The cost of land development therefore is less than the incremental income due to it. The B/C (benefit/cost) ratio may be said to be 1.44. This would suggest that the cultivators should be in a position to service the loan. In fact these calculations may be said to understate benefits in one way: the benefit is expected to be for long periods, since there is no reason to assume any deterioration in the state of the land if it is subject to normal agricultural practices, while our annual cost is estimated to be for eight years only. Of course, one can say, not without some justification, that the difference between the development cost and net incremental income (Rs.34/-) is too small, not to disaffer in years of poor crop production or due to unfavourable changes in prices of inputs and outputs. The most that can, therefore, be said under such condition is that the cultivators may be able to just cover the cost, without being left with any surplus whatsoever. Therefore, the actual repayment performance of the farmers in the sample Blocks was not satisfactory (see Table 3.8). It may be seen from the table that only 7 per cent of the total loan borrowed for the land development works were repaid till March 1982. This shows that the repayment performance was very poor. It was so, not because that the

Table 3.5 : Net Returns per Acre on the Undeveloped Dry Land in the Command Area of the Sample Blocks

| Items | Total Cost Rs. | Cost per acre |
|---|---|---|
| 1) Cost of Cultivation : | | |
| i) Hired human labour | 25,013.00 | 167.65 |
| ii) Bullock labour | 8,321.00 | 55.77 |
| iii) Seeds | 8,372.00 | 56.11 |
| iv) Manures | 18,353.00 | 123.00 |
| v) Fertilizers | 29,994.00 | 201.03 |
| vi) Land revenue | 539.00 | 5.34 |
| vii) Depreciation, repairs on agricultural implements | 774.00 | 5.19 |
| viii) Interest on crop loans | 385.00 | 2.58 |
| Total | 91,751.00 | 614.95 |
| ix) Family labour | 10,550.00 | 70.71 |
| Total Cost | 1,02,301.00 | 685.66 |
| 2) Value of Production : | | |
| i) Main produce | 1,51,587.00 | 1016.00 |
| ii) By products | 19,245.00 | 128.99 |
| Total | 1,70,832.00 | 1144.99 |
| Net Returns per acre | 78,531.00 | 459.33 |

Table 3.6 : Net Returns per Acre on the Dry Land Outside the Canal Command Area in the Sample Blocks

| Items | Total Cost Rs. | Cost per acre |
|---|---|---|
| 1) Cost of Cultivation : | | |
| i) Hired human labour | 52,770.00 | 125.83 |
| ii) Bullock labour | 29,848.00 | 71.17 |
| iii) Seeds | 12,810.00 | 30.55 |
| iv) Manures | 5,780.00 | 13.78 |
| v) Fertilizers | 49,858.00 | 118.89 |
| vi) Land revenue | 2,118.00 | 5.05 |
| vii) Depreciation, repairs on agricultural implements | 994.00 | 2.37 |
| viii) Interest on crop loans | 985.00 | 2.35 |
| Total | 1,55,163.00 | 369.99 |
| ix) Family labour | 23,347.00 | 55.67 |
| Total Cost | 1,78,510.00 | 425.66 |
| 2) Value of Production : | | |
| i) Main produce | 2,76,963.00 | 660.43 |
| ii) By products | 54,523.00 | 130.01 |
| Total Value | 3,31,486.00 | 790.44 |
| Net Returns per acre | 1,52,976.00 | 364.78 |

farmers did not have capacity to repay but because they were most unwilling to repay. Many of the sample farmers reported that they were unwilling to repay the borrowed loans as they were not happy with the quality of the land development works completed in their lands.

There was another important point which could be made with some justification in the case of the farmers who could not get canal water to their lands in the command area. Since they are unable to get water to their fields, there is no justification in their being required to bear the full capital cost of the land development work, a part of which is necessary only to carry water upto the field head and to drain out excess irrigation water (the socalled Part I costs). The only cost they may properly be required to bear is the Part II cost which was for levelling and shaping their lands. If we take only that cost (Part II) into account the net ratio of the incremental income to cost is Rs. 100:30.7 or a B/C of 3.29. Indeed, it should be more justifiable to ask farmers to pay only this Part II annual cost for eight years. The state should bear the Part I cost, since it is the State's responsibility to provide irrigation water to the farmers. Looked at differently, one finds, a tremendous wastage in capital investment (Part I for these farmers) due to failure of the irrigation authorities to provide water to these developed fields.

