A STUDY OF CROP HUSBANDRY IN LAKHAOTI COMMAND

A DISSERTATION

submitted in partial fulfilment of the
requirements for the award of the degree
of
MASTER OF ENGINEERING
in
WATER USE MANAGEMENT

By

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the Dissertation entitled **"A STUDY OF CROP HUSBANDRY IN LAKHAOTI COMMAND"** in partial fulfilment of the requirement for the award of the Degree of Master of Engieering in Water Use Management, submitted in the Water Resources Development Training Centre, University of Roorkee, Roorkee, is an authentic record of my own work carried out during the period since 16th July, 1991 to 8th December, 1991 under the supervision of Dr. S.K. Tripathi, Reader, W.R.D.T.C., University of Roorkee, Roorkee.

The matter embodied in this dissertation has not been submitted by me for the award of any other degree.

9th December, 1991 **(NAGENDRA PRASAD MISHRA)**

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

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A C K N O W L E D G E M E N T

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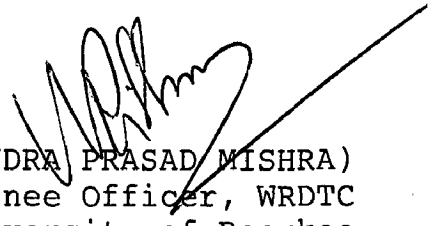

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A STUDY OF CROP HUSBANDRY IN LAKHAOTI COMMAND

S Y N O P S I S

A study of crop husbandry in Lakhaoti Command was undertaken during Kharif season 1991 with the principal objectives.

- To record crop husbandry practices under different irrigation sources in the command.
- To conduct irrigability, drainability and soil climatic surveys.
- To assess the biomass productivity using weather parameters
- To assess the dry matter production potential of the crops, and
- To analyse the water related yield constraints of the crops in the command area.

Principal crops of the kharif season of the command area were maize, sorghum (fodder), Pigeon-Pea (Arhar) and sugarcane. These crops were taken for studies, irrigated by four different sources of irrigation. The irrigation sources were, government tube wells, private tube wells, a combination of government and private tube wells, and canals. Three government tube well commands and three minor canal commands were selected for studies.

Soil samplings from six soil profiles, one from each commands were taken fro every 30 cm depth upto 1.80 m soil depth to analyse the soils physical and chemical properties. Field experiments were conducted for studying the hydraulic conductivity, field capacity and infiltration characteristics in each commands. Permanent wilting point for each command soil was determined in labouratory, subjecting the soil samples for 15 bar pressure with the help of, pressure membrane apparatus. On analysis it was found that soils in all commands are uniform.

A thorough analysis of soil properties and land features reveals that, as per IS standard the command soil belongs to Irrigability class A and land irrigability and drainability class I. The annual biomass productivity of the area assessed using weather parameters was found to be 118.40 t/ha.

The data monitoring crop husbandry practices were collected from the plots delineated in each of the commands. Part of information was gathered from the farmers interview. Observations of crop husbandry practices included recording of sowing methods, and dates, land prepartion, seed rate and variety, irrigation methods, amount and dates, fertilizer amounts, interculture operations and plant protection measures. The data reveals that crop husbandry practices are identical in the command. Observations on growth and development included the determination of dry matter production, rooting depth and leaf area development at periodical intervals. Water related yield constraint was analysed in various crops grown under various water supply conditions.

The maximum dry matter production potential recorded at harvest of maize, sorghum and sugarcane were found to be 12.6, 14.3 and 55.87 t/ha respectively.

The dry matter production in the government tube well commands were found to be low as compared to other commands as the crops faced water stress due to inadequate and untimely water supply. The present study will help in irrigation planning and improving the crop management practices of the command to get increased agricultural production.

C O N T E N T S

CHAPTER I

INTRODUCTION

A STUDY OF CROP HUSBANDARY IN LAKHAOTI COMMAND

CHAPTER - I

I N T R O D U C T I O N

1.1. GENERAL :

Conjunctive use of canal and ground water in Madhya Ganga Canal is being planned. Sufficient flow in River Ganga is available to irrigate Kharif crops only which can be allocated through Madhya Ganga Canal. Prior to the inception of Madhya Ganga canal, the area was irrigated by a number of Government and private tubewells, the depth of ground water has gone too low. A substantial decrease in the yield of tubewells and shortage of electrical energy to pump out the ground water aggravated the problem of irrigation. Hence, the main objective of constructing the Ganga canal is to divert the sufficiently available rainy season flow to Madhya Ganga canal command to provide the Kharif irrigation in the command and to spread the canal water to recharge ground water.

The main objective of irrigation project is to optimise use of water and produce the maximum crop without impovershing the productivity of the land and to study the impact of irrigation water through Madhya Ganga Canal on Madhya Ganga Command. The Water & Land Management Institute (WALMI) Okhala, New Delhi and Water Resources Development Training Centre, University of Roorkee, Roorkee took a joint Research Project to work on Lakhaoti Branch canal command.

The present work entitled "A Study of Crop Husbandry in Lakhaoti Command" was taken up with the following objectives :

(i) To record crop husbandry practices under different irrigation sources.

(ii) To conduct irrigability drainability and soil climatic surveys.

(iii) To compute ETo, biomass productivity and dry matter productio potential of crops in the area.

CHAPTER II

REVIEW OF LITERATURE

A STUDY OF CROP HUSBANDARY IN LAKHAOTI COMMAND

C H A P T E R - 2

REVIEW OF LITERATURE

2.1 ESTIMATION OF REFERENCE EVAPOTRANSPIRATION :

Thornthwaite (1948) assumed that an exponential relationship existed between mean monthly temperature and mean monthly consumptive use. The relationship was based on large number of observations&experiments made in the Central and Eastern United States. No allowance was made for different crops or varying land uses. The formula was orginally developed for the purpose of rational classification of the broad climate patterns of the world. Suitable coefficient therefore needs to be developed for realistic estimation of E To.

Energy balance method of calculating the potential evapotranspiration is by knowing the energy available for it on the evapotranspiring surface. In the equation of energy balance it is difficult to measure the parameter of sensible heat transfer from surface to air or from air to surface and also the measurement of heat flux due to evaporation and condensation. Approach of Bowen ratio was used to partition the energy and to calculate the energy available for potential evapotranspiration. (Mishra and Ahmed 1990).

Oliver (1961) developed a simple formula for estimating PET, by corellating average wet bulb depression in ^{o}C and cyclic (radiation/latitude) factor for a specific latitude.

Penman (1948) proposed an equation for evaporation from open water surface based on combination of energy balance and sink strength envolving various parameters like slope of saturation vapour pressure VS temperature curve at mean air temperature, saturation rapour pressure of evaporating surface, mean air temperature, net radiation, reflection coefficient of evaporating surface, Angots value of mean monthly extra terrestrial radiation, actual and possible hours of bright sunshine, Stefan Boltzman constant, saturation vapour pressure and relative humidity etc. Since the Penman equation estimated the evaporation from free water surface this was later modifid to provide ETo.

Blaney criddle equation (1950) involves the calculation of consumptive use factor (f) from mean temperature (T) and percentage (p) of total annual day light hours occuring during the period being considered. An empirically determined consumptive use crop coefficient (k) is then applied to establish the consumptive water requirements (CU) = K.f = K (p.T/100), with T in ^{o}F. (CU) is defined as the amount of water potentially required to meet the evaporative needs of vegetative area so that plant production is not limited by lack of water. The effect of climate on crop water requirement is, however, insufficiently defined by temperature and day length.

crop water requirement will vary widely between climate having similar values of T and p. Consequently the consumptive use crop coefficient (K) will need to varry not only with the crop but also very much with climatic condition.

Radiation method of computation ETo is essentially an adaptation of Makkink formula (1957), this method is suggested for areas where available climate data include measured air temperature and sunshine cloudiness or radiation, but not measured wind and humidity. Knowledge of general levels of wind and humidity required and these are to be estimated using published weather description, extrapolation from nearby area or from local sources. The radiation method is more reliable in equatorial zones, small islands, or at high altitudes (Dooranbas and Pruitt 1977). Evaporation pans provide a measurement of the integrated effect of radiation, wind, temperature and humidity on evaporation from a specific open surface. In a similar fashion the plant responds to the same climatic variables but several factors may produce significant difference in loss of water . Reflection of solar radiation from a surface is only 5%- 8%, from most vegetative surfaces 20 - 25 percent. Storage of heat within the pan can be appreciable and may cause almost equal evaporation during night and day. Most crops transpire only during the day time. Also the difference in water losses from pans and from crops can be caused by differences in turbulences, temperature and humidity of the air immediately above the surfaces.

Heat transfer through the sides of the pan, sitting of the pan, colour of the pan and pan environmentmeasures the difference the result. (Doorenbos and Pruitt, 1977).

Doorenbos and Pruitt (1977) proposed modified Penman Method for estimating reference crop ET.

2.2. AGROCLIMATIC CLASSIFICATION :

Köppen (1936) divided the world climate into 5 principal groups.

(1) Tropical rainy climate with sub divisions relating to the absence of a dry season or its occurrence in summer or winter.

(2) Dry climate with sub-divisions for semi and steppe, and arid or desert climate.

(3) Warm temperature rainy climate with sub-division on the basis of occurrence of a dry season.

(4) Cold and snow climate,

(5) Polar climate.

Emberger (1955), suggested the delimitation of various bioclimates by means of a pluviothermic quotient.

(Q) defined as $Q = \frac{100\ P}{(M-m)\ (M+m)}$

Where, M is the mean temperature of hotest month m is the mean minimum temperature (^{o}C) in the coldest month and (p) is

the annual rainfall in mm unlike other classification systems Emberger's quotient can not be used by itself to make a valid climatic map.

The main limitation of Köpen's widely used climatic classification is lack of rational basis for selecting temperature an precipitation values for different climatic zones.

Thornthwaite (1948) improved this by introducing the water balance concept in his classification. He introduced the concept of potential evapotranspiration and devised an elaborate method for its computation. Thornthwaite's method for determining potential evapotranspiration specifies it as an expression of day length as well as of temperature. Hence potential evapotranspiration can be used as an index of thermal efficiency. It is not merely a growth index but expresses growth in term of a water need for growth.

The book keeping procedure and methods of computing the water balance in Thornthwaite's 1948 system was improved by Thornthwaite and Mather (1955). In the original book keeping procedure it was assumed that the soil mantle has a capacity to hold 10 cm of water for purpose of evapotranspiration and whenever the precipitation (P) falls short of the water need i.e. potential evapotranspiration (PE), the shortage can be made good from the stored soil moisture so long as it is available when P is in excess of PE the excess will go

first to recharge the soil to its field capacity, and surplus will be available for runoff. To convert this surplus in to run off, a factor of $\frac{1}{2}$ is used in monthly water balance computations. Thornthwaite and Mather (1955) introduced revised procedures for the assumption of moisture holding capacity of a soil depends on its depth, type and structure.

Yet another change made in 1955 in the Thornthwaite's classification is the elimination of weighing factor for aridity index in the moisture index formula. The revised moisture index of Thornthwaite and Mather (1955) method is $Im = 100[\frac{P}{PE} - 1]$. The moisture regions according to this revised classification are 8. The change in limits from the 1948 classification are affected only for dry climates.

Hargreaves (1971) defined moisture availability index (MAI) as the ratio at the rainfall value expected with 75% probability for the concerned period to the estimated potential evapotranspiration Hargreaves (1975) gave the following moisture deficit classifications.

MAI	
0.00 to 0.33	Very deficient
0.34 to 0.67	Moderately deficient
0.68 to 1	Somewhat deficient
1 to 1.33	Adequate moisture
1.34	Execessive moisture

Krishnan and Mukhtar Singh (1968) demarcated soil climatic zones of India by super-imposing the moisture index (P-PE)/PE x 100) and mean air temperature isopleths on a soil map of India sowing major soil types. Mean annual potential evapotranspiration values (PE) were computed by Thornthwaite's method, and P is mean annual precipitation. Values for all stations in India and neighbouring countries for which long term normals are available were utilised for study. Accordingly moisture index scale to classify the region into right zones was suggested as follows :

Zone No.	Moisture Index Value	Moisture belt
1	< - 80	Extremely dry
2	-60 to -80	Semi dry
3.	- 40 to - 60	Dry
4	- 20 to - 40	Slightly dry
5	0 to - 20	slightly moist
6	0 to + 50	Moist
7	+ 50 to + 100	Wet
8	> 100	Extremely wet

The classes in terms of temperature were as follows :

	Mean Annual Temperature	Temperature Belt
A	28°C or more	Very hot
B	25°C or 28°C	Hot
C	20°C to 25°C	Mild
D	10°C to 20°C	Cold
E	10°C or less	Very cold

In order to facilitate agricultural planning in India, the National Commission on Agriculture, 1976 (NCA 1976) classified the agroclimate of the country into five zones (A to E) on the basis of occurrence and distribution of rainfall in different months during the year.

2.3. BIOMASS PRODUCTION POTENTIAL :

De Wit (1965) described a method of total dry matter computation for a standard crop.

2.4. CROP WATER REQUIREMENT :

Procedure for computing crop water requirement is as per FAO irrigation and drainage paper 24 (1977 Revised) along with Technical Series No. 2 (Revised) on a guide for estimating irrigation water requirement, by Government of India, Ministry of Irrigation, Water Management Division (1984) is followed. The computations of ETo, the modified Penman method as described in FAO 24 is adopted. Kc values of crops are as per FAO Irrigation and drainage paper No. 33, yield response to water with improvement of crop stages for local conditions.

2.5. PRODUCTION POTENTIAL :

FAO irrigation and drainage paper 33 on Yield Response to water describes two sellected methods for computation of production potential different climatic conditions. The methods enable quantification of production potential for different areas and thereby identify the most suitable area for production of a given crop. Computation techniques for two methods are given below :

(1) An adaptation of the method evaluated by the International Institute for Land Reclamation and Improvement (I_{LRI}), Wageningen, which is the based on earlier work by De Wit (1965) Bierhuizen Rijtema (1973) Feddes and Kowalic (1978) see Slabbers (1978).

(2) The method developed by Kassam (1977) for the Agro-ecological Zone Project.

Slabbers (1978) presents the simplified water yield relationships which celibrated and tested on extensive experimental data covering a wide range of climatic conditions. The so-called linear model is found to determine dry matter production adequately for alfalfa, maize, sorghum and wheat.

In the agro-ecological zone method, the methodology is developed to calculate crop production, which suits on continental basis. For a given climate, the possible potential yield is calculated for standard crop using the concept of De-Wit (1965). Using radiation data; for agricultural crops, correction are made for the genetically - controlled growth processes of the crop under the given climate.

2.7. WATER RELATED YIELD CONSTRAINT :

Water related yield constraint is determined through calculation of actual yield (Y_a). The concept of yield response factor (K_y) for stages of crop and for over all period is given in Irrigation and Drainage Paper No. 33. The method enable to quantify the actual yield if the actual evapotranspiration (ETa) are known.

Two methods are described in Irrigation and Drainage Paper No. 33 of FAO. Concept of soil water depletion fraction (p) is used in both methods. In the first method the ETa is

computed over the irrigation interval. The ø available soil water is computed for two consecutive irrigation intervals and ETa is worked out by the procedure given. In the second method the ETa computation is made over monthly periods. The concept of available soil water Index (ASI) is introduced. The ASI indicates the part of the month when the available soil water is adequate for meeting full crop water requirements. A combination of ASI value, maximum evapotranspiration (ETm) and remaining available soil water provides an estimate of the mean monthly ETa.

CHAPTER III

METHODOLOGY

A STUDY OF CROP HUSBANDARY IN LAKHAOTI COMMAND

CHAPTER - III

M E T H O D O L O G Y

3.1. DESCRIPTION OF THE AREA :

Lakhaoti Branch canal is part of Madhya Ganga Canal off taking from Madhya Ganga brrage on the river Ganga in Muzaffarnagar Distt. of Uttar Pradesh. The Lakhaoti Command area lies in the three districts, i.e. Bulandshahar, Aligarh and Gaziabad of Uttar Pradesh. The geographical area of the command is 210560 ha. The Lakhaoti Command is confined between latitude $77^{o}45'E$ to $78^{o}30'E$ and longitude $27^{o}45'$ N to $28^{o}445'N$, covering a culturable command Area of 1,93000 ha. in doabs of Kali Nadi and Neem Nadi, as shown in Index Map (Fig. 1). This area comprises of 10 blocks of Bulandshahar district and small area of Aligarh and Gaziabad districts of U.P. The terrain is gently sloping towards south east. The general slope of the tract is 0.0375%. The area is a part of Indo-Gangetic alluvial plain. The area is fertile. Perennial and seasonal crops are sown in the area. The main sources of irrigation are state Tubewells and Prive Tubewells. The Madhya Ganga Canal has been recently introduced for Kharif irrigation only. The Lakhaoti Branch canal off takes at Km. 82.40 of Madhya Ganga Canal to provide irrigation in the area. The micro distribution systems of Lakhaoti Branch Canal are under development.

Identification of Study Plots :

To study the crop husbandary practices in Lakhaoti Command, three Govt. tubewell commands and two canal minors falling under

INDEX MAP OF MADHYA GANGA CANAL PROJECT

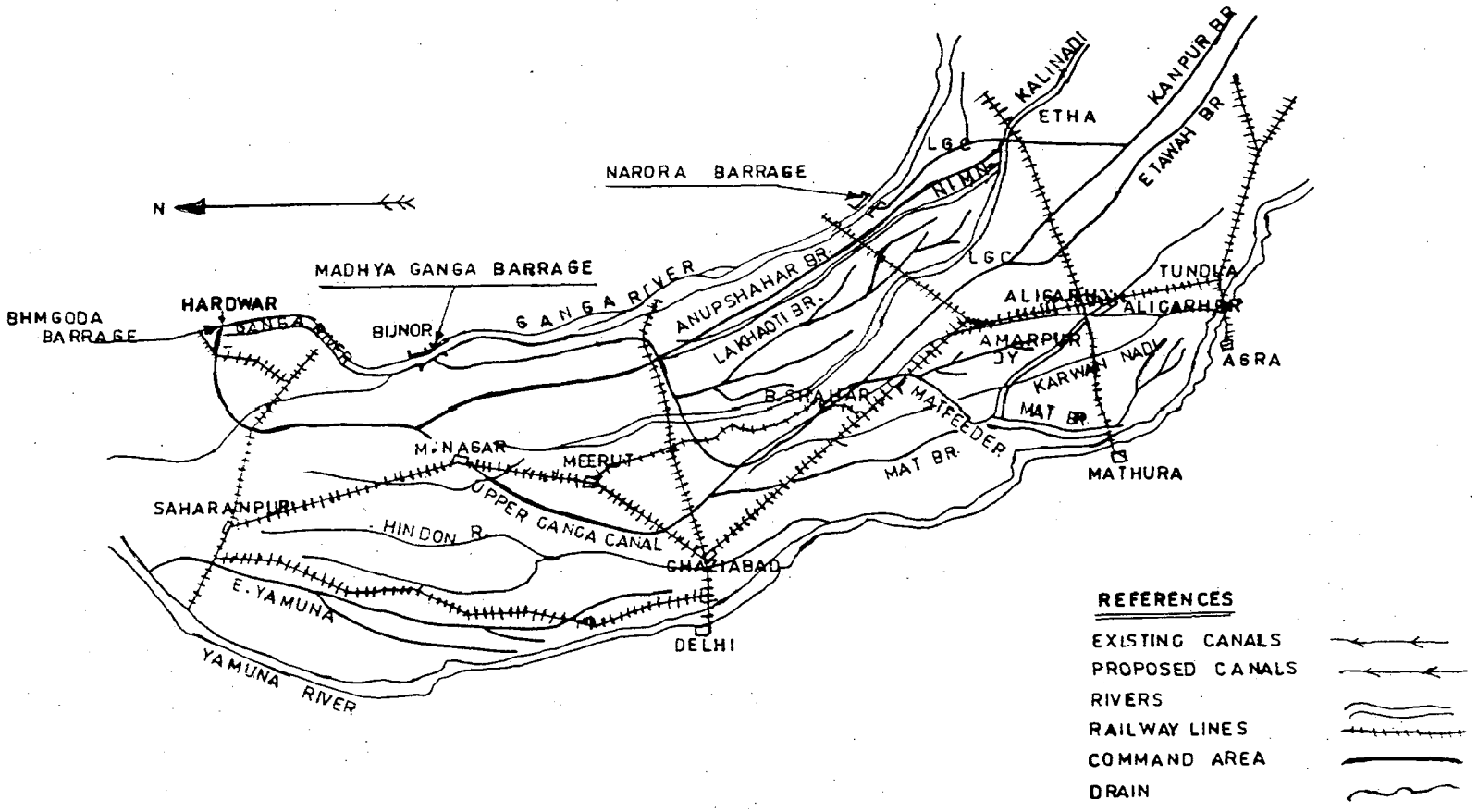


FIG. 1

Madhya Ganga Canal command (MGC) as well as the one Minor from Upper Ganga Canal (UGC) were selected.

Sl. No.	Command Name	Villages	Fig.No.
(i)	Govt.Tubewell No.43 JB	Manakpur	2
(ii)	Govt. Tubewell No. 84 KB	Charauramusla-ferbad & Bhawasi	3
(iii)	Govt. Tubewell No. 45 KB	Pipala	4
(iv)	Lakhaoti Minor, MGC	Lakhaoti	5
(v)	Mundi Bakapur Minor, MGC	Mundi Bakapur	6
(vi)	Machakauli Minor, UGC	Vehlimpura	7

The agricultural statistics of these commands are given in Table. 1

Three plots within each Government tubewells command area were selected keeping inview the following :-

(i) One plot irrigated by Govt. tubewells
(ii) One plot irrigated by private tubewells and
(iii) One plot irrigated by Govt. and Private tubewells of water.

The plots were numberd according to the sources of irrigation availability, e.g. 43 JB (1) means plot in the Government tubewell (43 JB) Command irrigated only by the Government tubwell water; 43 JB(2), means the plot if 43 JB

COMMAND AREA MAP OF STATE TUBEWELL NO. 43 J B IN MANAKPUR VILLAGE OF BULANDSHAHAR BLOCK

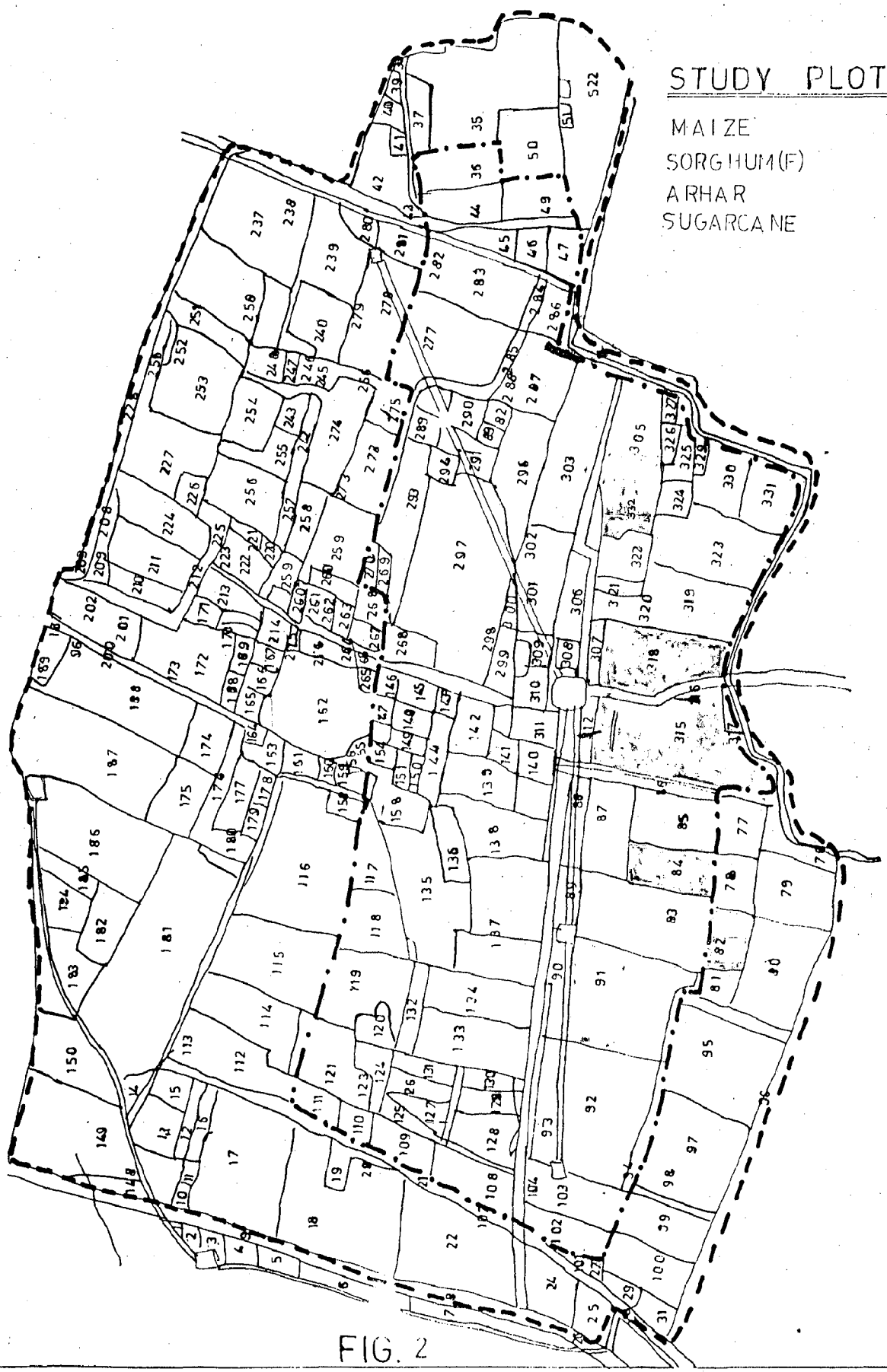


FIG. 2

COMMAND AREA MAP OF STATE TUBEWELL NO. 84 KB IN CHARORA VILLAGE OF LAKHAOTI BLOCK

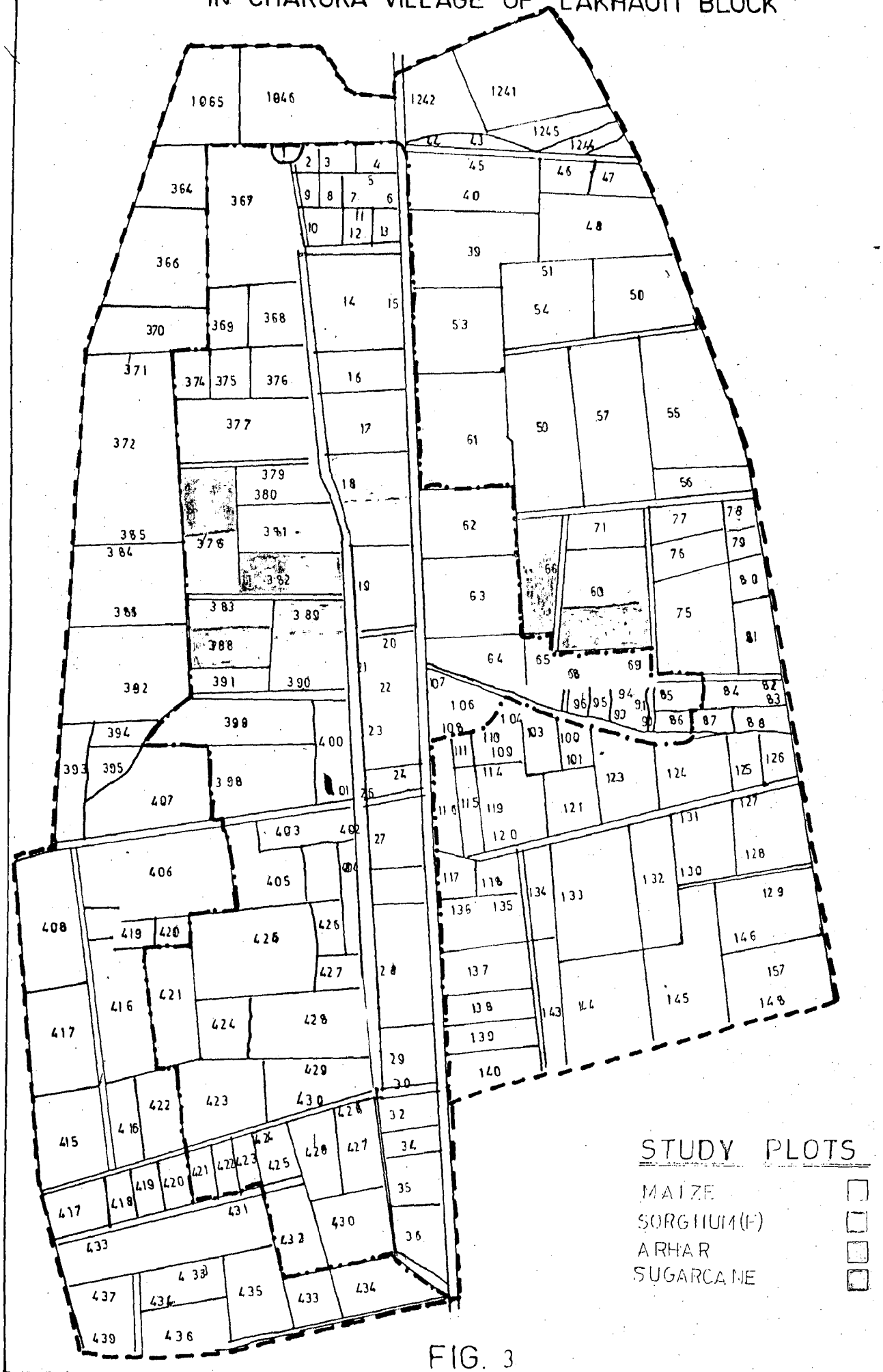


FIG. 3

COMMAND AREA MAP OF STATE TUBEWELL NO. 45 K B IN PIPALA VILLAGE OF LAKHAOTI BLOCK

LEGEND

- □ STATE TUBEWELL
- —— LINED CHANNEL
- ---- OLD BOUNDARY OF COMMAND
- -·-·- PRESENT BOUNDARY OF COMMAND
- ▲ PRIVATE T.W.
- ═══ ROADS

