CHAPTER-SIX

6.1

CHAPTER VI

A CRITICAL REVIEW OF THE MEASURES TO ALLEVIATE THE ADVERSE EFFECTS OF DROUGHTS :

6.1 DROUGHT PRONE AREA PROGRAMME (DPAP) .

The Drought Prone Area Programme (hereinafter referred to as DPAP) was started in the year 1974-75 on the basis of midterm appraisal of the fourth plan and report of the "Taskforce"on integrated rural development setup by the planning commission. The programme was based on the strategy of integrated area develpment in agriculture and allied sectors of the rural economy.The aims of the programme are (1)conservation , (2) development and optimum utilisation of the land,water, livestock and human resources in the areas and districts prone to drought.

The following are the main objectives of the programme.

i) Restoration of ecological balance in the long run.

ii) Soil and moisture conservation and afforestation

iii) Management of irrigation resources and development whenever necessary.

iv) Restructuring of the cropping pattern and changes in agronomic practices.

v) To provide for diversified sources of income and employment such as livestock, forestry, fisheries, sericulture, pasture , fodder etc.

vi) While achieving above objectives special attention is

6.2 provided in all the sectoral programmes, towards the weaker sections/target groups comprising small and marginal farmers and agricultural labourers.

The overall strategy of the programme has been to maximise the production in good rainfall years and to minimise the losses when the rainfall is not sufficient. Through integrated efforts on all sectors around agriculture in which sectoral linkages are ensured properly to derive optimum benefit. This could be achieved by adopting soil and water conservation measures on a scientific basis, so that optimum utilisation of all available water in the drought prone area will be ensured through scientific planning in watershed.

The soil survey of the land will be a necessary condition for determining the cropping pattern suitable to different types of soil, short duration crops will be introduced in the drought prone areas. Since the agricultural development has many limitations , the farmers are encouraged to take up diversified activities like animal husbandry, poultry, sheep breeding , horticulture etc. The DPAP will therefore undertake scheme of creating infrastructure like marketing , processing , transportation of goods produced. So that the main objective of generating additional income to the people becomes feasible. These are the aims , objectives and strategy of the DPAP , launched in the drought prone areas .

In the following paragraph we take brief resume of various measures implemented , so far to alleviate the adverse effects of the drought on the farmers in the Solapur district.

6.3 6.2 AGRICULTURE

i) Soil Survey :

As stated above, DPAP, which is an integrated programme, was started in the year 1974-75. The important physical achievement of the programme in the district, between 1974-75 and 1979-80, is completion of a survey of 7 lakh hectares of area in 20 water sheds, as well as in the non water sheds area. The soil survey both in water and non watershed area was essential to prepare a plan of soil conservation and also water conservation through raising up of farm bunds. Under the scheme bunds were raised in an area of about 25,000 hectares. The implementation of bunds raising programme was expected to result into the increase in the moisture retaining capacity of the dry farms . Though it was not possible for us to make an accurate measurement of the benefit derived from the soil conservation programme implemented in the district we can broadly point out that some lands did benefit by way of their increased capacity to retain moisture , necessary for the growth of the crops and also, to some extent , to prevent likely damages to the standing crops for want of moisture. But the major defective of the programme was that, the whole bunding plan is prepared at macro level at the village i.e. by taking into account the whole agricultural area of the village without consulting the village farmers. Some bunds have not been beneficial to certain farmers because of heavy logging of water on their farms, from which the neighbouring

6.4 farms are likely to benefit through percolation of water. So the bunds raised were dismantled by majority of the farmers and the bunds from which the benefits are likely to be derived are not properly maintained. After taking into account, this type of situation prevailing on the soil conservation front of DPAP, by way of suggestion, we make the strong recommendation that the soil conservation programme with consultation of the villagers, and [illegible] should be implemented vigorously without any delay. Bad experience of the first soil conservation programme gives rise to the need for creating awareness on raising the part of the farmers, likely benefits of raising the bunds and maintaining them properly. In order to seek their co-operation, their biased views that the programmes are launched to provide employment under the Employment Guarantee Scheme (EGS) and once the top layer soil is taken away, the lands become less fertile through effective organisation of demonstrations by concerned agricultural department.

ii) Water Conservation :

The basic problem of the drought prone area is the scarcity of water, resulting from scanty and uneven distribution of rains. The root cause of the scarcity conditions in the drought prone areas is temporal and spatial uneven distribution of rains and the lack of irrigation. After having surveyed 20 watershed, 313 Nallah bunding works have been completed. The work of Nallha bunding is expected to prevent the run off water and store on

