

EVALUATION STUDY SERIES NO. 16

**RIVER LIFT IRRIGATION SCHEME
IN KOLHAPUR DISTRICT
MAHARASHTRA
(AN EX-POST EVALUATION STUDY)**

**WORLD BANK FOR AGRICULTURE AND RURAL DEVELOPMENT
ECONOMIC ANALYSIS & PUBLICATIONS DEPARTMENT**

BOMBAY

1982

EVALUATION STUDY SERIES No.16

**RIVER LIFT IRRIGATION SCHEME
IN
KOLHAPUR DISTRICT
MAHARASHTRA
(AN EX-POST EVALUATION STUDY)**

**NATIONAL BANK FOR AGRICULTURE AND RURAL DEVELOPMENT
ECONOMIC ANALYSIS & PUBLICATIONS DEPARTMENT**

BOMBAY

1982

With the establishment of National Bank for Agriculture & Rural Development (NABARD) effective from July 12, 1982, the Agricultural Refinance & Development Corporation (ARDC) has ceased to exist. All the assets and liabilities of ARDC have been taken over by the NABARD. The schemes referred to in the present report were sanctioned by the erstwhile ARDC. However, due to the establishment of the new institution, we designate the said schemes as NABARD schemes. For this reason, the reference to NABARD in the body of the report may be taken as a reference to the erstwhile ARDC.

FOREWORD

This is the sixteenth in the series of evaluation reports brought out by the National Bank for Agriculture and Rural Development (NABARD) so far and the second one on evaluation of River Lift Irrigation Units (RLIUs) in Maharashtra, the previous one having studied RLIUs in Pune district.

The scheme evaluated through the present report is a co-operative enterprise implemented by the Panchaganga Sahakari Pani Purvatha Mandali, Ltd., (PSPPM) in Wadange and Nigwe villages of Karveer taluka in Kolhapur district. The report provides estimates of costs, benefits and incremental on-farm employment with reference to the scheme.

The scheme had implicitly assumed that its beneficiaries would continue bullock farming even after commissioning of the RLIU. However, the present evaluation, which was conducted some 11 years after the scheme completion, showed that about 80% of the beneficiary-households used tractors, either owned or hired. The study, therefore, attempts estimation of benefits from the river lift irrigation 'with' or 'without' tractor use. For obvious reasons, the benefits from the conjunctive use of tractor and irrigation are larger than those from irrigation use on bullock-operated farms.

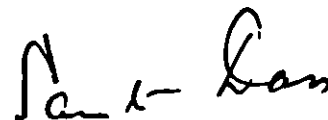
The principal motivation for the scheme was the development of sugarcane area and output. The cultivators in the scheme area did not, however, sell sugarcane to sugar factories but processed it into jaggery for sale. Due to the value-added in processing, the incremental income as well as the financial rate of return on the investment at 1980-81 costs and prices turned out to be much higher than might have been the case if the beneficiaries had sold sugarcane to some sugar factory. However, it is necessary to note that the price of jaggery during the year was quite favourable for the farmers. Given the year to year

fluctuations in the price of jaggery, it is not certain that the rate of return on investment in the river lift works would continue to be equally good at all times.

The scheme was implemented without any time overrun. The recovery performance of the PSPPM in respect of water charges from its members as also its own repayment of the long-term investment loan have been good. The society fully repaid the investment loan to the Maharashtra State Co-operative Land Development Bank (MSLDB) by January 1981, the due date.

A disquieting feature revealed by the study, however, is that the distribution of irrigation water among the members was not equitable, as those with large holdings were allowed to bring a higher proportion of their lands under sugarcane. It was also observed that irrigation water for the seasonal Kharif and Rabi crops was over-priced, while it was somewhat under-priced for sugarcane. This brings out the need for all lift irrigation societies for working out economic water rates for individual crops based upon the volume of irrigation water consumed and the cost incurred for providing a unit of irrigation.

The usual disclaimer about the responsibility of the NABARD as to the facts cited and views expressed in the report is implied.



SANT DASS
Managing Director

National Bank for Agriculture
and Rural Development
Bombay
19 October 1982

ACKNOWLEDGEMENTS

Assistance received from the following institutions in the conduct of the evaluation study is gratefully acknowledged.

1. Maharashtra State Co-operative Land Development Bank, Ltd.,
2. Government of Maharashtra - Irrigation Department (Kolhapur)
3. The Panchaganga Sahakari Pani Purvatha Mandali, Ltd., Kolhapur
4. Wadange Vividh Karyakari Sahakari (Vikas) Seva Sangha, Kolhapur
5. Jai-Hind, Nigwe-Dumala Vividh Karyakari Sahakari (Vikas) Seva Sangha, (Kolhapur)

CREDIT LIST

Overall Direction

Dr. M.V. Gadgil, General Manager

Shri P. Raman, Director

Analysis of Data and Drafting of Report

Shri P.R. Laud, Deputy Director

Shri R.G. Shaligram, Development Officer

Shri N.R. Tankhiwale, Specialist (Minor Irrigation)

Processing and Tabulation of Data

Shri M.V. Metkar

Field Investigations

Shri M.V. Metkar

Shri D.V. Namjoshi

Shri A.G. Avalaskar

GLOSSARY AND ABBREVIATIONS

| | | |
|------------|---------------|---|
| 1. | APMC | Agricultural Produce Marketing Committee, Kolhapur |
| 2. | BOFs | Bullock-operated Farms |
| 3. | FRR | Financial Rate of Return |
| 4. | GDP | Gross Domestic Product |
| 5. | MSEB | Maharashtra State Electricity Board |
| 6. | MSLDB | Maharashtra State Co-operative Land Development Bank, Ltd. |
| 7. | NABARD | National Bank for Agriculture and Rural Development |
| 8. | PSPPM | Panchaganga Sahakari Pani Purvatha Mandali, Ltd., Kolhapur |
| 9. | RLI | River Lift Irrigation |
| 10. | RLIU | River Lift Irrigation Unit |
| 11. | THFs | Tractor Hirers' Farms |
| 12. | TOFs | Tractor Owners' Farms |

TABLE OF CONTENTS

| | | Page No. |
|-------------------------|------------------------------------|----------|
| | | v |
| Basic Data Sheet | | ix |
| Summary and Conclusions | | 1-5 |
| Chapter 1 | The Scheme | 6-10 |
| Chapter 2 | Implementation of the scheme | 11-14 |
| Chapter 3 | Water management of the PSPPM | 15-22 |
| Chapter 4 | Methodology for the study | 23-25 |
| Chapter 5 | Economics of River Lift Irrigation | 26-40 |

LIST OF STATEMENTS & ANNEXURES

| Statement No. | Title | Page No. |
|------------------|--|----------|
| 1. | Costs of investment (upto 30 June 1981) | 41 |
| 2. | Area irrigated under RLIU and water rates charged by the PSPPM during the years 1970-71 to 1981-82 | 42 |
| 3. | Area under sugarcane and electricity bills | 43 |
| 4. | Water rates estimated by the PSPPM for the year 1980-81 (Budget) | 44 |
| 5. | Rates for water actually supplied by the PSPPM during the year 1980-81 | 45 |
| 6. | Expenditure of the PSPPM for 1980-81 | 46 |
| 7. | Operated holding per selected beneficiary household as on 30 June 1980 | 47 |
| 8. | Crop-pattern and value of produce during the year 1980-81 | 48-50 |
| 9. | Net income and incremental income during the year 1980-81 | 51 |
| 10. | Costs of cultivation during the year 1980-81 | 52 |
| 11. | Net income and incremental income during the year 1980-81 (Including value added in processing sugarcane into jaggery) | 53 |
| 12. | Recovery performance of the PSPPM of water charges from members | 54 |
| 13. | Repayment performance of the PSPPM | 55 |
| | | |
| Annexures | Title | Page No. |
| I. | Some details of 9 lift irrigation units | 56 |
| II. | Operational details of working of the PSPPM | 57 |
| III. | Economics of lift irrigation as assumed in the scheme | 58-60 |
| IV. | Income and expenditure of the PSPPM assumed in the scheme | 61 |
| V. | Cash Flow Statement | 62 |
| VI. | Sensitivity Analysis | 63 |
| VII. | The Economics of jaggery production | 64-65 |

BASIC DATA SHEET

| | |
|---|---------------|
| 1. Month/Year of sanction of the Scheme by NABARD | March 1968 |
| 2. Month/Year of commencement of investment work | February 1968 |
| 3. Month/Year of completion of investment work | January 1970 |
| 4. Costs of investment (Rs lakhs) | |
| (a) Anticipated | 7.97 |
| (b) Actual (upto June 1981) | 11.42 |
| 5. Benefited area (acres) | |
| (a) Anticipated | 800 |
| (b) Actual (in 1980-81) | 617 |
| 6. Financial Assistance from MSLDB (Rs lakhs) | 7.95 |

Results of field study [Reference year : 1 July 1980 - 30 June 1981]

| Item | BOFs | THFs | TOFs |
|--|-------|---------|-------|
| 1. Total number of beneficiary-households | 60 | 289 | 25 |
| 2. Number of beneficiary-households selected for study | 15 | 30 | 15 |
| 3. Average size of cultivated holding (Acres) | 2.06 | 3.70 | 10.10 |
| 4. Average area benefited by selected RLIU (Acres) | 1.43 | 1.53 | 4.47 |
| (a) of which area under sugarcane (%) | 50 | 75 | 80 |
| 5. Post-irrigation Cropping Intensity for benefited area (%) | 241 | 254 | 262 |
| 6. Incremental Income (Rs per benefited acre) | | | |
| (a) Without value added* | 733 | 1,891 | 2,128 |
| (b) With value added* | 2,309 | 4,444 | 4,875 |
| 7. Financial Rate of Return (%) | | | |
| (a) Without Value added* | 19 | 39 | 41 |
| (b) With Value added* | 45 | >50 | >50 |
| 8. Additional on-farm employment** (no. of person-days per acre) | 40 | 50 | 65 |
| 9. Scheme Impact (Net addition) | | | |
| (i) Net Irrigated Area (Acres) | | 617 | |
| (ii) Area under sugarcane (Acres) | | 504 | |
| (iii) Sugarcane production (Tonnes) | | 18,000 | |
| (iv) Foodgrains production (Tonnes) | | (-) 780 | |
| (v) Oilseeds production (Tonnes) | | (-) 20 | |
| (vi) Incremental Income (Rs lakhs) | | | |
| (a) Without value added* | | 11.01 | |
| (b) With value added* | | 15.18 | |
| (vii) Employment (no. in '000) | | | |
| (a) Without processing activity | | 36 | |
| (b) With processing activity | | 80 | |

* Value added in processing sugarcane into jaggery

** Exclusive of additional employment in processing activity

SUMMARY AND CONCLUSIONS

1. This is a report on the ex-post evaluation of a river lift irrigation scheme in Kolhapur District in Maharashtra. It was sanctioned by the National Bank for Agriculture and Rural Development (NABARD) in March 1968 to the Maharashtra State Co-operative Land Development Bank, Ltd., (MSLDB). The scheme beneficiaries had organised themselves into a co-operative called the Panchaganga Sahakari Pani Purvatha Mandali, Ltd. (PSPPM), located in Wadange and Nigwe villages of Karveer taluka.
2. The main investment work, which was designed by a special cell of the Government of Maharashtra, was initiated in February 1968 and completed in January 1970, as per schedule. However, the net benefited area at 617 acres during 1980-81 (reference year of the evaluation study) was less than the area of 800 acres assumed in the scheme document. Compared to an estimated capital cost of Rs 7.97 lakhs, the actual cost incurred by end-June 1981 stood at Rs 11.42 lakhs. This cost overrun was due to changes in the original design, extensions taken up after 1970 by the PSPPM and escalation in the prices of materials. The investment cost per benefited acre at historical prices thus rose from the anticipated Rs 996 to the actual of Rs 1,850, i.e., by 85%.
3. A field study conducted in June-July 1981 (i.e., about 11 years after the completion of the scheme) to assess its benefits showed that more than 80% of the beneficiary-households used tractors, either owned or hired. Benefits accruing from the RLI were, therefore, studied separately for households representing (a) bullock-operated farms (BOFs), (b) tractor-hirers' farms (THFs) and (c) tractor owners' farms (TOFs). The total population of scheme beneficiaries was 374 of whom BOFs numbered 60 (16%), THFs 289 (77%) and TOFs 25 (7%).

4. The holding size averaged 2.06 acres for BOFs, 3.70 acres for THFs and 10.10 acres for TOFs. The entire holding of all the three classes of farmers was irrigated from river lifts or dugwells. The area which benefited from the selected RLIU during 1980-81 averaged 1.43 acres for BOFs, 1.53 acres for THFs and 4.47 acres for TOFs. The proportionate share in the area benefiting from the selected RLIU was 13.4% for BOFs, 69.1% for THFs and 17.5% for TOFs. The proportion of area sown to sugarcane to the benefited area during 1980-81 was about 50% for the BOFs, 75% for the THFs and 80% for TOFs. The incremental income per acre of benefited area averaged Rs 733 for BOFs, as against Rs 1,891 for THFs and Rs 2,129 for TOFs. The difference in per-acre incremental income between the three classes of farms can be ascribed to the difference in the proportionate benefited area planted to sugarcane and the somewhat higher sugarcane yield per acre realised by the THFs and TOFs as compared with that of BOFs. Thus, tractor use, sugarcane acreage and incremental income appear to be inter-related.