DISCHARGE	22·50 lps
OLD GCA	96 ha.
OLD CCA	75 ha.
PRESENT GCA	11·03 ha.
PRESENT CCA	8·61 ha.
NO. OF PRIVATE T.W.	15

STUDY PLOTS

- MAIZE
- SORGHUM (F)
- ARHAR
- SUGARCANE

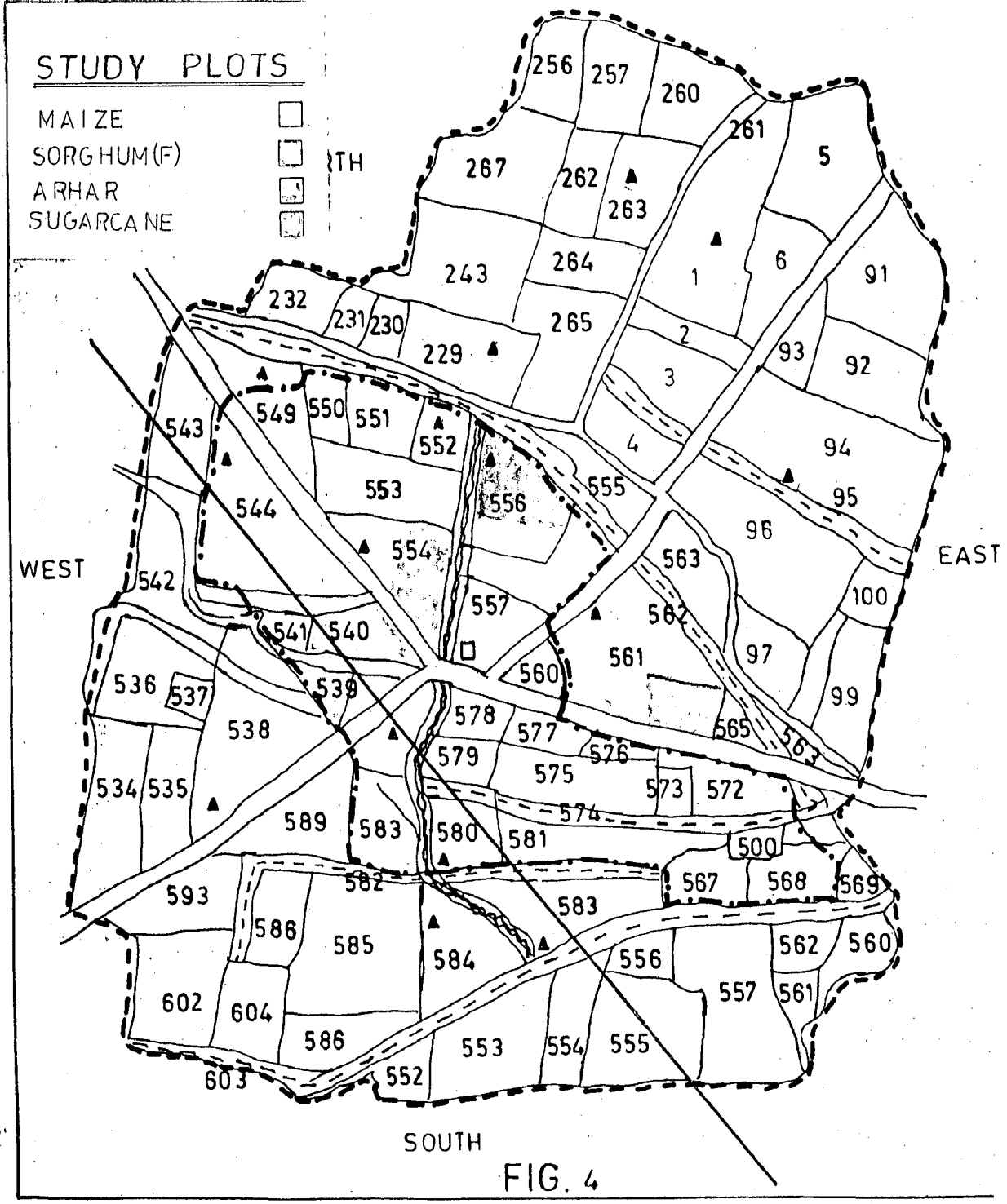


FIG. 4

COMMAND MAP OF LAKHAOTI MINOR DISTT. BULANDSHAHAR

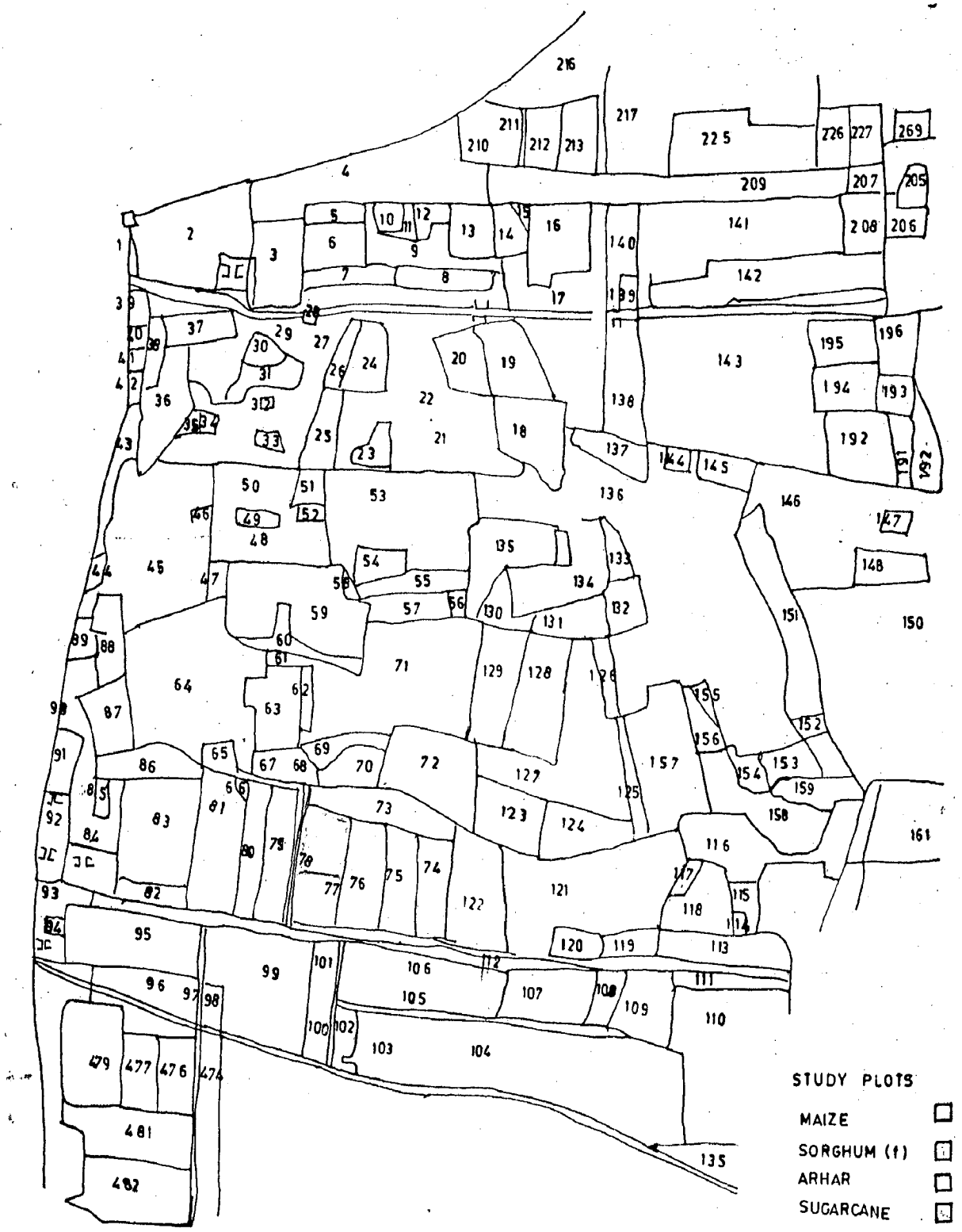


FIG. 5

COMMAND MAP OF MUNDI BAKAPUR MINOR DISTT. BULANDSHAHAR

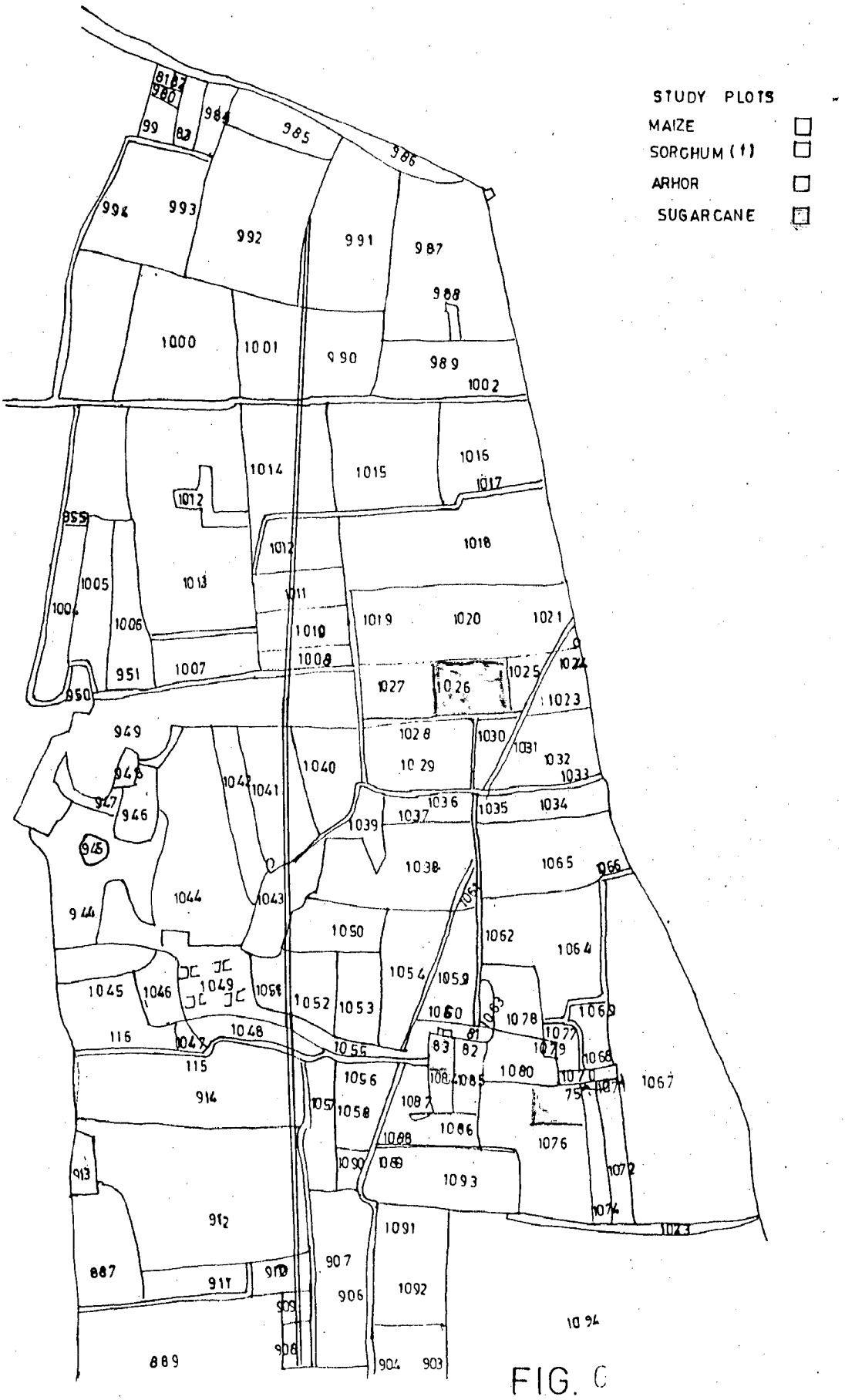


FIG. C

VILLAGE:- VEHLIMPURA

PART PLAN OF MACHAKAULI MINOR

NOT TO SCALE

FIG:7

Table - 1

AGRICULTURAL STATISTICS OF TUBEWELLS AND MINORS IN LAKHAOTI COMMANDS (1989-1990)

(Area in Hectares)

Crops	Commands					
	Tubewell Command (Government)			Canal Commands		
	43 JB Village: Manakpur	84 KB Village Charaura Mustafabad & Bhawsi	45 KB village: pipla	Machakauli Minor UGC Vill. Vehlimpura	Lakhaoti Minor MGC Village Lakhaoti	Mundibakapur Minor MGC Vill.Mundbakapur
1	2	3	4	5	6	7
(A)Kharif						
Pulses	2.02	7.33	1.04	4.27	8.34	7.52
Jowar & Bajara	14.19	11.72	3.51	15.65	14.81	15.83
Maize	15.87	2.82	0.80	19.35	16.68	15.29
Vegetables	0.92	1.96	-	4.23	1.56	2.04
Sugar-cane	8.19	2.38	2.56	13.15	12.08	14.22
Paddy	-	-	-	3.47	2.79	3.45
Total	41.19	26.21	7.91	60.12	56.26	58.35
(B) RABI						
Pulses	0.51	3.27	-	4.87	1.29	3.65
Wheat	21.55	15.85	6.09	22.03	27.72	22.52
Oats & Berseem	3.33	1.84	0.46	8.52	6.09	7.24
Oil seeds	4.15	1.25	-	7.87	7.10	8.46
Potato	1.22	0.91	-	3.46	2.20	3.97
Vegetables	2.22	0.52	-	5.39	3.83	2.81
Total	32.98	23.64	6.55	52.14	48.23	48.65

Contd/Table 1

1	2	3	4	5	6	7
Gross Commands Area	50.35	57.77	12.03	107.28	70.40	75.20
Cultural Command Area	43.16	54.48	9.61	68.82	63.36	64.26
Irrigable Command Area	74.17	49.85	14.46	112.26	104.49	107.00

tubewell command irrigated by private tubewell water only; similarly 43 JB (3) means the plot in tubewell No. 43JB command receiving water from Govt. as well as private tubewells both similar bracketed notations used to express Govt. Tube-well watered, Private tubewell watered and of 1,2, and 3 has been Govt. and Private tubewell watered combined has been used for Govt. tubewell commands 84 KB and 45 KB.

Since the canal supplies in MGC are only during Kharif and so far the Warabandi schedule is not operative hence for comparision of crop yield response etc. the study of one plot for each crops from Machakauli Minor lying in Upper Ganga Canal system is incorporated in the study.

Four principal crops have been selected for crop husbandry studies namely maize, Sorghum (Fodder), Pigeon,Pea (Arhar) and Sugarcane.

3.2. AGRO-CLIMATIC DATA COLLECTION :

3.2.1.Agriculture is to complex dynamic system of natural conditions amongst which the meteorological factors are the most important and variable. In a"soil plant atmosphere" system, soil and atmosphere are the physical media through which the plant exists. Agro-climatic factors act upon the living organism which determine their vitality, air light, heat and moisture play the most important role. Specific combination of these factors determine the development, growth

and productivity of plants or organism. The variable climatological factor in time and space is diverse.

3.2.2. In the study area of Lakhaoti command, there was no meteorological station. Therefore, the meteorological observations recorded at Delhi, located at Latitude 28°38' N, Longitude 77°10' E and altitude 216 m ASL were taken for calculations. The climalological data of 1979 to 1989 have been taken at 75% dependability. Data of climalotogical factors like maximum and minimum temperature, sunshine house. Wind speed, relative humidity and pan-evaporation used for computations. Data is given in Table 2.

3.2.3. The current period rainfall records from Dec. 1990 to Sept. 1991 of Bulandshahar Rain Gauge station which is adjucent to the area of study was used.

3.3. ESTIMATION OF REFERENCE EVAPOTRANSPIRATION :

3.3.1. The effect of climate or crop water requirements is given by reference evapotranspiration (ETo). ETo is the rate of evapotranspiration from an extensive surface of 8 to 15 cm tall, green grass cover of uniform height, actively growing, completely shading the ground and not short of water.

3.3.2. Among the various methods of computing the reference crop evapotranspiration the modified Penman Method as described in FAO 24 was adopted. With mean monthly values of temperature (T in °C), relative humidyt (RH in %), total wind-run

Table - 2

Mean Monthly Climatological Data of Delhi Station Latitude $28^{o}38'N$, Latitude $77^{o}10'$ Altitude 216 M ASL (75% Dependable Values Since 1979 to 1989)

Months	Rainfall (mm)	Pan Evaporation (mm)		RH mean %	Temperature ^{o}C		Sunshine hours	Wind speed km/hr.
		Total	Daily		Max.	Min.		
January	18.20	55.80	1.80	79	20.0	5.40	6.96	3.36
Feb.	7.40	127.80	4.58	73	27.10	9.00	7.50	5.17
March	10.80	180.00	5.81	68	27.10	12.30	7.50	5.29
April	8.80	210.50	7.02	56.30	34.30	17.60	8.60	4.20
May	7.40	256.50	8.27	45	35.30	21.90	8.80	3.70
June	24.00	234.00	7.80	56	38.80	25.90	9.00	5.79
July	123.40	145.70	4.70	75	34.20	25.70	5.55	5.56
Aug.	86.50	120.60	3.89	82	33.40	25.30	5.94	3.44
Sept	33.40	108.50	3.62	65.7	33.60	21.76	7.70	2.90
Oct.	0.00	68.90	2.22	65	32.89	16.70	8.40	2.00
Nov.	0.10	87.00	2.90	62	26.10	10.10	7.50	1.20
Dec.	3.20	73.60	2.37	62	22.60	6.50	7.20	2.62
Total	323.20	1669.40						

(U in Km./day at 2 m height) and actual sunshine duration (n in hour/day or radiation (Rs. or R_n equivalent evaporation in mm/day). Reference evapotranspiration (ETo) representing the mean value in mm/day over the period is obtained by :

$$ETo = C \left[W.R_n + (1 - W). f(U). (e_a - e_d) \right]$$

Where,

ETo = reference crop evapotranspiration in mm/day

W = temperature related weighting factor

R_n = net radiation in equivalent evaporation in mm/day.

f(u) = Wind-related function

$(e_a - e_d)$ = difference between the saturation vapour pressure at mean air temperature and the mean actual vapour pressure of the air, both in m-bar.

C = adjustment factor to compensate the effect day and night weather conditions.

For the adjustment factor is the value of U day/ U night is taken as 2.00. The computations are according to the guide lines of FAO Irrigation and Drainage Paper No. 24 (1977 revised). ETō computation by radiation method and Pan evaporation method is done as per guide lines of FAO 24 referred above. The same data as used for modified Penman method have been used.

The potential evapotranspiration by Thornthwaite methods wa: done by the method described in the book by A.M.Michael (1978).

3.4. SOIL SURVEY ANALYSIS :

3.4.1. Soils are natural bodies, a product of the environment under which they develop. An individual soil is a three dimensional, dynamic natural body with a recognizable boundaries. Mineral material, organic matter, water and air make up the soil mass. The soil that developes at any place is dependent upon the five factors of soil formation : parent material, climate, topography, organisms and time. Interaction of these five factors determine the kind of soil developed. The origin of soil of Lakhaoti Command is transported alluvial soil. The assessment of physical and chemical characteristics of soil was done for irrigability and drainability classifications. Six representative profiles from each representative command are taken for the study. Soil surveys have been done as per the guide lines of FAO soils Bulletin No. 42 (1979), soil Survey Investigation for Irrigation, IS - 10317 - 1982. Guide for evaluation of soil properties relevant to irrigation and as per Technical series No. 3 (revised) 1985, "The Water Management Manual of Government of India, Ministry of Water Resources, Water Management Division; Following Properties are studied".

3.4.2. Effective Soil Depth :

The depth of soil that can be effectively exploited by plant roots is an important criterion in sellecting land for irrigation. Root penetration, however, is often inhibited by mechanical factors (hard or impermeable horizons), chemical factors (zone of high gypsum or lime content) or poor drainage.

For exploration of soil depth, sampling by boring with hand auger was done. The soil depth in all the six profiles was more than 2.00 m deep. Within this depth no hard pan or impermeable horizon was noticed.

3.4.3. Organic Matter Content :

For determination of organic matter 10 gram of even dry soil samples were taken. These samples were burnt with petrol the residual soil is weighted, the difference is reported as percentage of organic matter content.

3.4.4. Bulk Density :

Bulk density (or volume weight) is the dry weight of a unit volume of soil and is usually expressed as gm/cm^3. Because the bulk densities may varry with moisture content, the volume of the sample is measured at nearly about field capacity core samples were taken and driven into the soil, care was taken that during sampling no compaction occurs in the process so that a known volume of soil having field structure is

obtained. The moist weight and over dry weight of the sample is then determined.

3.4.5. Particle Size Analysis and Textural Classification: (Hydrometric Analysis):

Particle Size Analysis :

Particle - size analysis requires the determination of the percent of primary particles (sand, silt and clay) a soil contain. In the original condition, as sampled most soils have structure, they are stabilised in to aggregates (secondary particles). These secondary particles must be dispersed (broken into primary particles) or dis-aggregated prior to particle size analysis. Dispersion requires removal of the cementing agent which is then followed by mechanical and chemical treatment. Since organic matter is a very common stabilizing agent in top soil, the first step is to remove it by oxidation using either hydrogen peroxide or sodium hypochlorite (laundary blench). In this analysis this step is omitted to simplify the procedure. Chemical dispersion is obtained by using 3.3 gram/litre sodium hexametaphosphate solution, which causes a repulsive force to arise among the aggreaged clay particles. Brakdown of the aggregate is assisted by mechanical agitation of some means after which the repulsive force is generated by chemical treatment tend to stabilize the dispersed condition, Dispersion thus assures that aggregated clay particles do not have silt or sand particles.

After dispersion sand silt and clay are seperated and quantitively measured. A simple and rapid technique (but less accurate than the pipet method) was developed by G. Bony Ouces, using specially designed hydrometer. With this method, the amounts of silt and clay are found by measuring suspension density, after appropriate settling times. A dispensed soil sample of known weight is suspended in a cylinder, settled for predetermined time periods (40 seconds and two hours) and densities are measured with hydrometer. The 40 seconds reading measures silt and clay and two hour reading observes clay. Readings are in gram per litre and needs to be corrected for water temperature (Johson, 1979). Each reading for temperature deviation from 20°C, add 0.36 g/l for each degree above 20°C or subtract 0.36 g/l for each degree below 20°C.

- % sand + % silt + % clay = 100

$$\text{- \% silt + \% clay} = \frac{\text{corrected 40 sec. Reading x 100}}{\text{Dry sample weight.}}$$

$$\text{- \% clay} = \frac{\text{corrected 2-hr. reading x 100}}{\text{Dry sample weight}}$$

- % Silt = (% silt + % Clay) - % clay

- % Sand = 100 - (% Silt + % Clay).

Since sample contains fraction of coarse material also hence after hydrometer reading is completed the same suspension

is washed over 2.00 mm seive and the material retrained is reported as gravel. A suitable correction on representative sample 100 g. is applied and the corrected percentage is worked out for actual representative sample.

Textural Classification :

The term "Texture" relates to the proportion of the various sizes of the particles in a soil sample. Texture is important in sub-surface drainage because it is a soil characteristic which has general relationship with hydraulic conductivity and water retention. Textural classes are arbitrary groupings based on relative proportion of the various size particles in the soil mass. The soil textural triangle given in the "Drainage Manual", A water Resources Technical Publication of USDI is used to convert the quantitative data from detailed gradation analysis of the seperates of less than 2 millimeters in diameter to textural class names of the soils.

3.4.6. Determination of Field Capacity (Field Method):

Field capacity is the moisture content in percentage of soil on ovendry basis when it has been completely saturated and downward movement of excess water has practically ceased. In the study area six different study plots were sellected for conducting the field capacity test. It was ensured that presence of water table is not within 2.00 m depth to cause capilary rise, Over the layor on which the field capacity was to be determined. A bund on an area of about 2.50 sq.m. on all four sides was

made and all weeds were removed to avoid transpiration. Water was poured till desired layer gets sufficiently wet. Straw mulch of sufficient thickness was laid over the plot and covered with polythen sheet to prevent evaporation. Soil samplings from each 30 cm layer was done after every 24 hrs. to determine the soil moisture content. The observation were taken for 4 days and moisture was determined weighing the wet sample and drying in the oven.

3.4.7. Determination of Moisture Retention Characteristics of Soil in Laboratory by Pressure Plate Apparatus :

In agricultural operations, mainly in scheduling the irrigation we are interested to know the lower and upper limit of available soil water (ASW). Lower limit of available soil water is known as permanent wilting point (PWP) or soil water potential, ψ of - 15 bars, upper limit field capacity - (F.C.) at which $\psi_{(w)}$ is - 1/3 bar. A composite soil sample is prepared from all 6 layers of 30 cm depth. Soil moisture retention at 15.00 bars etc. were estimated by pressure plate apparatus using plates for corresponding pressures. Corresponding to these values the graphs are prepared pressure in bar VS % moisture for each layers. Linear, logarithmic power and exponential relationships have been developed.

3.4.8. Infiltration Characteristics Measurement :

Six unfiltration experiments were conducted in the command by using double ring unfiltrometer. In double ring

infiltrometer the infiltration characteristics is determined by ponding water in two concentre metal cylenders installed at the field surface and observing the rate at which the water level is toward in the cylender. A functional relationship in the following form is developed (Kostiakov Model).

$$I = at^b$$

Where,

I = cumulative unfiltration in mm

t = cumulative unfiltration time in minutes

and a, b are the characteristic constants.

3.4.9. Determination of Piezometric Head of Ground Water :

In irrigated command the ground water table was found much below the rooting zone. Water level indicators were used to measure the water table depths in the tubewell. The general level of ground water table was 15 - 20 m below ground level in the month of August, 1991.

3.4.10. Determination of Hydraulic Conductivity By (Test Pit Method):

A circular test pit have been excavated. The hole was filled with clean water. The depth of water in the hole was maintained constant. The following equation is used to compute the hydraulic conductivity :

$$K = \frac{1440\ Q}{C\ a\ D}$$ (USBR Drainage Manual (1978)

Where,

K = Hydraulic conductivity in m/day

a = Diameter of the pit in meters

Q = Quantity of flow per unit time (m^3/min.)

D = Depth of water maintained (metres) and

C = Conductivity coefficient are given in the reference book, for different ratios of D/a.

Hydraulic conductivity in three tubewell commands and three canal commands of the study area have been carried out for 0-30 cm depth 30-60 cm depth and 60 to 150 cm depth for convenience.

3.4.11. Chemical Characteristics :

3.4.11.1. Soil Reaction (pH):

The degree of acidity or alkalinity of a soil is usually expressed as pH value which is defined as the negative logarithm of hydrogen ion activity. This definition can be represented by the equation -

$$pH = - \log_{10} a_{H^+}$$

in which a_H is the activity or effective concentration of hydrogen ions (H^+) in the soil suspension. The pH meter was used to measure the pH in 1:1 soil water extract.

3.4.11.2. Electrical Conductivity (EC) :

It is the receprocal of the electrical resistivity. Quantitatively the electrical resistivity is the resistance in Ohms of a conductor, metalic or electrolyte which is one cm long has a cross-sectional area of 1 sq.cm. Hence electrical conductivity is expressed as the receprocal of ohm-cm or mhos per cm. The presence of soluble salts in soil is estimated by determining the electrical conductivity of the saturation extract of the soil sample on an electrical conductivity meter.

Testing facility for analysis of other parameters was not available with our W.R.D.T.C., (W.U.M.) Lab. hence, further chemical analysis was not possible however, the chemical test result from the Ph.D. Thesis of Sri Mahabir Singh (1978) on "Studies on Relationship Between Soil Profile Characteristics and Quality of Sub-Soil Water and its Significance for Crop Production in Bulandshahar District" submitted to Meerut University, Meerut is taken.

3.5. AGROCLIMATIC CLASSIFICATION :

3.5.1. Agroclimatic classification is the identification of the area with regard to normal weather conditions round the year. Evaluation of moisture availability Index (MAI) is the basis prominantly used by reasearchers to make agroclimatic classifications -

$$MAI = \left(\frac{P - PET}{PET} \right) \times 100 = \text{(Thorthwaite \& Mathur 1955)}$$

$$PET = 1.60\ L_d \left(\frac{10\ T}{I} \right)^a \quad \text{Cm/month (Thonthwait,1948)}$$

Where,

P = 75% probability of occurrence of rain in cm.

PET = Potential evapotranspiration in cm/month

Ld = Conversion of actual sunshine duration in to 12 hourly sunshine days = SNA/12

SNA= Actual sunshine hours in a month.

T = mean monthly air temperature ^{o}C).

$$I = \text{Heat index} = \sum_{1}^{12} i$$

$$i = \left(\frac{T}{5} \right)^{1.514}$$

$$a = 67.5 \times 10^{-8}\ I^3 - 77.1 \times 10^{-6}\ I^2 + 17.92 \times 10^{-3}\ I + 0.49239$$

3.5.2. Thornthwaite and Mathers (1955) Agro-Climatic Classification

Thornthwaite (1948) classified the agroclimate on the basis of MAI and average monthly temperature during the year as under -

MAI - %	Agroclimatic Classification
> 100	Per humid
20-100	Humid
0-20	Moist sub-humid
-33.3-0	Dry sub-humid
-66.7 - (-) 33.3	Semi Arid
-100 - (-) 66.7	Arid

Based on average monthly temperature condition, following is the additional classification (Sarkar and Biswas 1980) :

Agroclimate	Description
Polar	When all 12 months record an average temperature between 0 - 10°C.
Boreal	When the average monthly temperature goes above 10°C for 1 to 3 months.
Sub-temperature	When the average monthly temperature goes above 10°C for 4 to 5 months.
Temperature	When the average monthly temperature goes above 10°C for 6 to 9 months.
Sub tropical	When all 12 months record average monthly temperature above 10°C.
Tropical	When all 12 months record average monthly temperature above 17°C.

3.6. Assessment of Biomass Productivity :

The methodology to calculate crop production was developed to suit the assessment on continental basis, However, the method can also be applied to a degree of detail required to suit specific locations. For a given climate, the possible potential yield is calculated for a standard crop using the concept of De Wit (1965) using radiation data; for agricultural crops. It is assumed that climate requirements of crop are met and the water, nutrient, salinity, pest and disease do not effect the crop growth and potential yield (γmp).

Under actual forming conditions, yield losses will occur due to adverse climatic conditions over short periods, limited water and nutrient supply, and problematic farm operation including land preparation weeding and harvesting. These constraints are complex and it is difficult to quantity their effect on yield. However, when compared to actual farmers yields the calculated potential yield (γmp) will give an indication of the efficiency in biomass productivity.

To calculate the potential yield of standard crop i.e potential biomass productivity, the gross dry matter production of standard crop is calculated with the maximum active incomming shortwave radiation (Rse in cal/cm^2/day) and gross dry matter production on overcast (yo) in(kg/ ha/day) and clear day (y_c) in (kg/ha./day) for standard crop at a specific location.

To calculate Gross Dry Matter (GDM) production of a standard crop (Y_o) applying the De wit (1965) concept the following relation was used.

$$Y_o = F. y_o + (1 - F) y_c .$$

Where,

Y_o = Gross dry matter production of a standard crop, kg/ha/day.

F = Fraction of the day time the sky is clouded, fraction on F = (Rse-0.5 Rs)/0.8 Rse. where Rse is the maximum incomming shortwave radiation on clear day in $cal/cm^2/day$,

Rs = Actual measured incomming shortwave radiation in $cal/cm^2/day$. Rs can also be measured from measured sunshine duration data (n) in hours/day.

y_o = Gross dry matter production rate of standard crop for a given location on a completely over-cast day, kg/ha./day.

$y_c^{\downarrow}$ = Gross dry matter production rate of standard crop for a given location on a clear (cloudless) day, kg/ha./day.

FAO irrigation and drainage paper No 33 "Yield Response to Water" guide lines an followed for computation of biomass production of standard crop. In calculating the values of Rse, y_o and y_e the latitude of Bulandshahar district is taken.

3.7. CROP WATER REQUIREMENT :

3.7.1. The ETo values estimated by modified Penman method based on climatological parameters, is required to be adjusted for crop ET , since under natural field conditions ETo or PET rarely occurs in most of irrigated field crops, with the exception of low land rice and probably for two to three days immediately after irrigation or rain. For converting ETo values into ET crop suitable crop coefficients (K_c) have been sellected from published data for different crops, taking into consideration soil and climate conditions and also for different range of growth for the same crop. ET crop is calculated as -

$$ET(crop) = K_c . ETo$$

K_c value relates to evapotranspiration of disease free crop grown in large fields under optimum soil water and fertility conditions and achieving full production potential under the given growing environment.

Crop stage wise crop water requirement was computed as per the procedure given in technical series No.2 (revised entitled "A Guide for Estimating Irrigation Water Requirements), a Ministry of Water Resources, Government of India, 1985 publications.

3.8. CROP PRODUCTION POTENTIAL :

3.8.1.The relationships encountered between crop, climate, water and soil are complex and many biological, physiological, physical and chemical processes are involved. A great deal of research information on these processes in relation to water is available; however, for practical application this knowledge must be reduced to a managable number of major components to allow a meaningfull analysis of crop response to water at the field level. The maximum yield level of a crop (Y_m) is primarily determined by its geneatic characteristics and how well the crop is adopted to a prevailing environment. Environmental requirements of climate, soil and water for optimum growth and yield vary with crop and crop variety. A carefull sellection of crop and the variety most suited to a given environment is of paramount importance for obtaining high and efficient production.