6.5 the farms, so that the surrounding area will have moisture content through percolation .Another advantage of it is that it prevents the soil erosion which is necessary in dry farming area.These two schemes -Nallha bunding and contour bunding were opposed by the farmers owing to the high cost which were beyond the reach of majority of the farmers.Hence these two will have to be taken up by the department of agriculture as a regular feature of the DPAP at the cost of government.The same experience has been with farm ponds.But in some of the cases construction cost being considerably high because of hard strata, the ponds dug were not having water when needed for protective irrigation because of percolation and evaporation. As such the scheme was given up in 1977-78.

iii) Well construction :

Another important measure to mitigate the severity of drought, was to grant long term credit to the farmers for digging wells. The Solapur district land development bank however did not provide credit in the initial stages of DPAP because of it's inadequate lending capacity resulting from its bad recovery position.Subsequently however, the land development bank was provided additional funds for lending to the farmers in DPAP water sheds.One more agency i.e.the national commercial banks were not liberal to the extent desired.The small and marginal farmers and others who constituted the targeted group of beneficiaries were defaulters of co-operative and government dues to the extent of 70 per cent and as such it was difficult

6.6 to ahieve the target fully.With a view to improving economic condition of the farmers' living in the dry prone areas,the measures will have to be adopted to reduce their dependence on the vagaries of the monsoon.This could be achieved by bringing maximum portion of their holdings under irrigation by exploiting the surface and ground water resources.The small and marginal farmers could be enabled to maximise portion of their holdings under irrigated crops thereby freeing themselves from the instability of yield and output.Keeping in view this aim the project for 1975-80 made a sufficient outlay for exploitation of ground water potential.As stated earlier the weaker sections i.e.small and marginal farmers are more prone to the hardships of frequent occurrance of drought are not financially in a position to invest considerably huge amount for digging of wells.Therefore,the programme implemented in the entire project i.e.1974-80 linked this component with the institutional finance.Individual farmers were to take loans from co-operative or commercial banks for the development of ground water resources and the project envisaged to provide 25 per cent or 33.3 per cent subsidy to the small and marginal farmers.The well development programme taken in 1975-76 project as stated above was aimed at providing subsidy on the cost of construction or renovation of wells under-taken by the small and marginal farmers.The following table no.VI.1 reveals that the programme was provided with an outlay of Rs.19.58 lakhs out of which only 38.76 per cent i.e.7.59 lakhs are spent.Further an observation can be made

6.7 from the same table that there is vast diversions between project target and achievement of upto March 1980.The divergence developed because of a conflict between the beneficiary and development bank authorities of quantum of work done from the first instalment resulting into withholding of second and third instalments.The delay in the release of second and third instalment resulted into large number of incomplete wells.The benefit of subsidy could not accure to large majority of the small and medium farmers because of their overdue to government and co-operative credit institutions . And as such they were considered as not being eligible for grant of subsidy.Therefore,the initiative of subsidy didn't work favourably in terms of expanding the area under well irrigation during the project period.

IV) Soil conservation :

The soil conservation programme consisted of 1)contour bunding 2) maintainance of contour bunds and 3) reclamation of ill drained unirrigated lands.

The water harvesting programme alongwith the soil conservation comprises of construction nallha checkbunds.The component of farm ponds under this programme is adopted cautiously in view of its economic viability not being established as yet.

The following table No.VI.2 reveals the physical targets,outlays achievements and expenditure under the various schemes of soil and moisture conservation during the project period of 1974-80.

From the table No.VI.2 it can be observed that under soil

6.8 conservation programme ,the targeted figure for contour bunding was 20,000 hectares of land ,and the outlay envisaged was Rs.40.00 lakhs .Whereas the actuals worked out to be 25,000 hectates and Rs. 46.33 lakhs which exceeded the targets both in physical and financial terms by 1980.Quite contrary to the above,we make an observation with regard to the maintenance of contour bunds,the targets figure of which were 75000 hectares and Rs.37.50 lakhs outlay,the actuals of which turned out to be 73000 hectares and Rs.4.97 lakhs correspondingly.The actual amount spent on maintenance of contours was substantially lower than the target though the area covered under the maintenance was slightly less than the target.As we have stated somewhere earlier ,the maintenance of contours after their construction was quite essential from the view point of raising the productivity of lands through enabling them to retain moisture required at different stages of crop growth.But unfortunately the maintenance of contours seems to have been neglected over a considerably longer period of time resulting into the non achievement of the objectives of soil conservation programme in the drought prone area.There is another item of the graded bunding for which target figures were not available.However, the actual figures of physical achievement and expenditure are just 51 hectares and Rs.0.09 lakhs correspondingly, forming very insignificant proportions of the totals envisaged under the soil and water harvesting programme.