5. The sugarcane growers in the scheme area did not sell sugarcane to sugar factories, but processed it into jaggery for sale. Taking into account the value added in such processing, the incremental income per acre averaged Rs 2,309 for BOFs, Rs 4,444 for THFs and Rs 4,875 for TOFs. Taking the scheme as a whole, its contribution to GDP at 1980-81 prices, including the value added in processing, can be placed at Rs 15.18 lakhs. In physical terms, the annual incremental production of sugarcane works out to 18,000 tonnes; however, it is offset by a decline of about 780 tonnes in the production of foodgrains and about 20 tonnes of oilseeds. The additional on-farm employment of a recurring nature generated annually as a result of the scheme is 80,000 person-days or 320 person-years, including the employment in processing activity as well. The financial rate of return (FRR) on investment in RLI scheme at 1980-81 costs and prices works

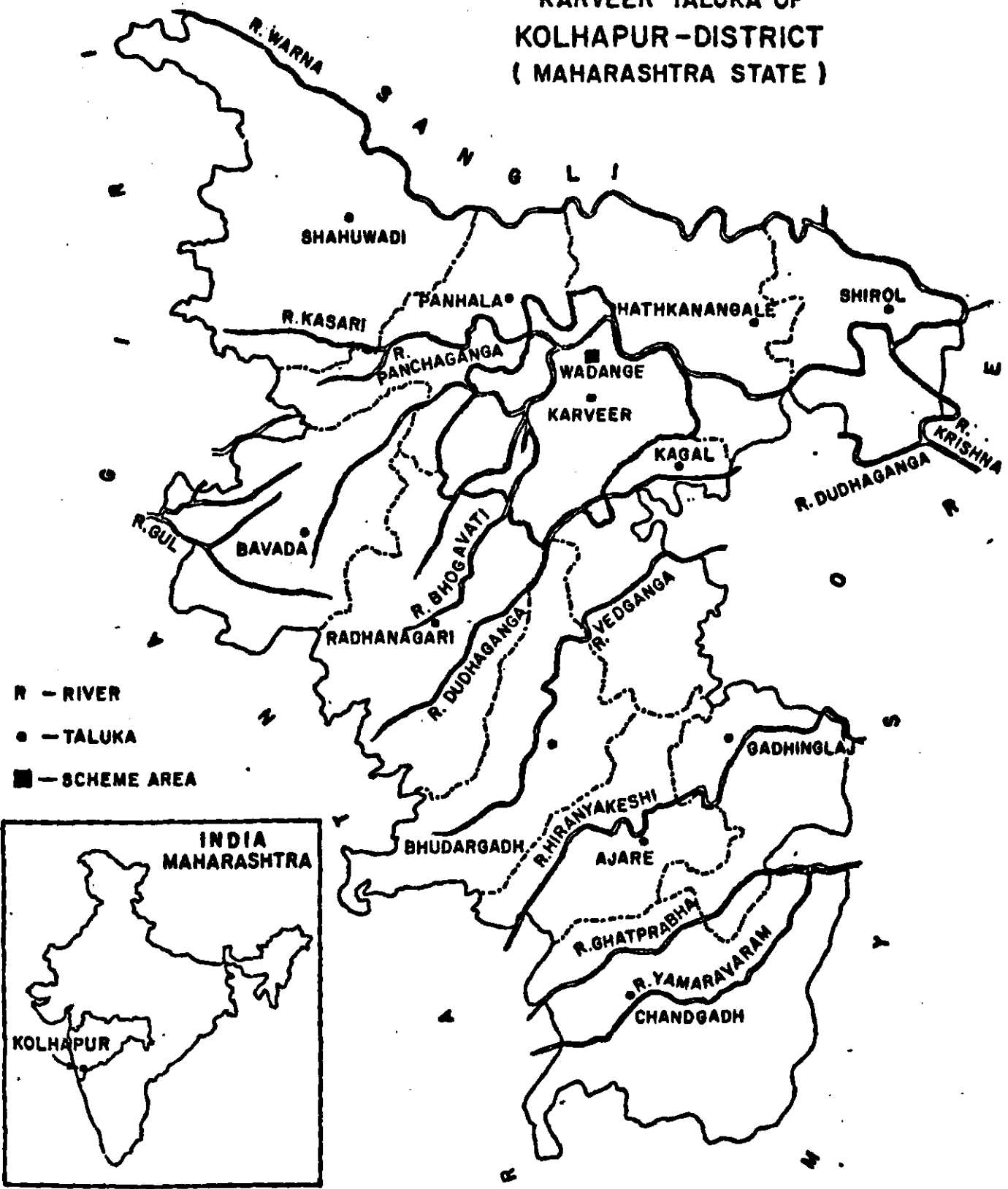
out at 19% exclusive of value added in processing and 45% with value added, assuming that all the benefited area was bullock-operated. If all the benefited area were under tractor-hire, the FRR without value added would work out to 39%. Allowing for the pro-rata tractor capital cost (i.e. in proportion to the share of benefited area in the total holding), the corresponding FRR for TOFs works out to 41%. With value added, it exceeds 50%. Thus, the rate of return on RLIU investment improved with tractor use.

6. The incremental income as well as the financial rate of return on the investment at 1980-81 costs and prices turned out to be much higher due to the value added in processing sugarcane into jaggery than might have been the case if the beneficiary-households had sold sugarcane to some sugar factory. However, it is necessary to note that the price of jaggery during the year was quite favourable for the farmers. Given the year to year fluctuations in the price of jaggery, it is not certain that the rate of return on investment in the river lift works would continue to be equally good at all times.
7. Sugarcane dominated the "with project" cropping pattern to such an extent that one-third of the beneficiaries had brought more area under the crop than was permitted by the Irrigation Department. Judged in terms of the proportionate area sown to sugarcane by the three classes of beneficiaries, the unequal race for sugarcane contributed to inequitable distribution of irrigation water among members. As already stated in para 5, increased sugarcane production was at the cost of foodgrains and oilseeds output.
8. The scheme was implemented without any time overrun. The performance of the PSPPM in respect of recovery of water charges from its members was good. Accordingly, the repayment

performance of the society towards the repayment of investment loan to the MSLDB was also good, the entire loan having been repaid by January 1981, the due date.

9. A disquieting feature revealed by the study, however, is that the distribution of irrigation water among the members was not equitable, as those with large holdings were allowed to bring a higher proportion of their lands under sugarcane. The water rates charged by the PSPPM for different crops favoured sugarcane but discriminated against other seasonal crops. In terms of the cost incurred by the society for providing a unit of irrigation and the volume of irrigation water consumed by different crops, irrigation was under-priced for sugarcane and over-priced for seasonal Kharif and Rabi crops. This brings out the need for all lift irrigation societies for working out economic water rates for individual crops based on the volume of irrigation water consumed and the cost incurred for providing a unit of irrigation.

**RIVER LIFT IRRIGATION SCHEME
IN WADANGE-NIGWE VILLAGES
KARVEER TALUKA OF
KOLHAPUR-DISTRICT
(MAHARASHTRA STATE)**



CHAPTER 1

THE SCHEME

- 1.1 This is a report on the ex-post evaluation of one of the river lift irrigation schemes in Kolhapur district in Maharashtra State sanctioned by the National Bank for Agriculture & Rural Development (NABARD) in March 1968 to the Maharashtra State Co-operative Land Development Bank (MSLDB) for the construction of river lifts to be undertaken as a co-operative enterprise. The scheme was completed by early 1970.
- 1.2 Kolhapur district is situated between 15° and 17° North latitude and 73° and 74° East longitude. The geographical setting of the district is quite typical as the ranges of Sahyadri passing through the district have divided it partly into Konkan type and partly into Deccan type of soils and other ecological conditions. On an average, the major portion of the district is 380 to 600 metres above mean sea level. The district gets rain principally from the south-west monsoon. The areas bordering the Konkan Plateau receive very high rainfall whereas in the plains, the rainfall is relatively low and erratic.
- 1.3 Krishna, Warna, Panchaganga, Dudhaganga, Vedganga and Hiranyakeshi are the principal rivers of the district. River Panchaganga is formed by 4 sub-rivers, viz., Kasari, Kumbhi, Tulsi and Bhogawati. It meets river Krishna at Narsobawadi in Shirol Taluka after covering approximately a distance of 136 kms.
- 1.4 The district has 3 broad soil zones. The western part is covered with laterite soil whereas the central zone is fertile and is covered with brownish well-drained soil. The dry type eastern part has medium black soil.

- 1.5 The district is dominated by rural population accounting for 79% of the total according to 1971 census. The average density of population per square kilometre is the lowest at 91.77 in Gaganbawda taluka and maximum at 703.52 in Karveer taluka.
- 1.6 Sugarcane is the major irrigated crop of the district. Paddy is being cultivated mostly in Western Ghat area where the rainfall is rather heavy. Jowar and groundnut are predominant in the eastern talukas of the district.
- 1.7 The major source of irrigation is river lifts, installed on a number of rivers flowing in the district. The percentage of irrigated land in 1972-73 was as high as 39.7% in Karveer taluka followed by 38.0% in Shirol, the district average being 20.5%.
- 1.8 Hydrogeologically, the terrain in Kolhapur district is not suitable for the development of groundwater resources on a significant scale. However, the Radhanagari Irrigation Project encouraged farmers to harness surface water by pumping either directly from the rivers to areas close to river banks or by constructing suitable civil and mechanical structures and pumping the water in single or multiple stages and carrying it to areas away from the river.
- 1.9 The Radhanagari Project consists of a masonry dam, 1,143 m long and 38.4 m high across the Bhogawati river in Panchaganga valley of the Krishna basin. It was taken up in the year 1949 and completed in 1967. The water stored in the reservoir is used to generate power at the toe of the dam and the tail-race water discharged into the river is diverted for irrigation by lift from Kolhapur type weirs.
- 1.10 The programme of construction of river lift is generally undertaken as a co-operative enterprise under which cultivators pool

their resources and raise joint loans for the irrigation of their lands. Initially, the Government of Maharashtra promoted such schemes and in order to provide technical and financial assistance to such river lift irrigation schemes in the co-operative sector, opened a separate wing under the registrar of co-operative societies and established independent office of joint registrar of co-operative lift societies with a Superintending Engineer attached to it. The Superintending Engineer formulated and executed a large number of schemes in Kolhapur district. However, all the schemes formulated could not be executed either because of non-availability of finance with the societies or because of high cost per acre above the yardstick of Rs 1,000 per acre recommended by the State Government. The respective societies of such schemes later executed the schemes themselves with some loan assistance, if necessary, by modifying the designs marginally. The present scheme taken up for evaluation is one such scheme.

- 1.11 The MSLDB submitted to NABARD in 1967 a programme for 13 river lift irrigation units to irrigate about 13,500 acres in 7 districts of Maharashtra. The programme was originally to be implemented over a period of two years ending 1969-70 at a total cost of about Rs 94 lakhs. However, the number of schemes was later reduced to nine with the approval of NABARD; four schemes in Kolhapur district, three in Sangli district and one scheme each in Satara and Dhulia districts, with a correspondig reduction in the command area to 8,400 acres and in the financial outlay to Rs 62.75 lakhs (Annexure I). The period of implementation was extended upto 1971-72. Of these 9 schemes sanctioned by NABARD, four schemes in Kolhapur district commenced operations during 1970-71. Three of these schemes have been providing water for irrigation since then. The scheme selected for the study is one of these three schemes, viz., the scheme managed by the PSPPM, a co-operative society in Wadange village of Karveer taluka of Kolhapur district. (See map on page 5).

- 1.12 The scheme area is about 5 kms North of Kolhapur city and covers part of villages of Wadange and Nigwe on the left bank of the Panchaganga river. The Kolhapur railway station is about 5 kms from the scheme area. There is a private sugar factory at a distance of 5 kms and a regulated market (APMC - Shahu Market) yard at a distance of about 10 kms from the scheme area. The source of irrigation water supply for the scheme is the Panchaganga river, the flow of which is regulated in the post-monsoon season by release of water from the Radhanagari dam. Water is released from the dam at intervals of 15 to 20 days and all attempts are made by the Irrigation Department to provide water to all lifts installed on the river. The soils in the area are medium deep black cotton and clay loam type, well drained and suitable for sugarcane crop.
- 1.13 Under the scheme, the PSCPM was to instal 3 units of vertical turbine pumps each with 90 HP electric motor capable of discharging 1,725 GPM (4.6 cusecs) against a gross head of 129 ft. The total cost of investment at 1966 prices was estimated at Rs 7.97 lakhs, Rs 4.92 lakhs on civil works and Rs 3.05 lakhs on mechanical and electrical works. The command area of the scheme was estimated at 800 acres; accordingly, the cost per acre was estimated at Rs 996 which was within the norm of Rs 1,000 per acre than prescribed by the State Government for such schemes.
- 1.14 A period of two years was anticipated for implementation of the scheme and no recoveries either of interest or of principal were to be made in the first two years. The interest for the first two years was to be collected in the third year along with the interest for third year. The principal and interest were to be collected in 10 equated annual instalments from the fourth year. Thus the loan period including the initial grace period was 13 years.