Table 3.7 : Net Returns per acre on the Developed Irrigated Land in the Command Area of the Sample Blocks

| Items | Total Cost Rs. | Cost per acre Rs. |
|---|---|---|
| 1) Cost of Cultivation : | | |
| i) Hired human labour | 1,90,960.00 | 191.46 |
| ii) Bullock labour | 90,828.00 | 91.07 |
| iii) Seeds | 1,71,207.00 | 171.66 |
| iv) Manures | 82,996.00 | 83.21 |
| v) Fertilizers | 3,66,520.00 | 367.49 |
| vi) Water charges | 34,920.00 | 35.01 |
| vii) Land revenue | 23,164.00 | 23.23 |
| viii) Depreciation, repairs on agricultural implements | 26,579.00 | 26.65 |
| ix) Interest on crop loans | 7,525.00 | 7.54 |
| Total | 9,94,699.00 | 997.32 |
| x) Family labour | 1,07,192.00 | 107.47 |
| Total Cost | 11,01,891.00 | 1104.80 |
| 2) Value of Production : | | |
| i) Main produce | 27,45,800.00 | 2753.04 |
| ii) By products | 62,610.00 | 62.78 |
| Total Value | 28,08,410.00 | 2815.82 |
| Net Returns per acre | | 1711.02 |

Table 3.8 : Repayment of Loans by the Farmers in the Sample Blocks till March 1982

| Block and Zone | Development loan Rs. | Repayment by farmers Rs. | % | Outstanding amount as on 31st March 1982 | | |
|---|---|---|---|---|---|---|
| | | | | Principal Rs. | Interest Rs. | Total Rs. |
| Blocks at the head zone | 55,083.54 | 2,685.52 | 4.88 | 52,397.02 | 19,028.52 | 71,425.54 |
| Blocks at the middle zone | 1,02,389.02 | 9,410.91 | 9.19 | 92,978.11 | 30,030.60 | 1,23,008.71 |
| Blocks at the tail end | 87,750.65 | 4,893.58 | 5.58 | 82,857.07 | 21,164.27 | 1,04,021.34 |
| Total | 2,45,223.21 | 16,990.01 | 6.93 | 2,28,233.20 | 70,223.39 | 2,98,456.59 |

## APPENDIX 3.1

### Cropping Pattern in the Command and Outside the Command Area in the Sample Blocks

Cropping pattern depends mainly on two factors : (1) type of land and (2) availability of irrigation. The cropping pattern followed on dry lands is way different from the lands having irrigation facility. It also differs if the land is of light soil, or medium black soil or of deep black soil. Similarly the cropping pattern is different if the land is developed and can be smoothly irrigated from the undeveloped, uneven lands. In Tables 3.1.1 to 3.1.7 we present the cropping pattern followed by the sample farmers in the command area of the sample blocks for the year 1980-81. The cropping pattern followed on the total command area, which included dry as well as irrigated lands, is presented in Table 3.1.1. It may be noted from the table that sugarcane and banana were the two major cash crops grown by the sample farmers wherever irrigation facility was available. These two crops taken together had claimed more than 13 per cent of the total cultivated land in 1980-81. The other crops taken on the irrigated lands were Paddy, Hybrid Jowar, Groundnut in summer season and wheat and gram in rabi season. Amongst the crops grown on the dry lands, Rabi local Jowar, local Bajara, Cotton and Pulses were the major ones claiming comparatively larger areas of the total cultivated land. In Table 3.1.2 we present the cropping pattern on the developed irrigated land from the command area of the sample blocks for the year 1980-81. It may be noted that as in the case of the total irrigated land, sugarcane and banana were the two major cash crops grown on the developed irrigated areas as well. These