Another important element of the programme is the land drainage scheme .Initially the land drainage scheme was expected

6.9 to cover 700 hectares involving Rs.5.25 lakhs.The actual achievement in terms of hectares covered by the scheme amounted to 2532 hectares costing Rs.13.23 lakhs far in excess of both physical and financial targets.Similarly another scheme Nallha checkbunds envisaged initially covered 200 check bunds with an outlay of Rs.20.60 lakhs.The achievements seem to be far more satisfactory because of the substantially higher physical and financial achievements.By the end of period ,1052 nallha checkbunds completed and the actual expenditure amounted to Rs.119.69 lakhs which was far greater than those on other schemes envisaged in the soil and water conservation programme. The expenditure incurred for exceeding the target and also the area could be appreciated on the ground that the nallha checkbunds have the greater capacity in increasing the moisture in adjoining areas as well as contributory to increase in ground water potential .Before completing the examination of the performance of the various schemes under soil and water conservation programme;a mention may be made that the programme of graded bunding was not included in the earlier project. The World Bank mission, however advised to undertake graded bunding work on pilot basis for the deep black soils and accordingly the work was undertaken. Diversion drain is a must in case of graded bunding works.But the farmers oppose to have diversion drains in the fields under the pretext that they are required to part with the cultivable land and lose the crop production to that extent.Therefore,the cultivators need to be convinced of the benefit of graded bunding .Though they

6.10 require to part with a certain portion of their cultivable lands under the bunds and diversion drains the benefits that they would be acquiring by way of extra yields will definitely compensate the apparent losses.Moreover by adopting soil conservation measures a rich soil would be saved from heavy erosion hazards in course of time.This should be alloted the topmost priority in the long term measures,conceived for the drought prone areas in general and particularly in Solapur district.

v) Ground water development :

A survey of entire district was carried out by the groundwater development agency.It recommended the 11903 additional wells could be constructed in the district and groundwater potential exists.Besides the central groundwater board has conducted survey to find groundwater potential in the Sina and Man rivers ;which are pernnial rivers of the district.The central groundwater board revealed that 45250 dug wells can be constructed in the Sina and Man river basins.A comprehensive programme therefore,for well development including new wells, repairs to old wells and energisation of wells was suggested in the project as a part of the maximum utilisation of potential water resources .

vi) Minor irrigation :

Minor irrigation tanks sanctioned under DPAP were executed by the Executive engineer ,minor irrigation division under

6.11 state sector along with their normal works.However minor irrigation works especially of tanks remained imcomplete by the end of the period.To complete the spellover works a huge amount was required .As such all these tanks remaining imcomplete would have been completed during 1980-85.

GENERAL REMARKS ON 1975-80 DPAP .

The World Bank Mission while formulating an appraisal report, recommended conduction reconnaisance survey in the entire Solapur district.The government of Maharashtra however dicided in the project report to carryout semi-detailed survey in about 4.5 lakhs hectares giving preference to water sheds selected under the DPAP.Accordingly a soil survey sub divisior was created in the month of September 1975 to conduct soil survey in the two districts of Ahmadnagar and Solapur.The soil survey sub division started semi detailed survey in Solapur district in the originally 10 selected water sheds and completed the survey in 1977. Further 10 additional water sheds were selected in April 1978 and the sub division carried semi-detailed survey in the new water sheds also.After completing the semi detailed survey in all the 20 water sheds the soil survey sub division started reconnaisance survey in the rest of the drought prone areas of the district.The following table No.II.3 gives an idea regarding the area covered under ,and details of reconnaisance survey undertaken by the sub division .

6.12 6.4 ACTION PLAN FOR 1980-85 .

i) Soil survey :

Deducting the areas of old water sheds (1,86,970 new watersheds 1,63,586 hectares) already covered under semi detailed survey, the balance area was 11,55,293 hectares which formed potential for soil survey in the district.Out of this an area of 7,19,627 hectares was covered under reconnaisance survey and semi detailed survey under DPAP or earlier survey by March 1980, leaving a balance of 4,35,616 hectares.This was to be durveyed under the Action Plan of 1980-85.

ii) Soil and water conservation :

The areas in the semi-arid zones having low and erratic rainfall are more vulnerable to soil erosion because of heavy rain water runoff owing to undulated topography .Further absence of vegetation cover on the area accelerates the process of soil erosion and water runoff and the land gradually loses its fertility,resulting into the low crop productivity.The soil and water conservation measures in a comprehensive manner therefore assumes greater importance in the DPAP in particular and in the planning process for agricultural development in general. These measures will help maintain the fertility of soil and the conservation of moisture will help the crop productivity to improve.

iii) Dryland farming :