1.15 The long-term loan per member was assumed at Rs 3,000 for a representative benefiting holding of 3 acres in the scheme area. The work relating to the river lift was to be completed in two years and the benefits of irrigation from the lift were to be realised from third year onwards. The cropping pattern was assumed to improve from rainfed jowar and maize during Kharif and Rabi in the first two years of construction of the lift (without project) to 0.50 acre under sugarcane and the rest of 2.50 acres under irrigated maize and paddy during Kharif and wheat during Rabi seasons (with project). The details of the anticipated economics are presented in Annexure III. The water charges (exclusive of debt service) for the above cropping pattern were estimated at about Rs 450 at the rate of Rs 300 per acre for sugarcane, Rs. 80 per acre for Rabi and Rs. 40 per acre for Kharif crops. The incremental income from the assumed benefited area of 3 acres was estimated at Rs 925 in the 3rd year, Rs 1,695 in the 4th year and Rs 2,525 from the 5th year onwards. The surplus after debt service was estimated at Rs 135 in the 3rd year, at Rs 1,238 in the 4th year and at Rs 2,068 from the 5th year onwards. The annual revenue of the PSPPM from collection of water charges inclusive of the recovery of capital loan was estimated at Rs 2.24 lakhs which was considered adequate to meet the annual expenditure of the society of Rs 1.02 lakhs and annual equated repayment instalment of Rs 1.21 lakhs towards long-term loan from MSLDB (Annexure IV).

CHAPTER 2

IMPLEMENTATION OF THE SCHEME

- 2.1 The Panchaganga Sahakari Pani Purvatha Mandali, Ltd., (PSPPM), was formed in January 1967 with the objective of improving the financial position of the farmers of Wadange and Nigwe villages of Karveer taluka of Kolhapur district by providing assured irrigation to 800 acres of their rainfed lands by lifting water from Panchaganga river. The society was registered on 30 September 1967. The scheme managed by the PSPPM is one of those approved by the Government of Maharashtra for lifting the water released through the Radhanagari dam.
- 2.2 The operational details of the working of the PSPPM are given in Annexure II. The membership of the PSPPM increased from 327 in the year 1970-71 when the lift became functional to 642 in 1980-81. With the intention of strengthening its financial position so as to enable it to complete the construction work early, some residents of the scheme villages and nearby areas not owning any land within the command of the scheme were initially allowed to purchase shares of the society and become nominal members. However, with improvement in the society's financial position in subsequent years, the number of such members was reduced. The initial share capital of the PSPPM of Rs 2.00 lakhs increased gradually and stood at Rs 3.61 lakhs by the end of June 1981. The reserves and general fund built up by the PSPPM upto 30 June 1981 were of the order of Rs 8.15 lakhs. The area irrigated (net) from the scheme increased from 146 acres in 1970-71 (the first year in which water was released through the lift), to 617 acres in 1980-81. The staff of the PSPPM consisted initially of 11 persons which increased to 17 in 1980-1981. It had a full time, paid manager and a secretary, besides a surveyor and an electrical supervisor. The PSPPM constructed

its own office building on a leased-in plot in the year 1973 and added a floor to it in 1980-81. The accounts were audited regularly by the Joint Registrar of Co-operative Societies, Kolhapur. It was classified by the auditors as 'B' upto 1971-72 and 'A' thereafter.

- 2.3 The PSPPM executed the civil work under the supervision of a consulting engineer appointed by it, who not only prepared the revised plans and estimates but also supervised the work being executed by the contractors. The design of the scheme, drawn earlier by the State Government, was suitably modified to provide for lifting water to the rising main in two stages instead of one and to provide three vertical turbine pumps each of 70 HP for handling a discharge of 13.8 cusecs over a head of 86 ft at Stage I and three centrifugal pumps of 50 HP each at Stage II for lifting the entire discharge over a head of 58 ft.
- 2.4 As actually implemented, however, 2 pumps of 100 HP each were provided at Stage I and 2 centrifugal pumps of 75 HP each at Stage II. The intake chamber as provided in the scheme could not be constructed in the river-bed as the foundation was of sand and clay. As an alternative, a Kolhapur type weir was constructed on downstream side of the intake chamber site. The work on construction of lift commenced in February 1968 and a major part of it was completed within 2 years, i.e., by January 1970, when water was released for the first time to irrigate 146 acres during 1970 Rabi season.
- 2.5 The consulting engineer who prepared the plans also supervised the work during the execution and gave day-to-day guidance to the executing agencies. The society consulted occasionally the engineer and MSLDB officials. MSLDB authorities also visited the site and discussed the problems at the site. The entire work executed on an agency basis was so synchronised that it was

completed almost within two years from the date of commissioning the work. Thus, there was not much of a time over-run in the implementation of the scheme. The credit for the timely implementation of the scheme goes to the dynamic and dedicated leadership of the society and the services rendered by the consulting engineer.

- 2.6 In addition to the above construction work, the PSPPM undertook three extensions to provide irrigation for about 70 acres of the command, which was situated at a higher elevation and could not receive enough water through the distribution system in the normal course. These were (i) Huzare odha (stream) extension, (ii) Nigwe (Dumala) extension, (iii) Bhuite mal extension.

The Huzare odha extension was completed in the year 1972-73. The regenerated flow of Huzare odha (stream) was impounded at the end of October every year by a small earthen bund 5 ft. high across the stream and the impounded water was pumped out till end of following May to irrigate about 25 acres by installing a centrifugal pump of 10 HP.

The Nigwe (Dumala) extension was completed in the year 1973-74. A sump well of 8 ft diameter and 12 ft depth was constructed and its water was pumped out with 15 HP centrifugal pump to irrigate about 25 acres.

The Bhuite mal extension was completed in the year 1976-77. The field distributory pipe from delivery chamber II was intercepted and water was stored in a trapezoidal sump well of 11 ft depth. Water was lifted with a 10 HP pump to irrigate about 20 acres of the command.

- 2.7 The cost of investment incurred by the PSPPM upto 1980-81 on various items of investment are given in Statement 1. The

total cost incurred was about Rs 11.42 lakhs as against Rs 7.97 lakhs envisaged in the scheme. The cost was Rs 1,850 per acre of area benefited during the year 1980-81 as against Rs 996 envisaged in the scheme. The increase in per acre cost was due to escalation of prices over the period, modification of design and undertaking extension schemes and distributory system and reduction in the area benefited by the lift from 800 acres envisaged in the scheme to 617 acres in 1980-81. The investments were financed mainly through the long-term loan amount of Rs 7.95 lakhs from MSLDB, a loan of Rs 37,500 in 1973-74 from Kolhapur District Central Co-operative Bank, Ltd., (which was fully repaid in subsequent two years) and also through owned funds. The MSLDB disbursed the loan in two equal instalments, the second instalment having been disbursed in March 1969. The society also collected deposits from its members at the rate of Rs 1000 per acre of their area under sugarcane. The amount of such deposits collected upto 1971-72 was Rs 1.24 lakhs, which increased to Rs 2.01 lakhs in 1980-81. The deposit-holders were given concession in water rates charged to them every year for sugarcane, at the rate of Rs 150 - Rs 200 per acre in lieu of interest on their deposits. If no area was brought under sugarcane by any depositor-member in a particular year, interest at 7% per annum was paid to such depositor.

- 2.8 Against the long-term loan, the land of 300 acres in the command belonging to 143 members was mortgaged to MSLDB. All these 143 members availed of lift water for irrigation in 1980-81. These members were not given any special concession or facility for the mortgage of their land. The members availing of irrigation water under the scheme but whose lands were not mortgaged to the MSLDB had to give an undertaking in writing to the PSPPM empowering it to mortgage their land in the command area if the need arose.

CHAPTER 3

WATER MANAGEMENT OF THE PSPPM

- 3.1 The ayacut area was selected after keeping in view two points; first, the cost per acre should not exceed Rs 1,000 per acre which was the then Government yardstick for approving such schemes and second, the area should be compact and well manageable. The area extending from the jackwell to the Stage II pump-house was already under irrigation from wells and other private lifts and, therefore, was not available for the present scheme.
- 3.2 The total gross command selected for the scheme was 1,100 acres of which culturable command was 1,000 acres. Of the latter, an area of 800 acres was considered initially as suitable for irrigation under the scheme. The remaining area was not available for irrigation because it was not suitable for irrigation due to topographic disposition or because it was put to non-agricultural uses - such as approach road. However, the PSPPM realised later that the actual area that could be irrigated from the scheme was only 600 acres as the remaining area was either under irrigation through 12 wells then existing in the command area or it was situated at a higher elevation which could not be irrigated normally through the existing outlets.
- 3.3 Thus, the command area was reduced from 800 acres to 600 acres for which, perhaps, a discharge of even 8.9 cusecs would have been sufficient, and accordingly, the cost of investment could have been reduced to some extent. The PSPPM, however preferred to utilise the excess discharge by providing water to the excess area brought under sugarcane by its members. The latter changed the proposed cropping pattern radically and only sugarcane and paddy and to some extent wheat were given water under the scheme. In addition, the PSPPM also undertook

in subsequent years extension works such as Huzare odha, Nigwe (Dumala) and Bhuite mal, referred to earlier, to provide water for irrigation to some of the lands situated at a higher elevation.

- 3.4 After completion of the scheme, the approved cropping pattern was never adopted and the tendency of the farmers as also of the society was to increase the area under sugarcane.

The farmers bringing excess area under sugarcane over that approved by the Irrigation Department preferred to pay penalty charges at the rate of Rs. 250 per acre over and above the usual irrigation cess of Rs. 125 per acre.

- 3.5 Though the PSPPM allowed excess area to be brought under sugarcane, it encountered difficulty in providing sufficient water to all the sugarcane area, particularly between the months of March and May when the flow of water in the river released from Radhanagari dam was restricted. During this period, initially, the general tendency of the cultivators was to give heavy irrigation so that the surplus soil moisture content could suffice for prolonged interval between two waterings. However, realising the possibility of the problem of water logging and salinity, the PSPPM decided to supply water on hourly basis which was accepted by the members. Subsequently, because of staggered release of water in the river by the Irrigation Department and staggering of electricity supply by Maharashtra State Electricity Board (MSEB), the PSPPM could lift water only for 7 days each twice a month, especially between March and May. In addition to these problems, frequent power cut for 6-7 hours during day time reduced pumping hours further. To fulfill the irrigation demand, therefore, the pumps had to be operated for 15 to 18 hours daily during the period. The PSPPM could provide 16 waterings in a year as against 18 supplied initially for sugarcane. This resulted in comparatively low yield of sugarcane. Of the 374 households

benefiting from the scheme, about 75% had a benefited area upto 2 acres each; there were as many as 20 households having a benefiting area of 5 acres or more each. Sugarcane being the most important crop accounting for about three-fourths of the benefiting area during 1980-81, had the PSPPM restricted the area under sugarcane, the beneficiaries with small areas under sugarcane could have obtained adequate irrigation and reaped better yields of sugarcane.

- 3.6 The sugarcane crop in the scheme area is SURU which is generally a 12-month crop. The sowing and harvesting of the crop typically occur during October-January. The members desirous of availing water from the lift in the ensuing year had to supply advance information to the PSPPM about the crops they wished to take, corresponding area under the crops and the period during which water would be needed for irrigation. On the basis of this information, the PSPPM prepared the programme of releasing water in different seasons. The first watering was released only when the backlog, if any, of water charges due from the members was cleared. Taking into consideration the likely income from investments, deposits, etc., the demand for water and the likely administrative, operation and maintenance expenditure (including recovery of principal and interest on long-term loan) estimated on the basis of the current year's position, the PSPPM prepared a budget and fixed the water rates for the ensuing year with the approval of members in the general body. The individual member's account was debited to the extent of his demand for water. Immediately after releasing the first watering, members were requested to pay the water charges in parts. The accounts were settled only when the crops were ready for harvest, after actually measuring the areas under different crops in the presence of the concerned members. The members were informed sufficiently in advance about their turn for supply of water and necessary passes were issued to them for the purpose. The PSPPM had

devised a proforma for keeping record of the daily supply of water.

3.7 Though the PSPPM did not initially apply any restrictions on the area to be brought under sugarcane, it requested members in 1974-75 to curtail the sugarcane area and substitute it with food crops due to difficulties in lifting and supplying sufficient water, increasing prices of fertilisers and also the policy of the Government to boost the production of food crops. But the response from the members was poor. The area under sugarcane decreased marginally from about 421 acres in 1974-75 to 404 acres in 1976-77, but increased from 1977-78 onwards (barring year 1978-79) to reach 504 acres in 1980-81. Correspondingly, the area under food crops (Rabi) increased from 85 acres in 1974-75 to 127 acres in 1976-77 and declined considerably thereafter. Even so, the PSPPM continued to request members in the general body meetings to restrict the area under sugarcane and raise food crops. The PSPPM made a special appeal to its members in the annual meeting 1980-81, to curtail sugarcane area as it could provide the required irrigation for only 350 to 400 acres of sugarcane. While working out the water rates for 1981-82, the area under sugarcane was, however, assumed at 450 acres. —

3.8 The water rates charged by the PSPPM to its members from 1971-72 are shown in Statement 2. The water rate for an acre of sugarcane upto year 1978-79 ranged between Rs 650 and Rs 850 and for Rabi crops between Rs 300 and Rs 350. The electricity charges and consumption were both higher during that period due to increasing area under sugarcane requiring heavy irrigation which consequently increased the number of hours of working of pumps (Statement 3). However, there was a relief in the electrical bills from 1978-79 due to a shift in the basis of power tariff - from the units actually consumed to a fixed charge per H.P. of the motors. As a result, the electricity bills were

substantially lower from 1978-79 and were less than one-fifth of the total expenses in 1980-81. Consequently, the water rates for sugarcane were reduced from Rs 800 per acre in 1978-79 to Rs 600 per acre in 1979-80. Further, as the PSPPM repaid the entire long-term loan to MSLDB in 1980-81, the rate fixed for sugarcane at Rs 600 per acre, was further reduced by Rs 80 to Rs 520 per acre, in the form of rebate. For the year 1981-82, the PSPPM fixed a slightly higher rate of Rs 560 per acre for sugarcane while the rates for Rabi crops were reduced from Rs 240 to Rs 200 and for Kharif crops from Rs 60 to Rs 50 (for one watering). The percentage reduction in water charges between 1977-78 and 1981-82 is 37.5 each for Kharif and Rabi crops and 34.0 for sugarcane. The relatively higher concession allowed for seasonal crops was intended to produce a shift against sugarcane. Members were aware that there might not be a substantial reduction in water rates, as the PSPPM had a plan to extend the command area to lands with higher elevation. Further, the PSPPM had a proposal to replace open field channels by pipelines in those areas where such work could not be undertaken earlier due to increased cost of material. For the latter purpose, the Kolhapur District Central Co-operative Bank, Ltd., had sanctioned to the PSPPM a loan of Rs 1.50 lakhs for 1981-82.