3.8.2Maximum yield of a crop (Y_m) is defined as the harvested yield of high producing variety, well adopted to the given growing environment, including the time available to reach maturity, under conditions where water, nutrients and pests and disease do not limit yield. Information on yield indicates the maximum yield that are obtained under actual forming conditions, with a high level of crop and water mamagement.

Climate factors which determine y_m are temperature, radiation and length of the total growing season in addition to

specific temperature and day length requirement for the crop development. In general temperature determines the rate of crop development and consequently affects the length of the total growing period required for the crop to form yield. Crop growth and yield are affected by the total radiation, crops differ in their response to how much of the total radiation received can be converted into growth and yield.

3.8.3. Maximum yield (Y_m) is calculated for the known climatic condition of Lakhaoti - Command by the method developed by Kassam (1977) for the agro-ecological zone Project. The methodology to calculate crop production was developed to suit the assessment on continental basis. For the given climate the possible potential yield is calculated for standard crop and following corrections over it are applied to get the production potential of a particular crops.

(a) Correction for crop species and temperature:- The gross dry matter production is crop species and temperature dependent. The production rate (Y_m) can be larger or smaller than 20 kg/ha/hr. as assumed for standard crop. The mean temperature during the growing period is computed from the known climatic data and corresponding to it the production rates (Y_m) in kg/ha/hr. for groups of crop is read from the table given in FAO 33, "Yield Response to Water" and De Wit is (1965) concept is applied, the values of y_o and y_c are adjusted for different crop groups as per following

(i) When y_m 20 kg/ha/hr.

$$Y_o = F\ (0.8 + 0.01\ y_m)\ y_o + (1-F)(0.5+0.025\ y_m)\ y_o$$

kg/ha/day

(ii) When y_m 20 kg./ha/hr.

$$Y_o = F\ (0.50 + 0.025\ y_m)\ y_o + (1-F)(0.05\ y_m)\ y_e \text{ kg/ha/day}$$

(b) Correction for crop development over time and Leaf Area(CL):

In relation to the maximum growth rate during the middle of total growing period, crop growth will be small at the start and at the end of the growing period, or the average rate over the growing period is about 50% of the rate during the maximum growth. Also for the standard crop an active leaf area of 5 times the ground surface is assumed (LAI = 5). When leaf area is smaller a correction must be applied; when greater than 5 the effect is small. Correction factors are given in FAO 33, The leaf area per square metre is observed for crops in all 48 plots. The observations are appended with the volume.

(c) Correction for Net Dry Matter Production :-

To maintain dry matter production, energy is required by the plant for the within plant growth processess, only

remaining energy can be used to produce new growth which is about 0.60 for cool (mean temp. $< 20^{o}C$) and 0.50 for warm (mean temp. $> 20^{o}C$) conditions, or cN = 0.5 to 0.60.

(d) Correction for Harvested part (cH):

In general, only a part of total dry matter such as grain, sugar or oil is harvested. The ratio between net total dry matter and harvested yield is given by the harvest index cH, for high producing varieties under irrigation. FAO 33 table 7 is used for sellecting the appropriate harvest factor. Since the observations are made for total dry matter production hence harvest factor as one is taken for all the crops under study.

3.8.4. In summary, potential yield (Y_{mp}) of a high - producing, climatically adopted variety grown under constraint-free condition over a growing period of G days is -

(i) When $y_m > 20$ kg/ha/hr.

$$Y_{mp} = GL.cN.cH.G\,[F\,(0.8 + 0.01\,y_m)\,y_o + (1-F)(0.50 + 0.025\,y_m)\,y_c] \text{ , kg/ha/period}$$

(ii) When $y_m < 20$ kg/ha/hour.

$$Y_{mp} = GL.,cN.\,cH,G\,[\,F\,\,(0.5 + 0.025\,y_m)\,y_o + (1-F)\,(0.05\,y_m)\,y_c] \text{ , kg/ha/period.}$$

Where,

c_L = Correction crop development and leaf area (Table 6, FAO 33).

c_N = Correction for dry matter production 0.60 for cool and 0.50 for warm conditions.

c_H = Correction for harvested index(taken as 1.00)

G = Total growing period, days,

F = Fraction of the day time the sky is clouded

y_m = Maximum leaf gross dry matter production rate of crop for a given climates kg/ha/day (Table 5, FAO 33).

y_o = Gross dry matter production rate of a standard crop for given location on clear (cloudless) day, kg/ha/day, (Table 3, FAO 33).

3.9. CROP HUSBANDRY SURVEY :

3.9.1. Crop husbandry is the practice of growing crops giving due care. The main objectives of the producer is to produce good crops as economic as possible without impovershing the land. The methods of cultivation used are developed with trials and errors. In recent years there have been many sweeping changes in agricultural technology as a result of introduction of many new and improved varieties, better use of fertilizers, better control of pest and diseases, chemical weed control and rapid improvement in the mechanization of such operation such as the

seed-bed preparation, planting, harvesting and storage etc.

A crop husbandry survey was conducted to understand how a farmer grows the crop, and manage it in Lakhaoti Command. The study being a part of the course work, observations could not been started with the start of agricultural activities on farm field. Farmers have been interviewed to know the previous operations and treatment given by them to their crops. Several crops are grown in the area. Only four principal Kharif crop of the area like maize sorghum (fodder), Arhar (Pigeon-pea) and Sugar-cane as perennial crop have been se lected for crop husbandary studies in three different tubewell commands and three seperate canal commands. Following crop husbandry practices have been recorded from the surveyed : The format on which observation were recorded are given in Table below :

Proforma for Crop Husbandry Survey

Proforma For Crop Husbandry Survey

Sl.No.	Particulars of Observations	
1.	Field Preparation	(a) Plughing
		(b) Harrowing
		(c) Planking
		(d) Levelling
2.	Sowing	(a) Variety
		(b) Seed rate/treatment (kg/ha)
		(c) Spacing
		(d) Sowing depth/Method
		FYM

---Contd/-----

Sl.No.	Particulars of Observations	
3.	Fertilizer Application	(a) Basal(kg)ha (b) Top dressing (kg.ha) (c) Spray (kg/ha)
4.	Plant Protection	Type of problem (a) Incorporation(Kg/ha) (b) Dusting(Kg./ha) (c) Spray kg/ha)
5.	Irrigation	(a) Method (b) Quantity applied(mm) (c) Runoff (mm)
6.	Interculture No. of units used	(a) Mannual (hoeing) (i) Hoeing (b) Bullockdrawn(ii)Harrowing (i)Hoeing (c) Tractor draw(ii)Harrowing
7.	Harvesting No.of unit	(a) Manual (b)Mechanical Bullock Tractor
8.	Transport of Produce	(a) Manual (b) Mechanical
9.	Threshing	(a) Manual (b) Mechanical
10.	Yield/Hectares	(a) Grain (quintals) (b) Straw (quintals)
11.	Others	

3.10. Water Related Yield Constraint Assessment :

3.10.1. When the water supply does not meet the crop water requirements, actual evapotranspiration (ETa) falls below maximum evapotranspiration (ETm) or ETa < ETm. Under this condition water stress develops in the plant which adversely affects growth and ultimately crop yield. The effect of water stress on growth and yield depends on the crop species and variety on the one hand and magnitude and time of water deficit on the other. Crops varry in their growth and yield response to water deficit. When water deficit occurs during a particular part of total growing period of a crop, the yield response to water deficit can havy greatly depending on how sensitive the crop is at that growth period. In general, crops are more sensitive to water deficit during emergence, flowering and early yield formation than they are during early (vegetative, after establishment) and late growth periods (ripening). The response of yield to water can not be considered in isolation from all other agronomic factors, such as fertilizers, plant density and crop protection, because these factors also determine the extent to which actual yield (y_a) approaches maximum yield (y_m).

3.10.2. The response of yield to water supply is quantified through the yield response factor (K_y) which relates relative yield dedrease ($1 - Y_a/Y_m$) to relative evapotranspiration deficit (1 - ETa/Em). Water deficit of a given magnitude, expressed

in the ratio. Actual evapotranspiration (ETa) and maximum evapotranspiration (ETm), may either occur continuously over the total growing period of the crop or may occur during any one of the individual growth periods the establishment (O), vegetative (1), flowering (2), yield formation (3), or ripening period (4) period).

3.10.3.In order to quantity the effect of water stress, the relationship between relative yield decrease and relative evapotranspiration deficit given by the empirically - derived yield response factor (K_y), or

$$\left(1 - \frac{Y_a}{Y_m}\right) = K_y \left(1 - \frac{ETa}{ETm}\right).$$

Where,

Ya = actual harvested yield

Ym = maximum harvested yield

K_y = yield response factor

ETa= Actual evapotranspiration

ETm= maximum evapotranspiration.

The value of Ky for different crops is based on theevaluation of numerous research results which cover a vide range of growing conditions. Table 24 of FAO 33 is used for adopting the values of Ky for different growth periods of crop while assessing the water related yield. Methodology for evaluating (ETa) is being given below.

3.10.4. Actual Evapotranspiration (Ea):

The demand for water by the crop must be met by the water in the soil via the root system. The actual rate of water uptake by the crop from soil in relation to its maximum evapotranspiration (ETm =ETcrop) is determined by whether the available water in the soil is adequate or whether the crop will suffer from stress including water deficit.

In order to determine actual evapotranspiration (ETa), the level of the available soil water must be considered. Actual evapotranspiration (ETa) equals maximum evapotranspiration (ETm) when the available soil water to the crop is adequate or ETa= ETm, However, ETa < ETm, when available soil water is limited. Readily available soil water can be defined as the fraction (P) to which the total available soil water can be depleted without causing ETa to become less than ETm. The magnitude of ETa can be quantified for periods between two irrigation or rains.

Total available soil water (Sa) is defined here as the depth of water in mm/m soil depth between soil water content at field capacity (FC) and the soil water content at permanent wilting point (PWP). F.C. and P.W.P. values are known for the local conditions.

Maximum evapotranspiration (ETm) will be maintained until the fraction (P) of the available soil water has been depleted.

Beyond this depletion level actual evapotranspiration (ETa) becomes increasingly smaller than ETm until next irrigation or heavy rain. When ETa < ETm, the magnitude if ETa will depend on the remaining available soil water (1-p). Sa.D. and on ETm. The available soil water is related to the crop group (Table 19 of FAO 33) to ETm (i.e. the fraction p) and to the total available soil water over the root depth (Sa.D). Applying an adoptation of the formulation by Rijtema and Aboukhaled (1975) given in Appendix I (FAO 33), actual evapotranspiration ETa is given by equation -

$$ETa = \frac{Sa.D}{t}\left[1 - (1-p)\, e^{\frac{-ETm.t}{(1-p)Sa.D}} + \frac{p}{1-p}\right]$$

Where,

Sa.D = total available soil water over the root depth.

ETm = maximum evapotranspiration

t = time in days

p = fraction of total available soil water.

Regarding working out the value of Sa, the soil test results are available for field capacity and permanent wilting point moisture percentages. Irrigation application or rainfall is recorded periodically. An assumption is made that at the sowing day the field was at the field capacity as the beginning data is not observed. The rooting depth development is assessed

during the irrigation and rainfall times. An approximate analysis of soil water balance in rooting zone is done to analyse the available soil water to plant, and carry over of the balance moisture to next irrigation or rainfall.

In this computation the effective rainfall is taken as that port of rainfall which is absorbed in the root zone moisture depleted below field capacity (FC). Balance rainfall is considered as lost in percolation and runoff.

CHAPTER IV

RESULTS AND DISCUSSION

A STUDY OF CROP HUSBANDARY IN LAKHAOTI COMMAND

CHAPTER - IV

RESULTS AND DISCUSSION

4.1. REFERENCE EVAPOTRANSPIRATION :

Average daily reference crop evapotranspiration computed by modified Penman Method, Radiation method, Pan Evap. method and Thornthwaite method is given in table 3 (Detailed computation an given in Annexure 7 (a) to 7 (d). Yearly ETo recorded was highest in Radiation Method and lowest in Pan Evaporation method. Modified Penman and Thorthwaite recorded almost same yearly ETo, however, recording appreciable difference in different months. Thorthwaite method recorded high values during summer and low values during winter as compared to modified Penman. Variability recorded in the computed values could be ascribed to the fact that input parameters used in the computation are variable in nature.

4.2. AGROCLIMATIC CLASSIFICATION & SOIL IRRIGABILITY AND LAND IRRIGABILITY CLASSIFICATIONS :

4.2.1. Thornthwaite and Mather (1955) Classification :

Potential evapotranspiration (PET) by Thornthwaite method is 1456.36 mm vide table 3. The annual 75% dependable rainfall (P) of Delhi station recorded is 323.20 mm.

$$\text{Hence} \quad MI = \left(\frac{P}{PET} - 1\right) \times 100$$

$$= \left(\frac{323.20}{1456.36} - 1\right) \times 100 = -77.80$$

Table 3

Reference Crop Evapotranspiration (ETo) Computations
(ETo in mm/day)

Months	Modified Penman Method	Radiation Method	Pan Evaporation Method	Thornthwaite method
January	1.69	2.20	1.53	0.50
February	2.59	2.50	3.65	0.75
March	3.79	3.80	4.71	1.95
April	5.14	5.50	5.68	4.57
May	5.73	6.50	6.70	6.51
June	7.47	6.50	6.32	9.23
July	4.89	4.10	4.00	7.55
August	4.50	4.10	3.31	6.83
September	4.57	5.00	2.93	3.98
October	3.40	4.50	1.80	3.67
November	2.22	2.70	2.35	1.38
December	1.88	2.40	1.92	0.74
Yearly ETo(mm)	1444.40	1524.0	1363.67	1456.36

(Absratcted from Annexure 7(a) to 7(d).

Since moisture Index (MI) is within range of - 100 to -66, hence the region is classified "Arid" zone. (Thornthwaite and Mather 1955).

4.2.2. Temperature Classification :

Observing the temperature data (Table 2) the 10 to 12 months average temperature is greater than $10^{o}C$ hence the zone is classified in "Sub-Tropical Zone". Thus based on 4.2.1. and 4.2.2. (Sarkar and Biswas 1980) as per the procedure described by Thornthwaite and Mather (1955) Lakhauti Command is Arid Sub-Tropic.

4.2.3. Singh and Krishnan Classification :

From climatological data the known annual rainfall is 323.20 mm and the total annual pan evaporation is 1668.40 mm. Hence moisture availability Index (MAI) is given by :

$$MAI = \left(\frac{323.20 - 1669.40}{1669.40} \right) \times 100 = -80.63$$

$$= -80.$$

Since the MAI is in the range of -60 to -80, hence the zone is classified in Semi-Dry Zone. (Krishnan and Muktar Singh 1968). Thus the zone could be Semi-Dry Sub-Tropic. (Sarkar and Biswas 1980, Krishnan and Singh 1968).

4.2.4. National Commission of Agriculture : (NCA'76 Classification : (Krishnan. A 1980).

Since rainfall of the region is within limit of 5 to 10 cm/month for 3 consecutive months which is just sufficient for crop having low water requirements, hence the zone is classified in category-D.

With above classifications the region could be classified in general as "Arid Sub-Tropical or Semi-Dry Sub-Tropic Zone".

4.2.5.Soil Irrigability and Land Drainability Classification:

4.2.5.1. Soils Physical Propertion Assessment :

(A) Bulk density : Bulk density determinations insitu by core cutting method from 6 situ in commands are given in Annexure - 1. The average Bulk density was 1.54 gm/cm^3.

(B) Partical Size Analysis and Textural Classification:

As per the particle size analysis of the soil there is uniformity in soil textural character in all the horizons. A detailed analysis of one representative sample from each command and one composite sample from all commands was analysed. (Refer Annexure - 2). The soil textural class was found be sandy loam.

(C) Field Capacity by Ponding Method :

Average field capacity by ponding method was found to be 19.13%. Details of field capacity observations for different layers in 6 commands is given in Annexre - 3.

(D) Field Capacity and Permanent Wilting Point by Pressure Plate Test:

The average field capacity (FC) and permanent wilting point moisture percentages are 21.6 and 7.53 respectively. The details of each 30 cm layer moisture retention analysis is given in Annexure - 4.

Table - 4

Soil Moisture Retention Characteristics of Soils of Lakhaoti Command

(Pressure Plate Test)

Pressure in Pressure plate (bar)	% Moisture Retained in Profile Depths of					
	0-30 CM	30-60 CM	60-90 CM	90-120 CM	120-150 CM	150-180 CM
0	25.937	20.031	19.844	19.443	20.076	21.139
0.50	25.936	23.873	19.085	18.083	19.703	20.654
1.0	23.575	21.725	18.957	17.469	17.947	20.898
2.0	22.731	21.201	18.108	17.409	16.725	19.683
3.0	20.214	19.062	16.743	16.824	15.621	17.196
5.0	17.163	16.277	14.292	15.523	14.214	14.512
8.0	13.446	12.399	9.994	10.408	10.660	10.882
12.00	11.643	10.054	8.673	7.836	7.519	7.867
15.00	7.214	8.741	7.528	7.528	7.455	6.49

(Abstracted from Annexure - 4)

Table - 5

Best Fit Equations of Soil Retention Characteristics in Lakhaoti Command

Soil Profile Depth (cm)	Best fit equation for Moisture retained (M)% And Applied pressure (P) in Bar and Correlation Coefficient r For Linear	Logarithmic	Exponentail	Power
0-30	M=24.96-1.22 P 0.982	M=19.205-1.62 lnP 0.71	M=21.16$e^{-0.079P}$ 0.988	M=17.438$P^{-0.07}$ 0.592
30-60	M=22.987-1.065P 0.976	M=17.97-1.44 lnP 0.722	M=24.06$e^{-0.074P}$ 0.983	M=16.56$P^{-0.0647}$ 0.621
60-90	M=19.34-0.87 P 0.975	M=15.21-1.13ln P 0.691	M=19.91$e^{-0.068P}$ 0.986	M=14.089$P^{-0.060}$ 0.599
90-120	M=18.49-0.837P 0.97	M=14.55-1.12lnP 0.71	M=19.031$e^{-0.068P}$ 0.985	M=13.78$P^{-0.085}$ 0.67
120-15	M=19.44-0.9P 0.984	M=14.785-1.21ln P 0.739	M=19.30$e^{-0.071P}$ 0.987	M=13.60$P^{-0.066}$ 0.629
150-180	M=20.80-1.047P 0.986	M=15.84-1.32ln P 0.683	M=21.82$e^{-0.0827P}$ 0.997	M=14.32$P^{-0.071}$ 0.58
Average equation	21.00-1.15P	16.26-1.31lnP	20.91$e^{-0.074P}$	14.96 $P^{-0.069}$
r	0.978	0.71	0.988	r = 0.615

Abstract of soil moisture retention characteristics are given in Table 4. The regression analysis for pressure application (Bar) and retained moisture is done for linear, logarithmic, exponential and power best fit curves. The equations are given in table 5. Various curves fitted are shown in Fig. 8(A) to 8(F). Study of the plotted curves and the worked out correlation coefficient shows that exponential best fit (equation $20.91e^{-0.074\rho}$) is most suitable in all six cases.

(E) Infiltration Characteristics :

The general intake characteristics equation of the soil in command is as found to be -

$$I = 1.61\ t^{0.68}$$

Where,

I = Cummulative infiltration depth (mm)

t = Cumulative infiltration time in minutes.

The details of infiltration experiment and characteristics equation are given in Annexure - 5.

(F) Hydraulic Conductivity :

The average lowest hydraulic conductivity was 24.58 mm/hr. and was found below 60 - 100 mm profile zone. The hydraulic conductivity determinations for different layer are given in Annexure - 6. Abstract of physical properties of Lakhaoti Command are given in Table. 6 and 7.

MOISTURE RETENTION CURVE

0-30 cm Depth

Linear eq. $M = 24.96 - 1.22\ P$

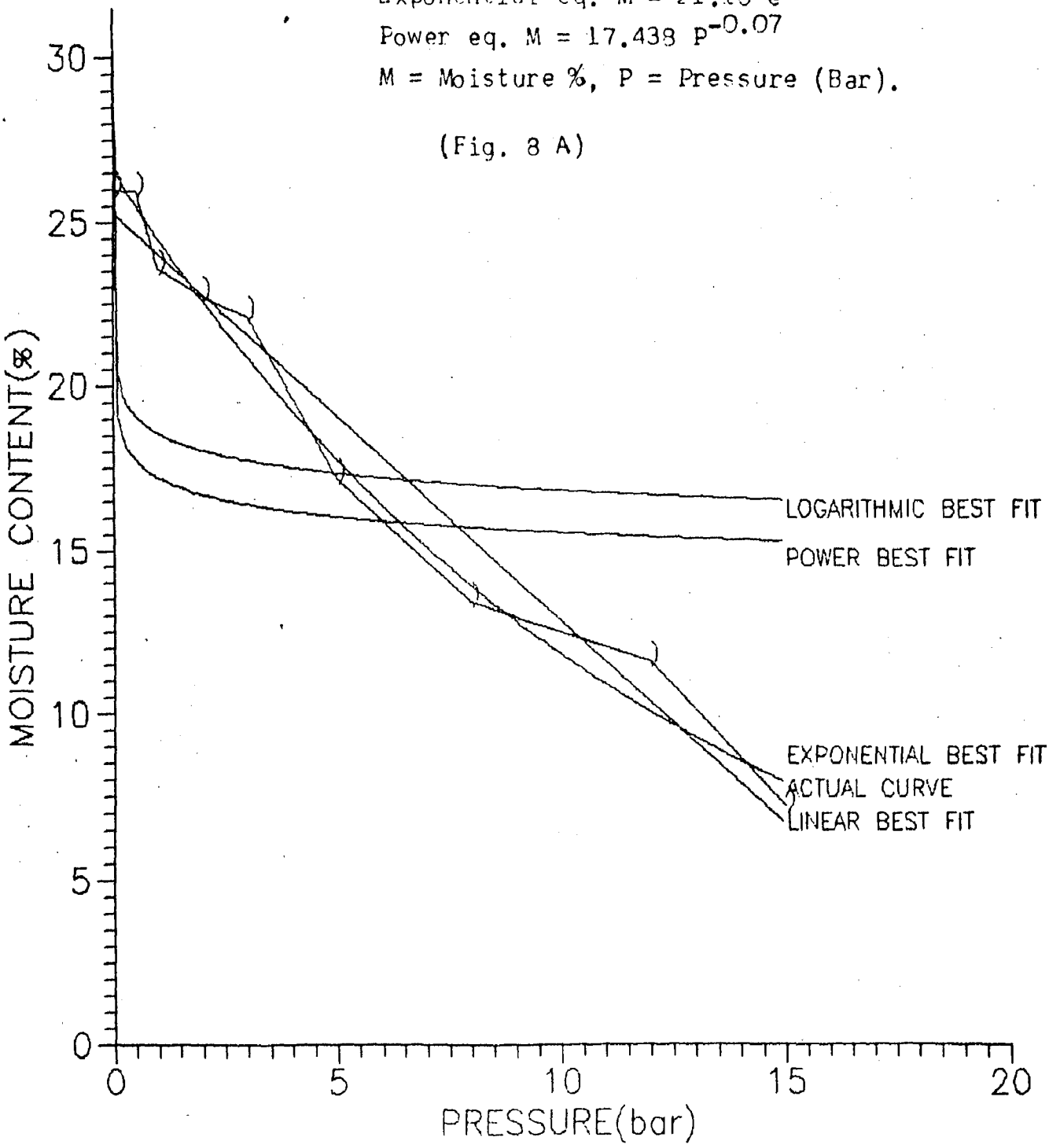
Log. eq. $M = 19.205 - 1.62\ \ln P$

Exponential eq. $M = 21.16\ e^{-0.079\ P}$

Power eq. $M = 17.438\ P^{-0.07}$

M = Moisture %, P = Pressure (Bar).

(Fig. 8 A)



MOISTURE RETENTION CURVE

30-60 cm Depth

Linear eq. $M = 22.987 - 1.065\ P$

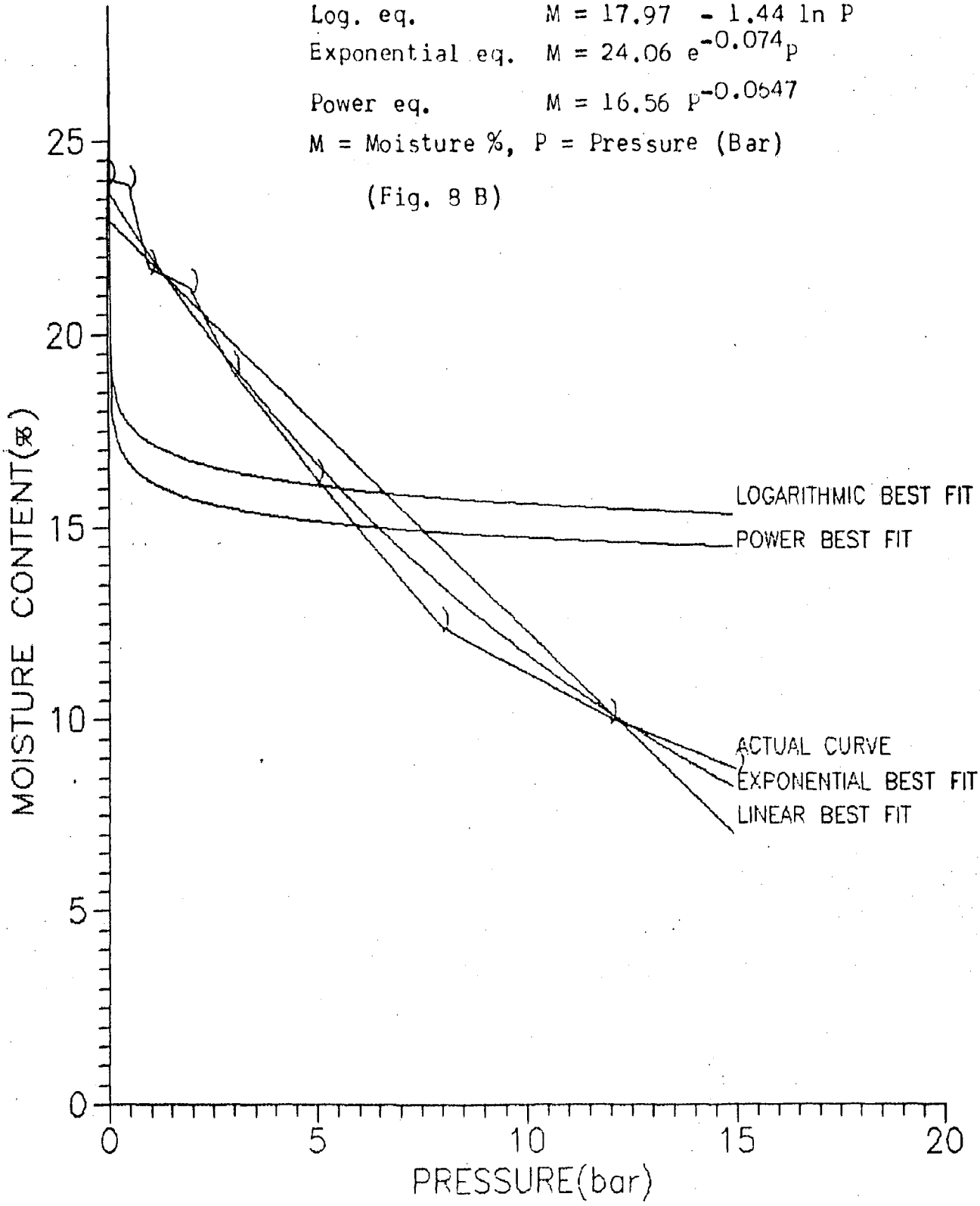
Log. eq. $M = 17.97 - 1.44 \ln P$

Exponential eq. $M = 24.06\ e^{-0.074P}$

Power eq. $M = 16.56\ P^{-0.0647}$

M = Moisture %, P = Pressure (Bar)

(Fig. 8 B)



MOISTURE RETENTION CURVE

60-90 cm Depth

Linear eq. $M = 19.34 - 0.87\ P$

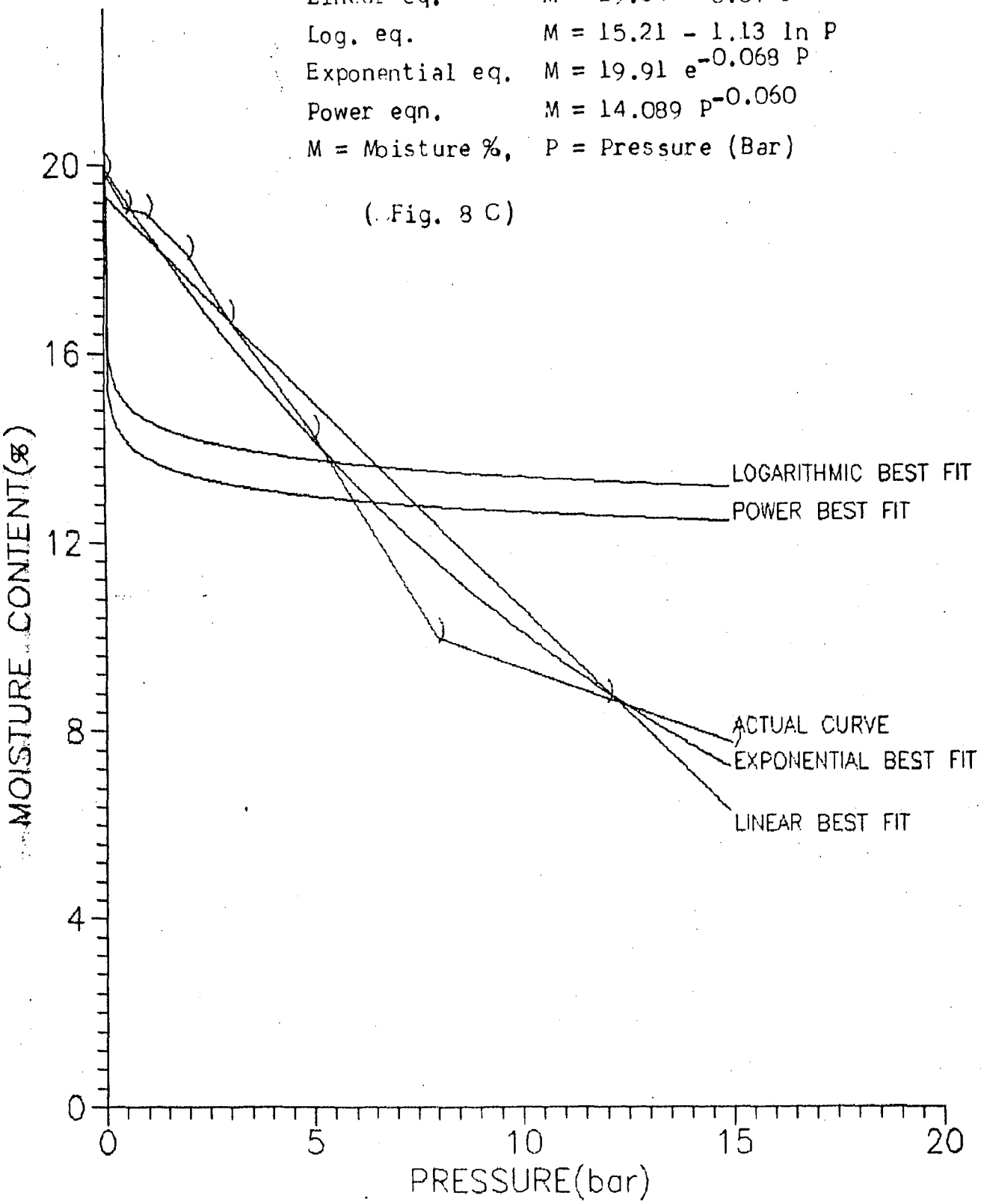
Log. eq. $M = 15.21 - 1.13\ \ln P$

Exponential eq. $M = 19.91\ e^{-0.068\ P}$

Power eqn. $M = 14.089\ P^{-0.060}$

M = Moisture %, P = Pressure (Bar)