In order to maximise production of rainfed crops under

6.13 drought conditions the dryland agricultural research centre Solapur has evolved the dryland farming technology through intensive research since 1942. The result of the research station are given in the appendix No.I to the present chapter. As it is well known majority of population in rural areas depend upon agriculture for their livelihood.Further a large number of farmers have small and marginal holdings .These farmers in the watershed have been following the ageold traditional methods of cultivation resulting in low production. The dryland farming programme is therefore considered as a core programme under DPAP.The process of adoption of the improved dryland farming technology by the farmers is slow as is generally observed in case of any new agricultural development programme.However,the work done during the first stage of DPAP was encouraging and had created confidence among the farmers and extension workers.And the second stage of DPAP will help in proper establishment of technology .Thus the main objective of the dryland farming programme of DPAP is to demonstrate to the vast majority of the farmers,the improved dryland technology which will definitely increase their farm production.The dryland farming technique evolved by the Solapur Dryland Farming Research Centre ,are suitable for the district but the farmers are rather sluggish in adopting them. It is therfore necessary to strengthen the extension services of the agricultural department through village level workers. The village level workers will have to train the farmers in the newly evolved dryland farming technologies.

6.14

iv) Surface irrigation :

Water being one of the main basic resource for agricultural production ,it's inadequacy leads to the condition of drought. To meet the adverse conditions of drought successfully,there are five ways.They are as follows -

1) Conservation of the available resources and using them at proper time.
2) Storing water during the period of surplus and using it as and when necessary.
3) Transferring the water from the areas of surplus to the areas of droughts as and when required.
4) Conservation of rain water as and where it touches the ground.
5) Conjunctive use of available surface and ground water resources.

Since the development of water resources by above means is crucial to the DPAP.The measures will have to be adopted to ensure maximum use of surface water and also ground water . For exploitation of surface water contrivances like minor tanks and bandharas are necessary for the purpose of surface irrigation and recharging of the underground water .

A) Minor irrigation tanks :

They comprise of having small storages and canals to distribute the stored water to the fields in the command areas .

6.15

B) Bandharas :

These are the structures which head up the water upstream and divert it to the fields through the canals by granting or alternatively, they allow facilities of lifting water from upstream which are known as Kolhapur type bandharas.(weirs.)

C) Percolation tanks :

These are the small storages. They are expected to recharge already parched acquifers downstream to augment the supplies to the well in the region. However the percolation tanks have not been taken under the plan because, the major portion of them was to be financed from other funds like EGS, etc . during previous plan for 1974-80. Sixteen minor irrigation tanks were included , out of these, five were nearly completed physically.

The remaining eight were still to be completed. While three others yet to be started , the estimated irrigation potential for all the sixteen tanks was 6416 hectares and the expenditure incurred upto 1980 was Rs.26.88 lakhs. A provision of Rs.167.14 lakhs was made in the 1980-85 period for the completion of the spillover works and also for four new minor irrigation works. Out of the total irrigation potential of the 6416 hectares projected for the 16 minor irrigation tanks, 1713 hectares of irrigation potential had been created by March, 1980.

6.16 Estimated cost of the 16 minor irrigation tanks was Rs.292.98 lakhs out of which upto 1980 Rs.238.39 lakhs were spent on these 16 minor irrigation tanks. In order to complete the remaining works a provision of Rs.109.74 required for the period 1980-85 was made. However in view of escalation of construction costs and wages the above mentioned amount will not be an adequate amount and as such the amount provided for will fall short of the actual expenditure to be incurred. Maybe due to rising cost of construction and inadequate funds may cause a delay in tapping all the irrigation potential estimated in the beginning of 1974-75. Besides in the next period, four more tanks with the estimated irrigation potential of 4663 hectares with the estimated cost of Rs.32.43 lakhs were proposed to be undertaken and for some new works for the period 1980-85 was made Rs.57.40 lakhs and the provision required for 1980-85 Rs.25.03 lakhs would be taken from EGS. But here also it will be true what we have observed in connection with the earlier 16 minor irrigation tanks' estimated cost falling short of the actual expenditure in view of the rising construction costs. For details of marginal irrigation works alongwith irrigation potential and actual irrigation potential created see the Appendix No.2

v) Development of ground water resources .

The ground water development agency(GSDA) has conducted a fresh survey of ground water potential in 1978, taking into

6.17 account the various water harvesting measures (minor irrigation tanks, percolation tanks and nallha bunds) undertaken in the development process. For the details of the survey see table No.VI.4. According to the survey 12142 additional wells were feasible in the district. Having such a large potential it is essential to push up the well irrigation development programme more vigorously as it will minimise the effects of drought to a considerable extent. Out of the total irrigation potential 10 percent in each taluka will be utilised by the category of small and marginal farmers . In addition to this (GSDA) survey, Central Ground Water Board undertook hydrological study in Sina and Man basin ; covering the talukas of Barsi, north Solapur , south Solapur , Mangalwedha, Sangola and Mohol. The Central Ground Water Board had suggested 45250 dug-cum-bore wells which are feasible in the basin areas in addition . Again apart from this (CGWB's survey) GSDA undertook the study of possible additional wells in the benefit zone of percolation tanks constructed. It has suggested additional of about 200 wells in the command area of 24 percolation tanks , out of 56 tanks of which survey was undertaken. It was contemplated to exploit this potential by excavating the wells under EGS and construction , and energisation by way of loans from Maharashtra State Co-operative Land Development Bank Solapur. Besides new wells were systematically proposed to be taken up under the command of Nallha bunds constructed under DPAP.