- 3.9 An attempt is made here to examine the rationality of water rates fixed by the society for the year 1980-81. When the water supply was normal and there was no problem with power supply, 18 waterings of 6" depth, i.e., 108 acre - inches of water was given to sugarcane, 6 waterings 3" deep, i.e., 18 acre-inches of water was given to Rabi crops and 1 watering 1.5" deep was given for Kharif crops; i.e., 1.5" acre-inches. On the basis of the expenditure estimate of the society for 1980-81 (Statement 6), the cost of supplying an acre-inch of irrigation water worked out to Rs 5.82. Correlating this with the quantity of irrigation water to be provided to crops, it is evident that irrigation for Kharif

and Rabi crops was over-priced while that for cane was somewhat under-priced (Statement 4).

3.10 The water supply during 1980-81 was not normal due to restricted power supply. The pumps of the lift worked for 2,335 hours during the year and the total water actually pumped out was 40,878 acre-inches (Statement 5). Sixteen waterings 5" deep were given for sugarcane, 4 waterings 3" deep were given for Rabi crops and one watering 1.5" deep was given for Kharif crops. Accordingly, the actual cost per acre-inch of water worked out to Rs 6.87. Based on this, the rates actually fixed by the PSPPM for the year 1980-81 for all the crops were higher than the actual cost. However, the incidence of excess charges was lower for sugarcane than for the seasonal crops.

3.11 In the procedure followed by the society for fixing water rates, the annual repayment instalment due on the long-term investment loan was not fully included in the estimated expenses as shown below :

| Year ending June | Provision for repayment* instalment of investment loan made in the estimated expenses (Rs Lakhs) | Actual repayment* dues to MSLDB (Rs Lakhs) |
|------------------|---|---|
| 1972 | 1.50 | 1.17 |
| 1973 | 1.78 | 1.16 |
| 1974 | 0.83 | 1.21 |
| 1975 | 1.14 | 1.21 |
| 1976 | 1.20 | 1.21 |
| 1977 | 1.10 | 1.21 |
| 1978 | 1.45 | 1.21 |
| 1979 | 1.25 | 1.21 |
| 1980 | 1.10 | 1.21 |
| 1981 | 0.99 | 1.47 |

* Principal and interest

Had the PSPPM fully included repayment instalment towards investment loan in addition to the operation and maintenance expenses on the expenditure side, the water rates for the year 1980-81 would have been as follows :

| Crop | Revised water rates for 1980-81 | | | |
|-----------|---------------------------------|------------------|-------------|------------------|
| | Budget | | Actual | |
| | Acre-inches | Water Rates (Rs) | Acre-inches | Water Rates (Rs) |
| Sugarcane | 108 | 730 | 80 | 680 |
| Rabi | 18 | 120 | 12 | 100 |
| Kharif | 1.5 | 10 | 1.5 | 10 |

Thus, the system of charging for water had several lacunae.

3.12 The members of the PSPPM were granted permission by the Irrigation Department for lifting water from the river Panchaganga taking into consideration the irrigation potential of the concerned Kolhapur type weir for irrigating 325 acres under sugarcane and 170 acres under Rabi crops for the period 1979-85. However, the permission for area under sugarcane was subsequently reduced by about 25% to 240 acres. Notwithstanding the restriction, the members of the PSPPM appear to have brought additional area of about 270 acres under sugarcane during 1980-81. For such additional area brought under sugarcane without proper permission, the Irrigation Department of the State Government charges a penalty of double the amount of normal charges of Rs 125 per acre, i.e., penalty of Rs 250 per acre. Thus, such cultivators had to pay Rs 375 towards irrigation charges for one acre of sugarcane. One-third of the selected households were liable for penalty in the reference year.

3.13 There were 19 wells in the command area of which 12 were existing prior to commissioning of RLIU. Four of these well-

owners were contacted during the field visit. On an average, 5.00 acres (net) of area was irrigated by a well prior to as well as after commissioning of the RLIU. It was stated that there was no significant increase in the yields of these wells due to re-generated recharge. Further, there was no change in their cropping pattern also. Of the 4 selected well-owners, 2 utilised lift water also for their plots in the command area.

CHAPTER 4

METHODOLOGY FOR THE STUDY

- 4.1 A field survey was undertaken in June-July 1981 to assess the benefits from the RLIU in the form of incremental output, income and employment, both at the micro and macro level. The reference period of the survey was 1 July 1980 to 30 June 1981.
- 4.2 The scheme was implemented in the compact area of 2 villages, viz., Wadange and Nigwe. There were 374 beneficiary-households in the scheme area at the end of June 1980. The economics of the scheme at appraisal was based on the assumption that the beneficiaries would continue to use bullock power for farm operations, even after the commencement of the RLIU. However, during the survey, it was observed that less than 1/5th of the beneficiary-households (60) conformed to the above assumption. As many as 289 households were using tractors as hirers. The remaining 25 beneficiary-households owned tractors. It was reported that there was no problem of timely availability of tractor service on hire. Further, there was increasing tendency among the beneficiary-households to use tractor on hire, mainly for pre-sowing operations for sugarcane such as ploughing, harrowing, ridging, etc. For purposes of the study, a sample of 15 beneficiary-households was selected at random from among the 60 households using bullock power so as to enable comparison of ex-ante assumptions with ex-post realisations, mainly with respect to production, income and employment. In addition, to assess the additional benefits, if any, derived by the beneficiary-households using tractor on hire during the reference year on account of the tractor use, a sample of 30 such households was selected at random. Though the beneficiary-households did not report any problem of timely availability of tractor

service on hire, a sample of 15 tractor-owners was selected at random to examine whether such households derived additional benefits over those of the tractor-hirers in their farm business. Thus, the total beneficiary sample consisted of 60 households.

- 4.3 It was ascertained during the field study that the area now benefited by the RLIU was entirely rainfed prior to introduction of the selected RLIU. However, it was observed during the field study that the entire command of the RLIU and also area outside the command operating under homogeneous agro-climatic conditions were under irrigation from the numerous river-lifts along the river bank and also from wells. Under the circumstances, a control sample to represent the 'without lift' situation of the selected beneficiary-households could not be selected. The data were, therefore, collected from the selected beneficiaries of the RLIU on crop pattern, yields, inputs, etc., pertaining to the year prior to utilising water from the RLIU for irrigation. These were counter-checked through discussions with the officials of the PSPPM and knowledgeable persons in the scheme area and were suitably edited.

The output and the inputs used during the reference year 'with project' and also under 'without project' situation were valued at 1980-81 constant prices.

- 4.4 The water rates worked out by the PSPPM were based on the estimated expenditure for the ensuing year which included items such as the provision for repayment instalment on investment loan. However, for estimating the cost of production of irrigated crops during the reference year, the water rates were suitably adjusted to exclude above items. The water rates used for the study during the reference year accordingly were :

| Crops | Water rate per acre (Rs) |
|----------------------------------|--------------------------------|
| Sugarcane (perennial) | 363 |
| Rabi crops | 193 |
| Kharif crops (one watering only) | 54 |

4.5 The beneficiary-households in the scheme area cultivated sugarcane as the main crop in larger part of their holding. However, the sugarcane produced was not sold to any sugar factory, but was processed into jaggery nearby their own farms and was sold. The benefits from the farm business were estimated by using the notional price of Rs 250 per tonne for sugarcane, i.e., the price paid by the nearby sugar factory. In addition, the benefits derived by the beneficiary-households were estimated separately to include the value added in processing activity of converting sugarcane into jaggery. The jaggery produced was valued at Rs 342 per quintal, the rate received by the beneficiary-households during 1980-81.

CHAPTER 5

ECONOMICS OF RIVER LIFT IRRIGATION

- 5.1 The analysis of data collected through the field survey of farm benefits and costs of the selected beneficiary-households is presented in this chapter. To start with, the results in respect of the beneficiary-households with bullock-operated farms (BOFs) have been discussed together with the comparison between the actual costs and benefits and those assumed in the economics of the scheme. The economics assumed in the scheme is given in Annexure III. This is followed by discussion on the costs and benefits in respect of selected households with farms operated by tractors on hire (THFs). Similar data for beneficiary-households with farms operated by owned tractors (TOFs) are presented later.
- 5.2 The average size of operated holding of the beneficiary-households with (BOFs) was 2.06 acres and was entirely irrigated, 1.43 acres by RLIU in the command of the lift and 0.63 acre outside command, irrigated by wells/river/other lifts. The introduction of the scheme thus resulted in the entire area of holding having been brought under irrigation (Statement 7). Among the selected beneficiary-households, about one-third had a benefited area of less than the average, the lowest being 0.45 acre. The highest benefited area above the average was 2.10 acres.
- 5.3 The 'with project' cropping pattern of the beneficiary-households with BOFs during the reference year favoured sugarcane, paddy and wheat, which crops collectively accounted for 89% of the gross cropped area (Statement 8A). Generally, cultivators raised sugarcane on a plot in two successive years, first with new planting and the second as a ratoon, followed by paddy/groundnut and wheat in the third year. About one-half of the net irrigated area from the selected RLIU was under sugarcane. The cropping

intensity, with due weightage for perennial crop (weight 3 for sugarcane and weight 1 for seasonal crops) increased from 133% without project to 241% with project. Sugarcane and HYV paddy were the two new crops cultivated with the introduction of RLI.

5.4 The yield per acre of sugarcane attained by the beneficiary-households with BOFs during the reference year was 34 tonnes from new planting and 31 tonnes from ratoon. The value of gross produce from all crops per benefited acre at 1980-81 prices increased from Rs 2,138 to Rs 5,566 (160%) (Statement 9). The cost of cultivation per benefited acre increased from Rs 615 to Rs 3,310 (438%). Of the total "with project" costs, 37% was on chemical fertilizers, 12% on wages paid to hired labour and 11% on organic manure. Bullock maintenance and water charges accounted for 14% and 7%, respectively, of the total costs (Statement 10). The net income per benefited acre increased from Rs 1,523 to Rs 2,256 or by Rs 733. The incremental income per acre for 50 per cent of the beneficiary-households was below the average, the lowest being Rs 216. This household did not go in for sugarcane during the reference year. The highest incremental income realized was Rs 1,113. The incremental income per household stood at Rs 1,045.

5.5 The average benefited area under the lift was assumed in the economics of the scheme at 3.00 acres. However, the survey data revealed that the average benefited area of the beneficiary-households with BOFs was only 1.43 acres. The cropping pattern after commissioning of the lift assumed in the scheme was 0.50 acre under sugarcane and the rest 2.50 acres (net) under irrigated crops such as maize and paddy in Kharif and wheat during Rabi and accordingly, the cropping intensity was assumed at 217 (weighted). However, the beneficiary-households preferred to raise sugarcane on half of their benefited area, followed by paddy and groundnut. The cropping intensity actually attained was higher at 241% (weighted) as against 217% assumed in

the scheme. The yield per acre of sugarcane was assumed at 40 tonnes. However, the actual average yield was only 34 tonnes from new planting and 31 tonnes from ratoon. The lower sugarcane yield was, perhaps, due to inadequate irrigation from the RLIU during the reference year.

- 5.6 The assumed 'without project' value of gross produce per acre was Rs 315, which was to have increased to Rs 1,860 on full development of 'with project' conditions. However, according to the survey data, the actual 'with project' value of produce per acre during 1980-81 was Rs 5,566. Similarly, the costs of cultivation per acre, assumed to increase from Rs 120 to Rs 823 on full development, actually increased to Rs 3,310 during 1980-81. The difference between anticipated and actual value of produce and costs can be ascribed to changes in crop pattern and cost-price relationship since 1967, when the scheme was formulated.
- 5.7 It was reported during the field investigations that the cultivators growing sugarcane preferred using tractor, owned or hired, especially for pre-sowing operations such as ploughing, harrowing, ridging, etc. The tractor use on hire was preferred to bullock pairs mainly because the former was time saving and less irksome and required no supervision or personal attendance of the cultivators. The pre-sowing operations for sugarcane required two bullock pairs for six to seven days for one acre of land under sugarcane, and the costs would be about Rs 600. The same operations if carried out with tractor on hire, could be completed in about 3 days at the same cost. However, it was reported that all these operations were not undertaken with tractor. The roots of sugarcane go deep into soil and it is difficult to remove them with ordinary plough. The households having bullocks, therefore, preferred ploughing operation with tractor whereas other operations with bullocks. Even some of the selected households carried out ploughing operations

with tractor on hire and other operations with bullocks on hire.