(Fig. 8 C)



MOISTURE RETENTION CURVE

90-120 cm Depth

Linear eqn. $M = 18.49 - 0.837\ P$

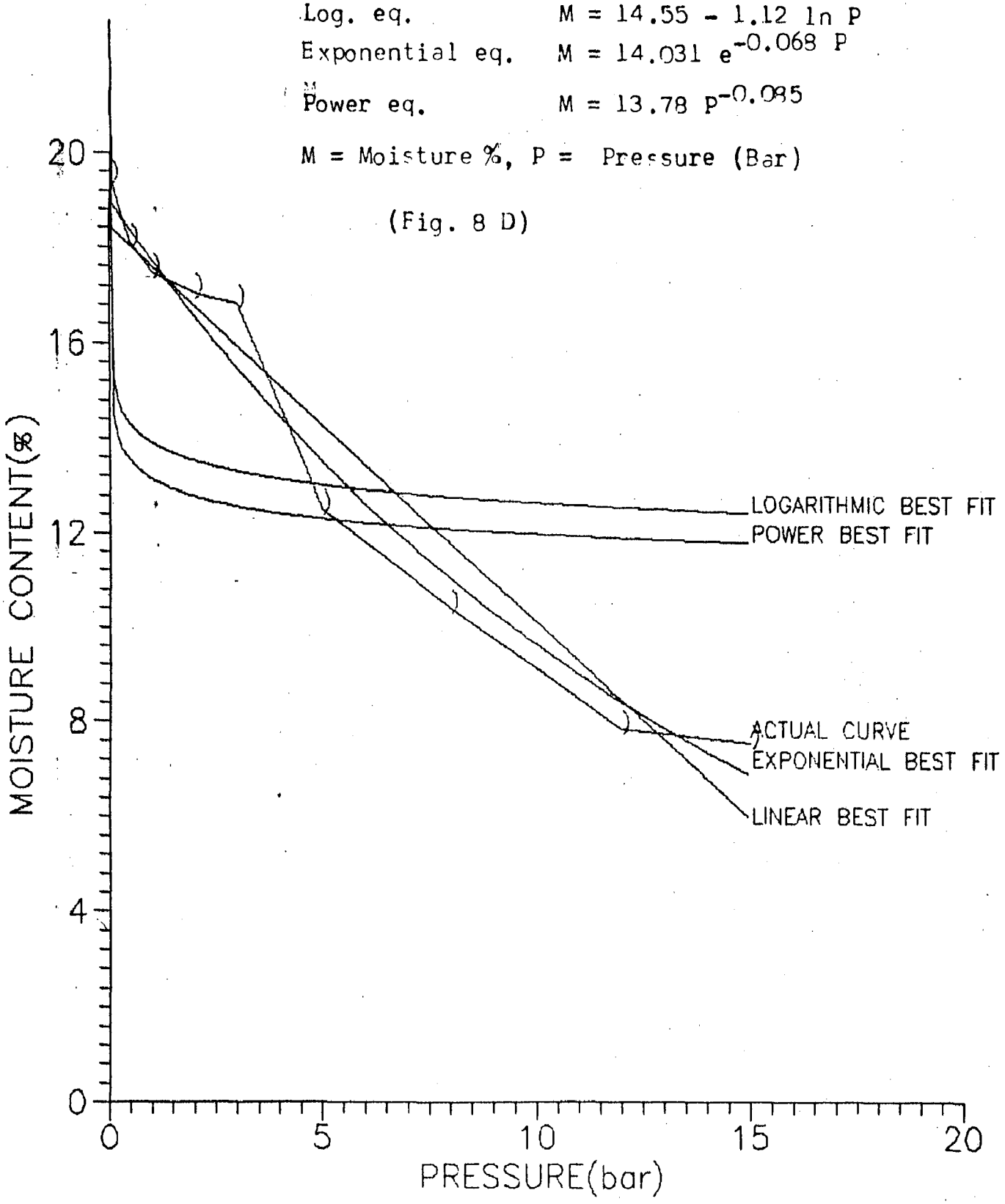
Log. eq. $M = 14.55 - 1.12 \ln P$

Exponential eq. $M = 14.031\ e^{-0.068\ P}$

Power eq. $M = 13.78\ P^{-0.085}$

M = Moisture %, P = Pressure (Bar)

(Fig. 8 D)

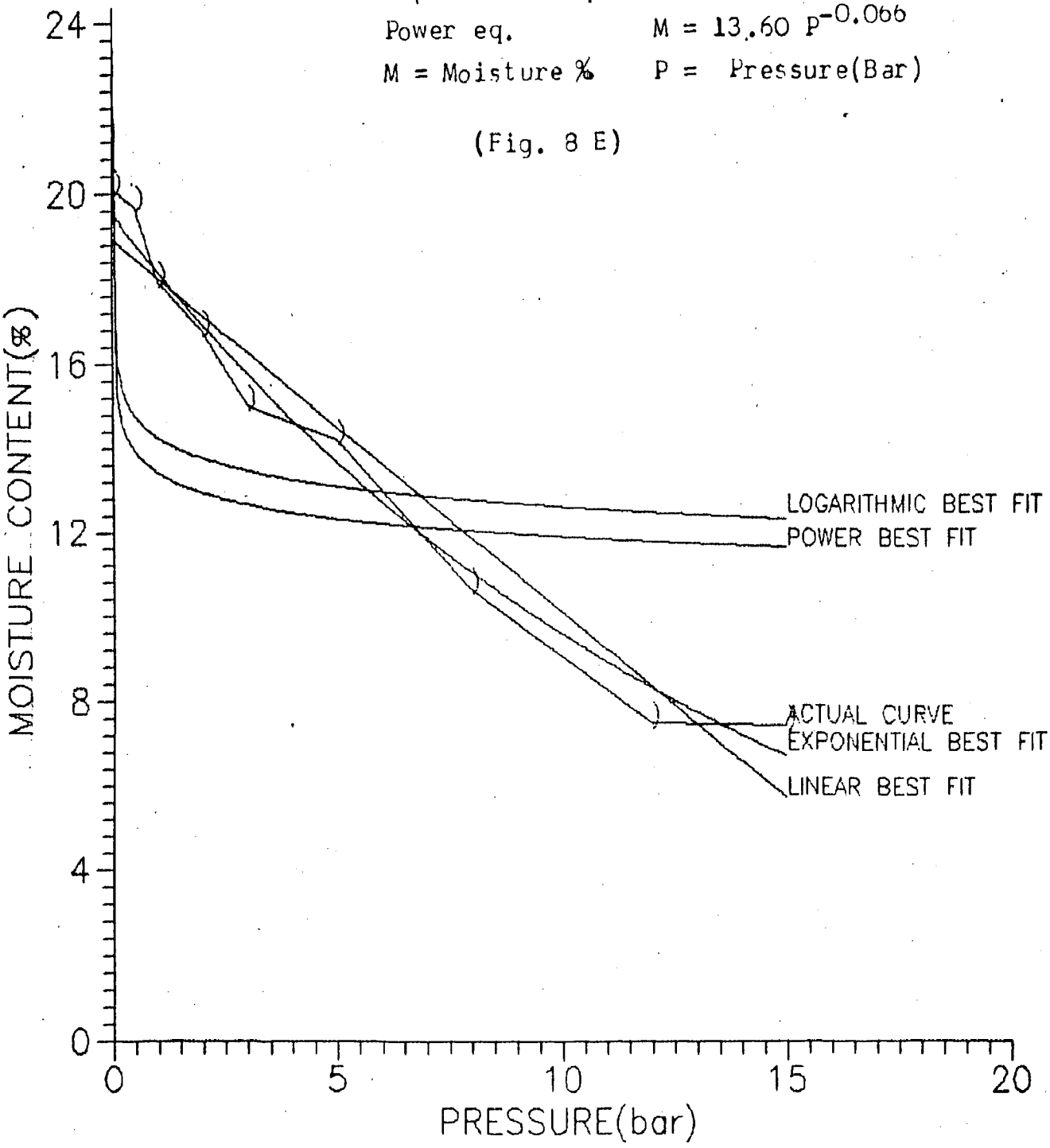


MOISTURE RETENTION CURVE

120-150 cm Depth

Linear eqn.	$M = 19.44 - 0.9\ P$
Log. eq.	$M = 14.785 - 1.21 \ln P$
Exponential eq.	$M = 19.50\ e^{-0.071\ P}$
Power eq.	$M = 13.60\ P^{-0.066}$
M = Moisture %	P = Pressure(Bar)

(Fig. 8 E)



MOISTURE RETENTION CURVE

150-180 cm Depth

Linear eqn. $M = 20.80 - 1.047\ P$

Log. eq. $M = 15.84 - 1.32 \ln P$

Exponential eq. $M = 21.82\ e^{-0.827P}$

Power eq. $M = 14.32\ P^{-0.071}$

M = Moisture %, P = Pressure (Bar)

(Fig. 8 F)

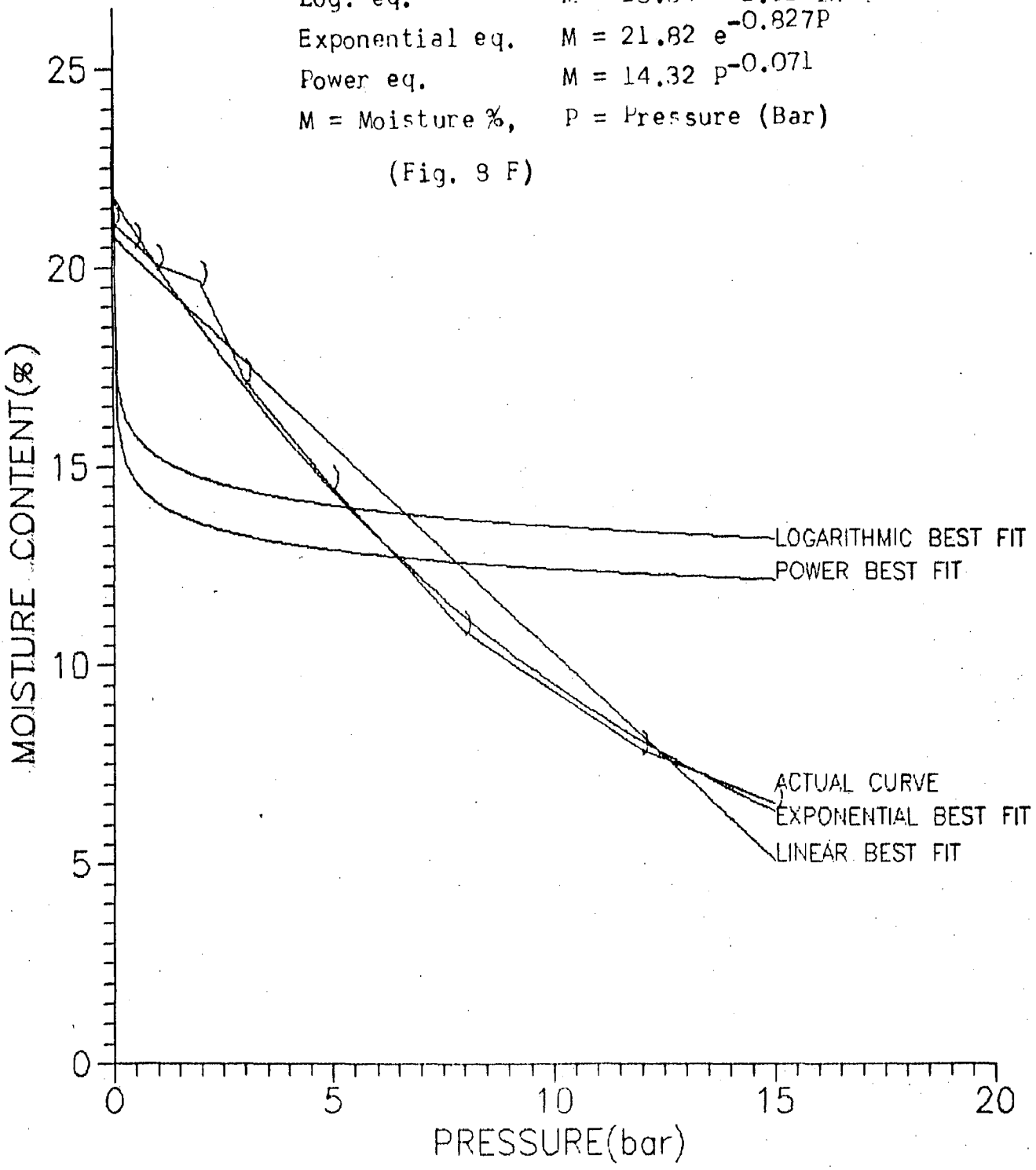


Table - 6

Abstract of Physical Properties of Soil in Lakhaoti Command

(Average Physical Properties)

Profile Depth (cm)	Bulk Density (g/cm^3)	Field Capacity from moisture Retention curve %	Permanent Wilting point PWP %	Carbon Content %age	Soil Texture
0-30	1.54	25.94	7.21	0.65	Sandy loam
30-60	1.52	24.00	8.74	0.62	Sandy Loam
60-90	1.54	19.50	7.75	0.59	Sandy Loam
90-120	1.52	19.40	7.53	0.45	Sandy loam
120-150	1.54	20.00	7.46	0.40	Sandy loam
150-180	1.59	20.80	6.49	0.38	Sandy loam
Average	1.54	21.60	7.53	0.52	Sandy loam

(Abstracted from Annexures 1,2, and 4).

Table - 7

(i) Average Hydraulics Conductivity in Rooting Zones of Soil in Lakhaoti Command

Name of Command	Profile Depth		
	0-30 CM	30-60 CM	60-150 CM
	Permeability m/day	Permeability m/day	Permeability m/day
43 JBTW	0.74	0.86	0.56
84 KBTW	0.77	0.83	0.63
45 KBTW	0.77	0.65	0.70
Lakhaoti Minor Min.	0.70	0.77	0.57
Mundi Bakapur Min.	0.69	0.64	0.59
Machakanli Minor	0.75	1.04	0.49
Average	0.74	0.80	0.59
Permeability in mm/hr	30.83	33.33	24.58

4.2.5.2. Soils Chemical Properties :

pH and electrical conductivity of a common representative sample analysed is given in Table 8. Cations and anions analysis by Mahabir Singh (1978) is given in Table 9.

4.2.5.3. Soil Irrigability and Land Irrigability Classification:

On the basis of physical and chemical properties of soils and topographic assessment, the soil is classified in irrigability class (A) as per detailed soil properties assessment done in Table 10.

As per soil irrigability class topographic characteristics and drainability conditions the assessment done is given in table 11, the land is classified for Land irrigability and drainability class - I. (IS : 10317 - 1982, Technical Series No.3 (Revised). (1985 : The water Management Manual; A government of India, Ministry of Water Resources, Water Management Division, Publication and FAO Soils Bulletin No. 42 (1979): Soil Survey Investigations for Irrigation).

4.3. BIOMASS PRODUCTION POTENTIAL :

Table 12 shows that the values of monthly gross dry matter production rates of a reference crop (Y_o) in kg/ha/day. The maximum rate of production is during the months of April to July with maximum production rate in the month of May which is 395.28 kg/ha/day. Because of clear sky conditions in these days, actual incomming shortwave measured are also the maximum over the other months in the year. Annual average biomass

Table - 8

Chemical Analysis of Soil in Lakhaoti Command

(For One Representative Soil Profile)

Profile Depth (cm)	pH of Soil	Electrical Conductivity EC (mmhos/cm).
0-30	7.90	1.34
30-60	7.80	1.42
60-90	7.80	1.45
90-120	7.80	1.98
120-150	7.80	1.69
150-180	7.80	1.78
Average	7.82	1.61

Table -9

Composition of Saturation Extract and Composition of Exchangable Complex of Ganga Recent Alluvial Soil of Bulandshahar - Village, Manakpur.

Components	Depth in Cm			
	0-15	15-30	30-60	60-120
	Composition of Saturated Extract			
Saturation %	22.7	23.7	23.0	22.80
pH	8.0	7.90	7.80	7.80
ECe mmhos/cm	1.37	1.42	1.57	2.20
Ca^{++} m.eq/100 g.	25.65	26.75	25.50	24.35
Mg^{++} "	16.20	15.75	15.22	15.23
Na^{+} "	24.56	24.75	25.28	26.76
K^{+} "	5.25	5.38	5.49	5.25
$Co3^{-}$ "	0.42	0.35	0.32	0.28
$HCo3^{-}$ "	0.87	0.85	0.78	0.72
Cl^{-} "	1.98	1.82	1.75	1.72
$So4^{-}$ "	1.96	1.98	2.05	2.12
	Composition of Exchangable complex			
CEC meq/100g	11.28	11.76	12.32	13.12
Ca^{++} "	5.12	5.28	5.37	5.75
Mg^{++} "	3.73	3.82	3.95	4.02
Na^{+} "	1.31	1.48	1.75	1.92
K^{+} "	1.12	1.18	1.25	1.43
ESP	11.60	12.59	14.20	14.63
EPP	9.90	10.03	10.15	10.90

Source: Ph.D. Thesis of Shri Mahabir Singh (1978), Submitted to Meerut University, Meerut.

Table - 10

Soil Irrigability Class

Sl.No.	Analysis of Soil Properties	Irrigable soil classification
(i)	Effective soil depth usefull to crop 20000 mm > 900 mm	A
(ii)	Texture of surface 30 cm - Sandy loam (Table 6)	A
(iii)	Soil permeability of least permeable layer From table 7 - 24.58 mm/hr which is within 5.0 -50 mm/hr.	A
(iv)	Available water holding capacity to depth of 90 cm, from table (6). $\left(\frac{FC-PWP}{100}\right) \times BD \times RD = \left(\frac{21.60-7.53}{100}\right) \times 1.54 \times 90$ = 19.50 cm i.e. 195 mm > 120 mm	A
(v)	Coarse fragments cobbles,and stones more than 75 mm - NIL	A
(vi)	Gravel and Kankar more than 25 upto 75 mm Annexure - 2 max. gravel 1.62% < 15%	A
(vii)	Salinity EC x 10^3 in saturation extract 1.34 mmhos to 1.98 mmhos < 4.00 mmhos	A
(ix)	Salt effected(visual percent of area affected - NIL	A
(x)	Severity of alkali problem ESP 11.6 to 14.63 < 15	A
(xi)	Sub-soil or substrata drainage characteristics-excellent	A
(xii)	Soil erosion status - NIL On the basis of above inferences the soil is classified in irrigability Class A	A

Table - 11

Assessment of Land Irrigability Class

Sl.No.	Land Characteristics	Irrigable land class
	Soil Irrigability Class - A	
	Topography	
1.	Slope 0.0375% less than 1.00%	Class I
2.	Surface grading : No restriction	Class I
	Drainage	
1.	Outlets - Informal suitable outlets available	Class I
2.	Surface - Less than 0.50m surface drain required per acre	Class I
3.	Sub-surface. No sub-surface drainage needed	Class I
4.	Depth of water table - 15m > 5 metres	Class I

Table 12

Monthly Biomass Production Potential in Lakhaoti Command (Reference Station Bulandshahar) Latitude $28^{o}24'N$)

Months	Actual Incomming short wave Rediation Rs Cal/ cm^2/day	Max. active incomming shortwave radiation on clear day Rse Cal/cm^2/ day	Gross dry matter production rate of standard crop for the completed over cast day y_o kg/ha/day	Gross dry matter production rate of standard crop for given location on clear day y_c kg/ha/day	Fraction F = (Rse-0.5 Rs)/ 0.8 Rse	Gross dry matter production rate of a standard crop Y_o kg/ha/day
1	2	3	4	5	6	7
January	347.51	200.28	142.28	289.48	0.1655	265.11
Feburary	413.00	252.68	172.00	339.09	0.2285	300.92
March	475.54	308.44	202.40	388.52	0.2864	335.22
April	545.16	364.92	232.48	437.32	0.3163	372.53
May	600.62	399.04	250.20	460.24	0.3093	395.28
June	502.09	414.28	259.24	485.64	0.4925	374.13
July	475.54	409.08	256.56	480.12	0.5235	363.09
August	442.50	384.32	242.84	455.20	0.5304	342.57
Sept.	461.97	336.84	217.60	410.08	0.3928	334.47
October	459.61	276.88	185.36	360.96	0.2125	323.64
November	391.17	218.64	152.80	306.84	0.1318	286.54
December	325.09	188.44	135.44	277.96	0.1712	253.48
Average annual Y_o, t/ha.						118.35

production potential per hectare is 118.35 tons. Crop growth and yield are affected by the total radiation received during the growing period. At a given temperature and radiation, crops differ in their response to how much of the total radiation received can be converted into growth and yield. This difference has an important effect on how efficiently water can be utilised by the crop for production. Crop selection can therefore, be made considering the radiation requirement and response of crop in addition to temperature and day length.

4.4. CROP WATER REQUIREMENT IN LAKHAOTI COMMAND :

Considering the ETo computed by modified Penman method and crops sowing period, crop durations and Kc values as given in table 13, the crop water requirement of four crops with four sowing dates were computed. The crop wise crop water requirement is as per following :

(a) Maize : Crop water requirement varied with sowing dates as given (Table 14, Fig. 9) and in Annexure 8 (A + D). The gross water requirement with early shown (15 May) crop is 680.34 mm and for the late sown (10 July) 565.77 mm. A variation of GIR and ETc between early and lost sowing is shown in Figure 9. Early sown crops shows high values of GIR as well as total ETcrop. Crop sown on 25 June recorded minimum, GIR. ETcrop recorded was however,. lowest when maize crop was sown on 10th July but the GIR recorded was not lowest. Variation in the

Table - 13

Sowing Period, Crop Duration and Kc Values of Principal Kharif Crops in Lakhaoti Command

Crops	Sowing Dates	Crop duration	Crop Periods and Kc Values			
			Initial stage days	Crop Development stage days	Mid season stage days	Late season stages days.
Maize	15 May - 10 July	100-110	20(0.30)	25(0.70)	35(1.05)	20(0.80)
Sorghum (Fodder)	25 May - 15 July	125-140	20(0.30	40(0.70)	50(1.0)	30(0.75)
Pigeon-Pea(Arhar)	10 May - 15 June	210-225	40(0.40)	95(0.70)	60(1.05)	30(1.00)
Sugarcane	15 Dec.-20 April	270-300	30(0.40)	90(0.70)	150(1.00)	30(0.75)

(Kc Values are shown in breaket)

Table - 14

Gross Irrigation Requirement and ETcrop of Maize with Different Sowing Dates in Lakhaoti Command

Sowing Dates	Gross Irrigation Requirement(mm)	ETcrop (mm)
15 May	680.34	549.72
5 June	571.16	512.79
25 June	533.00	481.12
10 July	565.77	451.30

(Abstracted from Annexure 8(a) to 8(d)

Table - 15

Gross Irrigation Requirement and ETcrop of Sorghum with Different Sowing Dates in Lakhaoti Command

Sowing Dates	Gross Irrigation Equipment(mm)	ETcrop (mm)
20 May	817.22	639.57
10 June	737.01	587.38
30 June	655.62	526.91
15 July	642.86	489.93

(Abstracted from Annexure 9(a) to 9(d)

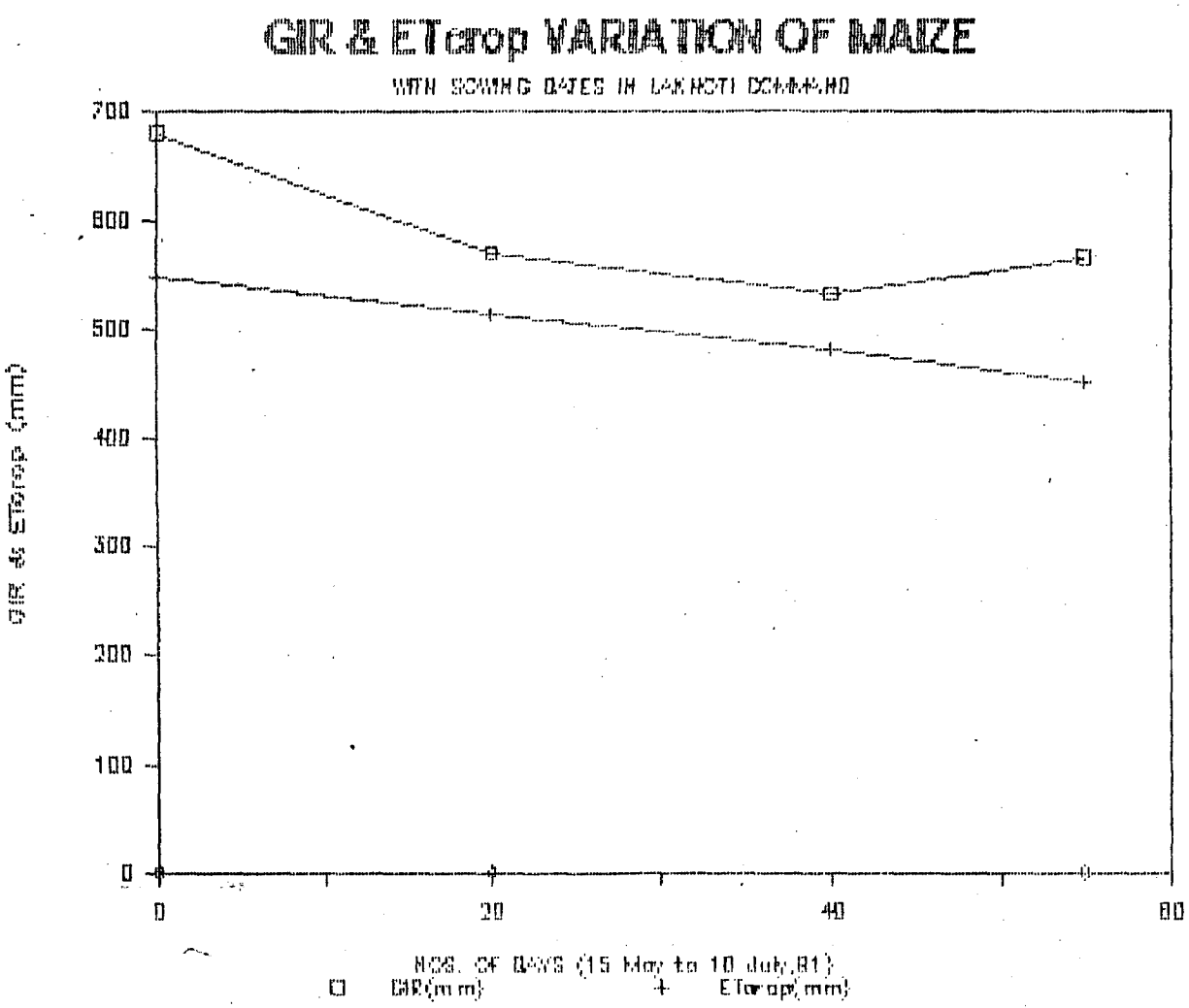

GR & ETcrop VARIATION OF MAIZE
WITH SOWING DATES IN LAKHOTI COMMAND
GR & ETcrop (mm)
700
600
500
400
300
200
100
0
0
20
40
60
NOS. OF DAYS (15 May to 10 July,81)
GR(mm)
ETcrop(mm)

Fig.9

pattern of GIR & ETc could be ascribed to availability of effective rainfall.

(b) Sorghum (Fodder): Computation of crop water requirement four different sowing dates an given in Annexure-9. A graph plotted for GIRand total ETc of crop from early sowing to last sowing shows continuous decline in GIR and ETcrop as shown in (Table 15 and Figure 10. The GIR of early sown crop is 817.22 mm and for late sown crop is 642.86 mm. This could be ascribed to the fact of effective rainfall contribution in the later sown crop and harvesting of crop by the end of rainy season.

(c) Pigeon - Pea (Arhar) :

Pigeon-Pea is long duration and draught resistant crop. In Lakhaoti command this crop is sown in early mansoon months so that harvesting in December to January may be possible to take the next crop. Crop water requirements with varrying sowing dates an given in Annexure-10.

The crop water requirement, GIR for first and last sown dates are 1029.89 mm and 796.45 mm.
The variation of GIR and ETc is shown in Table 16 and Fig. 11).