The following table No.VI-5 gives us the whole idea

6.18 of well irrigation potential of the entire district , talukawise explored by GSDA . The total well irrigation potential worked out to be 12142 wells out of which 1214 were to be allotted to the small and marginal farmers .(10 per cent of total potential)

The target fixed for 1980-85 was 55 per cent .Apart from the development of new potential through the repairs to old wells irrigation potential was to be generated and the total number of wells to be repaired came to 3858 out of which 192 wells were the fixed targets for the period 1980-85.At the same time the wells to be equipped with pump sets (engergisation) estimated potential was 3367 out of which 170 wells were to be engerised but the ahievement of these targets in connection with the new wells ,old wells and pump sets during the period 1980-85 was subjected to the availability of the funds of IRDP. and that were to be revised and made available for DPAP in future.

Apart from these two types of irrigation development programmes the medium and major irrigation projects are currently going on in the district.They are not being included in DPAP of the district.However,one will have to take note of the big irrigation project on Bhima river at Ujani.The first stage of which was completed in 1980.By the end of 1984-85 47 per cent of total canal lengths has been completed.The

6.19 command area of this project has been estimated at 1,53,430 hectares.After completion of this project ,112940 hectares of land will be brought under irrigation.In the year 1984-85, 124 hectares were perennially irrigated ,while 50772 hectares were seasonally irrigated.Five medium irrigation projects in the district and one in Satara district taken together have a command area of 42710 hectares in 1984-85.7347 hectares area was irrigated by these medium projects.By the end of 1983-84, 130 minor irrigation projects were under utilisation and 13119 hectares of land was brought under irrigation through them.[1]

Looking at the irrigation statistics of the district out of net irrigated area 23.11 per cent area was irrigated through canals and lift irrigation, whereas 76.39 per cent area is irrigated through well irrigation (According to 1980-81 figure.) Moreover of the total canal and lift irrigation ,the maximum 48.74 per cent area and the minimum 0.41 per cent area is irrigated in Malsiras and Barsi talukas respectively. The well irrigation similarly is the highest in Madha taluka i.e.90.18 and lowest 2.72 per cent in north Solapur taluka. After reviewing the situation on irrigation front the long term measures under which major and medium irrigation projects are included ,seem to have been delayed .As a result of which all existing irrigation potential has not been tapped as yet.

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1. District Social and Economic Abstract V.1982-85, Solapur district,economic and stat department of Govt.of Maharashtra II. p.9

6.20 In order to relieve the district from the recurrence of drought and the almost whole population of district (except Malsiras) the medium and minor projects will have to be expedited .The policy makers ,without indulging in controversy should realise the exigency of drought affected areas in general and the drought affected Solapur district in particular ,speed up the incomplete works of ongoing irrigation projects.

TABLE NO. VI-1 .

WELL IRRIGATION DEVELOPMENT PROGRAMME , 1975-76 .

Component	Unit	Physical		Finacial	
		Project Target	Achievement upto 1980	Project outlay Rs.in lakh.	Expeaditure upto March 80, Rs.in % inlakh
1. Repairs to old wells	No	220	121	2.42	1.41
2. Construction of new wells with electric pumpsets.	No	238	193	7.44	2.29
3. Construction of new wells with d diesel pumpsets.	NO.	238	192	9.72	2.77
4. Pumpsets	-	22	92	-	0.91
5. Lift Irrigation	-	-	2	-	0.21
TOTAL				19.58	7.59

Source : Project Report of Drought Prone Area Programme 1980-85 , Solapur District .

TABLE NO.VI -2.

Physical and Financial achievement of the Soil Conservation Programme 1974 -80.

Sr.No!	Scheme	'Unit	Project targets	'Project outlay Rs.in lakh.	Achievement up to March 1980 .	'Expenditure upto March 1980.
1	2	3	4	5	6	7
1.	Contour bunding	Ha'ooo	20	40.00	25	46.33
2.	Maintenance	Ha'ooo	75	37.50	73	4.97
3.	Graded bunding	Ha	-	-	51	0.09
4.	Land drainage	Ha	700	5.25	2532	13.23
5.	Nalla check bunds	NO	200	20.60	1052	119.69
6.	Farm ponds	No.	550	17.50	76	3.95
7.	Establishment	-	-	71.85	-	94.47

Source : As in Table No. VI -1.