two crops taken together had occupied more than one-fourth of the total developed irrigated area in the sample blocks. Other important crops grown on the developed irrigated area were Groundnut in summer season and wheat in rabi season. Groundnut in the summer season of 1980-81 had claimed about 23 per cent and wheat, about 16 per cent of the total developed irrigated land. In the case of the irrigated land not needing any land development, Hybrid Kharif Jowar and Summer Groundnut were the two major crops grown in the year 1980-81. (see Table 3.1.3). As pointed out earlier more than 50 per cent of the total command area in the sample blocks, had remained dry, even though a large proportion of it was developed to receive canal water, which could not be provided due to various reasons. The cropping pattern followed in the developed dry areas is presented in Table 3.1.4, which shows that the most common crop grown in such areas was Hybrid Kharif Jowar. It alone had claimed more than 45 per cent of the total developed dry lands in the sample blocks. Similar was the case of the dry areas not needing any land development works. In the case of these lands as well, Hybrid Kharif Jowar was a dominent crop occupying more than 62 per cent of such lands in the sample block (see Table 3.1.5). The cropping pattern on the lands which had remained undeveloped was not much different from the developed dry lands in the sample blocks. On the undeveloped areas also Hybrid Kharif Jowar was commonly grown by the sample farmers. It had claimed near about 35 per cent of the total undeveloped areas in the sample blocks. Other important crops grown on such lands were local Bajara and Groundnut in the Kharif season (see Table 3.1.6). On the areas outside the canal command the major crop grown was the local jowar, claiming more than 51 per cent of the total land. (see Table 3.1.7).

Table 3.1.1 : Cropping Pattern in the Total Irrigated and Dry Areas in the Command Land of the Sample Blocks in the Year 1980-81

| Crop | Area under crop in acres | % |
|---|---|---|
| Sugarcane | 192.30 | 7.58 |
| Banana | 149.23 | 5.88 |
| Other fruit crops | 18.01 | 0.71 |
| Paddy | 19.97 | 0.79 |
| Jowar hybrid K | 672.69 | 26.52 |
| Jowar local K | 19.18 | 0.76 |
| Jowar hybrid R | 25.75 | 1.01 |
| Jowar locak R | 100.45 | 3.96 |
| Bajara hybrid K | 66.15 | 2.61 |
| Bajara local K | 122.51 | 4.83 |
| Bajara hybrid R | 0.63 | 0.02 |
| Groundmut K | 39.02 | 1.54 |
| Groundnut Summer | 333.90 | 13.16 |
| Cotton hybrid | 20.75 | 0.82 |
| Cotton local | 139.96 | 5.52 |
| Wheat | 248.94 | 9.81 |
| Gram | 93.92 | 3.70 |
| Pulses | 126.60 | 4.99 |
| Maize | 1.95 | 0.08 |
| Vegetables | 88.51 | 3.49 |
| Other crops | 56.30 | 2.22 |
| Total | 2536.72 | 100.00 |

Table 3.1.2 : Cropping Pattern in the Developed Irrigated Area in the Sample Blocks in the Year 1980-81

| Crop | Area under crop in acre | % |
|---|---|---|
| Sugarcane | 170.77 | 17.12 |
| Banana | 126.55 | 12.69 |
| Other fruits | 18.01 | 1.81 |
| Paddy | 19.97 | 2.00 |
| Jowar hybrid K | 32.14 | 3.22 |
| Jowar hybrid R | 7.75 | 0.77 |
| Jowar local R | 36.38 | 3.65 |
| Bajara hybrid K | 1.25 | 0.13 |
| Bajara local K | 5.75 | 0.58 |
| Bajara hybrid R | 0.63 | 0.06 |
| Groundnut K | 2.25 | 0.23 |
| Groundnut S. | 226.77 | 22.73 |
| Cotton hybrid | 15.75 | 1.58 |
| Cotton local | 9.50 | 0.95 |
| Wheat | 161.57 | 16.20 |
| Gram | 65.83 | 6.60 |
| Pulses | 6.04 | 0.61 |
| Maize | 1.95 | 0.20 |
| Vegetables | 88.51 | 8.87 |
| Total | 997.37 | 100.00 |

Table 3.1.3 : Cropping Pattern in the Irrigated Areas Not Needing Any Land Development Work in the Sample Blocks in the Year 1980-81

| Crop | Area under crop in acres | % |
|---|---|---|
| Sugarcane | 21.53 | 4.75 |
| Banana | 22.68 | 5.00 |
| Jowar Hybrid K | 120.07 | 26.49 |
| Jowar hybrid R | 6.00 | 1.32 |
| Jowar local R | 12.31 | 2.71 |
| Bajara local K | 5.00 | 1.10 |
| Groundnut (Summer) | 99.63 | 21.98 |
| Cotton | 20.25 | 4.46 |
| Wheat | 80.99 | 17.86 |
| Gram | 23.59 | 5.20 |
| Other crops | 41.39 | 9.13 |
| Total | 453.44 | 100.00 |