(d) Crop Water Requirement for Sugarcane :

Sugarcane is an annual crop, its crop requirement is high compared to the other field crops. The crop water

TABLE- 16

Gross Irrigation Requirement and ETcrop of Pigeon-Pea with different Sowing Dates in Lakhaoti Command

Sowing Dates	Gross Irrigation Requirement(mm)	ETcrop (mm)
10 May	1029.89	796.45
20 May	990.89	773.03
30 May	909.10	723.96
15 June	841.61	656.85

(Abstracted from Annexure 10(a) to 10(d)

TABLE - 17

Gross Irrigation Requirement and ETcrop of Sugarcane with Different Sowing Dates in Lakhaoti Command

Sowing Dates	Gross Irrigation Requirement(mm)	ETcrop(mm)
15 December	1950.92	1369.05
1 February	1893.69	1323.71
10 March	1623.06	1158.93
20 April	1493.55	1083.63

(Abstracted from Annexure 11(a) to 11(d)

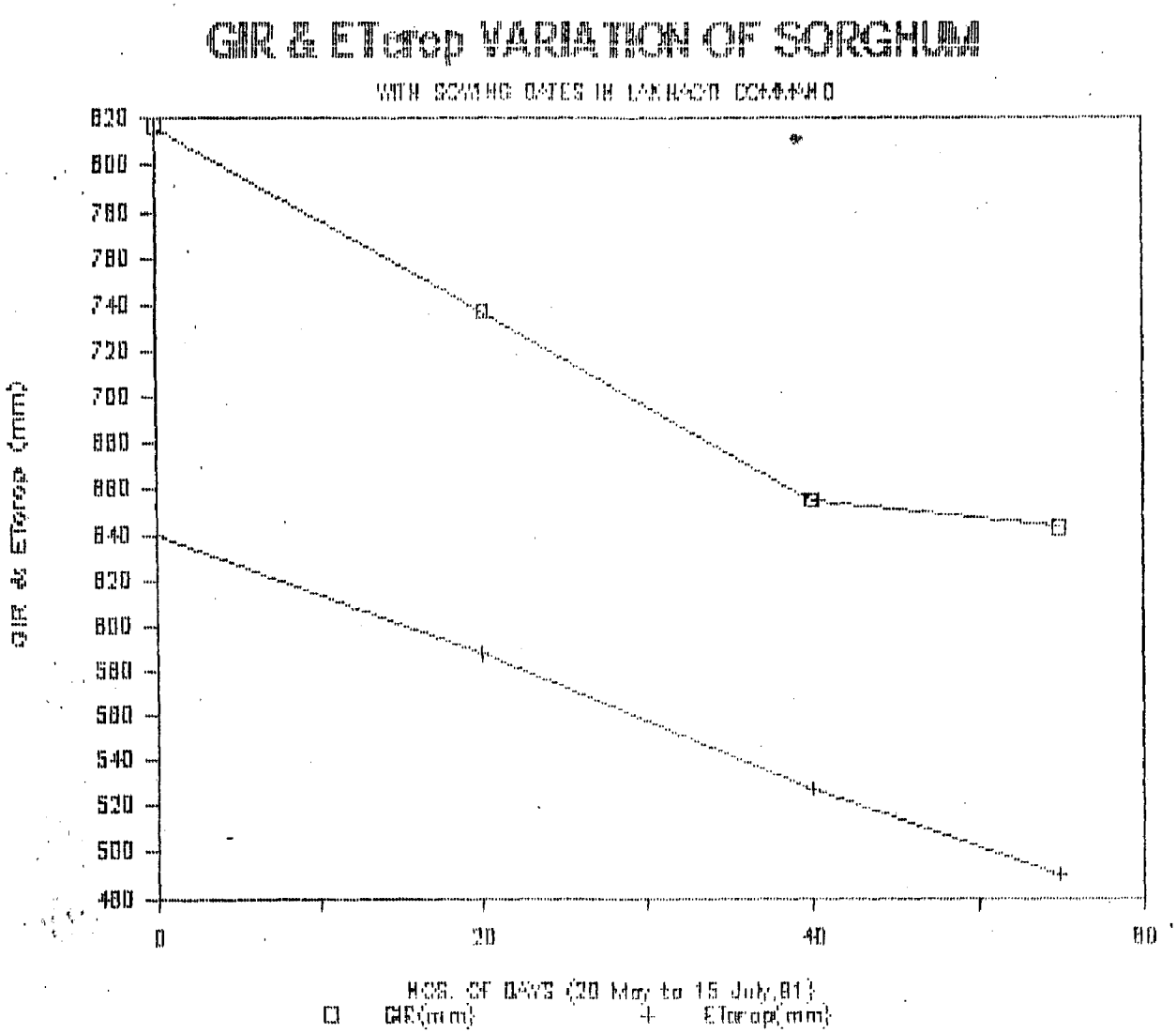

GR & ETcrop VARIATION OF SORGHUM
WITH SOWING DATES IN LAHORE CONDITIONS
GR & ETcrop (mm)
820
800
780
760
740
720
700
680
660
640
620
600
580
560
540
520
500
480
0
20
40
60
NOS. OF DAYS (20 May to 15 July,81)
GR(mm)
ETcrop(mm)

Fig. 10

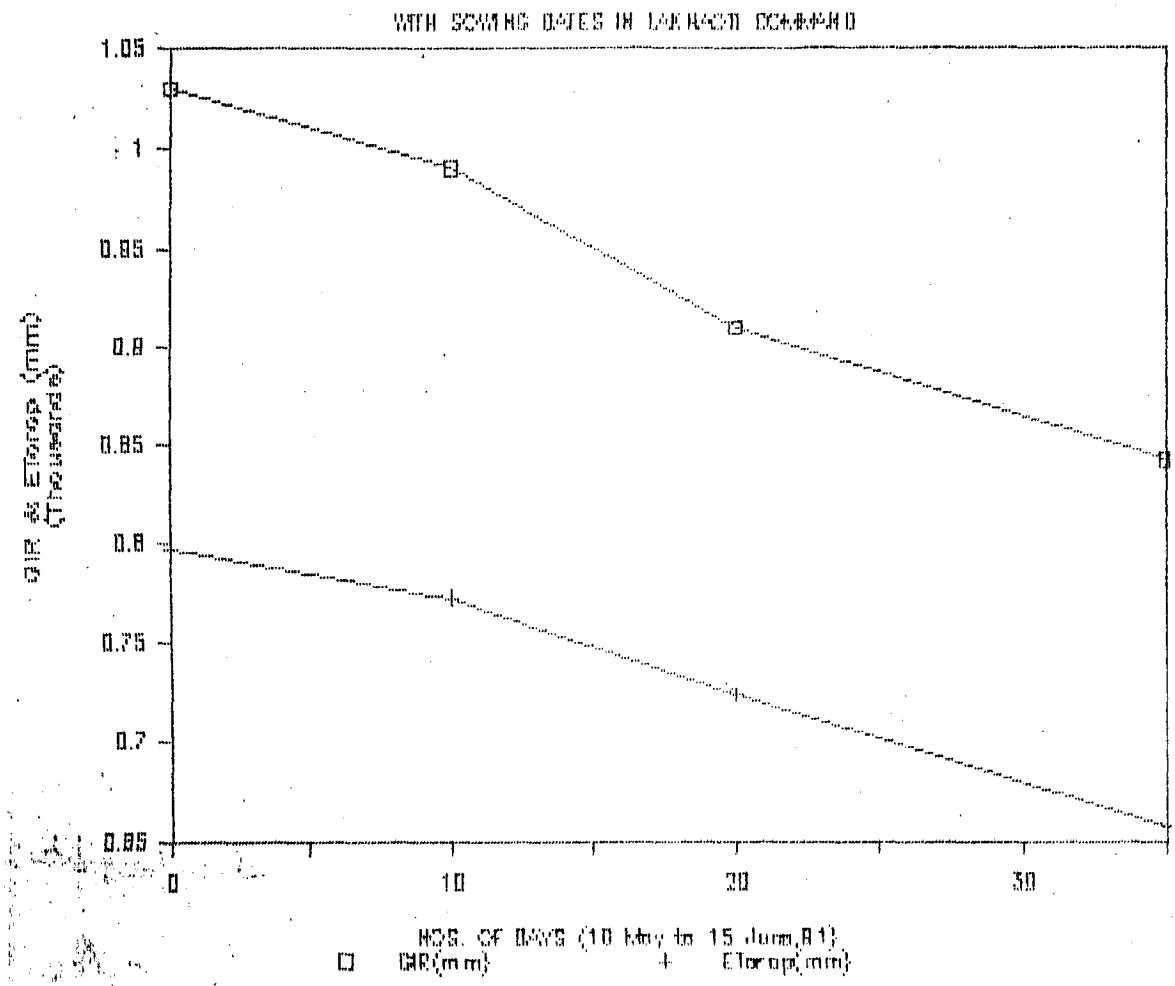

GR & ETcrop VARIATION OF PIGEON-PEA
WITH SOWING DATES IN LOCATION COMMAND
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0
10
20
30
GR & ETcrop (mm)
(Treated as 1)
NOS. OF DAYS (10 May to 15 June,81)
GR(mm)
ETcrop(mm)

Fig. 11

requirement is calcculated for four different sowing dates since 15th Dec. to 20 April practiced in Lakhaoti Command Annexure - 11. The crop development period of early maize lies in summer which needs more irrigation water. The gross irrigation requirement computations shown the values of 1950.92 mm and 1493.55 mm for early and late sown crops. GIR and ET crops an abstracted in Table - 17.

On the basis of computation a graph is prepared to show the nature of change in ETcrop and GIR with different sowing dates from early to late date. Fig. 12. It is distinctly seen that upto February sowing, the GIR demand is high. After February sowing the crop water requirement records a steep decline in GIR and ETc upto 10th March, Lowest ETc and GIR an recorded in the crop sown on 20th April.

4.5. PRODUCTION POTENTIAL ASSESSMENT OF CROPS IN LAKHAOTI COMMAND :

The observed leaf area index (LAI) is given in Annexure-12 Dry matter production potential of maize, sorghum (Fodder), Pigeon-pea (Arhar) and sugarcane have been assessed periodically. The details of computations given in Annexure 13 for all four crops.

Cropwise production potential assuming soil and water constraint conditionsand good management practice for different crops are discussed below:

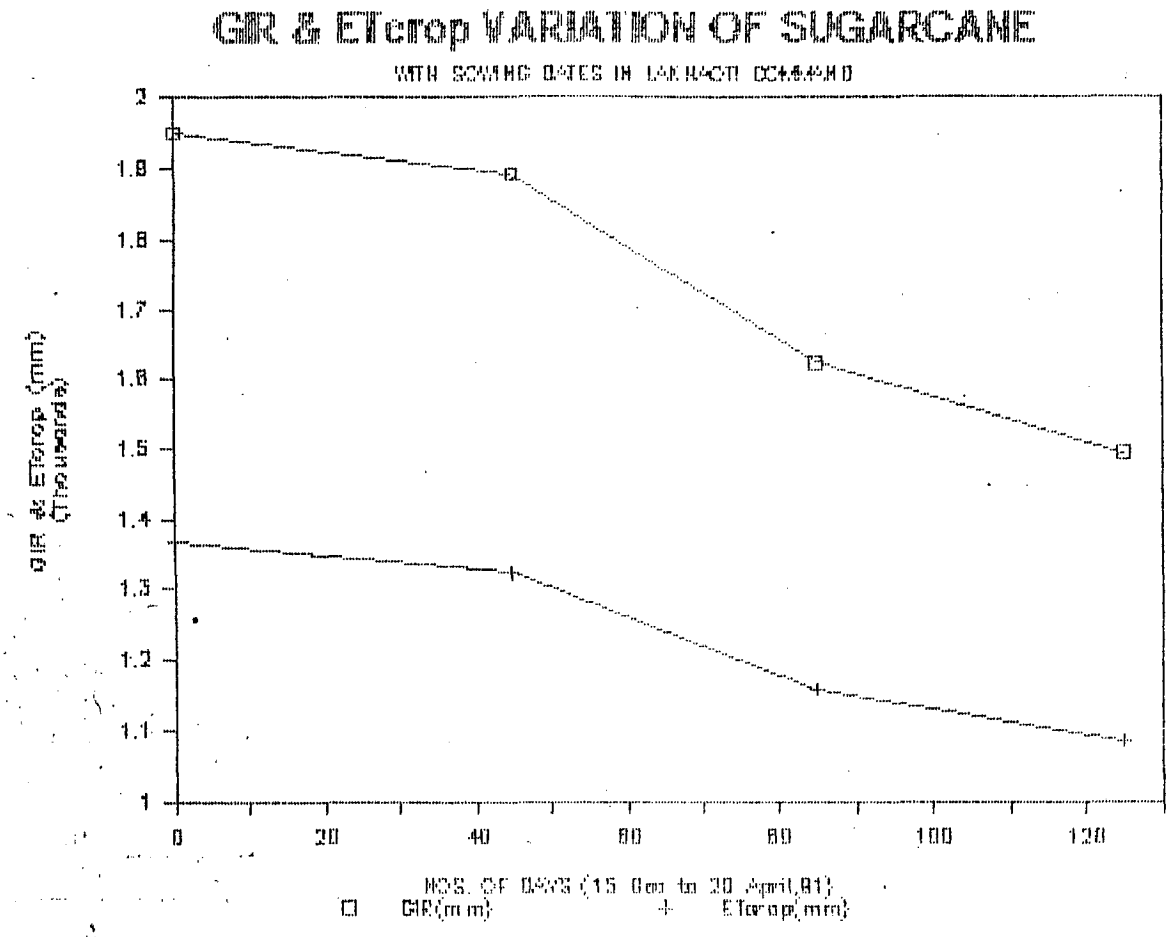

GR & ETcrop VARIATION OF SUGARCANE
WITH SOWING DATES IN LAHORE
GR & ETcrop (mm)
(Treatments)
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0
20
40
60
80
100
120
NOS. OF DAYS (15 Dec to 30 April,81)
GR(mm)
ETcrop(mm)

Fig. 12

(a) Maize :

Dry matter production potential from the sowing dates are worked out in annexure 13. The abstract of computed and harvested dry matter production in given in Table 18. The ultimate dry matter production is shown with varying sowing date in Table 19. Results shows that there is substantial decrease in dry matter production in delayed sowing of crop. The computed dry matter production and harvested dry matter production is shown in Fig. 13. The crop sown on Maizes irrigated with private tubewell recorded highest DM production as 1235 g/m^2 whereas crop sown in July 10 and irrigated with Govt. tubewell recorded, lowest yield as 502 g/m^2, The loss in production due to delayed sowing could be ascribed to less availability of sunshine and inconvenience in cultural operations.

Since the variety of the seed is local and cropping management is not much intensive hence the crop production potential could be low.

(b) Sorghum :-

The maximum dry matter production was recorded in the command of 84 KB (2). The actual observed production was 1430 g/m^2 against the potential of 1642.6 g/cm^2. Table 21 is prepared by scrutinising the maximum harvested yield in the range of different sowing dates. The data presented graphically on Fig. 14 shows that the gap between the computed dry matter production and harvested dry matter production increases with delay in sowing dates.

STATEMENT SHOWING THE DRY MATTER PRODUCTION(COMPUTED AND OBSERVED)

IN THE LAKHAOTI COMMAND OF DIST.BULANDSHAHAR

CROP MAIZE grams/sqm

Plot No:	Sowing dates	Harvest dates	DRY MATTER PRODUCTION							
			COMP	OBS	COMP	OBS	COMP	OBS	COMP	OBS
T.W.Commands			1		2		3		4	
43jb1	20/5/91	8/9/91	956.228	685	961.388	810	-	-	233.000	577
43jb2	25/5/91	9/9/91	1241.992	820	1256.170	1235	-	-	263.000	972
43jb3	10/6/91	15/991	701.998	555	739.349	672	-	-	198.000	474
84kb1	29/6/91	26/9/91	427.449	388	582.316	434	696.252	502	126.000	502
84kb2	5/6/91	10/9/91	749.010	532	829.473	612	-	-	148.000	464
84kb3	14/6/91	20/9/91	574.419	419	575.091	513	-	-	133.000	389
45kb1	4/7/91	5/10/91	544.964	413	573.837	520	-	-	142.000	378
45kb2	12/6/91	15/9/91	735.944	570	740.286	598	-	-	187.000	411
45kb3	25/6/91	28/9/91	695.355	449	715.420	556	723.100	563	77.000	486
CANAL COMMANDS										
Machakauli(MI)	10/6/91	11/9/91	855.523	602	-	-	-	-	220.000	382
Lakhaoti(MI)	22/6/91	16/9/91	811.671	610	837.263	735	-	-	223.000	512
Mundi Bakapur(MI)	8/6/91	8/9/91	843.850	696	-	-	-	-	190.000	506

COMP: Computed

OBS: Observed

TABLE NO: 18

TABLE - 19

Maximum Dry Matter Productions of Maize in Lakhaoti Command

Sowing Date upto	Selected Plot of Max.Yield	Computed Dry Matter Production Potential at Lost Observation g/m^2	Dry Matter Production at Last Observation g/m^2
20.5.91	437JB(2)	1256,17	1235
10.6.91	Mundi Baka-pur Minor	843.85	740
25.6.91	Lakhaoti Minor	837.263	735
5.7.91	84 KB(1)	696,52	502

(Abstracted from Table 18)

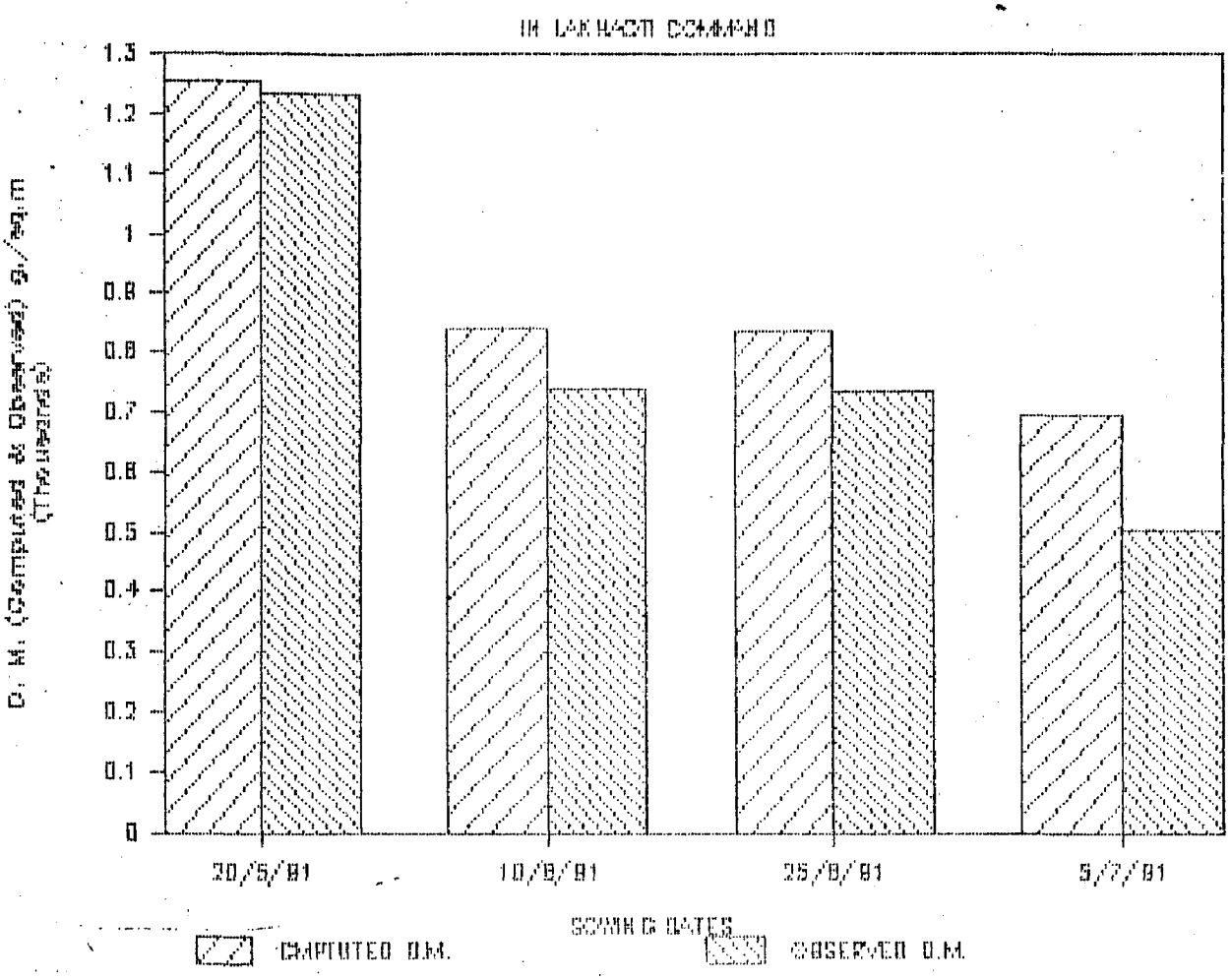

MAX. D.M. PRODUCTIONS OF MAIZE
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
20/5/81
10/6/81
25/6/81
5/7/81
COMPUTED D.M.
OBSERVED D.M.

Fig. 13

STATEMENT SHOWING THE DRY MATTER PRODUCTION(COMPUTED AND OBSERVED)

IN THE LAKHAOTI COMMAND OF DIST.BULANDSHAHAR

CROP SORGHUM (FODDERS) grams/sqm

Plot No:	Sowing dates	DRY MATTER PRODUCTION							
		COMP	OBS	COMP	OBS	COMP	OBS	COMP	OBS
T.W.Commands		1		2		3		4	
43jb1	10/6/91	731.227	672	889.738	720	1139.918	1060	1206.385	1107
43jb2	20/6/91	1024.829	924	1105.117	1008	1366.386	1205	1459.282	1259
43jb3	15/7/91	421.364	396	577.519	523	732.779	683	963.893	878
84kb1	14/7/91	326.114	260	492.999	377	647.699	548	817.687	692
84kb2	30/5/91	1208.396	832	1419.511	1040	1568.054	1270	1642.594	1430
84kb3	10/6/91	864.317	704	1026.202	902	1332.509	1034	1540.926	1276
45kb1	20/5/91	1020.239	905	1420.996	1237	1463.207	1332	1529.805	1411
45kb2	12/6/91	782.666	672	980.385	813	1068.233	937	1147.397	1045
45kb3	15/7/91	626.000	593	871.000	1017	856.000	1180	936.000	936
CANAL COMMANDS									
Machakauli(MI)	30/5/91	761.530	680	1061.008	948	1160.294	1040	1197.618	1080
Lakhaoti(MI)	15/7/91	470.464	464	580.499	524	735.404	622	817.226	740
Mundi Bakapur(MI)	20/6/91	491.680	471	881.425	792	984.501	823	1084.514	947

TABLE NO: 20

COMP:- Computed

OBS :- Observed.

TABLE-21

Maximum Dry Matter Production of Sorghum in Lakhaoti Command

Sowing Date upto	Plot No.of Max.Yield	Computed Dry Matter Production g/m^2	Observed Dry matter Production g/m^2
30.5.91	84 KB(2)	1642.594	1430
10.6.91	84 KB(3)	1540.926	1276
20.6.91	43 JB (2)	1459.28	1259
15.7.91	45 KB(3)	1180	936

(Abstracted from Table 20)

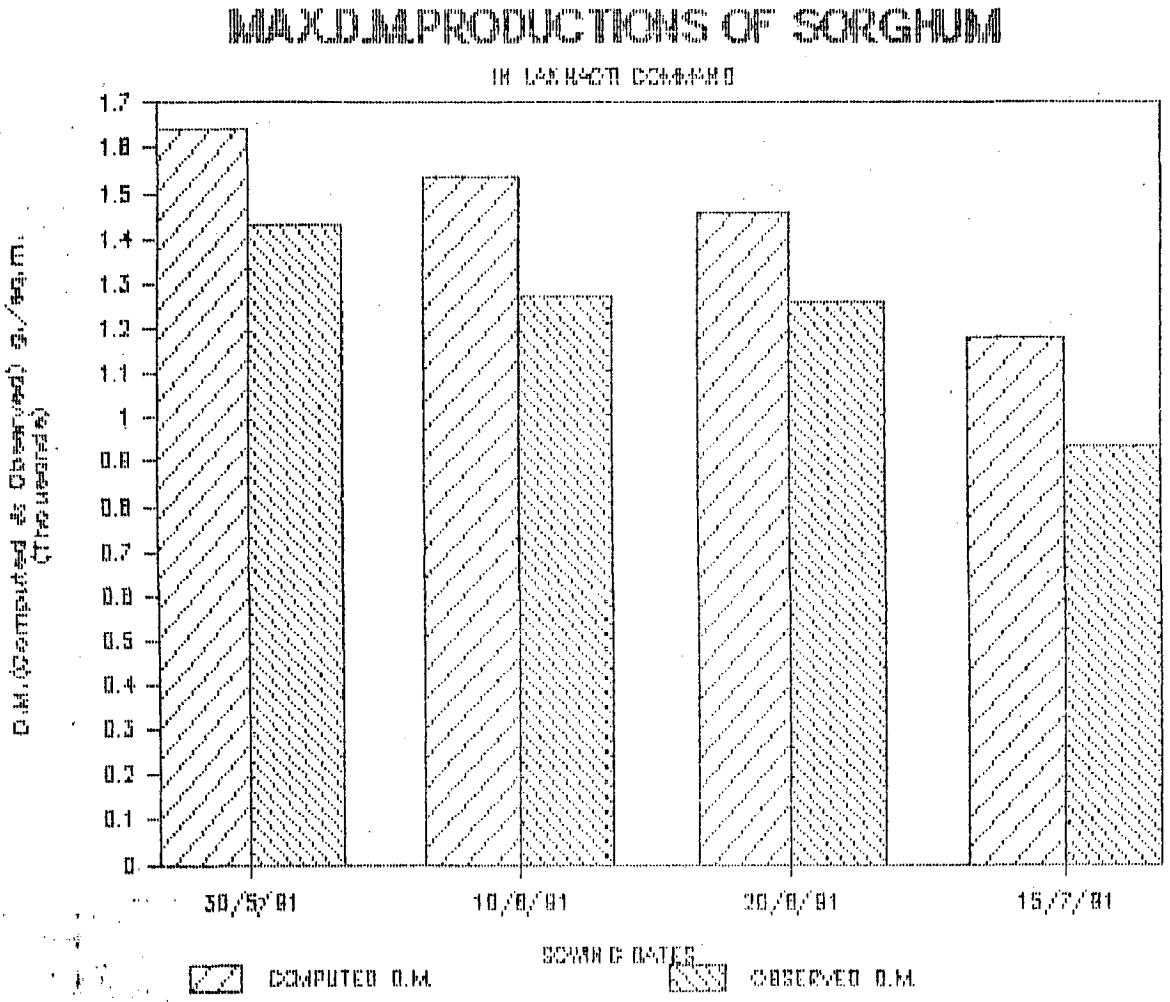

MAXIMUM PRODUCTIONS OF SORGHUM
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
30/5/81
10/6/81
20/6/81
15/7/81
COMPUTED D.M.
OBSERVED D.M.

Fig. 14

(c) Pigeon-Pea (Arhar):

The computate potential dry matter production is given in Annexure 13(1).

The abstract of computed and observed dry matter production is given in Table 22. The production observed with varying sowing date is arranged in Table 23 and Fig. 15.

(d) Sugarcane :

The dry matter production potential of sugarcane is computed by the Agro-ecological zone method. The computate values are given in Annexure 13(d).

For four observation data on potential dry matter production and observed dry matter is given in Table No.24. The dry matter production observed maximum and computed dry matter production corresponding for sowing date is given in table 25. A comperative bar graph is prepared with these values.(Fig-16) No substantial variation between computed and observed dry matter production is found.

The maximum crop production for standard cropping conditions as per FAO 33 (1979) is 110-150 t/ha. i.e. 1100-1500 gram/m^2. The maximum dry matter production observed to nearly at harvesting stages crops recorded 5287 g/m^2 in plot No. 43 JB(2), 3486 gm/m^2 in Mundi Minor-1 and 4302 g/m^2 Mundi Minor No.2 plot. Crop management needs improvement for harvesting more yield.

STEMENT SHOWING THE DRY MATTER PRODUCTION(COMPUTED AND OBSERVED)

IN THE LAKHAOTI COMMAND OF DIST.BULANDSHAHAR

CROP ARHAR (Pigeon-Pea) grams/sqm

Plot No: T.W.Commands	Sowing dates	DRY MATTER PRODUCTION							
		COMP	OBS	COMP	OBS	COMP	OBS	COMP	OBS
		1		2		3		4	
43jb1	16/5/91	249.341	220	289.609	186	323.804	284	354.731	316
43jb2	25/5/91	225.462	168	265.725	192	299.917	214	408.588	312
43jb3	29/5/91	245.590	238	278.065	258	338.477	324	416.284	374
84kb1	10/6/91	222.849	212	269.331	253	387.098	344	439.747	402
84kb2	13/5/91	259.729	217	374.826	348	514.806	472	567.331	456
84kb3	8/6/91	222.467	187	272.026	213	377.444	335	453.591	405
45kb1	20/5/91	243.512	204	285.985	267	320.180	275	350.170	300
45kb2	10/6/91	199.407	180	246.343	209	327.861	300	398.033	369
45kb3	14/6/91	177.636	177	217.592	207	258.081	225	295.436	260
CANAL COMMANDS									
Machakauli(MI)	11/5/91	462.957	402	499.939	442	632.515	591	745.093	702
Lakhaoti(MI)	15/6/91	271.485	251	341.938	292	503.022	392	571.232	464
Mundi Bakapur(MI)	15/5/91	396.710	385	471.083	448	733.254	656	833.042	745

COMP:- Computed
OBS :- Observed

TABLE NO: 22

TABLE - 23

Maximum Dry Matter Production Levels of Pigeon Pea with Varrying Sowing Dates in Lakhaoti Command

Sowing Date upto	Plot No. of Maximum dry Matter Production	Computed dry matter Production g/m^2	Observed Dry matter Production g/m^2
15 May	Mundi Bakapur-1	833.042	745.00
30 May	43 JB(3)	416.28	374.00
10 June	84 KB(1)	439.747	402.00
15 June	Lakhaoti-Minor	571.232	464.00

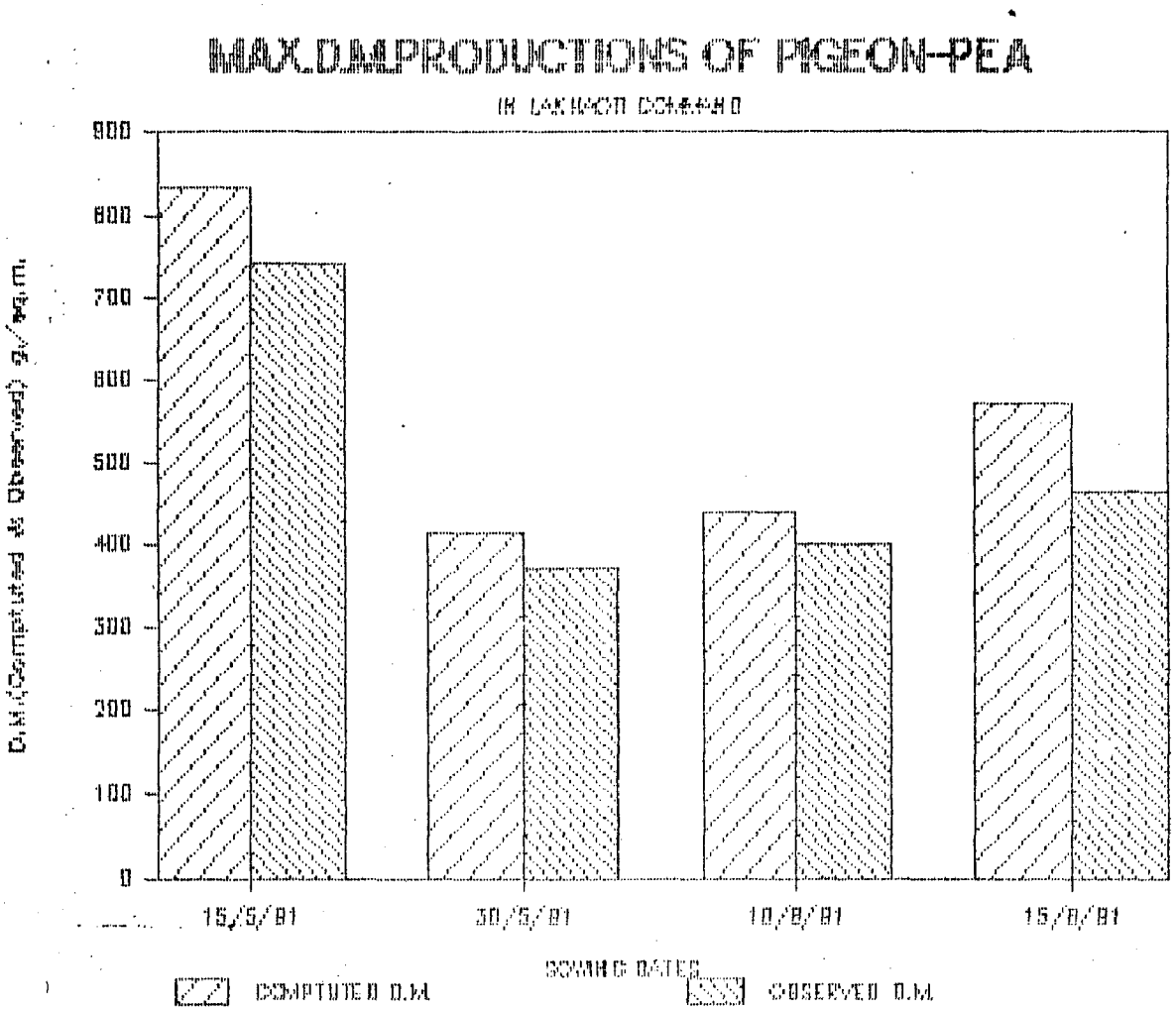

MAX.DM PRODUCTIONS OF PIGEON-PEA
900
800
700
600
500
400
300
200
100
0
15/5/81
30/5/81
10/8/81
15/8/81
SOWING DATES
COMPUTED D.M
OBSERVED D.M

Fig. 15

STATEMENT SHOWING THE DRY MATTER PRODUCTION(COMPUTED AND OBSERVED)

IN THE LAKHAOTI COMMAND OF DIST.BULANDSHAHAR

CROP SUGARCANE grams/sqm

Plot No:	Sowing Date	DRY MATTER PRODUCTION							
		COMP	OBS	COMP	OBS	COMP	OBS	COMP	OBS
T.W.Commands		1		2		3		4	
43jb1	20/2/91	3015.78	2812	3385.449	3110	3720.637	3615	3930.306	3814
43jb2	25/2/91	4519.41	4496	4807.742	4779	5120.901	5072	5330.158	5287
43jb3	25/2/91	2803.92	2785	3681.808	3607	4102.520	4025	4370.031	4304
84kb1	24/2/91	2847.90	2820	3164.332	3082	3573.866	3547	3795.401	3613
84kb2	5/2/91	3436.55	3350	3728.586	3720	4027.070	3975	4238.509	4152
84kb3	8/2/91	3389.01	3358	3679.186	3638	3907.238	3828	4119.288	4085
45kb1	20/4/91	2189.00	2170	2444.645	2345	2709.192	2650	2917.829	2865
45kb2	25/3/91	2703.62	2610	2994.978	2970	3239.100	3196	3451.114	3324
45kb3	20/3/91	1830.95	1724	2084.810	1900	3034.770	2860	3241.864	3050
CANAL COMMANDS									
Machakauli(MI)	16/3/91	2827.85	2728	3085.930	2960	3380.780	3192	3592.180	3466
Lakhaoti(MI)	18/2/91	2734.08	2610	3054.008	3020	3298.676	3192	3510.169	3486
Mundi Bakapur(MI)	25/1/91	3680.89	3626	3956.385	3868	4201.093	4104	4412.720	4302

TABLE NO: 24

COMP:- Computed

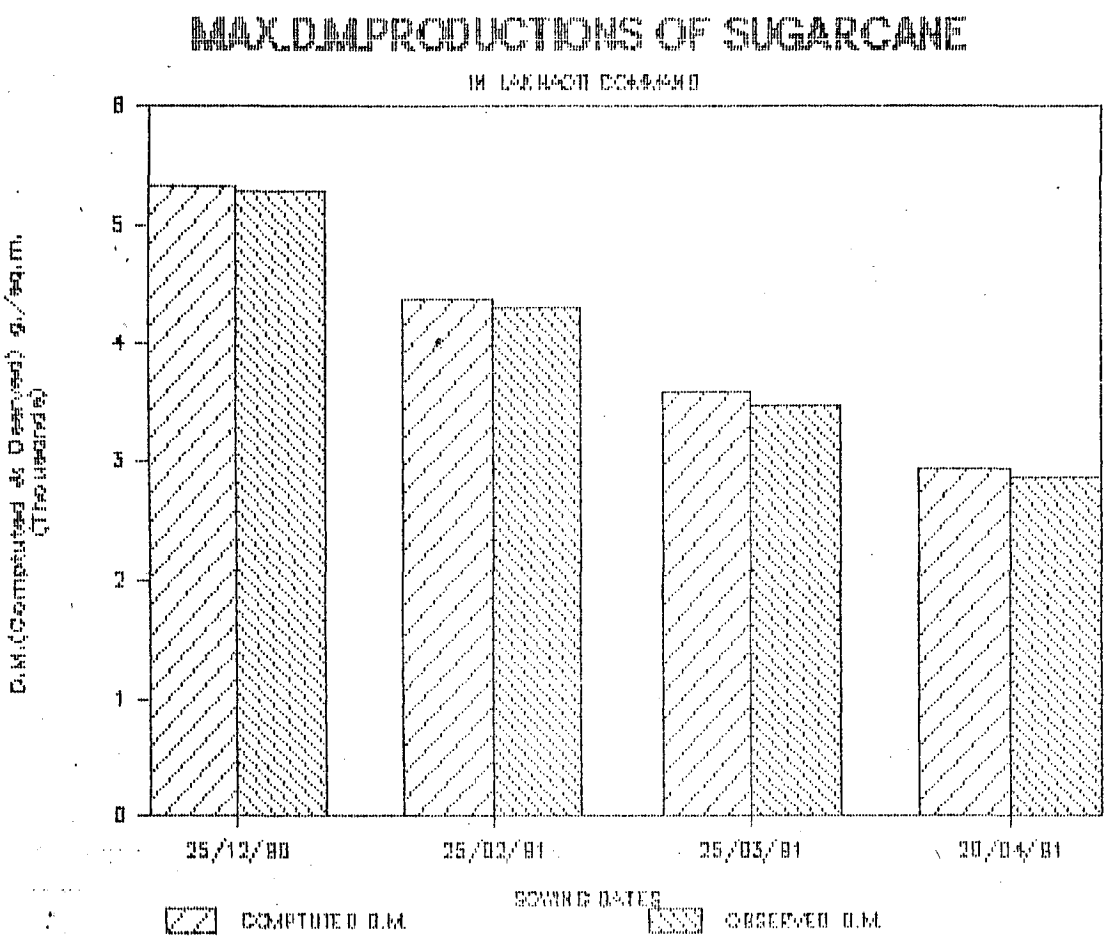
OBS:- Observed

TABLE - 25

Maximum Dry Matter Production Levels of Sugarcane with Varrying Sowing Dates in Lakhaoti Command

Sowing date upto	Plot No. of Maximum dry Matter Production	Computed Dry Matter Production g/m^2	Observed Dry Matter Production g/m^2
25 Dec.1990	43 JB(2)	5330.158	5287
25 Feb. 1991	43 JB (3)	4370.031	4304
25 March,91	Mach. Minor	3592.18	3466
20 April,91	84 KB (1)	2917.829	2865

(Abstracted from Table 24)


MAXDMPRODUCTIONS OF SUGARCANE
0
1
2
3
4
5
6
25/12/80
25/02/81
25/03/81
20/04/81
COMPUTED D.M.
OBSERVED D.M.