- 5.8 The data collected from 30 beneficiary-households who hired-in tractor during the reference year revealed that the average size of operated holding was 3.70 acres and it was entirely irrigated, 1.53 acres in the selected lift command and 2.17 acres outside command, (1.75 acres irrigated by wells and 0.42 acre by other private lifts). The benefited area ranged between 0.35 acre and 3.50 acres for the selected beneficiary-households; a little over 50% had a benefited area of less than the average. About three-fourths of their net cropped area was under sugarcane (Statement 8B). The 'with project' cropping intensity attained was 254% (weighted). The yield per acre of sugarcane was 37 tonnes with new planting and 34 tonnes for ratoon. The value of gross produce from all crops per benefited acre at 1980-81 prices was Rs 7,316 (Statement 9).
- 5.9 The costs of cultivation of beneficiary-households with THFs per acre of net cropped area was Rs 3,902. The distribution of the total costs over various items was more or less similar to that of the beneficiary-households with BOFs except that the share of fertilizers was slightly more at 39% as compared to 37% of the latter (Statement 10). Because of tractor use, the hire charges formed about 8% of the total costs which resulted in corresponding reduction in the cost of bullock maintenance to 7% as against 14% in the case of those using bullocks.
- 5.10 As a consequence, the net income per benefited acre of those using tractor on hire at Rs 3,414 was more than double that of Rs 1,523 under the 'without lift' situation. The incremental income per acre accordingly was Rs 1,891 which was more by Rs 1,158 than the corresponding figure of Rs 733 realised by the beneficiary-households with BOFs. This was mainly because of proportionately larger area under sugarcane, better yield and consequently higher value of produce realised by the former.

Among the selected cultivators, two did not take sugarcane during the reference year. Their incremental income per acre was, therefore, Rs 182 and Rs 300, respectively. For the rest, the incremental income per acre ranged between Rs 1,519 and Rs 2,427. The incremental income for about 30% of the selected households was less than the average.

- 5.11 The average size of operated holding of beneficiary-households with TOFs was 10.10 acres under selected RLIU and 5.63 acres outside the command of the RLIU (Statement 8C). The benefited area varied from 1.00 to 9.00 acres for the selected tractor-owners. Nearly two-thirds had a benefited area each of less than the average, together accounting for only one-third of the total benefited area of the selected tractor-owners. About four-fifths of area benefited by the RLIU was under sugarcane and the 'with project' cropping intensity was 262% (weighted). There was no substantial variation between tractor-owners and tractor-hirers in per acre yield of sugarcane or costs of cultivation. The net income and the incremental income per benefited acre in respect of TOFs was Rs 3,651 and Rs 2,128, respectively, which were higher by 7% and 13% over those of THFs. The lowest per acre incremental income was Rs 1,581 and the highest was Rs 2,327; the incremental income of about 37% of the selected households was more than the average of Rs 2,128. Thus, there is no material additional benefit to tractor-owners over tractor-hirers from their farms benefited by the selected RLIU. There were sufficient tractors in two villages served by the RLIU and there was no difficulty in obtaining timely services of tractors on hire.
- 5.12 To sum up, though the area benefited by the selected RLIU for THFs was more or less the same as that of the households with BOFs during the reference year, the incremental income per acre of net cropped area of the former was two and half times that of the latter. The benefited area of beneficiary-households with TOFs was more than three times that of BOFs

and their incremental income per acre was slightly less than three times that of those with BOFs. This was mainly due to proportionately larger area under sugarcane and higher yield per acre enjoyed by households using tractor, owned or hired, over those with BOFs.

- 5.13 Assuming proportionately the same area under sugarcane for the three classes of farmers, (i.e., 50% of the benefited area), the share of value of sugarcane in the total value of gross produce for the THFs and TOFs gets reduced to 76% and 78% from 91% and 93%, respectively as against 71% for the BOFs. On the other hand, assuming the same yield rate of sugarcane for the BOFs as that realised by THFs/TOFs, the share of value of sugarcane in the total value of produce increases only from 71% to 75%. As there was no substantial variation in the per acre costs of cultivation of sugarcane, the above results indicate that the use of tractor enabled the households to bring more area under sugarcane and obtain higher income.
- 5.14 Although some of the households with small holdings used bullock power during the reference year, they were inclined to shift to the use of tractor on hire. Such households reported that they preferred to switch over to tractor hire due more to the resultant saving of time and the convenience of operations than higher sugarcane yields. There is an increasing tendency in Kolhapur district among sugarcane growers to shift to tractor use for pre-sowing operations. It is, therefore, necessary to explore the possibility of formulation of a farm mechanisation scheme in the sugarcane growing areas in the district.
- 5.15 There were 25 owned tractors in the command area of the lift. The tractor-owners used these tractors on their own farm in the command area as well as outside the command area and also gave on hire to other households. The 15 selected households

owning tractors reported, on an average, 179 hours of tractor use on their own farms (58 hours in the command of the lift), 200 hours on custom service for agricultural operations and 24 hours for non-agricultural purposes, i.e., a total of 403 hours. On this basis, the net income generated in the area benefited by selected RLIU by a tractor per acre of net cropped area was estimated at Rs 3,473 before providing for depreciation of the tractor or Rs 3,274 after providing for depreciation. The additional (net) income generated through use of a tractor in the command area was estimated at Rs 1,250 and Rs 1,018 per acre, before and after providing for its depreciation, respectively, over the income generated by the use of bullock power for pre-sowing operations of sugarcane crop.

5.16 The net income and incremental income realised by the selected beneficiary-households inclusive of value added in processing of sugarcane into jaggery are presented in Statement 11. The incremental income realised per benefited acre on BOFs, THFs, and TOFs was Rs 2,309, Rs 4,444 and Rs 4,875, respectively. Thus, the additional incremental income per benefited acre generated through processing activity in the case of above three types of farms was, respectively, Rs 1,576, Rs 2,553 and Rs 2,747. The additional incremental income generated in processing activity was mainly due to the price of Rs 342 received per quintal of jaggery as against a notional price of Rs 250 per tonne for sugarcane and low costs in processing. (For details, please see Annexure VII).

5.17 The price for sugarcane paid by the sugar factory nearby the scheme area and the price paid by APMC, Kolhapur, for jaggery are given overleaf for the period 1975-76 to 1980-81.

**Prices for sugarcane and jaggery during
1975-76 to 1980-81**

| Year | Price for Sugarcane* (Rs per tonne) | Price for Jaggery (Rs per quintal) |
|---------|--|---------------------------------------|
| 1975-76 | 152.50 | 256 |
| 1976-77 | 140.66 | 235 |
| 1977-78 | 121.83 | 174 |
| 1978-79 | 144.00 | 216 |
| 1979-80 | 214.00 | 406 |
| 1980-81 | 250.00 | 342** |

* To be finalised

** Provisional

The price for sugarcane and jaggery declined from 1975-76 to 1977-78 and then increased consistently except for the year 1980-81 in which the price for jaggery declined to Rs 342 from Rs 406 in the previous year. Consequent to fall in price in 1977-78, there was a fall in the area under sugarcane in the subsequent year; however, this was not significant.

- 5.18 The short-term credit requirements of the beneficiary-households were met by two multi-purpose co-operative service societies, viz., Waiange Vividh Karyakari Sahakari (Vikas) Seva Sangha and Jai-Hind Nigve-Dumala Vividh Karyakari Sahakari (Vikas) Seva Sangha. The membership of the former was 2,109 and that of the latter was 966 as on 30 June 1980. (Both the societies were with audit classification 'A'). Sugarcane seeds and seeds of improved varieties of paddy used by the selected beneficiary-households were mostly home-grown. The short-term credit required by the beneficiary-households for other inputs/operations was related to their undertaking to sell jaggery which would be produced from sugarcane in their holding in the ensuing

season, through the agents of these societies in the regulated market, Shri Shahu Market Yard, at a distance of about 10 kms. from the scheme area. The credit at the rate of Rs 800 per acre was provided to those who undertook to sell jaggery of about 7 quintals through these societies. The societies supplied fertilizers to their members and also provided storage and marketing facilities mainly for jaggery. The farmers in the scheme area were progressive and getting additional inputs required by them from the nearby market at Kojhapur. Almost all selected beneficiary households were members of these societies and availed of the above facilities for crop loans during the reference year and were satisfied with the facilities. Additional short-term requirements for agriculture, if any, were met through owned funds. The linking of crop loans of these societies to the sale of jaggery of the beneficiary households facilitated the PSPPM in their recovery of the water charges from members through these societies. These societies also provided advances on the jaggery actually sold through them.

5.19 The recovery performance of the PSPPM is presented in Statement 12. As the recovery was linked to produce (jaggery) marketed by its members through multi-purpose societies, the recovery was quite good. In the year 1972-73, as much as 93% of the water charges were recovered in the same year. Thereafter, the recovery was about 80% till 1976-77 and near about 70% subsequently. The balance was generally recovered in the following year before supplying water to the sugarcane crop of the next season.

5.20 The PSPPM was granted a loan of Rs 7.95 lakhs at 8.5% p.a. interest for the construction of lift unit by the MSLDB in the year 1968-69. The loan was to be repaid in ten annual equated instalments of Rs 1.21 lakhs each. The PSPPM repaid the loan amount fully with interest by January 1981, i.e., within the

specified period though there was some shortfall in repayment during the initial two years (Statement 13). On the whole, repayment performance was good, the credit for which goes to the efficient management of the society and timely collection of water charges by the staff of the PSPPM.

5.21 The benefited area of the scheme which depended on rainfall prior to commencement of the RLIU was supplied with assured water for irrigation which helped the cultivators of the scheme area to take cash crop, sugarcane. Further, due to availability of assured water for irrigation and increase in number of tractors in the scheme area, many of the beneficiary-households used tractor on hire mainly for pre-sowing farm operations. The incremental income realised, on an average, per benefited acre was Rs 733, Rs 1,891 and Rs 2,128 during the reference year, for households with BOFs, with THFs and with TOFs, respectively. The sugarcane produced was processed into jaggery on farm, which gave them an additional incremental income per benefited acre, of Rs 1,575, Rs 2,553 and Rs 2,747, respectively.

(ii) Due to availability of sugarcane fodder, many beneficiary-households undertook dairy as ancillary activity. However, the spillover of such indirect benefits has not been separately evaluated. About 50% of the selected beneficiary households reported having dairy animals. During the field investigation it was observed that households not having dairy animals were inclined to participate in dairy scheme, if formulated, as the area has an advantage of nearness to Kolhapur city. There was scope for those having milch animals to expand dairy activity by purchasing additional animals. This activity enabled them to have good quality of milk for home consumption and also additional income through sale of milk. There were two milk collecting centres in the scheme area.

(iii) The additional income from the RLIU enabled the beneficiary-households to improve their residential buildings, go for purchase of utensils, and also purchase of transport equipments such as scooter, motorcycle, etc. Of the 8 households selected owning tractors, 3 households purchased tractors after commencement of the lift.

(iv) The beneficiary-households could produce under RLIU about 18,000 tonnes of sugarcane in the benefited area during the reference year. However, this resulted in the net decline of about 780 tonnes in the production of foodgrains and 20 tonnes of oilseeds.

(v) The incremental income generated in the scheme area (assuming notional price for sugarcane of Rs 250 per tonne) because of RLIU was estimated at Rs 59,000 from BOFs whereas the incremental income from RLIU and tractor use was estimated at Rs 8.06 lakhs from THFs and Rs 2.36 lakhs from TOFs owned, i.e., a total of Rs 11.01 lakhs. By processing sugarcane into jaggery the additional incremental income of about Rs 15.18 lakhs was generated.

(vi) The daily average wage rates of agricultural labourers for farm operations in the scheme area during the reference year were Rs 5 for male and Rs 3 for female. Compared to the increase in price of sugarcane, there was no corresponding improvement in wage rates of agricultural labourers.

*(vii) Availability of assured water for irrigation and taking sugarcane crop required more employment of labour on the farm. The on-farm employment generated during the reference year was 90,000 person-days as against 60,000 person-days prior to RLIU. Of the 90,000 person-days of employment generated during the year 1980-81, 10,000 person-days of employment

was generated on an area of about 80 acres operated by bullock, of which 38% was family labour and 62% was hired labour. The area of about 426 acres, operated under tractors on hire, generated employment of about 62,000 person-days of which family labour was 27% and hired labour was 73%. The area of 111 acres operated under owned tractors generated employment of 18,000 person-days of which family labour was only 6% whereas hired labour constituted about 94%. The proportionate share of hired labour was higher on tractor-operated farms than those operated by bullock. The incremental employment per benefited acre generated on BOFs was 40 person-days, on THFs was 50 person-days and on TOFs was 65 person-days. The more employment on farms operated by tractor, hired or owned, was mainly due to proportionately larger area under sugarcane than bullock operated farms. As the tractor was used mostly for pre-sowing operations and that too for ploughing, there does not appear any displacement of labour due to introduction of tractors. The additional employment generated annually in the scheme area due to introduction of RLIU was 30,000 person-days, which was sufficient to provide round the year employment for 120 new persons. One-time employment generated for construction of lift unit and allied investments, however, could not be estimated as the entire work was completed on contract basis and that too about 10 years before. As all the households were processing sugarcane into jaggery, the additional employment generated on account of processing activity of sugarcane into jaggery was estimated at about 44,000 person-days or about 175 person-years. However, this employment generated was seasonal for 3 to 4 months and was usually provided by labourers from outside command of the RLIU either from Kolhapur or from nearby state. Further, the staff employed by the PSPPM for various current items of work was estimated at 6,000 person-days or about 24 person-years. On this basis, the total additional employment generated on recurring basis

annually was estimated at 80,000 person-days or 320 person-years (1 year = 250 person-days).