Table 3.1.4 : Cropping Pattern in the Developed Dry Area in the Sample Blocks in the Year 1980-81

| Crops | Area under crops | % |
|---|---|---|
| Jowar hybrid K | 314.45 | 45.53 |
| Jowar local K | 10.10 | 1.46 |
| Jowar local R | 43.76 | 6.34 |
| Bajara hy. K. | 48.48 | 7.02 |
| Bajara local K | 78.31 | 11.34 |
| Groundnut K | 15.92 | 2.31 |
| Groundnut S | 7.50 | 1.09 |
| Cotton local | 58.04 | 8.41 |
| Pulses | 99.23 | 14.37 |
| Other crops | 14.69 | 2.13 |
| Total | 690.48 | 100.00 |

Table 3.1.5 : Cropping Pattern in the Dry Area Not Needing Land Development Work in the Command Lands of the Sample Blocks in the Year 1980-81

| Crops | Area under crop in acres | % |
|---|---|---|
| Jowar hybrid K | 154.40 | 62.71 |
| Jowar local K | 2.00 | 0.81 |
| Jowar hybrid R | 12.00 | 4.87 |
| Jowar local R | 8.00 | 3.25 |
| Bajara hybrid K | 9.92 | 4.25 |
| Bajara hybrid K | 9.92 | 4.03 |
| Bajara local K | 15.49 | 6.29 |
| Groundnut K | 2.68 | 1.09 |
| Cotton | 41.52 | 16.86 |
| Other crops | 0.22 | 0.09 |
| Total | 246.23 | 100.00 |

Table 3.1.6 : Cropping Pattern on the Undeveloped Area of the Sample Blocks in the Year 1980-81

| Crops | Area under crop in acres | % |
|---|---|---|
| Jowar hybrid K | 51.63 | 34.60 |
| Jowar local K | 7.08 | 4.75 |
| Bajara hybrid K | 6.50 | 4.36 |
| Bajara local K | 17.96 | 12.04 |
| Groundnut K | 18.17 | 12.18 |
| Cotton Jarila | 5.00 | 3.35 |
| Cotton local | 10.65 | 7.14 |
| Mug | 9.05 | 6.06 |
| Udid | 1.25 | 0.84 |
| Chavali | 0.35 | 0.23 |
| Tur | 8.98 | 6.02 |
| Karle | 1.45 | 0.97 |
| Til | 0.25 | 0.1 |
| Gram | 4.50 | 3.02 |
| Wheat | 6.38 | 4.28 |
| Total | 149.20 | 100.00 |

Table 3.1.7 : Cropping Pattern in the Dry Land in the Area Outside the Command in the Year 1980-81

| Crops | Area under crops | % |
|---|---|---|
| Jowar local K | 216.50 | 51.63 |
| Jowar hybrid K | 4.00 | 0.95 |
| Jowar local R | 1.00 | 0.24 |
| Bajara hybrid K | 51.28 | 12.23 |
| Bajara Local K | 110.78 | 26.42 |
| Groundnut K | 33.58 | 8.00 |
| Cotton | 2.23 | 0.53 |
| Total | 419.37 | 100.00 |

## APPENDIX 3.2

### Costs of Production and Returns

The calculations of Costs of Production and returns from different crops were done on the basis of the following concepts.

(1) Human Labour : It included family human labour and hired human labour. The family labour employed in the crop production activity were valued at the prevailing wage rates paid to the hired labour in the rural area of Bhadgaon taluka, Jalgaon district, in 1980-81. In the case of the hired labour the actual payment made in cash or kind were taken into account.

(2) Bullock Labour : Owned bullock labour were accounted as per the rates of hired pair of bullocks prevailing in the area in 1980-81. In the case of hired bullock labour, the actual payment in cash were considered.

(3) Seeds, manures, fertilizers etc. : Home produced seeds and home collected manures were valued at the prevalent prices in the villages in 1980-81. The purchased seeds, manures and fertilizers were valued at the actual prices paid and reported in 1980-81.

(4) Land revenue : Land revenue paid along with the other taxes like educational cess, Zilla Parishad tax etc. were taken into account.

(5) Depreciation : The depreciation was calculated by the straight line method at the rate of 10 per cent for all the agricultural implements and machinery etc. Minor repairs to the agricultural implements were directly added to the depreciation charges.