4.6. CROP HUSBANDRY PRACTICES :

The abstract of partial crop management cost is given in Table 26 . These Figures shows that the expenses in cultivation areals most uniform in various the commands. The crop husbandry practices observations made during study period since August 1991 to 10 October,1991 are abstracted and given in Table26(a)to 26(d) for maize, sorghum Pigeon-pea and sugarcane crops.

Analysis of the observations recorded Tables 26(a) to 26(d) reveal that the level of management of various crops is moderately poor because. farmers are not using certified seeds,sowing time is much extended fertilizer dose used is far below the recommended level and plant protection measures are unsatisfactory. However, same exception observed with some fields where the farmer (s) was or were of progressive nature and had adopted improved practices. Various research for this moderately poor level of management could be ascribed to the techno-economic problems with farmers.

4.7. WATER RELATED YIELD CONSTRAINT ANALYSIS :

With the observed data of irrigation application rainfall data of Bulandshahar (vide Annexure 14) and rooting depth (Annexure-15) the availability of soil water to meet the plant evapotranspirative demand is analysed for all plots and each crops (Annexure - 16) crop wise analysis results are as follows :

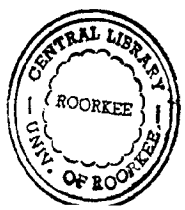


Table 26

Abstract of Partial Crop Management cost in Lakhaoti Command (Cost in Rupees Hectare)

Plot No.	Crops			
	Maize	Sorghum (Fodder)	Pigeon-Pea (Arhar)	Sugarcane
TUBEWELL COMMANDS				
43 JB(1)	2624	663	1390	4647
43 JB(2)	2363	1100	1725	7261
43 JB(3)	2820	770	1635	7440
84 KB(1)	3503	604	1107	4820
84 KB(2)	2877	1550	1827	6071
84 KB(3)	2128	850	919	5983
45 KB(1)	3223	680	1790	4769
45 KB(2)	3946	645	1344	6707
45 KB(3)	3208	1083	1818	7868
CANAL COMMANDS				
Machakanli Mi-1	3435	773	1603	6586
Lakhaoti Mi-1	4510	1592	1445	-
Mundi Minor-1	3229	1051	1794	7483
Mundi Mi-2	-	-	-	5911
Average	3322/-	947/-	1533/-	6296/-

(Abstracted from tables 26(a),(b),(c) and (d)).

TABLE - 26(a)

A Crop Husbandry Study in Lakhaoti Command - (Crop Maize)

(Data for per Hectare Units of Land)

Particulars		43 JB1		43 JB2		43 JB3		84 KB1		84KB2		84KB2	
Plot No.													
Sajara No.		82		91		332		19		66		389	
Area (Ha.)		0.40		0.20		0.33		0.28		0.30		0.20	
Owner		Sri Rajpal Singh		Sh.Ratan Singh		Sh.Jagge Singh		Sri.K.Singh		Sri Buli Singh		Sh.Dhara Singh	
Village		Manakpur		Manakpur		Manakpur		Charaura Mustafabad		Charaura Mustafabad		Bhawasi	
Source ofIrrigation		Govt.TW No.43JB		Own TW		Govt.TW No.43 JB+Pvt.TW		Govt.TW No. 84 KB		Own TW		Govt.TW 84 KB+ Pvt.TW	
Behaviour Crop Rotation		Maize/Lahi/wheat		Maize+Blackgram/ wheat		Maize+green-gram/oats				Maize/Lahi/ oats		Sorghum+Mung/ wheat	
	Qty.	Qty.	Cost Rs.	Qty.	Cost Rs	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.
	1	2	3	4	5	6	7	8	9	10	11	12	13
Field	Ploughing	2 By	350	3(By tractor	450	3 by local	545	4	714	5 Bullocks	470	4 By bullocks	500/-
	Harrowing	1 Tractor		1		1		1		1		1	
	Planking	2		2		2		2		3		2	
	Levelling	-		-		-		-		-		-	
Sowing	Variety	Local		Local		Local		Local		Local		Local	
	Seed rate (kg/ha)	12.50	88/-	12.50	88	15	90/-	15	90/-	17	102/-	10	60/-
	Spacings/plant density/m	10		11		9		10		9		9	
	Sowing Depth(cm)	4-5		4-5		4-5		4-5		4-5		4-5	
	Sowing Method	Broad-cast.		Broad-cast.		Broad-cast.		Broad-cast.		Baord-cast.		Broad-cast.	
Fertili-zer application (per/ha)	(a)BASAL FYM(Qty.	-		-		-		90	340/-	-	-	-	
	Urea	-		50	125/-	-	-	100	250/-	50	125/-	125	313/-
	DAP	-		-	-	-	-	-	-	-	-	-	-
	(b)To Dressing Urea	62.50	156	-	-	120	300	100	250	30	75	-	-
	DAP	-	-	-	-	-	-	-	-	-	-	-	-
	(c) Spray	-	-	-	-	-	-	-	-	-	-	-	-
Plant Protection	Type of Problem	Weed growth		weed growth		Weed growth		Weed growth		Weed growth		Weed growth	
	(a) Incorpora-tion(kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Dusting(kg/ha)-	-		-	-	-	-	-	-	-	-	-	-
	(c) Spray(kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
Irrigation	(a) Method	Basin flooding		Basin flooding		Basin flooding		Basin flooding		Basin flooding		Basin flooding	
	(b) Quantity applying(mm)	300	270	250	450	75	20	50	104	200	560	90	175
	(c) Runoff (mm)	-	-	-	-	-	-	-	-	-	-	-	-

Table contd/----------

1		2	3	4	5	6	7	8	9	10	11	12	13
13. Interculture	(a)Mannual hoing (No./labour)	1/40	1000	2/30	450	3/40	1000	2/32	800	2/27	675	1/20	500
	(b) Bullock drawn												
	(i) Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(ii)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
	(c)Tractor drawn												
	(i)Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(ii) Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
14. Harvesting	(a) Mannual(No.of labour)	12	360	15	450	18	540	18	540	16	480	10	300
	(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
15. Transport Produce	(a) Mannual	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Mechanical	Buggi 15 trip	150	Buggi 15 trip	150	Buggi 10	100	14 Buggi	140	12 Buggi	120	15 Buggi	150
16. Thressing	(a) Mannual	-	-	-	-	-	-	-	-	7 Labour	210	5 Labour	150
	(b) Mechanical	Hired Thressor	250	HT	200	HT	225	HT	275	-	-	-	-
17. Yield/ha	(a) Grain(Quintals)	23.30	-	26.30	-	19.30	-	12.60		14.30		13.30	
	(b) Straw (Quintals)	57.70	-	97.20	-	47.40	-	50.20	-	46.40	-	38.00	
18. Others		-	-	-	-	-	-	-	-	-	-	-	
Total cost of cultivation/ ha(Rupees)		2624/-			2363/-	2820/-		3503/-		2877/-		2129/-	

TABLE - 26 (a)

A CROP HUSBANDRY STUDY IN LAKHAOTI COMMAND

CROP : MAIZE (Data for per Hectare Units of Land)

S.No.	Particulars											
1.	Plot No.	45 KB1		45 KB2		45 KB3		Mach. M-1		Lakhaoti Mi-1		Mundi Mi-1	
2.	Sajara No.	560		561		554		354		74		82	
3.	Area (Ha)	0.31		0.74		0.31		0.40		0.26 Ha		0.65	
4.	Owner	Smt.Rakam Kaur		Sh.Moradhaj Singh		Shri Ranvir Singh		Sh.Prem Singh		Sh.Dal Singh		Sh.Harpal Singh	
5.	Village	Pipala		Pipala		Pipala		Vehlimpura		Mundi Bakapur		Mundi Bakapur	
6.	Source of Irrigation	Govt.T.W. No. 45 KB		Own T.W.		Govt. T.W. No.45 KB+Pvt. T.W.		Canal		T.W.+ Canal		T.W. + Canal	
7.	Previour Crop Rotation	Maize-Arhar/ Wheat		Maize/Rai/ Wheat		Maize+Arhar/ Wheat		Maize/Lahi/ Wheat		Maize/Potato/ Wheat		Maize+Mung-Rai-Wheat	
		Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.
8.	Field Preparation: Ploughing	5 By	390/-	5 By	670/-	4 By	625/-	2 By	400/-	4 By	615/-	5 By	446
	Horrowing	1 Bull-		1 Bull		1 Trac-		1 trac-		1 Bull-		1 Bull-	
	Planking	2 ock		4 ock		2 tor		1 tor		2 ock		2 ock	
	Levelling	-		-		-		-		-		-	
9.	Sowing: Variety	Local		Local		Local		Local		Local		Local	
	Seed rate (Kg/ha)	10	60/-	12	84/-	13	78/-	15	105/-	15	105/-	12.50	88/-
	Spacings/ Plant density per Sq.m.	10		45 cm.B/R 15 cm P/P		10		9		8		8	
	Sowing depth (cm)	4-5		4-5		4-5		4-5		3-5		3-5	
	a/Broadcasting Sowing method			Dibbing									
10.	Fertilizer application (q per/ha): a) BASAL FYM (Qunts)	64	560/-	200	1750/-	-	-	130	1140/-	260	570/-	80	700/-
	Urea	-	-	125	3131/-	80	200/-	50	125		150/-	80/-	200/-
	DAP	-	-	62.50	224/-	-	-	-	-	-	-	-	-
	b)Top Dressing Urea	75	188/-	-	-	80	200/-	-	-	60	150	80	200
	DAP	-	-	-	-	-	-	-	-	-	-	-	-
	c)Spray	-	-	-	-	-	-	-	-	-	-	-	-
11.	Plant Protection: Type of Problem	Weed growth		Weed growth		Weed growth		Weed growth		Weed growth		Weed growth	
	a)Incorporation (q/ha)	-	-	-	-	-	-	-	-	-	-	-	-
	b)Dusting (q/ha)	-	-	-	-	-	-	-	-	-	-	-	-
	c)Spray (q/ha)	-	-	-	-	-	-	-	-	-	-	-	-
12.	Irrigation: a)Method	Basin flooding		Basin Flooding		Basin Flooding		Basin Flooding		Basin Flooding		Basin Flooding	
	b)Quantity Applied(mm)	105	450	200	345	100	190	400	300	470	120	450	255
	c)Runoff (mm)	-	-			-	-						

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
13. Intercul ture	a)Mannual Hoeing No/Labour	2142	1050	4/58	1450	4/48	1200	2/25	625	3/42	1050	3/28	700/-
	b)Bullock drawn i)Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	ii)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
	c)Tractor drawn i) Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	ii)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
14. Harvesting	a) Manual	10	300/-	20	600/-	13	390/-	20	600/-	12	360/-	11	330/-
	b)Mechani cal	-	-	-	-	-	-	-	-	-	-	-	-
15.Transport of Produce	a) Manual	-	-	-	-	-	-	-	-	-	-	-	-
	b)Mechani cal	10 Buggi	100/-	12 Buggi	120/-	3 Tractor	150/-	12 Buggi	120/-	15 Buggi	150/-	13 Buggi	130/-
16.Thresning (per/ha)	a)Manual	-	-	8 Labour	240/-	-	-	-	-	8	240/-	6	180/-
	b)Mechani cal	Hired M/c	125/-			Hired M/c	175/-	Hired M/c	200/-	-	-	-	-
17. Yield/ ha	a)Grain (Qtl)	14.20		18.70		7.70		22.00		22.3		19.00	
	b)Straw (Qtl)	37.80		41.10		48.50		38.20		51.20		50.50	
18. Others						Crop damaged by heavy rains				Crop damaged by heavy rains			
Total Cost of Cultivation/ ha(rupees)		3223/-		5946/-		3208/-		3435/-		4510/-		3229/-	

Table 26 (b)/---Contd/--

A crop Husbandry Study in Lakhaoti Command

Crop: Sorghum (Fodder)

Sl.No.	Particulars	43 JB(1)	43JB(2)	43JB(3)	84KB(1)	84KB(2)	84KB(3)
1.	Plot No.	303	91	332	18	78	389
2,	Sajara No.	0.30	0.50	0.25	18	0.25	0.20
3.	Area (Ha.)	Sh.S.Singh	Sh.R.Singh	Sh.J.Singh	Sh.K.Singh	Sh.B.Singh	Sh.Dhara Singh Bbawasi
4.	Owner	Manakpur	Manakpur	Manakpur	Chauran Mustafabad	Charaura Mustafabad	
5.	Village	43JB Govt. TW	Own TW	43 JB Govt.TW+Pvt. TW	84 KB Govt. TW	Own TW	84 KB Govt. TW+ Pvt. TW
6.	Source of Irrigation	Sorghum/ Lahi/Wheat	Sorghum+ Anwar/ Wheat	Sorghum/Lahi/ Wheat	Sorghum/Lahi/ Oats	Sorghum/Lahi Wheat	Sorghum+Mung-Wheat
7.	Previous crop rotation						

			Qty.	Cost Rs.	Qty.	Cost Rs	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
8.	Field Preparation	Ploughing	4 By Bullock	300	4 Tra-ctor	300	3 by Bullock	400	3 By Bullock	450		
8.	Field Preparation											
		Ploughing	4 By bullock	300	4 Tra-ctor	300	3 By Bullock	400	3 By Bullock	450	5 Tra-ctor	900	4 By Bullock	700
		Harrawing	-	-	-		1	-	2	-	1	-	1	-
		Planking	2	-	2	-	2	-	1	-	3	-	3	-
		Levelling	-	-	-	-	-	-	-	-	-	-	-	-
9.	Sowing													
		Variety	Local	-	Local	Local	Local	-	Local	-	-	-	Local	-
		Seed Rate (kg/ha)	25	175	20	100	20	100	22	154	20	100	20	100
		Spacing/ Plant density per sq.m.	32	21	-		23	-	35	-	18	-	18-	-
		Sowing depth(cm)	3-5	-	3-5	-	3-5	-	3-5	-	3-5	-	3-5	-
		Sowing Method	BC*	-	BC	-	BC	-	BC	-	BC	-	BC	-
10.	Fertilizer Application (per/ha)													
		(a)BASAL EYM(Qtl)	-	-	-	-	-	-	-	-	-	-	-	-
		Urea	-	-	60	150	-	-	-	-	60	150	-	-
		DAP	-	-	-	-	-	-	-	-	-	-	-	-
		(b)Top Dressing Urea	25	188	-	-	60	150	-	-	60	150	-	-
		DAP	-	-	-	-	-	-	-	-	-	-	-	-
		(c) Spray	-	-	-	-	-	-	-	-	-	-	-	-

*BC = Broad-Casting

1	2 3	4	5	6	7	8	9	10	11	12	13	14	15
11.	Plant Protection												
	Type of Problem	RR	Flies	RRF	RRF	RRF	RRF	RRF	RRF	RRF	RRF	RRF	RRF
	(a) Incorporation	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Dusting(Kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
	(c) Spray(Kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
12.	Irrigation												
	(a) Method	Rain-fall	-	Basin	Flooding	Basin	Flooding		Rainfed	Basin	Flooding	Basin	Flooding
	(b) Qty.Applied(mm)	-	-	250	550	50	120	-	-	250	520	50	150
	(c) Run off (mm)	-	-	-	-	-	-	-	-	-	-	-	-
13.	Interculture												
	(a) Mannual hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Bullock drawn (i) Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(ii)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
	(c) Tractor drawn (i) Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(ii)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
14.	Harvesting												
	(a) Mannual	Not observed		Not estimated		Not estimated		Not estimated		Not estimated		Not estimated	
	(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
15.	Trasnport Produce												
	(a) Mannual	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Mechanical	By Buggi		By Buggi	-	Bugi	-	Buggi	-	Buggi		-	By Buggi
16.	Thressing												
	(a) Mannual	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
17.	Yield/ha.												
	(a) Grain(Qntl)	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Straw(qntl)	-	-	-	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-	-	-	-
	Total cost of cultivation/ha(Rupees)	663/-		100/-		770/-		604/-		1550/-		850/-	

*RRF = Root Rot & Flies

TABLE - 26(b)-Contd-

A CROP HUSBANDRY STUDY IN LAKHAOTI COMMAND

CROP - SORGHUM (FODDER) (Data for Per Hectare Units of Land)

Particulars		45KB1		45KB2		45KB3		Mach Mi-1		Lakh-Mi-1		Nundi Mi-1	
1. Plot No.													
2. Sajara No.		556		561		578		352		72		1086	
3. Area(Ha)		0.57		0.32		0.29		0.20		0.26		0.24	
4. Owner		Sri Ramvir Singh		Sri Moradhaj Singh		Sri Jag-Pal Singh		Sri Prem Singh		Sri Rajendra Singh		Sri Ram Saran	
5. Village		Pipala		Pipala		Pipala		Vehlimpura		Lakhaot		Mundi Bakepur	
6. Source of Irrigation		45KB Govt. T.W.		Own T.W.		45 KB Govt. T.W. + Pvt. T.W.		Canal Irrigation		Canal Irrigation + T.W.		Canal Irrigation + T.W.	
7. Previou. Crop		Sorghum/Lahi/ Oats		Sorghum+Arhar/ Wheat		Sorghum(f) Lahi/Wheat		Jowar/Lahi/ Wheat		Sorghum/Lahi/ Wheat		Sorghum/Lahi/ Wheat	
		Qty	Cost Rs.	Qty	Cost Rs.	Qty	Cost Rs.	Qty	Cost Rs.	Qty	Cost Rs.	Qty	Cost Rs.
8. Field Preparation	Ploughing	4 By	500/-	5 By	375/-	2 By	520/-	4 Tractor	330/-	3	615/-	5 Bullock	500/-
	Harrowing	1 Tractor		2 Bullocks		1 Tractor		-		1		1	
	Planking	2		3		2		2		2		4	
	Levelling	-		-		-		-		-		-	
9. Sowing	Variety	Local		Local		Local		Local		Local		Local	
	Seed rate(kg/ha)	20	140/-	20	100/-	24	168/-	20	140/-	26	182/-	25	175/-
	Spacings/plant density/sq.m.	28	-	16	-	20	-	24	-	25	-	18	-
	Sowing Depth(cm)	3-5	-	3-5	-	3-5	-	3-5	-	3-5	-	3-5	-
	Sowing method	Broad Cast		Broad Cast.		Broad Cast		Broad Cast		Broad Cast		Broad Cast	
10. Fertilizer Application(per/ ha)	(a)BASAL FYM	-	-	-	-	-	-	-	-	-	-	-	-
	Urea	-	-	-	-	50	125/-	25	63/-	100	250/-	62.50	156/-
	DAP	-	-	-	-	-	-	-	-	-	-	-	-
	(b)Top Dressing Urea	-	-	-	-	-	-	-	-	50	125/-	-	-
	DAP	-	-	-	-	-	-	-	-	-	-	-	-
	(c)Spray												
11. Plant Protection	Type of Problem	Root Rot and flies attack		Weed growth & flies attack		Weed growth		Weed growth & flies attack		-		-	
	(a)Incorporation (Kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
	(b)Dusting(kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
	(c)Spray(kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
12. Irrigation	(a)Method	By Basin flooding		By Basin flooding		By Basin flooding		By Basin flooding		By Basin flooding		By Basin flooding	
	(b)Quantity Applied(MM)	25	40/-	100	170/-	25	95/-	350	240/-	400	120/-	250	220/-
	(c)Runoff (mm)	-	-	-	-	-	-	-	-	-	-	-	-
13. Inter-culture	(a)Manual Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(b)Bullock drawn(a)Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(b)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
	(c)Tractor drawn(a)Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(b)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-

.....2/-

		45KB1	45KB2	45KB3	Mach Mi-1	Lakh-Mi-1	
14. Harvesting	(a)Manual	Not observed	Not observed	Not observed	Not observed	Not observed	
	(b)Mechanical	- -	- -	- -	- -	- -	-
15. Transport of Produce	(a)Manual	- -	- -	- -	- -	- -	-
	(b)Mechanical	By Buggi	By Buggi	By Buggi	- -	By Buggi	
16. Threshing (per/ha)	(a)Manual	- -	- -	- -	- -	- -	-
	(b)Mechanical	- -	- -	- -	- -	- -	-
17. Yield/ha	(a)Grain(Quintals)	- -	- -	- -	- -	- -	-
	(b)Straw(Quintals)	- -	- -	- -	- -	- -	-
18. Others				Weeding out 7 Labour		Weeding out 12 Labour 300/-	
Total Cost of Cultivation/ha (Rupees)		680/-	645/-	1083/-	773/-	1592/-	1051

TABLE 26 (c)

A Crop Husbandry Study in Lakhaoti Command

(Crop : Pigeon Pea (Arhar) (Data for per hectare Units of Land)

Particulars							
Plot No.		43 JB1	43 JB2	43 JB3	84 KB1	84 KB2	84KB3
Sajara No.		84	82	332	388	67	382
Area(Ha)		0.40	0.33	0.24	0.33	0.30	1.13
Owner		Sr.N.Singh	S.N.Singh	Sh.J.Singh	Sh.D.Singh	Sh.B.Singh	Sh.H.Do
Village		Manakpur	Manakpur	Manakpur	Bhawasi	Charaura Mustafabad	Bhawasi
Source of Irrigation		43JB Govt.T.W.	Pvt.T.W.	43 JB Govt. T.W.+Pvt.TW	84 KB Govt. TW	Own TW	Pvt.TW+ Govt.TW
Previous crop rotation		Maize/Lahi/oats	Maize+Arhar/ Wheat	Maize/Lahi/ Wheat	Sorghum Kahi/Wheat	Maize+Green-gram/Wheat	Sorghum/ Lahi/Wh

		Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	R
1	2	3	4	5	6	7	8	9	10	11	12	13	1		
Field Preparation	Ploughing	2 By tractor	300	3 By tractor	450	3 Bullock	560	4 By Bullock	600	4 By tractor	625	4 By bullock	3		
	Harrowing	-	-	-	-	1	-	1	-	1	-	1	-		
	Planking	1	-	1	-	2	-	2	-	2	-	3	-		
	Levelling	-	-	-	-	-	-	-	-	-	-	-	-		
Sowing	Variety	Local		Local		Local		Local		Local		Local			
	Seed rate (kg/ha)	15	165	15	165	15	165	12	132	17	187	14	1		
	Spacings plant density per sq.m.	8	-	14	-	12	-	-	-	-	-	-	-		
	Sowing depth (cm)	4-5		4-5		4-5		4-5		4-5	-	-	-		
	Sowing method			Broad casting		Broad casting		Broad casting		Broad casting		Broad casting			
Fertilizer application (per/ha)	(a) Basal FYM	-	-	-	-	-	-	-	-	-	-	-	-		
	Urea	-	-	-	-	-	-	-	-	-	-	-	-		
	DAP	-	-	-	-	-	-	-	-	-	-	-	-		
	(b) Top dressing, Urea	-	-	-	-	-	-	-	-	-	-	-	-		
	DAP	-	-	-	-	-	-	-	-	-	-	-	-		
	(c) Spray	-	-	-	-	-	-	-	-	-	-	-	-		
Plant Protection	Type of Problem	-	-	Termite Problem	-	-	-	-	-	-	-	-	-		
	(a) Incorporation	-	-	-	-	-	-	-	-	-	-	-	-		
	(b) Dusting (kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-		
	(c) Spray (kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-		

1	2	3	4	5	6	7	8	9	10	11	12	13	14
2.	Irrigation (a)Method	By flooding Basin		By flooding Basin		By flooding Basin		Rainfed		By Basin Flooding		By flood-in Basin	
	(b)Qty.Applied (mm)	100	300	275	660	200	410	-	-	225	265	109	1
	(c)Runoff(mm)	-	-	-	-	-	-	-	-	-	-	-	-
3.	Inter-culture (a) Mannual Hoing No/ Total Labour	1/25	625	1/18	450	2/20	500	1/15	375	2/30	750	1/13	9
	(b) Bullock drawn (i)Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(ii)Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
	(c) Tractor drawn (i) Hoing	-	-	-	-	-	-	-	-	-	-	-	-
	(ii) Horrowing	-	-	-	-	-	-	-	-	-	-	-	-
4.	Harvesting (a) Mannual	Not harvested		Not harvested		Not Harvested		Not harvested		Not harvested		Not harveted	
	(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
5.	Transport of produce (a)Mannual	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Mechanical		-	-	-	-	-	-	-	-	-	-	-
6.	Thressing (per/ha) (a) Mannual	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Mechanical		-	-	-	-	-	-	-	-	-	-	-
17.	Yield/ ha (a) Grain (Quintals)	-	-	-	-	-	-	-	-	-	-	-	-
	(b) Straw (quintals)	-	-	-	-	-	-	-	-	-	-	-	-
18.	Others	-	-	-	-	-	-	-	-	-	-	-	-
	Total cost of cultivation/ha.(Rupees)	1390		1725/-		1635/-		1107/-		1827/-		919/-	

TABLE 26 (c) Contd/-

A Crop Husbandry Study in Lakhaoti Command

Crop: Pigeon-Pea(Arhar)(Data for per Hectare Units of Land)

1.No.	Particulars						
.	Plot No.	45 KB1	45 KB2	45 KB3	Kachakauti M-1	Lakhaoti M-1	Mundi Minor-I
.	Sajara No.	539	561	556	444	78	75
.	Area (Ha)	0.20	0.40	0.26	0.40	2.02	0.32
.	Owner	Sh.K.P.Singh	Sh.M.Singh	Sh.R.Singh	Sh.C.P.Singh	Sh.P.Chandra	Sh.D.Dhimar
).	Village	Pipala	Pipala	Pipala	Vehlimpura	Lakhaoti	Mundibakapur
).	Source of Irrigation	45KB Govt.TW	Own TW	45KB Govt. TW+Pvt.TW	Canal	TW+Canal irrigation	TW+Canal Co-
'.	Previous crop rotation	Maize/Lahi/ Wheat	Sorghum/ green gram/ wheat	Sorghum/ Wheat	Maize/Lahi/ Wheat	Sorghum/ Lahi/oats	Sorghum+Arh- / Wheat

			Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees	Qty.	Cost Rupees
2		3	4	5	6	7	8	9	10	11	12	13	14	15
.	Field Preparation	Ploughing	3 By Bullock	400	3 By Bullock	400	4 By Tractor	730	5 By Tractor	450	4 Tractor	767	4 By Bullock	656
		Harrowing	1	-	1	-	1	-	1	-	1	-	1	-
		Planking	2	-	1	-	2	-	3	-	2	-	2	-
		Levelling	-	-	-	-	-	-	-	-	-	-	-	-
).	Sowing	Variety	Local		Local		Local		Local		Local		Local	
		Seed rate (kg/ha)	15	165	12.50	138	12	138	12.50	138	12.50	138	12.50	138
		Spacing/Plant density per sq.km.	13	-	9	-	12	-	12	-	22	-	9	-
		Sowing depth (mm)	4-5		4-5		4-5		4-5		4-5		4-5	
		Sowing method	Broad casting		Broad casting		Broad casting		Broad casting		Broad casting		Broad casting	
0.	Fertilizer application (per/ha)	(a)BASAL FYM	-	-	-	-	-	-	-	-	-	-	-	-
		Urea	-	-	62.50	-	-	-	-	-	-	-	-	-
		DAP	-	-	-	-	-	-	25	90	-	-	-	-
		(b) Top dressing,												
		Urea	-	-	-	-	-	-	-	-	-	-	-	-
		DAP	-	-	-	-	-	-	-	-	-	-	-	-
		(c) Spray	-	-	-	-	-	-	-	-	-	-	-	-
1.	Plant Protection	Type of Problem	Termite Problem			Termite Problem			-	-	Termite Problem-			-
		(a) Incorporation(kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Dusting (Kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
		(c) Spray (kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
12.	Irrigation	(a) Method	By Basin flooding			Basin Irrigation			Basin Irrigation			Basin Irrigation		
		(b) Qty.applied (mm)	100	475	125	275	200	450	360	300	125	165	225	
		(c) Runoff(mm)	-	-	-	-	-	-	-	-	-	-	-	-
13.	Interculture	(a) Mannual Hoing No/ Labour	1/30	750	1/15	375	1/20	500	2/25	625	1/15	375	2/30	7
		(b) Bullock drawn												
		(i)Hoing	-	-	-	-	-	-	-	-	-	-	-	-
		(ii) Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
		(c) Tractor Drawn												
		(i)Hoing	-	-	-	-	-	-	-	-	-	-	-	-
		(ii)Harrowing		-	-	-	-	-	-	-	-	-	-	-
14.	Harvesting	(a) Mannual	Not harvested			Not Harvested		Not Harvested		Not harvested			Not harve	
		(b) Mechanicla	-	-	-	-	-	-	-	-	-	-	-	-
15.	Transport of produce	(a) Manual	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
16.	Thressing (per/ha)	(a) Mannual	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
17.	Yield/ha	(a)Grain (Quintals)	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Straw (quintals)	-	-	-	-	-	-	-	-	-	-	-	-
	Others													
	Total cost of cultivation/ ha.(Rupees)		1790/-			1341/-		1818/-		1603/-		1445/-	1794/-	