TABLE NO. VI -3 .

Details of Semi-Detailed and Reconnaisance Survey in (Area in hectare)

YEAR	SEMI-DETAILED SURVEY	RECONNAISANCE SURVEY
1975-76	50,000	-
1976-77	53,000	1,42,000
1977-78	-	1,48,000
1978-79	75,000	28,000
1979-80	2,82,000	-
TOTAL	3,80,000	3,18,000

Source : As in Table No. VI -1 .

TABLE NO. VI -4

List of the proposed Minor Irrigation Tanks included in Project 1980-85

Sr.No.	Name of the work	Estimated cost Rs.in lakhs .	Irrigation potential in Hects.	Cost per Hect.	Labour Potential (lakh mandays)
1	2	3	4	5	6
(A)	SPILLOVER WORKS				
1.	Minor Irrigation Tank Kumbhej	18.19	212	8590	2.72
2.	Minor Irrigation Tank Mamadour	24.20	326	7427	3.62
3.	Minor Irrigation Tank Kategaon	12.46	212	6493	3.11
4.	Minor Irrigation Tank Chare	18.66	297	6993	3.11
5.	Minor Irrigation Tank Nimgaon	21.66	296	7317	3.24
6.	Minor Irrigation Tank Pokharapur	25.75	338	7626	3.86
7.	K.T.Weir Malikpeth	9.02	1987	462	1.53
8.	Minor Irrigation Tank Darphal	24.99	552.	5585	3.74
9.	Minor Irrigation Tank Chikkehalli	20.22	325	6279	3.03
10.	Minor Irrigation Tank Torni	17.80	248	7208	2.67
11.	Minor Irrigation Tank Borgaon	22.31	416	5250	3.35
12.	Minor Irrigation Tank Hanamgaon	23.25	455	5110	3.48
13.	Kole Bandhara	3.44	152	2263	0.51
14.	Minor Irrigation Tank Dongargaon	16.02	206	7739	2.40
15.	Minor Irrigation Tank Kalamawadi	10.30	129	7923	1.54
16.	Minor Irrigation Tank Kave	24.71	364	6611	N.A.
	Total (A)	292.98	6516		45.52.

Contd.on next page.

1	2	3	4	5	6
(B)	NEW WORKS :				
1.	K.T.Weir Bopale	12.21	2068	457	1.83
2.	Minor Irrigation Tank Gholasgaon	39.40	350	11867	5.91
3.	K.T.Weir Barajgol	16.48	955	1726	2.47
4.	K.T.Weir Akole-Vasud	14.34	1290	1315	2.51
	Total(B)	82.43	4663		54.63

TABLE NO. VI -5

A comprehensive statement with regard to well and their energisation

Sr.No.	Tahsil/	New wells			Repairs to old wells		Pumpsets	
		Potential G.S.D.A.	10% small farmers.	Target fixed 80-85	Potential total	Target 80-85	Potential	Target 80-85
1.	North Solapur	885	88	69	58	18	46	17
2.	South Solapur	241	24	99	40	18	94	17
3.	Akkalkot	692	69	39	110	18	1205	17
4.	Barsi	1394	139	27	151	15	232	17
5.	Pandharpur	1383	138	39	939	14	176	17
6.	Sangola	720	72	69	939	18	542	17
7.	Mangalwedha	782	78	69	13	12	121	17
8.	Mohol .	684	68	69	1134	18	161	17
9.	Madha	615	62	24	360	18	400	17
10.	Karmala	2560	256	69	624	10	268	17
11.	Malsiras	2186	218	48	291	24	128	17
	TOTAL :	12142	1214	551	3859	192	3367	170

Note : 1) The targets figure for pumpsets area also suggested in the light of experience of last few years .

2) Potential for pumpsets indicated is 107 of the total.

Source : As in table No.VI-.1 .

Appendix-1

RESULT OF RESEARCH EXPERIMENTS ON DRYLAND FARMING AT SOLAPUR.

Sr. No.	Crop experimented.	Nature of experiments.	Results of experiments.
1.	2.	3.	4.
1.	Rabi Jowar.	**Soil & Water Conservation.** 1. Effect of bunding.	Crop in bunded plot yielded 7.8% more than in unbunded plot. Recent studies carried out at the Station during 1976-78 showed increas in yield by 14.3 and 19.0 percent of Bajara and Red Gram, respectively over unbunded area in bajara and red gram intercrop syster. This also increased cropping infensity by 67 percent.
2.	Bajara, Red Gram Matki.	2. Effect of strips of different legumes on runoff and soil loss.	Growing erosion permitting(Bajara & Red Gram) & erosion resisting(groundnut, horse gram) crops in alternate strips alongw the contour control soil erosion & runoff losses. Soil losses under alternate strips of Matki & Bajara & Tur were 1.26 ton/ha. as against 5.98 tons/ha. under bajara & Tur. Run off losses were 11% under strip crpping as against 16% under local practice of mixed cropping. This system is suitable for shallow soils. Width of strip of crops is to be kept as follows