(viii) Due to assured supply of water through the RLIU and increase in area under sugarcane, the number of tractors in the scheme area increased from 11 tractors prior to commencement of the RLIU to 25 tractors after RLIU. These tractors generated an additional net income of Rs 5.47 lakhs without value added by processing sugarcane into jaggery and of Rs 11.06 lakhs including value added because of sugarcane processing on 537 acres on which 25 tractors were used (either on owned farms or on custom service during the reference year).

5.22 On the basis of estimates of income of the beneficiary-households 'with' and 'without' RLIU, cash flow statement has been worked out separately, with sugarcane produced valued at notional price of Rs 250 per tonne and secondly, including value added in processing sugarcane into jaggery, for a period of twenty years after the completion of the investment, i.e., after commencement of accrual of benefits of the scheme. The income estimates have already been discussed in the earlier paras. The cash flow statements (Annexure V) are based on the following assumptions.

(i) Economic life of the three major investment components are assumed as :

| | |
|-------------------------------------|----------|
| (a) Civil works | 50 years |
| (b) Electrical and mechanical works | 20 years |
| (c) Pipelines | 33 years |

(ii) The historical cost of investment on RLIU has been updated to reflect the cost at 1980-81 prices so as to make the benefits comparable with investment cost. An annual increase of Rs 5 for every Rs 100 of the historical cost has been assumed to work out project cost at 1980-81 prices.

(iii) The acreage irrigated by the lift unit as well as the incremental income remained constant from 11th to 22nd year.

(iv) Incremental income was 50% during the first year, 75% during the second and 100% the third year onwards of that estimated from the study.

(v) Residual values of investment components were calculated on the basis of their assumed life from the year of purchase.

(vi) All the data presented are at 1980-81 prices.

(vii) All the beneficiary-households had farms operated by bullocks.

The FRR was 19% with sugarcane valued at notional price of Rs 250 per tonne. With 10% increase in the investment cost or 10% reduction in benefits, the FRR worked out to 17% in each case. With 10% increase in costs and 10% reduction in benefits taken together the FRR came to 16% (Annexure VI).

Assuming that all the beneficiary-households hired tractors, the financial rate of return would work out to 39%.

During the field study, the data on benefits and costs of TOFs were collected only in respect of their benefited area under the RLIU under study. This accounted for only 45% of their total holding which was entirely irrigated. Allowing for pro-rata tractor capital cost of Rs 45,000 (i.e., in proportion to the share of benefited area in the total holding) and assuming that the tractor was purchased in the fifth year (in the first year of full benefits under the lift) the FRR worked out to 41%.

This would indicate that the financial rate of return with combined effect of tractor use and the RLIU was substantially higher than that of the river-lift and traditional method of bullock farming.

With the value added in processing sugarcane into jaggery, the financial rate of return was 45% for beneficiary-households with BOFs. This came down to 39% assuming that there was a 10% fall in benefits and 10% increase in costs. For beneficiary-households with THFs and TOFs, the financial rate of return after value-added exceeded 50%.

The above analysis indicates that the investment was profitable.

Statement I
Costs of Investment (upto 30 June 1981)

(Amount in Rs lakhs)

| Item | Estimated cost | Year of commencement | Expenditure incurred upto 1980-81 |
|-----------------------------|-------------------|-------------------------|---|
| Intake chamber | 0.05 | Not constructed | |
| Intake pipe | 0.05 | 1968 | 0.19 |
| Jackwell pumphouse | 0.56 | 1968 | 1.56 |
| Rising main Stage I & II | 3.24 | 1969 | 3.34 |
| Delivery Chamber I | 0.04 | 1969 | 0.08 |
| Delivery Chamber II | 0.04 | 1969 | 0.06 |
| Pumphouse II | 0.04 | 1969 | 0.14 |
| Distributory System | 0.90 | 1970 | 2.26 |
| Huzare odha extension | Not included | 1972-73 | 0.14 |
| Nigwe Dumala extension | " | 1973-74 | 0.59 |
| Bhuite Mal extension | " | 1976-77 | 0.07 |
| Total | 4.92 | | 8.43 |
| Mechanical/Electrical works | 3.05 | 1969-70 | 2.99 |
| TOTAL COST | 7.97 | | 11.42 |

Statement 2

Area irrigated under RLIU and water rates* charged by the PSPPM from 1970-71 to 1981-82

| Year | Water rates per acre (Rs) | | | Area actually irrigated (in acres) | | | Area proposed to be irrigated (in acres) | | |
|---------|---------------------------|---------------|-----------|---------------------------------------|---------------|-----------|---|---------------|-----------|
| | Kharif Crops + | Rabi Crops | Sugarcane | Kharif Crops + | Rabi Crops | Sugarcane | Kharif Crops + | Rabi Crops | Sugarcane |
| 1970-71 | .. | .. | .. | - | 4 | 142 | .. | .. | .. |
| 1971-72 | .. | .. | .. | - | 43 | 396 | .. | .. | .. |
| 1972-73 | 75 | 350 | 650 | - | 49 | 393 | 50 | 40 | 425 |
| 1973-74 | 75 | 300 | 750 | - | 42 | 457 | 100 | 50 | 350 |
| 1974-75 | 80 | 350 | 800 | - | 84 | 422 | 150 | 150 | 350 |
| 1975-76 | 80 | 300 | 750 | - | 131 | 414 | 125 | 150 | 350 |
| 1976-77 | 80 | 300 | 750 | - | 126 | 404 | 125 | 250 | 350 |
| 1977-78 | 80 | 320 | 850 | 130 | 71 | 434 | 200 | 200 | 400 |
| 1978-79 | 80 | 320 | 800 | 72 | 77 | 391 | 85 | 100 | 425 |
| 1979-80 | 60 | 240 | 600 | 104 | 61 | 478 | 100 | 100 | 400 |
| 1980-81 | 60 | 240 | 520 | 76 | 36 | 504 | 100 | 50 | 450 |
| 1981-82 | 50 | 200 | 560 | .. | .. | .. | 50 | 75 | 450 |

.. = Not available

+ = One watering only

* = Exclusive of Govt. taxes and cess

Source : Annual Reports of the PSPPM

Statement 3

Area under sugarcane and electricity bill

| Year | Area under sugarcane (Acres) | Electricity bill (Rs lakhs) |
|---------|---------------------------------|--------------------------------|
| 1971-72 | 396 | 0.67 |
| 1972-73 | 393 | 1.13 |
| 1973-74 | 457 | 0.98 |
| 1974-75 | 422 | 1.23 |
| 1975-76 | 414 | 1.18 |
| 1976-77 | 404 | 1.60 |
| 1977-78 | 434 | 1.60 |
| 1978-79 | 391 | 0.44 |
| 1979-80 | 478 | 0.50 |
| 1980-81 | 504 | 0.49 |

Note :

Electricity charges were based on 'units consumed' upto 1977-78 and on H.P. of the motors thereafter.

Statement 4

Water rates estimated by the PSPPM for the year 1980-81 (Budget)

A. IRRIGATION WATER REQUIREMENT

| Crop | Acreage to be irrigated (acres) | No of waterings | Depth of each watering (inches) | Acre-inches of water required | |
|-------------|---------------------------------|-----------------|---------------------------------|-------------------------------|---------------|
| | | | | Per acre | Total |
| Sugarcane | 450 | 18 | 6" | 108 | 48,600 |
| Rabi crop | 50 | 6 | 3" | 18 | 900 |
| Kharif crop | 100 | 1 | 1.5" | 1.5 | 150 |
| | | | | Total | 49,650 |

B. ESTIMATED WATER RATE

| Total Expenditure* (Budget) (Rs) | Total Estimated acre-inches of water required | Rate per acre-inch (Rs) |
|----------------------------------|---|-------------------------|
| 2,89,000 | 49,650 | 5.82 |

C. ESTIMATED WATER RATE PER ACRE

| Crop | Acre-inches of irrigation water to be provided | Estimated cost per acre-inch (Rs) | Cost per acre (Rs) | Rate actually fixed by the PSPPM (Rs) |
|-------------|--|-----------------------------------|--------------------|---------------------------------------|
| Sugarcane | 108 | 5.82 | 630 | 600 |
| Rabi crop | 18 | 5.82 | 100 | 240 |
| Kharif crop | 1.5 | 5.82 | 10 | 60 |

* For details, please see Statement 6.

Statement 5
Rates for water actually supplied by the PSPPM
during the year 1980-81

A. TOTAL WATER DISCHARGED FROM THE LIFT⁺

| Crop | Area irrigated (acres) | No of waterings | Depth (inches) | Acre-inches of water actually supplied |
|-------------|---------------------------|--------------------|-------------------|--|
| Sugarcane | 504 | 16 | 5" | 40,32 |
| Rabi crop | 37 | 4 | 3" | 44 |
| Kharif crop | 76 | 1 | 1.5" | 11 |
| Total : | | | | 40,87 |

B. WATER RATE PER ACRE-INCH

| Total actual expenditure* (Rs) | Water supplied (Acre-inches) | Rate per acre-inch (Rs) |
|--------------------------------------|------------------------------------|-------------------------------|
| 2,80,996 | 40,878 | 6.87 |

C. WATER RATES PER ACRE

| Crop | Water actually given per acre (Acre-inches) | Cost per acre- inch (Rs) | Cost per acre (Rs) | Rate actually fixed by the PSPPM (Rs) |
|-------------|---|-----------------------------------|--------------------------|--|
| Sugarcane | 80 | 6.87 | 550 | 600 |
| Rabi crop | 12 | 6.87 | 80 | 240 |
| Kharif crop | 1.5 | 6.87 | 10 | 60 |

* For details, please see Statement 6.

+ Transit losses are assumed to be negligible due to delivery of water through underground pipelines.

Statement 6
Expenditure of the PSPPM for 1980-81
(Major Heads only)

(Amount in Rs)

| Sr. No. | Item | Expenditure in 1980-81 | |
|---------|---|------------------------|------------------------|
| | | Budgeted | Actual |
| 1. | Electricity Bill | 50,000 | 48,587 |
| 2. | Other operation & maintenance expenses (excluding salaries) | 23,800 | 23,131 |
| 3. | Salaries (including bonus) | 53,000 | 65,729 |
| 4. | Rebate in water charges to depositor-members, in lieu of interest on deposits | 35,000 | 32,818 |
| 5. | Repayment of investment loan (annual instalment) | 73,500 | 67,547 |
| 6. | Interest on investment loan | 25,000 | 13,699 |
| 7. | Others | 28,700 | 29,486 |
| 8. | Total | 2,89,000 (3,37,500) | 2,80,997 (3,46,751) |

Source : PSPPM Annual Report, 1980-81

Notes : Figures in brackets relate to the expenditure taking into account the actual repayment instalment of Rs 1,35,000 and interest of Rs 12,000 on investment loan due in 1980-81.

Statement 7

Operated holding per selected beneficiary household as on 30 June 1980

(Area in acres)

| Category of selected beneficiary | No. of selected beneficiaries | Total operated holding | Within command of selected RLIU | | | | | | Outside command of selected RLIU | | | | | |
|----------------------------------|-------------------------------|------------------------|---------------------------------|-------|---------------|--------------|-------|-----------|----------------------------------|---------------|--------------|-------|---|------|
| | | | Irrigated | | | Un-irrigated | Total | Irrigated | | | Un-irrigated | Total | | |
| | | | RLIU | Wells | Other sources | | | Wells | Other lifts | Other sources | | | | |
| A | 15 | 2.06 | 1.43 | - | - | 1.43 | - | 1.43 | 0.20 | 0.43 | - | 0.63 | - | 0.63 |
| B | 30 | 3.70 | 1.53 | - | - | 1.53 | - | 1.53 | 1.75 | 0.42 | - | 2.17 | - | 2.17 |
| C | 15 | 10.10 | 4.47 | - | - | 4.47 | - | 4.47 | 3.13 | 0.16 | 2.34 | 5.63 | - | 5.63 |

Note : A = Beneficiary-households with BOFs.