(6) Interest on crop loans : Interest was charged at the rate of 11 per cent per annum for three to six months in the case of seasonal crops. In the case of Adsali

sugarcane, banana and other perennial crops the interest was charged on yearly basis.

(7) Returns : Value of main product and by-products were calculated at the prevailing prices in the area at the time of harvest in the year 1980-81.

## CHAPTER IV

## SUMMARY AND CONCLUSIONS

In Maharashtra State, the Government has introduced a number of measures to maximise the utilisation of irrigation potential created by the various irrigation projects. Judicious use of water assumes greater importance, particularly in the Maharashtra State, where water for irrigation is more scarce. A changeover from dry cultivation to irrigated cultivation through the adoption of appropriate cultural practices and revised cropping patterns is not an easy task. Lands in the command areas have to be prepared for receiving irrigation water properly and to utilize it more optimally and economically. It is also essential to have field drains to remove sub-soil water and surface runoff. Till recently all these works of land development were left to individual land owners themselves. But their failure to develop their lands properly created problems either of excessive irrigation or of non-utilization of the water facility. The Government, therefore, considered essential to take special measures to get the land development works executed through its Land Development Agency and recover its costs from the farmers in easy instalments.

The land development works in the Command area of the Girna project commenced in 1965 and was completed in 1976. The total area developed under command of the Girna canal came to about 82,200 hectares. Out of this total developed land, the area which was developed during the three year period from 1972 to 75 and which was refinanced by the ARDC was around 42,015 hectares. A detail analysis of the data collected in the case of the sixteen sample blocks from the area developed during the three year period was interesting and indeed revealing.

From the sample blocks, we found, as expected, that all the farmers having their lands in the command areas had felt free to temper with the land development works carried out under the scheme, for their own individual benefits. We observed that the farmers had obstructed even the distributory to raise its water level and to divert it's water directly into their own fields. At some places they had even breached the distributaries. Breaches in the field channels was a common sight. The field channels were extended to irrigate even the areas outside the command or the areas under command in the neighbouring blocks. Some of the field drains were used as field channels to carry canal water to their fields. We noticed that almost all the field drains in the sample blocks had lost their section, shape and size and these were all overlaid by wild grass and throny bushes. The present state of the graded bunds was also similar. Almost all of them were reduced in section and were not maintained at all. The works of land levelling and land-grading were not properly done in some pockets and the farmers, instead of levelling the land further, preferred to divert the field channel itself to the ridge portion and release canal water from that point to irrigate the entire area of their fields. On the whole it appeared to use that the community items of land development were just not attended to by the farmers and there was considerable wastage of canal water all over the command areas in the sample blocks.

The costs of land development are of two types : (1) Part I, the communal and (2) Part II, the individual. The communal costs included the cost of construction of field channels which take water from outlets on distributory to the head of every individual field; field drains providing outlets for excess irrigation water; and bunds constructed

to check soil erosion etc. These items of land development were compulsory for all cultivators in the command area. The Part II costs included individual items like the work of land-levelling, grading and shaping undertaken to achieve smooth and easy spread of irrigation water on the field. The land development costs calculated at 1979-80 prices after compounding at 9 per cent of interest over two years of grace period came to Rs.39.72 per acre of the developed land for Part I items and Rs.30.43 per acre for Part II items. Taken together the total costs of land development came to about Rs.70/- per acre of the developed area.

As against the above stated costs of land development, the benefits accrued to farmers due to such developmental works on their lands was calculated by comparing the net returns from the developed unirrigated land with that of the undeveloped unirrigated land in the command area, and the developed irrigated land with the developed dry land. The net income from the developed unirrigated land came to Rs.560.60 per acre and Rs.1777 per acre from the developed irrigated land at 1980-81 prices. The net returns from the undeveloped unirrigated land in the command area was around Rs.459.33 per acre. Thus the net annual incremental income which may be attributed to land development works was about Rs.101 per acre. This net incremental income may be compared with the costs of land development - Rs,70/- per acre of the developed area. The cost of land development, therefore, is less than the net incremental income due to it. The benefit/cost ratio is 1.44. This suggests that the cultivators are in a position to service the loan taken for land development works on their lands. If we take into account only the Part II cost of land development as

irrigation water could not be provided the benefit/cost ratio becomes as high as 3.29. As canal water could not be supplied to them, the cultivators may be required to bear only the Part II cost of the land development.