TABLE 26 (d)

A Crop Husbandry Study in Lakhaoti Command

Crop: Sugercane (Data for per hectare units of land)

Sl.No.	Particulars						
1.	Plot No.	43 JB1	43 JB2	43 JB3	84 KB1	84 KB2	84 KB3
2.	Sajara No.	318	315	332	382	66	378
3.	Area (Ha.)	0.70	1.20	0.16	1.62	0.73	0.65
4.	Owner	Sh.N.P.Singh	Sh.G.Singh	Sh.J.Singh	Sh.D.Singh	Sh.Buli Singh	Sh.B.Sin
5.	Village	Manakpur	Manakpur	Manakpur	Bhawasi	Charauramusta-bad	Bhawasi
6.	Source of Irrigation	43JB Govt.TW	Own TW	43 JB Govt. TW+Pvt.TW	84KB Govt. TW	Own TW	84 KB Go +Pvt.TW
7.	Previous crop rotation	Sorghum/Wheat/ Sugarcane	Maize/S.Cane	Maize-Wheat+S.Cane	S.Cane+ Wheat/ S.Cane	S.Cane+Wheat/ S.Cane	S.Cane+ S.Cane

			Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
8.	Field Prepa-tion	Ploughing	4 By Tractor	600	7 By Tractor	1050	6 By Bullock	900	6 By Tractor	1085	5 By Tractor	768	6 By Tractor	92
		Harrowing	-	-	1	-	1	-	1		-	-	-	-
		Planking	3	-	4	-	3	-	3	-	2	-	3	-
		Levelling	-	-	-	-	-	-	-	-	-	-	-	-
9.	Sowing	Variety	IR.1148	-	-	IR.1148	Local		IR.1148		Local	-	Local	
		Seed rate (Qntl/kg/ha)	50	200	37.50	1500	50	2000	50	2000	50	2000	35	140
		Spacings R/R(cm)	45-50	-	60	-	50	-	60	-	50	-	50	-
		Sowing Depth (mm)	15-20	-	15-20	-	15-20	-	15-20	-	15-20	-	15-20	-
		Sowing method	Mannually setting	300	Manua-lly setting	300	Mannua-lly setting	300	Manua-lly setting	300	Manua-lly setting	300	Manua-lly setting	30
10.	Fertilizer application (per/ha)	(a)BASAL FYM(Qntl)	-	-	80	560	-	-	-	-	30	245	60	490
		Urea	225	562	200	500	300	750	200	500	275	688	150	37
		DAP	-	-	150	570	-	-	-	-	-	-	-	-
		(b)Top Dressing, Urea	50	125	250	625	100	250	-	-	-	-	125	31
		DAP	-	-	-	-	-	-	-	-	-	-	-	-
		(c) Spray	-	-	-	-	-	-	-	-	-	-	-	-
11.	Plant Protection	Type of Problem	-	-	Flies attack		-	-	-	-	-	-	-	-
		(a)Incorporation(kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Dusting(kg/ha)	-	-	Gamax in 25	125	-	-	-	-	-	-	-	-
		(c) Spray(kg/ha)	-	-	-	-	-	-	-	-	-	-	-	-

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12.	Irrigation	(a) Method	Basin Irrigation			Basin Irrigation			Basin Irrigation			Basin Irrigation		
		(b) Qty. applied (mm)	500	330	825	1591	750	2600	400	555	700	1750	775	1430
		(c) Runoff (mm)	-	-	-	-	-	-	-	-	-	-	-	-
13.	Interculture													
		(a) Mannual Hoing No./ Labour	2/23	690	1/12	360	1/20	600	10	300	1/8	240	2/25	750
		(b) Bullock drawn (i) Hoing	1	40	2	80	1	40	2	80	2	80	-	-
		(ii) Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
		(c) Tractor drawn												
		(i) Hoing	-	-	-	-	-	-	-	-	-	-	-	-
		(ii) Harrowing	-	-	-	-	-	-	-	-	-	-	-	-
14.	Harvesting													
		(a) Mannual	Not harvested			Not Harvested			Not harvested			Not harvested		Not harved
		(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	
15-	Transport of Produce													
		(a) Mannual	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
16.	Thressing (per/ha)	(a) Mannual	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Mechanical	-	-	-	-	-	-	-	-	-	-	-	-
17.	Yield/ha													
		(a) Grain(qntl)	-	-	-	-	-	-	-	-	-	-	-	-
		(b) Straw(qntls)	-	-	-	-	-	-	-	-	-	-	-	-
Others			-	- Bordering labour		210	-	-	-	-	-	-	-	-
Total cost of cultivation/ ha(Rupees)			4647/-			7261/-		7440/-	4820/-		6071/-		5983/-	

Table 26 (d) Contd/-----

A Crop Husbandry Study in Lakhaoti Command

Crop: Sugarcane (Data for per hectare units of land)

Sl.No.	Particulars						
1.	Plot No.	45 KB1	45 KB2	45 KB3	Machakanli Minor-1	Mundi M-1	Mundi Mi-2
2.	Sajara No.	540	554	556	-	83	1026
3.	Area (Ha.)	0.80	1.02	0.61	-	0.12	0.40
4.	Owner	Sh.N.Singh	Sh.M.Singh	Sh.H.Singh	-	Sh.H.P.Singh	Sh.R.Pandit
5.	Village	Pipala	Pipala	Pipala	Vehhimpura	Mundibakapur	Mundibakapur
6.	Source of Irrigation	45 KB Govt. TW	Pvt.TW	Govt.TW 45 KB+P.TW	Canal Irrign.	TW+Canal Irri.	TW+Canal Irri
7.	Previous crop rotation						

			Qty.	Cost Rs.	Qty.	Cost Rs	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.	Qty.	Cost Rs.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
8.	Field Prepa-tion	Ploughing	5 By Tractor	675	6 By Tractor	950	7 By Tractor	918	9 By Tractor	1350	5 By Bullock	833	7 By Tractor	1075
		Harrowing	-	-	-	-	-	-	1	-	-	-	-	-
		Planking	2	-	3	-	2	-	40	-	3	-	4	-
		Levelling	-	-	-	-	-	-	-	-	-	-	-	-
9.	Sowing	Variety	Local		Local		Local		Local		Local		Local	
		Seed rate (Q/kg/ha)	42	1680	40	1680	36	1512	50	2000	42	1764	40	1680
		Spacings RIR	50	-	50	-	50	-	60	-	60	-	45	-
		Sowing depth (mm)	15-20	-	15-20	-	15-20	-	15-20	-	15-20	-	15-20	
		Sowing method	Manually	300	Manua-lly	300	Manua-lly	300	Manua-lly	300	Manua-lly	300	Manua-lly	300
10	Fertilizer Application (per/ha)	(a) BASAL FYM(Qntl)	40	350	-	-	230	2000	200	756	264	2310	100	875
		Urea	187.50	470	125	375	250	625	125	313	125	313	125	313
		DAP	62.5	224	50	179	-	-	150	537	-	-	-	-
		(b) Top Dressing Urea	-	-	100	250	125	313	200	500	125	125	313	-
		DAP	-	-	-	-	-	-	-	-	-	-	-	-
		(c) Spray	-	-	-	-	-	-	-	-	-	-	-	-
11.	Plant Protection	Type of Problem-	-		Termite Problem		TP				Termite & flies		Flies attac	
		(a) Incorpora-tion(kg/ha)-	-		25	125	50	250	5	150	50	250	25	125
		(b) Dusting(kg/ha)-	-		-	-	-	-	-	-	-	-	-	-
		(c) Spary(kg/ha) -	-		-	-	-	-	-	-	-	-	-	-

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
12.	Irrigation													
	(a) Method		Basin irrigation			Basin Irrigation			Basin Irrigation			Basin Irrigation		
	(b) Qnty. applied (mm)		350	640	900	1928	825	1570	1000	300	1325	550	1075	550
	(c) Runoff(mm)		-	-	-	-	-	-	-	-	-	-	-	-
13.	Interculture													
	(a) Mannual Hoing No./Labour		2/13	390	2/28	840	1/10	300	1/10	300	1/25	750	2/20	600
	(b) Bullock drawn (i)Hoing		1	40	2	80	2	80	2	80	1	40	2	80
	(ii)Harrowing		-	-	-	-	-	-	-	-	-	-	-	-
	(c) Tractor drawn													
	(i) Hoing		-	-	-	-	-	-	-	-	-	-	-	-
	(ii) Harrowing		-	-	-	-	-	-	-	-	-	-	-	-
14.	Harvesting													
	(a) Mannual		Not harvested		Not harvested		NA Harvested		Not harvested		NA harvested		Not harvested	
	(b) Mechanical		-	-	-	-	-	-	-	-	-	-	-	-
15.	Transport of Produce													
	(a) Mannual		-	-	-	-	-	-	-	-	-	-	-	-
	(b) Mechanical		-	-	-	-	-	-	-	-	-	-	-	-
16.	Thressing (Per/ha)													
	(a) Manual		-	-	-	-	-	-	-	-	-	-	-	-
	(b) Mechanical		-	-	-	-	-	-	-	-	-	-	-	-
17.	Yield/ha													
	(a) Grain(Qntls)		-	-	-	-	-	-	-	-	-	-	-	-
	(b) Straw(Qntls)		-	-	-	-	-	-	-	-	-	-	-	-
18.	Others		-	-	Tieing cost 10 labour	300	-	-	-	-	-	-	-	-
	Total cost of cultivation/ha (Rupees)		4769/-			6707/-		7868/-		6586/-		7483/-	5911/-	

(a) Maize :-

Water related yield constraint analysis computations are in Annexure 16(a). Table No. 27 shows the crop stagewise yield decrease due to water deficit in percentage against each crop. Study of table 26 shows that maize crop grown in tubewell commands have faced water deficit during crop development stage as well as the mid season stage. For these stages the crop is very sensitive to yield.

(b) Sorghum (Fodder):

Water related yield analysis details are given in Annexure-16(b). The abstract of percent yield decrease over the crop development stage is given in table 28. The general practice for sorghum fodder is to give palewa irrigation and one irrigation at initial stage if pre mansoon rainfall or mansoon rainfall does not occur. Other wise the crop is left unirrigated. In this command the same practice has been followed but the rainfall of this year was not regular and uniform, as a result of this the crop faced water stress mostly at development stage.

(c) Pigeon-Pea (Arhar):

Yield decrease due to water deficit is analysed and shown in Annexure - 16 (c), Table 29 is prepared showing the abstract of percentages decrease due to water deficit in percent. Study of the table shows that this crop is always under water stress up to observation period.

Table - 27

Water Related Yield Deficit in Maize Crop of Lakhaoti Command

	Crop Plot No.	Percent Yield Decrease Over Crop Development Stages			
		Initial	Crop Development	Mid Season	Late season
	1.	2	3	4	5
1.	43 JB (1)	8.0	34.80	5.00	0.11
2.	43 JB(2)	0.56	1.11	1.34	0.11
3.	43 JB(3)	0.35	5.70	13.57	12.18
4.	84 KB(1)	-	12.22	9.65	-
5.	84 KB(2)	6.94	10.39	11.53	-
6.	84 KB(3)	13.78	24.69	0.42	-
7.	45 KB (1)	-	2.43	-	-
8.	45 KB(2)				
9.	45 KB(3)	1.24	-	-	0.44
10.	Machakauli Minor-1	2.77	21.12	1.39	-
11.	Lakhaoti Minor-1	-	-	-	-
12.	Mundi Minor-1	4.06	-	-	-

(Abstracted from Annexure 16(a)

Table 28

Water Related Yield deficit in Sorghum (Fooder)crop of Lakhaoti Command

	1	2	3	4	5
1.	43 JB(1)	1.55	13.34	14.76	-
2.	43 JB(2)	3.42	14.93	20.04	5.67
3.	43 JB(3)	-	17.93	2.10	-
4.	84 KB(1)	-	0.65	-	Not computed
5.	84 KB(2)	3.75	14.30	11.78	-
6.	84 KB(3)	1.48	16.34	-	1.52
7.	45 KB(1)	-	29.26	8.45	9.11
8.	45 KB(2)	3.75	17.03	0.39	7.07
9.	45 KB(3)	-	13030	0.54	2.59
10.	Machakauli Minor-1	6.64	17.30	2.12	10.14
11.	Lakhaoti Minor-1	1.14	-	6.85	-
12.	Mundi Minor-1	4.11	5.03	1.44	-

(Abstracted from Annexure 16(b)).

Water Related Yield Deficit in Pigeon-Pea (Arhar) crop of Lakhaoti Command

	1	2	3	4	5
1.	43 JB(1)	6.72	16.93	0.82	Not computed
2.	43 JB(2)	9.47	13.18	1.42	"
3.	43 JB(3)	9.81	3.31	3.39	"
4.	84 KB(1)	4.42	2.65	3.29	"
5.	84 KB(2)	7.30	10.92	9.73	"
6.	84 KB(3)	7.21	9.49	3.25	"
7.	45 KB(1)	12.04	4.88	4.31	"
8.	45 KB(2)	5.66	9.24	3.39	"
9.	45 KB(3)	5.66	7.67	-	"
10.	Machakauli Minor-1	3.76	4.14	5.63	"
11.	Lakhaoti Minor-1	4.90	-	-	"
12.	Mundi-Minor-1	5.39	11.04	1.01	"

(Abstracted from Annexure 16(c)

There is uniformity in water deficit in tubewell and canal commands almost in the same pattern.

(d) Sugarcane :

The analysis of crop water stress is given in Annexure-16(d). Abstracting of yield decrease due to water deficit in percentage corresponding to the crop stages is done in table No.30 .

Sugarcane crop is found always under water stress in tubewell commands the amount of water stress in private tubewell commands are generally low where as in the Govt. tubewells it is high. Only the crop under canal commands are practically free from water deficit.

Water Related Yield Deficit in Sugarcane Crop of Lakhaoti Commands

	1	2	3	4	5
1.	43 JB(1)	0.12	20.30	20.54	Not computed
2.	43 JB(2)	-	7.04	22.15	"
3.	43 JB(3)	4.08	16.69	1.08	"
4.	84 KB(1)	3.76	10.13	21.71	"
5.	84 KB(2)	-	13.06	22.73	"
6.	84 KB(3)	-	17.80	8.76	"
7.	45 KB(1)	3.19	17.53	10.49	"
8.	45 KB(2)	0.61	1.55	0.80	"
9.	45 KB(3)	-	11.44	4.43	"
10.	Machakauli Minor-1	0.99	1.82	24.66	"
11.	Lakhaoti-Minor-1	-	-	-	"
12.	Mundi Minor-1	-	5.80	-	"
13.	Mundi Minor-2	-	-	8.16	"

(Abstracted from Annexure 16(d)

CHAPTER V

CONCLUSION

A STUDY OF CROP HUSBANDARY IN LAKHAOTI COMMAND

CHAPTER - V

C O N C L U S I O N

On the basis of studies made in the preceding Chapters following conclusions are drawn :

- The Lakhaoti Branch Command lies in "Arid Sub-Tropic zone, the soil, falls in irrigability class 'A'. The land is classified in irrigability and drainbility Class I, hence the area is most suitable for irrigation.

- The texture of the soil is sandy loam, which is light soil having a medium to low moisture retention at field capacity. Irrigation water supplies for a good crop production has to be at frequent interval.

- The Kharif sowing of crops should be planned in June, when the Gross Irrigation requirement is not high. Part of crop water requirement is met by effective rainfall. Maize crop, the best sowing period is between 5th June to 25 June. Similarly for sorghum 10th June to 30th June, for Pigeon-pea 30 May to 15th June and for Sugarcane March is the

moist suitable sowing period. Late sowing should be avoided as late sowing leads to decreased total dry matter production and crop management practices like interculture etc. become inconvenient.

- All local and untreated seeds are being used by farmers. New high yielding varieties of seeds and other crops which are capable to tolerable more water deficit and produce more needs to be popularised.

- Under present crop management system the crops mostly in Government tubewell commands being irrigated by Government tubewells or by Government and Private tubewell Commands in general recorded water stress almost all over the cropping period which lead to a substantial, decrease in dry matter production. As production level of the area is low, there is enough scope to improve it. The distribution schedule of tubewell water supply needs revisions for better production level of the crops.

- The crop husbandry practices are almost identical in the Lakhaoti Command, the sowing method is very old. Spacing between row to row and plant to plant is not properly maintained, Mostly the sowing is done by broadcasting in which plant population per unit area is not uniform.

- Biomass productivity estimated lowest was 253.48 kg/ha/day during December and 395.28 kg/ha/day during June in the Lakhaoti Command. Good yields could be obtained by sowing high fielding varieties adapte to the climatic conditions of Lakhaoti.

- Pigeon-Pea and Sugarcane crop varities grown in the Lakhaoti Commands are of longer durations. Short duration varieties of these crop needs to be popularised. It will help in increasing the cropping intensity in the command. The efficiency of utilising the biomass productivity potential will also increase by improving the cropping intensity of the command.

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ANNEXURE-1

STUDY OF PHYSICAL PROPERTIES OF SOIL IN LAKHAOTI COMMAND OF MADHYA GANGA CANAL COMMAND, DISTT. BULANDSHAHAR [U.P.]

A; BULK DENSITY

SAMPLE TAKEN AT: VILLAGE:Behlimoura[Machakauli Minor] Upper Ganga Canal

SAMPLING DEPTH [CM]	CORE&MOIST SAMPLE WT. [gram]	CORE&DRIED SAMPLE WT. [gram]	WT. OF CORE [gram]	SAMPLE DRY WEIGHT [gram]	CORE SIZE DIA/LENGTH [cm]	CORE VOLUME [cc]	BULK DENSITY [gram/cc]	DRY BULK DENSITY [gram/cc]
0-30	875.00	790.00	360.00	430.00	5/15	294.52	1.75	1.46
30-60	505.00	470.00	245.00	230.00	3.664/15	158.24	1.64	1.45
60-90	262.00	241.00	105.00	136.00	3.786/7.7	86.68	1.81	1.57
90-120	254.00	237.00	105.00	132.00	3.786/7.7	86.68	1.71	1.53
120-150	810.00	727.00	295.00	432.00	5.1/13.5	275.78	1.86	1.57
150-180	261.00	242.00	105.00	137.00	3.664/7.7	81.18	1.92	1.68
		VILLAGE: MANAKPUR 43JB GOVT.TW COMMAND						
0-30	260.00	240.00	105.00	135.00	3.78/7.7	86.68	1.79	1.55
30-60	250.00	235.00	105.00	130.00	3.78/7.7	86.68	1.67	1.50
60-90	881.00	797.00	360.00	437.00	5/15	294.52	1.76	1.48
90-120	809.00	725.00	295.00	430.00	5.1/13.5	275.78	1.86	1.53
120-150	263.00	240.00	105.00	135.00	3.66/7.7	81.18	1.94	1.66
150-180	259.00	241.00	105.00	136.00	3.78/7.7	86.68	1.77	1.57
	Village:Charaura Mustafabad ,Command Area of Tubewell No:84KB							
0-30	255.00	240.00	105.00	135.00	3.78/7.7	86.68	1.73	1.55
30-60	803.00	721.00	295.00	426.00	5.1/13.5	275.78	1.84	1.54
60-90	257.00	241.00	105.00	136.00	3.78/7.7	86.68	1.75	1.56
90-120	254.00	241.00	105.00	136.00	3.78/7.7	86.68	1.71	1.56
120-150	249.00	239.00	105.00	134.00	3.78/7.7	86.68	1.66	1.54
150-180	246.00	239.00	105.00	134.00	3.78/7.7	86.68	1.62	1.54
	Vill.: PIPALA Command areaof 45KB Govt.TW							
0-30	805.00	725.00	295.00	430.00	5.1/13.5	275.78	1.85	1.56
30-60	804.00	721.00	295.00	426.00	5.1/13.5	275.78	1.84	1.54
60-90	251.00	239.00	105.00	134.00	3.78/7.7	86.68	1.68	1.54
90-120	246.00	240.00	105.00	135.00	3.78/7.7	86.68	1.62	1.56
120-150	252.00	236.00	105.00	131.00	3.78/7.7	86.68	1.69	1.51
150-180	252.00	237.00	105.00	132.00	3.78/7.7	86.68	1.69	1.52
	Village: Lakhaoti ,LHS of LAKHAOTI Branch Canal							
0-30	814.00	730.00	295.00	435.00	5.1/13.5	275.78	1.88	1.57
30-60	255.00	240.00	105.00	135.00	3.78/7.7	86.68	1.73	1.55
60-90	253.00	242.00	105.00	137.00	3.78/7.7	86.68	1.70	1.58
90-120	509.00	486.00	245.00	241.00	3.66/15	158.15	1.66	1.52
120-150	251.00	239.00	105.00	134.00	3.78/7.7	86.68	1.68	1.54
150-180	259.00	241.00	105.00	136.00	3.78/7.7	86.68	1.77	1.57
	Village: Mundi Bakapur ,RHS of Lakhaoti Branch Canal							
0-30	258.00	241.00	105.00	136.00	3.78/7.7	86.68	1.76	1.56
30-60	250.00	237.00	105.00	132.00	3.78/7.7	86.68	1.67	1.52
60-90	252.00	238.00	105.00	1333.00	3.78/7.7	86.68	1.69	1.53
90-120	253.00	240.00	105.00	135.00	3.78/7.7	86.68	1.70	1.55
120-150	508.00	488.00	245.00	233.00	3.64/15	158.15	1.66	1.53
150-180	812.00	728.00	295.00	433.00	5.1/13.5	275.78	1.87	1.57

A NNEXURE- 2

TEXTURAL ANALYSIS OF SOIL IN LAKHAOTI COMMAND, MGC; DISTT. BULANDSHAHAR ,U.P.

[Representative soil weight, 500 gm for mechanical&100 gm for hydrometric analysis]

PROFILE DEPTH(cm)	Wt.RET. ON 2mmSEIVE (gram)	40 sec. hydrometer reading	2 hours hydrometer reading	% gravel	%sand	%silt	% clay	OVER ALL % GRAVEL	OVER ALL % SAND	OVER ALL % SILT	OVER ALL % CLAY	TEXTURAL CLASS
TUBE WELL COMMAND AREA OF 43 JB, VILLAGE; MANAKPUR												
0_30	1.860	45.000	6.000	0.372	55.000	39.000	6.000	0.372	54.795	38.855	5.978	SANDY LOAM
30_60	8.122	43.000	6.000	1.624	57.000	37.000	6.000	1.624	56.074	36.399	5.903	SANDY LOAM
60_90	5.122	42.000	6.000	1.024	58.000	36.000	6.000	1.024	57.406	35.631	5.939	SANDY LOAM
90_120	1.200	45.000	5.000	0.240	55.000	40.000	5.000	0.240	54.868	39.904	4.988	SANDY LOAM
120_150	4.125	45.000	6.000	0.825	55.000	39.000	6.000	0.825	54.546	38.678	5.951	SANDY LOAM
150_180	5.125	44.000	5.500	1.025	56.000	38.500	5.500	1.025	55.426	38.105	5.444	SANDY LOAM
TUBE WELL NO 84 KB , VILLAGE; CHARAURA MUSTAFABAD												
0_30	7.151	42.000	7.000	1.430	58.000	35.000	7.000	1.430	57.170	34.499	6.900	SANDY LOAM
30_60	2.145	43.000	5.000	0.429	57.000	38.000	5.000	0.429	56.755	37.837	4.979	SANDY LOAM
60_90	6.120	44.000	8.000	1.224	56.000	36.000	8.000	1.224	55.315	35.559	7.902	SANDY LOAM
90_120	3.170	43.000	5.500	0.634	57.000	37.500	5.500	0.634	56.639	37.262	5.465	SANDY LOAM
120_150	2.125	44.000	6.500	0.425	56.000	37.500	6.500	0.425	55.762	37.341	6.472	SANDY LOAM
150_180	3.375	43.000	6.500	0.675	57.000	36.500	6.500	0.675	56.615	36.254	6.456	SANDY LOAM
TUBE WELL NO:45 KB ,VILLAGE; PIPALA MAHESHPUR												
0_30	1.121	44.000	5.500	0.224	56.000	38.500	5.500	0.224	55.874	38.414	5.488	SANDY LOAM
30_60	1.051	46.000	5.500	0.210	54.000	40.500	5.500	0.210	53.886	40.415	5.488	SANDY LOAM
60_90	3.760	44.000	6.500	0.752	56.000	37.500	6.500	0.752	55.579	37.218	6.451	SANDY LOAM
90_120	2.220	42.000	5.500	0.444	58.000	36.500	5.500	0.444	57.742	36.338	5.476	SANDY LOAM
120_150	6.420	41.000	6.000	1.284	59.000	35.000	6.000	1.284	58.242	34.551	5.923	SANDY LOAM
150_180	2.470	42.000	5.500	0.494	58.000	36.500	5.500	0.494	57.713	36.320	5.473	SANDY LOAM
MACHAKAULI MINOR ,UGC; VILLAGE: VEHLIMPURA_BULANDSHAHAR												
0_30	3.120	42.000	6.500	0.624	56.000	37.000	6.500	0.624	55.651	36.769	6.459	SANDY LOAM
30_60	2.410	42.000	6.000	0.482	58.000	36.000	6.000	0.482	57.720	35.826	5.971	SANDY LOAM
60_90	0.845	43.000	6.000	0.169	57.000	37.000	6.000	0.169	56.904	36.937	5.990	SANDY LOAM
90_120	1.670	44.000	5.000	0.334	56.000	39.000	5.000	0.334	55.813	38.870	4.983	SANDY LOAM
120_150	0.850	44.000	5.000	0.170	58.000	37.500	5.000	0.170	57.901	37.436	4.992	SANDY LOAM
150_180	2.810	45.000	6.000	0.562	55.000	39.000	6.000	0.562	54.691	38.781	5.966	SANDY LOAM
LAKHAOTI MINOR, MGC; VILLAGE: LAKHAOTI												
0_30	3.870	45.000	5.000	0.774	55.000	40.000	5.000	0.774	54.574	39.690	4.961	SANDY LOAM
30_60	2.120	42.000	6.000	0.424	58.000	36.000	6.000	0.424	57.754	35.847	5.975	SANDY LOAM
60_90	2.007	44.000	6.000	0.401	56.000	38.000	6.000	0.401	55.775	37.847	5.976	SANDY LOAM
90_120	5.147	45.000	5.500	1.029	55.000	39.500	5.500	1.029	54.434	39.093	5.443	SANDY LOAM
120_150	4.261	46.000	6.000	0.852	54.000	40.000	6.000	0.852	53.540	39.659	5.949	SANDY LOAM
150_180	4.381	45.000	6.000	0.876	55.000	39.000	6.000	0.876	54.518	38.658	5.947	SANDY LOAM
MUNDIBAKAPUR MINOR; VILLAGR: MUNDIBAKAPUR												
0_30	2.810	42.000	6.000	0.562	58.000	36.000	6.000	0.562	57.674	35.798	5.966	SANDY LOAM
30_60	2.421	45.000	6.000	0.484	55.000	39.000	6.000	0.484	54.734	38.811	5.971	SANDY LOAM
60_90	5.470	44.000	6.000	1.094	56.000	38.000	6.000	1.094	55.387	37.584	5.934	SANDY LOAM
90_120	2.125	43.000	5.000	0.425	57.000	38.000	5.000	0.425	56.758	37.839	4.979	SANDY LOAM
120_150	2.560	42.000	6.000	0.512	58.000	36.000	6.000	0.512	57.703	35.816	5.969	SANDY LOAM
150_180	3.681	43.000	6.000	0.736	57.000	37.000	6.000	0.736	56.580	36.728	5.956	SANDY LOAM
MIXTURE OF SOIL FROM ALL ABOVE COMMAND- A COMMON REPRESENTATIVE SAMPLE												
0_30	2.680	45.000	6.500	0.536	55.000	38.500	6.500	0.536	54.705	38.294	6.465	SANDY LOAM
30_60	1.450	42.000	6.000	0.290	59.000	36.000	6.000	0.290	57.832	35.896	5.983	SANDY LOAM
60_90	2.470	46.000	6.000	0.494	54.000	40.000	6.000	0.494	53.733	39.802	5.970	SANDY LOAM
90_120	3.120	43.000	5.000	0.624	57.000	38.000	5.000	0.624	56.644	37.763	4.969	SANDY LOAM
120_150	4.470	45.000	5.500	0.894	55.000	39.500	5.500	0.894	54.508	39.147	5.451	SANDY LOAM
150_180	3.250	45.000	6.000	0.650	55.000	39.000	6.000	0.650	54.643	38.747	5.961	SANDY LOAM

ANNEXURE-3

FIELD CAPACITY EXPERIMENT RESULTS IN LAKHAOTI COMMAND.
[Moisture Percentages By Dry Weight of Soil]

DEPTH BELOW G.L.[cm]	MOISTURE PERCENTAGES AT THE END OF 1ST DAY	2ND DAY	3RD DAY	4TH DAY	WHC
	Village: Vehlimpura, Machakauli Minor Command.				
0-30	25.53	23.77	20.52	18.97	24.00
30-60	21.13	19.89	18.67	17.12	20.00
60-90	20.47	18.87	17.84	16.82	18.50
90-120	19.51	18.12	17.06	16.11	18.00
120-150	20.12	18.43	16.26	15.14	18.40
150-180	20.10	18.41	16.15	15.08	18.40
	Village:MANIKPUR, Command Area of Tubewell No:43 JB				
0-30	24.73	23.12	20.66	18.43	23.50
30-60	21.47	19.49	19.31	17.63	20.00
60-90	20.12	18.11	17.79	16.00	18.00
90-120	18.12	17.32	16.00	15.80	17.50
120-150	18.56	17.42	16.50	15.94	18.00
150-180	18.16	17.41	16.21	15.87	17.50
	Village:Charaura Mustafabad ,CommandArea of Tubewell No:84KB				
0-30	25.17	24.21	23.12	19.32	23.50
30-60	23.47	19.92	18.98	16.70	20.00
60-90	20.12	19.00	18.24	16.01	19.00
90-120	18.22	17.85	17.32	15.67	17.50
120-150	18.01	17.12	16.87	15.33	17.00
150-180	17.92	17.83	16.32	15.30	17.80
	Village: PIPALA 45 JB GOVT. TW COMMAND				
0-30	24.36	22.71	22.81	19.47	23.00
30-60	20.84	19.27	18.81	16.62	19.20
60-90	19.12	19.08	18.18	16.18	19.00
90-120	19.07	18.12	17.77	15.47	18.00
120-150	18.12	17.43	16.69	15.45	17.50
150-180	17.88	17.34	16.03	15.34	17.50
	Village:Lakhaoti ,LHS ofLakhaoti Branch Canal.				
0-30	25.12	23.90	22.86	19.12	23.00
30-60	20.22	19.41	18.95	17.22	19.00
60-90	20.18	18.71	17.87	16.98	18.50
90-120	19.05	17.91	17.12	16.97	18.00
120-150	18.11	17.64	16.95	16.12	17.60
150-180	17.93	16.81	16.77	15.12	17.00
	Village:Mundi Bakapur ,RHS of Lakhaoti Branch Canal.				
0-30	26.12	24.40	22.63	18.57	23.00
30-60	20.77	19.58	18.82	17.18	20.00
60-90	19.21	18.65	17.85	16.95	18.60
90-120	18.10	17.51	16.99	16.86	17.50
120-150	17.97	17.54	16.80	16.84	17.50
150-180	17.52	16.80	16.50	15.97	17.00

PRESSURE PLATE TEST FOR SOIL MOISTURE RETENTION
LAKHAOTI COMMANDS, BULANDSHAHAR DISTT.