B = Beneficiary-households with THFs

C = Beneficiary-households with TOFs

Statement 8A
Crop pattern and value of produce during the year, 1980-81
 [Beneficiary-households with BOFs]

| Crop | Without RLI | | | With RLI | | |
|-----------------------------------|----------------------------|-----------------------|-------------------|----------------------------|-----------------------|-------------------|
| | Area per household (acres) | Value of produce (Rs) | | Area per household (acres) | Value of produce (Rs) | |
| | | Per household | Per acre | | Per household | Per acre |
| Sugarcane (New) | | | | 0.41 | 3,435 | 8,625 |
| Sugarcane (R) | | | | 0.30 | 2,250 | 7,700 |
| Paddy (HYV) | | | | 0.23 | 502 | 2,160 |
| Paddy (L) | 1.30 | 2,184 | 1,680 | 0.55 | 814 | 1,680 |
| Wheat | 0.31 | 474 | 1,530 | 0.30 | 652 | 2,186 |
| Groundnut (L) | 0.12 | 192 | 1,600 | 0.20 | 280 | 1,550 |
| Jowar (L) | 0.18 | 207 | 1,150 | - | - | - |
| Green fodder | | | | 0.04 | 27 | 650 |
| All crops | 1.90 (1.43) | 3,057 | 1,609 (2,138)* | 2.03 (1.43) | 7,960 | 3,921 (5,566)* |
| Cropping intensity (weighted) (%) | 133 | | | 241 | | |

* Per acre of net cropped area

R = Ratoon

L = Local variety

HYV = High-Yielding Variety

Produce valued at

| Commodity | Price per quintal (Rs) |
|-----------|------------------------|
| Sugarcane | 25 |
| Paddy | 120 |
| Wheat | 170 |
| Groundnut | 400 |
| Jowar | 115 |

Statement 8B
Crop pattern and value of produce during the year, 1980-81
[Beneficiary-households with THFs]

| Crop | Without RLI | | | With RLI | | |
|----------------------------------|----------------------------|-----------------------|--------------------|----------------------------|-----------------------|--------------------|
| | Area per household (acres) | Value of produce (Rs) | | Area per household (acres) | Value of produce (Rs) | |
| | | Per household | Per acre | | Per household | Per acre |
| Sugarcane (New) | | | | 0.81 | 7,391 | 9,125 |
| Sugarcane (R) | | | | 0.33 | 2,830 | 8,575 |
| Paddy (HYV) | | | | 0.13 | 343 | 2,680 |
| Paddy (L) | 1.38 | 2,318 | 1,680 | 0.20 | 366 | 1,680 |
| Wheat | 0.32 | 490 | 1,530 | 0.08 | 177 | 2,210 |
| 64 Groundnut (L) | 0.12 | 192 | 1,600 | 0.03 | 72 | 2,400 |
| Jowar (L) | 0.20 | 230 | 1,150 | 0.03 | 14 | 460 |
| Green fodder | - | - | - | - | - | - |
| All Crops | 2.03 (1.53) | 3,266 | 1,609 (2,138) * | 1.61 (1.53) | 11,193 | 6,996 (7,316) * |
| Cropping intensity (weighted)(%) | 133 | | | 254 | | |

* Per acre of net cropped area

R = Ratoon

L = Local variety

HYV = High-Yielding Variety

Produce valued at

| Commodity | Price per Quintal (Rs) |
|-----------|------------------------|
| Sugarcane | 25 |
| Paddy | 120 |
| Wheat | 170 |
| Groundnut | 400 |
| Jowar | 115 |

Statement 8C

Crop Pattern and value of produce during the year, 1980-81

[Beneficiary-households with TOFs]

| Crop | Without RLI | | | With RLI | | |
|---|----------------------------|-----------------------|-------------------------|----------------------------|-----------------------|-------------------------|
| | Area per household (acres) | Value of produce (Rs) | | Area per household (acres) | Value of produce (Rs) | |
| | | Per household | Per acre | | Per household | Per acre |
| Sugarcane (New) | | | | 2.34 | 21,475 | 9,175 |
| Sugarcane (R) | | | | 1.25 | 10,400 | 8,325 |
| Paddy (HYV) | | | | 0.90 | 2,530 | 2,760 |
| Paddy (L) | 4.05 | 6,829 | 1,680 | - | - | - |
| Wheat | 0.95 | 1,461 | 1,530 | 0.03 | 61 | 2,040 |
| Groundnut (L) | 0.36 | 576 | 1,600 | - | - | - |
| Jowar (L) | 0.60 | 690 | 1,150 | - | - | - |
| Green fodder | - | - | - | - | - | - |
| All Crops | 5.95 (4.47) | 9,556 | 1,609 (2,138) | 4.52 (4.47) | 34,466 | 7,625 (7,711) |
| Cropping intensity (weighted)(%) | 133 | | | 262 | | |

* Per acre of net cropped area

R = Ratoon

L = Local variety

HYV = High-Yielding Variety

Produce valued at

| Commodity | Price per Quintal (Rs) |
|-----------|------------------------|
| Sugarcane | 25 |
| Paddy | 120 |
| Wheat | 170 |
| Groundnut | 400 |
| Jowar | 115 |

Statement 9

Net Income and Incremental Income during the year, 1980-81

(Amount in Rs)

| Item | Per Household | | Per acre of net cropped area | |
|---|---------------|----------|------------------------------|----------|
| | Without RLI | With RLI | Without RLI | With RLI |
| Beneficiary-households with BOFs | | | | |
| Value of produce | 3,057 | 7,960 | 2,138 | 5,566 |
| Costs of cultivation | 879 | 4,737 | 615 | 3,310 |
| Net income | 2,178 | 3,223 | 1,523 | 2,256 |
| Incremental income | | 1,045 | | 733 |
| Beneficiary-households with THFs | | | | |
| Value of produce | 3,266 | 11,193 | 2,138 | 7,316 |
| Costs of cultivation | 941 | 5,974 | 615 | 3,902 |
| Net income | 2,325 | 5,219 | 1,523 | 3,414 |
| Incremental income | | 2,894 | | 1,891 |
| Beneficiary-households with TOFs | | | | |
| Value of produce | 9,556 | 34,466 | 2,138 | 7,711 |
| Costs of cultivation | 2,782 | 18,146 | 615 | 4,060 |
| Net income | 6,774 | 16,320 | 1,523 | 3,651 |
| Incremental income | | 9,546 | | 2,128 |

Statement 10
Costs of cultivation during the year, 1980-81

| Item | Without RLI | | With RLI | | | | | |
|---|---------------------|--------------|----------------------------------|--------------|----------------------------------|--------------|----------------------------------|--------------|
| | Costs per acre (Rs) | % to Total | Beneficiary households with BOFs | | Beneficiary households with THFs | | Beneficiary households with TOFs | |
| | | | Costs per acre (Rs) | % to Total | Costs per acre (Rs) | % to Total | Costs per acre (Rs) | % to Total |
| Seeds | 65 | 10.5 | 182 | 5.5 | 229 | 5.9 | 196 | 4.8 |
| Organic manures | 98 | 16.0 | 368 | 11.1 | 357 | 9.2 | 249 | 6.1 |
| Chemical fertilizers | 16 | 2.6 | 1,236 | 37.3 | 1,525 | 39.1 | 1,714 | 42.2 |
| Wages paid to hired labour | 218 | 35.4 | 387 | 11.7 | 453 | 11.5 | 699 | 17.2 |
| Water charges | - | - | 216 | 6.6 | 294 | 7.5 | 312 | 7.7 |
| Bullock Maintenance | | | | | | | | |
| Owned | 165 | 27.9 | 310 | 9.4 | 87 | 2.2 | 27 | 0.7 |
| Hired | | | 159 | 4.8 | 206 | 5.2 | 116 | 2.9 |
| Tractor hire charges | - | - | - | - | 302 | 7.7 | - | - |
| Tractor owned-operation and maintenance charges | - | - | - | - | - | - | 355 | 8.7 |
| Others (including irrigation cess/penalty) | 54 | 7.5 | 452 | 13.6 | 450 | 11.6 | 392 | 9.7 |
| Total | 615 | 100.0 | 3,310 | 100.0 | 3,902 | 100.0 | 4,060 | 100.0 |

Statement II
Net income and incremental income during the year, 1980-81
(Including value added in processing sugarcane into jaggery)

(In Rupees)

| Item | Per Household | | Per acre of net cropped area | |
|---|---------------|----------|------------------------------|----------|
| | Without RLI | With RLI | Without RLI | With RLI |
| Beneficiary-households with BOFs | | | | |
| Value of produce | 3,057 | 11,711 | 2,138 | 8,190 |
| Costs of cultivation & processing | 879 | 6,234 | 615 | 4,359 |
| Net income | 2,178 | 5,477 | 1,523 | 3,831 |
| Incremental income | | 3,299 | | 2,309 |
| Beneficiary-households with THFs | | | | |
| Value of produce | 3,266 | 17,721 | 2,138 | 11,582 |
| Costs of cultivation & processing | 941 | 8,591 | 615 | 5,615 |
| Net income | 2,325 | 9,130 | 1,523 | 5,967 |
| Incremental income | | 6,805 | | 4,444 |
| Beneficiary-households with TOFs | | | | |
| Value of produce | 9,566 | 54,907 | 2,138 | 12,283 |
| Costs of cultivation & processing | 2,782 | 28,063 | 615 | 5,885 |
| Net income | 6,774 | 26,844 | 1,523 | 6,398 |
| Incremental income | | 20,070 | | 4,875 |

Statement 12
Recovery performance of the PSPPM of water charges from members

(Amount in thousands of Rs)

| | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 | 1975-76 | 1976-77 | 1977-78 | 1978-79 | 1979-80 | 1980-81 |
|---|------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Water charges due for the year | 75 | 2,29 | 2,80 | 3,43 | 3,32 | 3,31 | 4,32 | 3,47 | 2,27 | 2,74 | 2,83 |
| Water charges collected during the year | 41 (55) | 1,60 (70) | 2,60 (93) | 2,78 (81) | 2,76 (83) | 2,83 (85) | 3,58 (83) | 2,52 (73) | 1,41 (62) | 1,91 (70) | 2,02 (71) |
| <u>Water charges overdue</u> | | | | | | | | | | | |
| Overdue for less than 1 year | 34 | 69 | 20 | 65 | 56 | 48 | 74 | 95 | 86 | 83 | 81 |
| Overdue for 1 year | - | 1 | 1 | 3 | 12 | 17 | 13 | 18 | 32 | 17 | } 13 |
| Overdue for 2 years | - | - | - | 1 | 1 | 4 | 7 | 7 | 11 | 13 | |
| Overdue for 3 years | - | - | - | - | - | - | 4 | 5 | 5 | 5 | |
| Overdue for 4 years | - | - | - | - | - | - | - | 2 | 5 | 1 | |
| Overdue for 5 years | - | - | - | - | - | - | - | - | 1 | 3 | |
| Overdue for more than 5 years | - | - | - | - | - | - | - | - | - | 1 | |
| Total Overdues | 34 | 70 | 21 | 69 | 69 | 69 | 98 | 1,27 | 1,40 | 1,23 | 1,08 |

Figures in brackets are the proportions of charges collected to the charges due for the year.

Statement 13
Repayment performance of the PSPPM
 (Total loan Rs 7.95 lakhs)

(Rs lakhs)

| Year ending June | Dues | | | Payments | | | |
|---------------------|-----------|-------------|-------------|--------------|-------------|-------------|--------------|
| | Principal | Interest | Total | Principal | Interest* | Total | |
| 1971 | ... | - | 1.26 | 1.26 | - | 0.13 | 0.13 |
| 1972 | ... | 0.49 | 0.68 | 1.17 | - | 0.74 | 0.74 |
| 1973 | ... | 0.53 | 0.63 | 0.16 | 1.02 | 1.86 | 2.88 |
| 1974 | ... | 0.63 | 0.58 | 1.21 | 0.63 | 0.72 | 1.35 |
| 1975 | ... | 0.67 | 0.54 | 1.21 | 0.67 | 0.45 | 1.12 |
| 1976 | ... | 0.73 | 0.48 | 1.21 | 0.73 | 0.48 | 1.21 |
| 1977 | ... | 0.78 | 0.43 | 1.21 | 0.78 | 0.43 | 1.21 |
| 1978 | ... | 0.85 | 0.36 | 1.21 | 0.85 | 0.36 | 1.21 |
| 1979 | ... | 0.92 | 0.29 | 1.21 | 0.92 | 0.29 | 1.21 |
| 1980 | ... | 1.00 | 0.21 | 1.21 | 1.00 | 0.21 | 1.21 |
| 1981 | ... | 1.35 | 0.12 | 1.47 | 1.35 | 0.12 | 1.47 |
| Total | ... | 7.95 | 5.58 | 13.53 | 7.95 | 5.79 | 13.74 |