% slope of land.	Width(n)ratio of erosion permitting & erosion resisting crops.
1.00	1 : 5
2.0	1 : 4
3.0	1 : 3

1.	2.	3.	4.
		3. Effect of Mulches of soil moisture conservation.	Use of Mulch is most effective in conserving soil moisture. Mulching minimizes the evaporation losses of moisture and makes available about 35 mm of moisture, than the unmulched plot. During 1971-74 this increased yield of rabi jowar by 58% of grain and 59% of fodder than unmulched areas. Farm waste material such as red gram stalks, jowar, stubbles or dry grass is to be spread @ 5th/ha between rows, within 15 days after germination.
3.	Moath bean, Hulga Groundnut.	4. Effect of tillage practices & cropping systems on soil erosion.	Soil losses are maximum (90.80 t/ha) where rabi jowar is grown during rabi keeping kharif fallow. Growing Moth bean during Kharif showed minimum soil leases (3.7 t/ha) as against kharif fallow (11.0 t/ha). Hulga & groundnut recorded 443 & 6.8 t/ha. soil losses, respectively. Bajara-redgram-groundnut and bajara-redgram-hulga are the suitable crop rotations with minimum soil losses as compared to pure crops of bajara and red gram.
		5. Water harvesting.	Runoff water can be stored in dug-out pond and used as protective irrigation to rabi jowar.
4.	Grass.	6. Cultivation of grasses	Grasses are found to be effective in stabilizing bunds, conservation of soil & also give fodder cultivation of grasses on shallow and very shallow soils is more profitable than growing crops. 8 to 12 tons of green fodder through 3 to 4 cuttings could be obtained by grass cultivation Blue panic (Panicum antidotale) & Marvel-8 (Disanthinn annulatum) are the most promising varieties.

1.	2.	3.	4.
		7. Soil Reclamation	Application of gypsum @ 1/6 gypsum requirement, provision of adequate to drainage, & proper crop rotation found to be effective in improving the physicochenical properties of saline-sodic soils.
5. Cereals, pulses cilseeds.		8. Crop planting.	Crops & cropping patterns are to be adopted on the basis of land use capability. The experimental results indicated that the following cropping patterns are most suitable for dryland areas. Soil type. : Crops. 1. Very shallow soils (7.5 cm.) : Grasses. 2. Shallow soils (7.5 to 22.5 cm.) : Grasses, horse gram, bajara. 3. Medium deep soils (22.5 to 45 cm.) : Bajara, groundnut, red-gram, black gram, sunflower. 4. Medium deep (45 to 60 cm) : Double cropping of bajara-gram-safflower black gram jowar (fodder) bajara (fodder) gram & pure crops of rabi jowar with yearly sowing, first forthnight of September.). 5. Medium deep (60 cm & deep) : Double cropping of black gram-rabi Jowar M-35-1, Bajara safflower & Pure crops of Safflower Rabi Jowar & gram.
6. Rabi Jowar, Bajara green gram, black gram.		Cropping systems. 1) Sequence cropping.	Sequence cropping of green gram followed by rabi jowar or black gram followed by rabi jowar or bajara followed by gram are most suitable for soils with depth of 60.90 cm, during favourable rainfall years. The sequence of cropping increases crop yields by 100-200 percent.

1.	2.	3.	4.
7.	Bajara, Red Gram.	2. Intercropping.	Intercropping of bajara with red gram in 2:1 proportion is the most efficient cropping system for soils with 30-40 cm. depth. During 1974-75 this system increased the crop productivity 6[illegible] percent compared to pure crop sytem, reduces risk and gives maximum net profit.
		Fertilizer use in drylands.	
8.	Bajara, Rabi Jowar Setaria, safflower, sunflower, pulses.	1. Response of different crops to fertiliser.	Application of 25 to 50 kg. nitrogen/ha. at the time of sowing (at 10 cm. depth near seed row) to crops like bajara, setaria, sunflower, rabi jowar, safflower increased crop production. Yield increased and ranged 40 to 60 percent and 60 to 100 percent at 25 kg. and 50 kg. N /ha. respectively. Application of phospheric acid (62 % @ 25 Kg/ha to all rainfed crops except rabi jowar and safflower is recommended.
9-	Cereals, pulses & oil seeds.	Crop improvement. Screening & testing of rainfed crops.	The following improved crops varieties are suitable for dryland areas which give higher yield over the local varieties.