* Including penal interest

Source : MSLDB, Kolhapur

Annexure I
Some details of 9 lift irrigation units⁺

(Area in acres; Amount in Rs lakhs)

| No. | Name | Village | District | Anticipated cost | Loan amount disbursed | Command Area | | Area irrigated during the year | | | | | | | | |
|-----|---|-----------|----------|------------------|-----------------------|--------------|---------|--------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| | | | | | | Original | Revised | 1971-72 | 1972-73 | 1973-74 | 1974-75 | 1975-76 | 1976-77 | 1977-78 | 1978-79 | 1979-80 |
| 1. | Panchaganga Sahakari Pani Purvatha Mandali, Ltd. | Wadange | Kolhapur | 7.97 | 7.95 | 800 | 800 | 438 | 442 | 500 | 506 | 545 | 531 | 636 | 540 | 643 |
| 2. | Shri Kaleshwar Sahakari Pani Purvatha Mandali, Ltd. | Shirol | Kolhapur | 8.41 | 8.41 | 850 | 1,800 | 197 | 25 | - | 156 | - | - | - | - | 100 |
| 3. | Jay Hind Sahakari Pani Purvatha Mandali, Ltd. | Shirdhon | Kolhapur | 8.92 | 8.92 | 1,400 | 1,400 | 395 | 907 | 745 | 1,337 | 942 | 685 | 715 | 750 | 736 |
| 4. | Jawahar Sahakari Pani Purvatha Mandali, Ltd. | Shirdhon | Kolhapur | 3.69 | 3.69 | 440 | 400 | 227 | 398 | 320 | 473 | 394 | 239 | 273 | 292 | 321 |
| 5. | Shri Jyotirling Sahakari Pani Purvatha Sanstha, Ltd. | Sakharale | Sangli | 6.28 | 14.48 | 790 | 1,500 | 550 | 550 | 900 | 900 | 900 | 392 | 420 | 461 | 518 |
| 6. | Shri Mahadeo Sahakari Pani Purvatha Sanstha, Ltd. | Junekhed | Sangli | 7.48 | 7.48 | 930 | 769 | 769 | - | - | - | - | 330 | 415 | 355 | 345 |
| 7. | Shri Someshwar Sahakari Pani Purvatha Sanstha, Ltd. | Kasegaon | Sangli | 9.72 | 13.44 | 1,412 | 1,608 | - | 333 | 437 | 364 | 326 | 414 | 512 | 415 | 497 |
| 8. | [•] Yeshwant Cooperative Lift Irrigation Society, Ltd. | Supane | Satara | 5.06 | 5.08 | 775 | 775 | - | - | - | - | - | - | - | - | - |
| 9. | ^{**} Akkadase Sonewadi Co-op. Pani Purvatha Mandali, Ltd. Sonewadi | Akkadase- | Dhulia | 6.24 | 11.99 | 1,000 | 1,200 | - | - | - | - | - | 200 | 213 | - | - |

⁺ Position as on 30 June 1980

[•] The scheme was not functioning

^{**} Scheme was closed due to change of water flow of Tapi River

Source : MSLDB

Annexure II
Operational details of the working of the PSPPM

(Amount in Rs lakhs)

| Item | Y E A R | | | | | | | | | | |
|--------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | 1970-71 | 1971-72 | 1972-73 | 1973-74 | 1974-75 | 1975-76 | 1976-77 | 1977-78 | 1978-79 | 1979-80 | 1980-81 |
| Membership (No.) | 327 | 456 | 504 | 521 | 515 | 571 | 568 | 563 | 616 | 626 | 642 |
| Share Capital | 2.34 | 2.51 | 3.34 | 3.52 | 3.51 | 3.54 | 3.47 | 3.43 | 3.56 | 3.64 | 3.61 |
| Reserves and General Fund | - | - | 0.22 | 0.84 | 1.64 | 2.38 | 4.08 | 5.23 | 6.05 | 7.26 | 8.15 |
| Irrigated area (acres) | 146 | 438 | 442 | 500 | 506 | 545 | 531 | 636 | 540 | 643 | 617 |
| (i) Of which under sugarcane (acres) | 142 | 396 | 393 | 457 | 422 | 414 | 404 | 434 | 391 | 478 | 504 |
| Water charges (Due) | 0.75 | 2.29 | 2.80 | 3.43 | 3.32 | 3.31 | 4.32 | 3.47 | 2.27 | 2.74 | 2.83 |
| MSLDB Loan outstanding | 7.95 | 7.95 | 6.93 | 6.30 | 5.63 | 4.90 | 4.12 | 3.27 | 2.35 | 1.35 | - |
| Audit classification | B | B | A | A | A | A | A | A | A | A | A |

Annexure III
Economics of Lift Irrigation Assumed - representative holding of 3 acres
I : Area under crops and value of produce

| Crop | Year I | | | | Year II | | | | Year III | | | |
|------------------|--------------|---------------------------|------------------------|---------------------|--------------|---------------------------|------------------------|---------------------|--------------|----------------------------------|-------------------------------|---------------------|
| | Area (Acres) | Yield (Quintals per acre) | Total yield (Quintals) | Value of yield (Rs) | Area (Acres) | Yield (Quintals per acre) | Total yield (Quintals) | Value of yield (Rs) | Area (Acres) | Yield (Quintals/Tonnes per acre) | Total yield (Quintals/Tonnes) | Value of yield (Rs) |
| Kharif | | | | | | | | | | | | |
| Jowar | 1.50 | 4 | 6 | 330 | 1.50 | 4 | 6 | 330 | - | - | - | - |
| Maize | 1.50 | 4 | 6 | 300 | 1.50 | 4 | 6 | 300 | 1.50 | 6 | 9 | 450 |
| Paddy | - | - | - | - | - | - | - | - | 1.00 | 10 | 10 | 600 |
| Rabi | | | | | | | | | | | | |
| Jowar | 1.50 | 2 | 3 | 165 | 1.50 | 2 | 3 | 165 | - | - | - | - |
| Maize | 1.50 | 2 | 3 | 150 | 1.50 | 2 | 3 | 150 | 1.00 | 4 | 4 | 200 |
| Wheat | - | - | - | - | - | - | - | - | 0.50 | 8 | 4 | 280 |
| Paddy | - | - | - | - | - | - | - | - | 1.00 | 6 | 6 | 360 |
| Perennial | | | | | | | | | | | | |
| Sugarcane | - | - | - | - | - | - | - | - | 0.50 | 30 | 15 | 1,800 |
| Total | 6.00 | - | - | 945 | 6.00 | - | - | 945 | 5.50 | - | - | 3,690 |

Annexure III (Contd.)

Economics of Lift Irrigation Assumed - representative holding of 3 acres

I - Area under crops and value of produce (Contd)

| Crops | Year IV | | | | Year V | | | |
|------------------|-----------------|--|---|---------------------------|-----------------|--|---|---------------------------|
| | Area (Acres) | Yield (Quintals/ Tonnes per acre) | Total Yield (Quintals/ Tonnes) | Value of yield (Rs) | Area (Acres) | Yield (Quintals/ Tonnes per acre) | Total Yield (Quintals/ Tonnes) | Value of yield (Rs) |
| <u>Kharif</u> | | | | | | | | |
| Jowar | - | - | - | - | - | - | - | - |
| Maize | 1.50 | 8 | 12 | 600 | 1.50 | 10 | 15 | 750 |
| Paddy | 1.00 | 12 | 12 | 720 | 1.00 | 16 | 16 | 960 |
| <u>Rabi</u> | | | | | | | | |
| Jowar | - | - | - | - | - | - | - | - |
| Maize | 1.00 | 6 | 6 | 300 | 1.00 | 8 | 8 | 400 |
| Wheat | 0.50 | 10 | 5 | 350 | 0.50 | 10 | 5 | 350 |
| Paddy | 1.00 | 8 | 8 | 480 | 1.00 | 12 | 12 | 720 |
| <u>Perennial</u> | | | | | | | | |
| Sugarcane | 0.50 | 36 | 18 | 2,160 | 0.50 | 40 | 20 | 2,400 |
| Total | 5.50 | | | 4,610 | 5.50 | | | 5,580 |

Annexure III (Contd.)

Economics of Lift Irrigation Assumed - representative holding of 3 acres (Contd.)

II-Net Surplus

(Amount in Rs)

| Item | Year I | Year II | Year III | Year IV | Year V |
|---|-----------|------------|-------------|------------|-----------|
| (I) Value of gross produce | 945 | 945 | 3,690 | 4,610 | 5,580 |
| (II) Cost of cultivation | | | | | |
| (i) <u>Variable</u> | | | | | |
| (a) Water charges | - | - | 430 | 430 | 430 |
| (b) Others | 300 | 300 | 1,550 | 1,700 | 1,800 |
| Sub-total | 300 | 300 | 1,980 | 2,130 | 2,230 |
| (ii) <u>Overhead</u> | | | | | |
| (a) Interest on short-term loans, etc. | 60 | 60 | 200 | 200 | 240 |
| (iii) Total cost of cultivation | 360 | 360 | 2,180 | 2,330 | 2,470 |
| (III) Net income | 585 | 585 | 1,510 | 2,280 | 3,110 |
| (IV) Repayment of loan of Rs 3,000/- in 10 equated annual instalments (including interest) | - | - | 790 | 457 | 457 |
| (V) Net surplus available for maintenance of family | 585 | 585 | 720 | 1,823 | 2,653 |

Annexure IV

Income and Expenditure of the PSPPM assumed in the scheme

| Sr. No. | I n c o m e | | | E x p e n d i t u r e | | |
|---------|--------------------|-----------------------------|-----------------------------|-----------------------|--|-----------------|
| | Crop | Area under the crop (Acres) | Water charges per acre (Rs) | Amount (Rs) | Item | Amount (Rs) |
| 1. | Sugarcane | 80 | 600 | 48,000 | 1. Electricity | 40,000 |
| 2. | Paddy (K) | 60 | 80 | 4,800 | 2. Insurance | 4,404 |
| 3. | Groundnut (K) | 150 | 80 | 12,000 | 3. Maintenance | |
| 4. | Jowar (K) or Maize | 510 | 80 | 40,800 | a) Civil works at 1.5% of cost | 7,494 |
| | | | | | b) Mechanical works at 3% of cost | 5,664 |
| 5. | Jowar (R) | 300 | 165 | 49,500 | 4. Depreciation | |
| 6. | Maize (R) | 120 | 165 | 19,800 | a) 2.5% of civil works cost | 12,490 |
| 7. | Wheat (R) | 300 | 165 | 49,500 | b) 7% of mechanical works cost | 13,216 |
| | | | | | 5. Salaries and wages | 14,520 |
| | | | | | 6. Others | 4,000 |
| | | | | | 7. Sub-total | 1,01,788 |
| | | | | | 8. Repayment of loan in ten equated annual instalments at 8.5% | 1,21,402 |
| | Total | | | 2,24,400 | Total | 2,23,190 |

Annexure VI

Sensitivity Analysis

Financial Rate of Return

| | | | | |
|-------|------------------------|-----|------|------|
| (i) | Investment cost (+10%) | (a) | 42 % | |
| | | (b) | 17 % | |
| (ii) | Benefits (-10%) | (a) | 42 % | |
| | | (b) | 17 % | |
| (iii) | Investment cost (+10%) | } | (a) | 39 % |
| | and | | (b) | 16 % |
| | Benefits (-10%) | | | |

(a) with value added in processing sugarcane into jaggery

(b) without value added in processing sugarcane into jaggery

Annexure VII

The Economics of Jaggery Production

Sugarcane was the most important crop in the scheme area and all the beneficiary households processed sugarcane into jaggery. The sowing operations were carried out in months of October to January and generally the harvesting of sugarcane commenced in October.

The processing of sugarcane was undertaken either under personal supervision or by giving the work on contract basis. Normally the jaggery production season commenced in October and lasted for about four months. Every processing unit, called 'gurhal' employed about 22 persons who worked from about 3 p.m. to 5 a.m. next day. A unit processed 10 tonnes of sugarcane into about 12 quintals of jaggery every day. 'Gulwya' or the head of the unit was paid about Rs 20 per day and rest of his assistants were paid Rs5 to Rs7.50 per day each. The labour charges and the job of each category of person in such a group are given below :

Wage rates during 1980-81 of persons in a unit engaged in processing sugarcane into jaggery

| Particulars of work on a processing unit | No of persons employed | Wage rate per person per day | | | | Total (Rs) |
|---|------------------------|------------------------------|--------------|-----------------|------------|------------|
| | | In cash (Rs) | In kind (Rs) | Jaggery In Kind | | |
| | | | | (Kgs) | Value (Rs) | |
| Gulwya specialised in jaggery making technique | 1 | 20 | 10 | 3 | 10 | 40 |
| Chulmarya/furnace attendants | 2 | 7.50 | 10 | 1.5 | 5 | 22.50 |
| Attendants to Gulwya | 2 | 5 | - | 2 | 7 | 12 |
| Fadkari for harvesting, cleaning, crushing, etc., of sugarcane | 12 | 5 | - | 2 | 7 | 12 |
| Labourers for carrying away the bagasse and spreading it for drying | 5 | 5 | - | 2 | 7 | 12 |
| Total | | | | | | 310 |

In addition to this, generally 3 bullock carts were also required for transporting the sugarcane from the field to the processing site. Each bullock cart with the service of a driver was hired at Rs 30 per day. The machinery and other accessories were generally taken on hire. The hire charges for one day prevalent in this area during the reference year were of Rs 90 for sugarcane crusher and Rs 25 for the big pans used for boiling the sugarcane juice to golden syrup which is later transformed into jaggery. Thus, the cost of processing of 10 tonnes of sugarcane into jaggery was Rs 640.

Cost of processing of 10 tonnes of sugarcane into jaggery

| Item | Cost (Rs) |
|---|------------|
| 1. Cost of fuel (wood) | 25 |
| 2. Miscellaneous materials (powder, Acid/Ladies finger plants) etc. | 100 |
| 3. Labour charges etc., | 310 |
| 4. Hire charges for Bullock-cart and machinery and other accessories etc. | 205 |
| Total | 640 |

The quantity of jaggery produced from 10 tonnes of sugarcane was, on an average, 12 quintals. The price received for jaggery of quality No. 2, (which is the quality of jaggery produced in the scheme area) during the reference year was Rs 342 per quintal.