Crops.	Variety.		
Bajara	BJ 104	Seasamum -	D.7.11, Uma Til No.1.
Green gram	S-8, J-781	Sunflower-	EC-39878
Black gram.	T-9, No.55, G-104.	Castor.	SA-1 Aruna Girija.
Cow pea	K-11, C-152	Sorghum - (rabi)	CSH 6 R, M-35-1 SPV-84.
Red gram	No.148	Gram -	N-59.
Horse gram	K-42, D-40-1	Safflower-	N-62-3, 5-4 Tara (for late sowing).
Groundnut	SB-XI, M-13		

10.	Rabi Jowar Safflower.	Cultural experiments. 1. Advance sowing.	Advance sowing i.e. first fortnight of September for rabi jowar & Second fortnight of September for safflower are best suited. During 1974-75, this gave 30 percent additional grain yield & 93 percent fodder yield in case of rabi jowar & 81 percent grain yield of safflower over the traditional sowing.

1.	2.	3.	4.
11.	Bajara, red gram setaria, groundnut black gram, green gram, Castor, Sunflower.	2. Mid-season correction.	Under delayed monsoon conditions, bajara, red gram, castor, horse gram & setaria are best suited for sowing upto 15th July & for further delayed season, castor & sunflower are the suitable crops.
12.	Bajara	3. Weed management.	Clean cultivation of bajara during first 30 days after sowing keep down weeds and increases crop production al-lowed by 35% over uncleaned area. Application of alter-azine @ 0.5 kg. a.i./ha. as a pre-emergence application is equally effective in controlling weeds.
13.	Koo-babhul.	4. Fuel & fodder trees.	Koo-babhul (Leucaena glauca) is suitable for growing on field bunds and road side for fuel & fodder. Koo-babhul fodder is rich in protein content & also plantable.
14.	Glyricidia maculata.	5. Compositing of green leaves.	Glyricidia maculate is suitable for growing on field bunds and road-sides. Green leaves and tender branches are useful for compost making.
15.	Rabi Jowar.	6. Protective irrigation.	One protective irrigation to rabi jowar during pre-boot stage (about 55-60 days after sowing) increased the rabi jowar production by 60 percent.
16.	All crops.	Improved implements Two bowl ferti-seed-drill.	Two bowl ferti-seed-drill develtned at the station is found to be very suitable for proper planement of fertiliser and sowing of seed simultenecously.

Appendix - 2

PROGRESS OF MINOR IRRIGATION TANKS TAKEN UP IN THE PROJECT
PERIOD 1974-80.

Sr. No.	Name of the M.I.Tank.	Taluka.	Irrigation potential (Ha)	Irrigation potential created upto March 1980.	Estimated cost Rs in lakhs.	Expenditure upto March 1980 Rs in lakh.	Provision required for 1980-85
1.	M.I.Tank Darphal BB	North Solapur.	552	447	24.99	25.04	2.87
2.	M.I.Tank Hanamgaon	South Solapur.	455	304	23.25	31.65	3.00
3.	M.I.Tank Chikkehalli	Akkalkot	325	107	20.22	28.86	2.00
4.	M.I.Tank Torni	-do-	249	—	17.80	0.26	12.80
5.	M.I.Tank Borgaon	-do-	416	142	22.31	9.97	3.10
6.	M.I.Tank Mamadapur	Barsi	326	200	24.20	28.83	9.82
7.	M.I.Tank Kategaon.	-do-	212	71	12.46	15.04	5.01
8.	M.I.Tank Chare	-do-	297	Nil	18.66	..	20.81
9.	Kole Bandhara	Sangola	152	51	3.44	4.18	1.00
10.	M.I.Tank Dongargaon	Mangal-vedha.	206	206	16.02	26.23	0.10
11.	M.I.Tank Kalamwadi	Malshiras	129	443	10.30	10.29	1.50
12.	M.I.Tank Nimgaon.	Madha	296	..	21.66	20.19	18.21
13.	M.I.Tank Kavhe	-do-	364	..	24.71	..	..
14.	M.I.Tank Pokhara-pur	Mohol	338	..	25.75	0.03	25.75
15.	K.T.Weir Malikpeth.	-do-	1987	..	9.02	6.19	1.67
16.	M.I.Tank Kumbhej,	Karmala	212	142	18-14	31.27	1.10
		Total :	6416	1713	292.98	238.39	109.74
	NEW WORKS.						
1.	M.I.TANK Gholasgaon.	Akkalkot	350	..	39.40	..	17.08 *
2.	K.T.Weir Borasghol.	-do-	955	..	16.48	..	13.77
3.	K.T.Weir Akole-Vasud	Sangola	1290	..	14.34	..	14.34
4.	K.T.Weir Bopale	Mohol	2068	..	12.21	..	12.21
		Total :	4663	..	82.43	..	57.40

* Unspilled portion will be taken from EGS.

.....70.