PRESSURE bar]	Wt. MOIST SOIL+FILT. [gram]	Wt.DRIED SOIL+FILT. [gram]	Wt.of FILTER [gram]	Wt.MOIST SOIL [gram]	Wt.DRIED SOIL [gram]	Wt.HELD WATER [gram]	%MOISTURE	AVERAGE RET.MOIST %
	PROFILE DEPTH 0--30 cm							
0.000	34.551	28.435	5.116	29.435	23.319	6.116	26.228	
0.000	30.366	25.167	4.895	25.471	20.272	5.199	25.646	25.937
0.500	35.371	29.239	5.238	30.133	24.001	6.132	25.549	
0.500	26.471	22.024	5.130	21.341	16.894	4.447	26.323	25.936
1.000	35.935	30.631	5.836	30.099	24.795	5.304	21.391	
1.000	33.876	28.205	5.735	28.141	22.470	5.671	25.238	23.315
2.000	30.080	25.643	5.845	24.235	19.798	4.437	22.411	
2.000	36.954	31.150	5.970	30.984	25.180	5.804	23.050	22.731
3.000	26.412	22,965	5.564	20.848	17.401	3.447	19.809	
3.000	23.420	20.242	4.835	18.585	15.407	3.178	20.627	20.218
5.000	25.045	22.163	5.016	20.029	17.147	2.882	16.808	
5.000	28.308	24.851	5.118	23.190	19.733	3.457	17.519	17.163
8.000	23.060	21.250	6.155	16.905	15.095	1.810	11.991	
8.000	18.749	17.047	5.655	13.094	11.392	1.702	14.940	13.466
12.000	23.664	21.654	5.516	18.148	16.138	2.010	12.455	
12.000	20.921	19.341	4.754	16.167	14.587	1.580	10.832	11.643
15.000	24.090	22.870	5.175	18.915	17.695	1.220	6.895	
15.000	26.289	24.871	6.048	20.241	18.823	1.418	7.533	7.214
	PROFILE DEPTH 30-60 cm							
0.000	29.890	25.127	5.124	24.766	20.003	4.763	23.811	
0.000	28.835	24.147	4.815	24.020	19.332	4.688	24.250	24.031
0.500	33.549	28.173	5.540	28.009	22.633	5.376	23.753	
0.500	28.731	24.116	4.881	23.850	19.235	4.615	23.993	23.873
1.000	26.858	23.120	6.214	20.644	16.906	3.738	22.110	
1.000	33.531	28.475	4.781	28.750	23.694	5.056	21.339	21.725
2.000	29.174	25.127	6.212	22.962	18.915	4.047	21.396	
2.000	30.770	26.473	6.018	24.752	20.455	4.297	21.007	21.201
3.000	29.327	25.441	5.812	23.515	19.629	3.886	19.797	
3.000	28.769	24.871	4.785	23.984	20.086	3.898	19.407	19.602
5.000	29.426	25.959	4.917	24.509	21.042	3.467	16.477	

5.000	29.528	26.123	4.812	24.716	21.311	3.405	15.978	16.227
8.000	30.322	27.437	4.715	25.607	22.722	2.885	12.697	
8.000	30.783	28.112	5.817	24.966	22.295	2.671	11.980	12.339
12.000	31.771	29.471	5.257	26.514	24.214	2.300	9.499	
12.000	30.594	28.127	4.873	25.721	23.254	2.467	10.609	10.054
15.000	27.375	25.499	4.921	22.454	20.578	1.876	9.117	
15.000	28.187	26.475	6.011	22.176	20.464	1.712	8.366	8.741

PROFILE DEPTH 60-90 cm

0.000	32.814	28.125	4.819	27.995	23.306	4.689	20.119	
0.000	27.788	24.167	5.663	22.125	18.504	3.621	19.569	19.844
0.500	26.532	23.151	5.651	20.881	17.500	3.381	19.320	
0.500	27.860	24.231	4.815	23.045	19.416	3.629	18.691	19.005
1.000	29.045	25.167	4.969	24.076	23.125	4.878	21.094	
1.000	30.178	26.147	5.120	25.058	21.450	3.608	16.821	18.957
2.000	30.958	27.147	6.173	24.785	20.974	3.811	18.170	
2.000	26.198	23.112	6.012	20.186	17.100	3.086	18.047	18.108
3.000	27.653	24.567	5.481	22.172	19.086	3.086	16.169	
3.000	28.496	25.124	5.653	22.843	19.471	3.372	17.318	16.743
5.000	29.519	26.478	4.935	24.584	21.543	3.041	14.116	
5.000	32.629	29.121	4.875	27.754	24.246	3.508	14.468	14.292
8.000	25.708	24.145	6.012	19.696	18.133	1.563	8.620	
8.000	25.080	23.112	5.801	19.279	17.311	1.968	11.368	9.994
12.000	29.959	28.167	5.785	24.174	22.382	1.792	8.006	
12.000	27.372	25.459	4.975	22.397	20.484	1.913	9.339	8.673
15.000	25.718	24.398	5.954	19.764	18.444	1.320	7.157	
15.000	28.232	26.436	4.891	23.341	21.545	1.796	8.336	7.746

PROFILE DEPTH 90-120 cm

0.000	28.913	25.169	5.122	23.791	20.047	3.744	18.676	
0.000	28.560	24.679	5.475	23.085	19.204	3.881	20.209	19.443
0.500	26.293	23.147	6.122	20.171	17.025	3.146	18.479	
0.500	25.398	22.119	5.118	20.280	17.001	3.279	19.287	18.883
1.000	26.127	23.121	5.587	20.540	17.534	3.006	17.144	
1.000	30.823	23.127	5.556	25.267	21.450	3.817	17.795	17.469
2.000	27.874	24.676	5.875	21.999	18.801	3.198	17.010	
2.000	28.672	25.160	5.439	23.233	19.721	3.512	17.808	17.409
3.000	30.548	27.159	5.975	24.573	21.184	3.389	15.998	
3.000	31.833	27.875	5.451	26.382	22.424	3.958	17.651	16.824

5.000	26.307	24.165	6.021	20.286	18.144	2.142	11.806	
5.000	26.608	24.118	5.311	21.297	18.807	2.490	13.240	12.523
8.000	30.315	28.198	6.251	24.064	21.947	2.117	9.646	
8.000	29.526	27.165	6.028	23.498	21.137	2.361	11.170	10.408
12.000	25.413	24.117	6.132	19.281	17.985	1.296	7.206	
12.000	26.755	25.136	6.014	20.741	19.122	1.619	8.467	7.836
15.000	26.487	24.851	5.581	20.906	19.270	1.636	8.490	
15.000	24.789	23.623	5.864	18.925	17.759	1.166	6.566	7.528

PROFILE - DEPTH 120-150 cm

0.000	27.773	24.165	5.437	22.336	18.728	3.608	19.265	
0.000	26.935	23.167	5.127	21.808	18.040	3.768	20.887	20.076
0.500	29.220	25.125	4.819	24.401	20.306	4.095	20.166	
0.500	30.030	26.167	6.089	23.941	20.078	3.863	19.240	19.703
1.000	28.580	25.116	6.017	22.563	19.099	3.464	18.137	
1.000	30.076	24.115	4.817	25.259	21.450	3.809	17.758	17.947
2.000	29.972	26.157	5.767	24.205	20.390	3.815	18.710	
2.000	28.024	25.127	5.473	22.551	19.654	2.897	14.740	16.725
3.000	26.152	23.117	5.965	20.187	17.152	3.035	17.695	
3.000	26.996	24.675	5.875	21.121	18.800	2.321	12.346	15.020
5.000	31.614	28.127	5.347	26.267	22.780	3.487	15.307	
5.000	32.371	29.225	5.247	27.124	23.978	3.146	13.120	14.214
8.000	35.123	32.167	5.937	29.186	26.230	2.956	11.270	
8.000	26.051	24.167	5.423	20.628	18.744	1.884	10.051	10.660
12.000	24.371	23.115	5.118	19.253	17.997	1.256	6.979	
12.000	25.696	24.167	5.425	20.271	18.742	1.529	8.158	7.569
15.000	26.578	25.118	5.160	21.418	19.958	1.460	7.315	
15.000	29.887	28.117	4.812	25.075	23.305	1.770	7.595	7.455

PROFILE DEPTH 150-180 cm

0.000	29.208	24.775	4.815	24.393	19.960	4.433	22.209	
0.000	26.556	23.124	6.022	20.534	17.102	3.432	20.068	21.139
0.500	27.913	24.167	5.811	22.102	18.356	3.746	20.407	
0.500	25.545	22.167	6.012	19.533	16.155	3.378	20.910	20.659
1.000	30.875	26.479	5.375	25.500	21.104	4.396	20.830	
1.000	31.245	25.127	5.641	25.604	21.450	4.154	19.366	20.098
2.000	27.761	24.147	5.322	22.439	18.825	3.614	19.198	
2.000	25.591	22.167	5.189	20.402	16.978	3.424	20.167	19.683

3.000	28.146	24.675	5.547	22.599	19.128	3.471	18.146	
3.000	28.358	25.113	5.139	23.219	19.974	3.245	16.246	17.196
5.000	27.258	24.675	5.967	21.291	18.708	2.583	13.807	
5.000	28.197	25.119	4.891	23.306	20.228	3.078	15.217	14.512
8.000	26.547	24.675	6.175	20.372	18.500	1.872	10.119	
8.000	28.384	25.972	5.261	23.123	20.711	2.412	11.646	10.882
12.000	23.604	22.175	5.381	18.223	16.794	1.429	8.509	
12.000	23.384	22.175	5.442	17.942	16.733	1.209	7.225	7.867
15.000	26.046	24.675	5.391	20.655	19.284	1.371	7.110	
15.000	24.717	23.667	5.781	18.936	17.886	1.050	5.871	6.490

ANNEXURE-5

DATA &COMPUTATION SHEET ON DOUBLE RING METHOD OF INFILTRATION IN LAKHAOTI COMMAND OF MGC, DISTT. BULANDSHAHAR, [U.P.]

INFILTR. TIME [minuts.]	GAUGE READINGS [mm]	TIME INTERVAL [minuts.]	INFILT. DEPTH [mm]	CUMMULAT. INFL.TIME t,[min.]	CUMMULAT. INFL.DEPTH I,[mm]	ln(I)	ln(t)	ln(I)* ln(t)	ln(t)**2	FITTED INFILTR. EQUATION
	Village :Vehlimpura (Machakauli Minor) Maize Crop Field									
0	120.00	0.00	0.00	0.00	0.00	ERR	ERR	ERR	ERR	2.87 t**0.5
10	111.00	10.00	9.00	10.00	9.00	2.20	2.30	5.06	5.30	r=0.976
20	103.00	10.00	8.00	20.00	17.00	2.83	3.00	8.49	8.97	
30	98.00	10.00	5.00	30.00	22.00	3.09	3.40	10.51	11.57	
40	95.00	10.00	3.00	40.00	25.00	3.22	3.69	11.87	13.61	
50	93.00	10.00	2.00	50.00	27.00	3.30	3.91	12.89	15.30	
60	91.00	10.00	2.00	60.00	29.00	3.37	4.09	13.79	16.76	
80	88.00	20.00	3.00	80.00	32.00	3.47	4.38	15.19	19.20	
100	85.00	20.00	3.00	100.00	35.00	3.56	4.61	16.37	21.21	
	Village:MANAK PUR (Command Area of GOVT. TW 43JB)									
0	140.00	0.00	0.00	0.00	0.00	ERR	ERR	ERR	ERR	1.51t**0.70
10	133.00	10.00	7.00	10.00	7.00	1.95	2.30	4.48	5.30	r=0.988
20	128.00	10.00	5.00	20.00	12.00	2.48	3.00	7.44	8.97	
30	123.00	10.00	6.00	30.00	18.00	2.89	3.40	9.83	11.57	
40	119.00	10.00	4.00	40.00	22.00	3.09	3.69	11.40	13.61	
50	116.00	10.00	3.00	50.00	25.00	3.22	3.91	12.59	15.30	
60	113.00	10.00	3.00	60.00	28.00	3.33	4.09	13.64	16.76	
80	110.00	20.00	3.00	80.00	31.00	3.43	4.38	15.05	19.20	
100	107.00	20.00	3.00	100.00	34.00	3.53	4.61	16.24	21.21	
	Village:Charaura Mustafabad (command area of GOVT. TW NO:84 KB)									
0	120.00	0.00	0.00	0.00	0.00	ERR	ERR	ERR	ERR	1.97t**0.64
10	112.00	10.00	8.00	10.00	8.00	2.08	2.30	4.79	5.30	r=0.992
20	106.00	10.00	6.00	20.00	14.00	2.64	3.00	7.91	8.97	
30	101.00	10.00	5.00	30.00	19.00	2.94	3.40	10.01	11.57	
40	97.00	10.00	4.00	40.00	23.00	3.14	3.69	11.57	13.61	
50	94.00	10.00	3.00	50.00	26.00	3.26	3.91	12.75	15.30	
60	92.00	10.00	2.00	60.00	28.00	3.33	4.09	13.64	16.76	
80	88.00	20.00	4.00	80.00	32.00	3.47	4.38	15.19	19.20	
100	84.00	20.00	4.00	100.00	36.00	3.58	4.61	16.50	21.21	
	Village: Pipala (Command area of GOVT. TW No:45 KB)									
0	150.00	0.00	0.00	0.00	0.00	ERR	ERR	ERR	ERR	1.073 t**0.
10	144.00	10.00	6.00	10.00	6.00	1.79	2.30	4.13	5.30	r=0.996
20	139.00	10.00	5.00	20.00	11.00	2.40	3.00	7.18	8.97	
30	134.00	10.00	5.00	30.00	16.00	2.77	3.40	9.43	11.57	
40	130.00	10.00	4.00	40.00	20.00	3.00	3.69	11.05	13.61	
50	127.00	10.00	3.00	50.00	23.00	3.14	3.91	12.27	15.30	
60	124.00	10.00	3.00	60.00	26.00	3.26	4.09	13.34	16.76	
80	117.00	20.00	5.00	80.00	31.00	3.43	4.38	15.05	19.20	
100	114.00	20.00	5.00	100.00	36.00	3.58	4.61	16.50	21.21	

ANNEXURE-5-Contd/---

Village:Lakhaoti Command of Lakhaoti MINOR, Lakhaoti BR. MGC)

0	140.00	0.00	0.00	0.00	0.00	ERR	ERR	ERR	ERR	
10	133.00	10.00	7.00	10.00	7.00	1.95	2.30	4.48	5.30	1.08 t**0.7
20	128.00	10.00	5.00	20.00	12.00	2.48	3.00	7.44	8.97	r=0.994
30	124.00	10.00	4.00	30.00	16.00	2.77	3.40	9.43	11.57	
40	120.00	10.00	4.00	40.00	20.00	3.00	3.69	11.05	13.61	
50	117.00	10.00	3.00	50.00	23.00	3.14	3.91	12.27	15.30	
60	115.00	10.00	2.00	60.00	25.00	3.22	4.09	13.18	16.76	
80	112.00	20.00	3.00	80.00	28.00	3.33	4.38	14.60	19.20	
100	109.00	20.00	3.00	100.00	31.00	3.43	4.61	15.81	21.21	

Village: Mundi Bakapur, Mundi Minor (Lakhaoti Br. MGC)

0	150.00	0.00	0.00	0.00	0.00	ERR	ERR	ERR	ERR	1.68t**0.65
10	144.00	10.00	6.00	10.00	6.00	1.79	2.30	4.13	5.30	r=0.992
20	139.00	10.00	5.00	20.00	11.00	2.40	3.00	7.18	8.97	
30	134.00	10.00	5.00	30.00	16.00	2.77	3.40	9.43	11.57	
40	130.00	10.00	4.00	40.00	20.00	3.00	3.69	11.05	13.61	
50	127.00	10.00	3.00	50.00	23.00	3.14	3.91	12.27	15.30	
60	123.00	10.00	4.00	60.00	27.00	3.30	4.09	13.49	16.76	
80	119.00	20.00	4.00	80.00	31.00	3.43	4.38	15.05	19.20	
100	115.00	20.00	4.00	100.00	35.00	3.56	4.61	16.37	21.21	

~~DATA &COMPUTATIONS OF INFILTRATION IN PADDY~~ DATA &COMPUTATIONS ~~OF INFILTRATION TEST IN PADDY~~ CROP FIELD

ANNEXURE-6

DATA &COMPUTATION SHRRT ON TEST PIT METHOD FOR HYDRAULIC CONDUCTIVITY.
IN, LAKHAOTI COMMAND AREA, OF MGC, DISTT. BULANDSHAHAR

TEST RANGE BELOW GL [cm]	DEPTH OF PIT,[D] [metres]	DIA. OF PIT[a] [metres]	OBSERVED TIME [minuts]	DISCHARGE [Q] IN [lps/min]	COND. COEFF. [C]	HYDR.COND. K in K=1.44Q/CaD[cm/sec.] [m/day]	
	Village: Vehlimpura ,MACHAKAULI MINOR.						
0-30	0.40	0.20	10.00	0.35	6.92	0.91	1.05
0-30	0.40	0.20	10.00	0.30	6.92	0.78	0.90
0-30	0.40	0.20	10.00	0.30	6.92	0.78	0.90
0-30	0.40	0.20	10.00	0.29	6.92	0.75	0.87
30-60	0.50	0.18	5.00	0.60	8.78	1.12	1.30
30-60	0.50	0.18	5.00	0.56	8.78	1.04	1.21
30-60	0.50	0.18	5.00	0.57	8.78	1.05	1.21
30-60	0.50	0.18	5.00	0.57	8.78	1.07	1.23
90-150	0.90	0.18	5.00	0.70	12.39	0.51	0.60
90-150	0.90	0.18	5.00	0.64	12.39	0.47	0.50
90-150	0.90	0.18	5.00	0.66	12.39	0.49	0.57
90-150	0.90	0.18	5.00	0.67	12.39	0.49	0.57
	Village: Manakpur, [43 JB Command.]						
0-30	0.35	0.18	5.00	0.26	6.92	0.88	1.02
0-30	0.35	0.18	5.00	0.24	6.92	0.81	0.94
0-30	0.35	0.18	5.00	0.23	6.92	0.78	0.90
0-30	0.35	0.18	5.00	0.22	6.92	0.74	0.85
30-60	0.37	0.18	5.00	0.27	6.92	0.86	1.04
30-60	0.37	0.18	5.00	0.25	6.92	0.86	0.84
30-60	0.37	0.18	5.00	0.28	6.92	0.89	1.04
30-60	0.37	0.18	5.00	0.27	6.92	0.86	1.00
60-150	0.88	0.18	5.00	0.80	12.39	0.60	0.70
60-150	0.88	0.18	5.00	0.76	12.39	0.56	0.66
60-150	0.88	0.18	5.00	0.75	12.39	0.57	0.66
60-150	0.88	0.18	5.00	0.74	12.39	0.56	0.65
	Village:Charaura Mustafabad [84 KB GOVT. TW Command.]						
0-30	0.30	0.30	5.00	0.25	4.92	0.81	0.90
0-30	0.30	0.30	5.00	0.23	4.92	0.74	0.87
0-30	0.30	0.30	5.00	0.24	4.92	0.76	0.85
0-30	0.30	0.30	5.00	0.24	4.92	0.77	0.89
30-60	0.30	0.30	5.00	0.24	4.92	0.78	0.90
30-60	0.30	0.30	5.00	0.23	4.92	0.82	0.96
30-60	0.30	0.30	5.00	0.26	4.92	0.85	0.98
30-60	0.30	0.30	5.00	0.26	4.92	0.83	0.97
60-150	0.95	0.18	5.00	0.90	13.12	0.59	0.69
60-150	0.95	0.18	5.00	0.94	13.12	0.62	0.72
60-150	0.95	0.18	5.00	0.97	13.12	0.64	0.74
60-150	0.95	0.18	5.00	0.96	13.12	0.63	0.73

	Village:Pipala [45 KB Govt. TW Command.]						
0-30	0.30	0.30	5.00	0.22	4.92	0.71	0.83
0-30	0.30	0.30	5.00	0.24	4.92	0.78	0.90
0-30	0.30	0.30	5.00	0.24	4.92	0.77	0.89
0-30	0.30	0.30	5.00	0.24	4.92	0.77	0.89
30-60	0.35	0.30	5.00	0.25	5.25	0.64	0.75
30-60	0.35	0.30	5.00	0.25	5.25	0.66	0.76
30-60	0.35	0.30	5.00	0.26	5.25	0.66	0.77
30-60	0.35	0.30	5.00	0.25	5.25	0.65	0.75
60-150	0.86	0.18	5.00	0.88	12.13	0.69	0.80
60-150	0.86	0.18	5.00	0.89	12.13	0.70	0.81
60-150	0.86	0.18	5.00	0.88	12.13	0.70	0.80
60-150	0.86	0.18	5.00	0.89	12.13	0.70	0.81
	Village: Lakhaoti ,[LHS of Lakhaoti Branch Canal]						
0-30	0.36	0.30	5.00	0.27	5.32	0.68	0.78
0-30	0.36	0.30	5.00	0.28	5.32	0.71	0.82
0-30	0.36	0.30	5.00	0.29	5.32	0.71	0.83
0-30	0.36	0.30	5.00	0.28	5.32	0.70	0.81
60-150	1.00	0.18	5.00	0.92	13.60	0.56	0.64
60-150	1.00	0.18	5.00	0.93	13.60	0.56	0.65
60-150	1.00	0.18	5.00	0.94	13.60	0.60	0.66
60-150	1.00	0.18	5.00	0.95	13.60	0.57	0.66
30-60	0.46	0.30	5.00	0.36	5.92	0.63	0.73
30-60	0.46	0.30	5.00	0.35	5.92	0.63	0.73
30-60	0.46	0.30	5.00	0.35	5.92	0.64	0.74
60-150	0.98	0.18	5.00	0.92	13.41	0.58	0.67
60-150	0.98	0.18	5.00	0.93	13.41	0.58	0.67
60-150	0.98	0.18	5.00	0.94	13.41	0.59	0.68
60-150	0.98	0.18	5.00	0.94	13.41	0.59	0.68

ANNEXURE-7(a)

REFERENCE CROP ETo COMPUTATIONS BY MODIFIED PENMAN METHOD FOR LAKHAOTI COMMAND AREA OF MADHYA GANGA CANAL SYSTEM

STATION: DELHI, Long. 77deg.1Ø min. Lat. 28deg 38 min. Alt. 216 m.

SL.NO.	PARTICULARS	FOURTNIGHTS/MONTHS JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEPT	OCT	NOV	DEC
1	Tmax. deg.C	2Ø.5	21.6	27.1	34.3	35.3	38.8	34.2	33.4	33.61	32.89	26.1	22.6
2	Tmin. deg.C	5.4	7	12.3	17.6	21.9	25.9	25.7	25.3	21.76	16.7	1Ø.1	6.25
3	Tmean deg.C	12.95	14.3	19.7	25.95	28.6	32.35	29.95	29.35	27.68	24.79	18.1	14.42
4	RH MEAN,%	79	73	68	56.3	45	56	75	82	65.7	65	62	62
5	n,hrs.	6.96	7.1	7.5	8.6	8.8	9	5.55	5.94	7.7	8.4	7.5	7.2
6	N, hrs	1Ø.5	11.16	12	12.83	13.5	13.9	13.77	13.14	12.37	11.53	1Ø.7	1Ø.7
7	Ra, mm/day	9.2	11.Ø2	13.34	15.28	16.5	16.84	16.72	15.7	14.Ø6	11.92	9.82	8.7
8	U, km/hrs	3.36	5.17	5.29	4.2	3.7	5.79	5.56	3.44	2.9	2	1.2	2.62
9	ea, m bar	14.7	16.27	22.98	33.5	37	53.25	4Ø.1	4Ø.91	37.Ø8	31.31	2Ø.74	16.6
1Ø	ed, m bar	11.61	11.87	15.62	18.86	16.65	29.82	3Ø.Ø7	33.54	24.36	2Ø.35	12.85	1Ø.29
11	f(u)	Ø.487	Ø.6Ø5	Ø.612	Ø.542	Ø.5Ø9	Ø.645	Ø.63Ø	Ø.492	Ø.457	Ø.399	Ø.347	Ø.439
12	Rs,mm/day	5.349	6.26Ø	7.5Ø3	8.941	9.5Ø2	9.661	7.549	7.473	7.89Ø	7.322	5.896	5.1Ø2
13	f(t)	15.93	16.63	19.14	22.39	23.89	26.14	24.68	24.33	23.37	21.76	18.37	16.74
14	f(ed)	Ø.19	Ø.19	Ø.17	Ø.15	Ø.16	Ø.1	Ø.1	Ø.Ø9	Ø.12	Ø.15	Ø.18	Ø.2
15	f(n/N)	Ø.69	Ø.67	Ø.66	Ø.7	Ø.69	Ø.68	Ø.46	Ø.51	Ø.66	Ø.76	Ø.73	Ø.71
16	Rnl, mm/day	2.Ø88	2.116	2.147	2.35Ø	2.637	1.777	1.135	1.116	1.85Ø	2.48Ø	2.413	2.377
17	Rn, mm/day	1.923	2.578	3.48Ø	4.354	4.489	5.468	4.526	4.488	4.Ø67	3.Ø1Ø	2.ØØ8	1.449
18	W	Ø.6	Ø.62	Ø.69	Ø.75	Ø.78	Ø.81	Ø.81	Ø.78	Ø.77	Ø.74	Ø.67	Ø.62
19	c	Ø.97	Ø.99	1	Ø.98	Ø.99	1.Ø2	1.Ø1	1.Ø5	1.Ø2	1.Ø1	Ø.98	Ø.96
2Ø	ETo, mm/day	1.7Ø3	2.582	3.798	5.145	5.726	7.447	4.915	4.514	4.56Ø	3.4ØØ	2.2Ø5	1.874

NOTE:- Climatological data is 75% dep. data of DELHI station since 1979 to 1989.

ANNEXURE-7(b)

ETo Computation by Radiation Method

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. Mean Temperature °C.	12.70	14.30	19.70	25.95	28.60	32.35	29.95	29.35	25.16	24.80	18.10	14.55
2. n Mean observed day time(hrs)	6.96	7.10	7.50	8.60	8.80	9.00	5.55	5.94	7.70	8.40	7.50	7.20
3. N Max.possible mean day time(hrs)	10.50	11.16	12.00	12.83	13.50	13.90	13.77	13.14	12.37	11.53	10.70	10.70
4. Extra terrestrial Rad.(Ra)mm/day	9.20	11.02	13.34	15.28	16.50	16.84	16.72	15.70	14.06	11.92	8.92	8.70
5. Radiation Rs=(0.25+ 0.50 n/N)Ra mm/day	5.35	6.26	7.50	8.94	9.50	9.66	7.55	7.47	7.89	7.32	5.36	5.10
6. Weighing factor(W) for the effect of radiation on ETo at diff. temp.altitude	0.60	0.62	0.68	0.75	0.77	0.81	0.78	0.78	0.750	0.75	0.67	0.62
7. WRs	3.21	3.88	5.10	6.71	7.31	7.82	5.89	5.83	5.92	5.49	3.59	3.16
8. RH(Mean %)	79.00	73.00	68.00	56.30	45.00	56.00	75.00	82.00	65.70	65.00	62.00	62.00
9. U (day time) m/sec.	0.93	1.44	1.47	1.17	1.02	1.60	1.54	0.95	0.81	0.56	0.33	0.73
10.ETo (mm/day)(Fig.2 FAO 24)	2.20	2.50	3.80	5.50	6.75	6.50	4.10	4.10	5.00	4.50	2.70	2.40

ANNEXURE 7(c)

ETo By Pan Evaporation Method

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. E Pan(daily averaged mm/day)	1.80	4.29	5.81	7.02	8.27	7.80	4.70	3.89	3.62	2.22	2.90	2.37
2. Wind velocity km/day	80.64	124.08	126.96	100.80	88.80	138.46	133.40	82.56	70.56	48.00	28.80	62.88
3. Ru (mean	79.00	73.00	68.00	56.30	45.00	56.00	75.00	82.00	65.70	65.00	62.00	62.00
4. K Pan	0.85	0.85	0.81	0.81	0.81	0.81	0.85	0.85	0.81	0.81	0.81	0.81
5. ETo = Kpan Epan	1.53	3.65	4.71	5.68	6.70	6.32	4.00	3.31	2.93	1.80	2.35	11.92

ANNEXURE-7(d)

Potential Evapotranspiration by Thornthwaite Method

Sl. No;	Month	Mean Monthly Temp. ^{o}C (t)	Monthly heat Index from table (F_3)	Unadjusted PET(cm) e=1.60 x(10t/I)^{a}	Correction factor e from table F_2 ($\frac{h}{12} \times \frac{m}{30}$)	Corrected value of PET cm Col4x Col5	Daily ETo in mm
1	2	3	4	5	6	7	8
1.	Jan.	12.70	4.10	1.69	0.91	1.54	0.50
2.	Feb.	14.30	4.91	2.37	0.88	2.09	0.75
3.	March	19.70	7.97	5.87	1.03	6.05	1.95
4.	April	25.95	12.10	12.80	1.07	13.70	4.57
5.	May	28.60	14.02	16.85	1.16	19.55	6.51
6.	June	32.35	16.89	23.88	1.16	27.70	9.23
7.	July	29.95	15.03	19.20	1.18	22.66	7.55
8.	Aug.	29.35	14.58	18.13	1.13	20.49	6.83
9.	Sept.	25.16	11.55	11.72	1.02	11.95	3.98
10.	Oct.	24.80	11.30	11.26	0.90	4.15	1.67
11.	Nov.	18.10	7.01	4.61	0.90	4.15	1.38
12.	Dec.	14.55	5.04	2.49	0.90	2.21	0.74
	Total	=	124.50			145.60	

$a = 65.7 \times 10^{-8} \times (124.50)^3 - 77.1 \times 10^{-6} * (124.50)^2 +$

$17.92 \times 10^{-3} \times 124.50 + 0.49239 = 2.8309$

ANNEXURE-8(a)

Crop Water Requirement of Maize, Sowing Date -15 May (Crop Duration 110 days)

Sl.No.	Crop Period	ETo (mm)	Kc	ETcrop (mm)	Effective rainfall Re (mm)	NIR= ETc -Re (mm)	GIR = NIR / 0.60
1	2	3	4	5	6	7	8
1.	Pre sowing water requirement	-	-	100.00	-	100.00	166.67
2.	15 May-4 June	121.26	0.30	36.47	-	36.47	60.78
3.	5 June-9July	238.23	0.70	166.76	9.88	156.88	261.47
4.	10 July - 13 August	166.08	1.05	174.38	92.38	82.00	136.67
5.	14 Aug-2 Sept.	90.14	0.80	72.11	39.25	32.85	54.75
Total				549.72		408.0	680.35

Effective rainfall is evenly distributed throughout the month for computations.

Annexure-8 (b)

Crop Water Requirement of Maize, Sowing
Date : 5 June (Crop duration 110 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing water requirement	-	-	100	-	100	166.67
2.	5th June to 25 June	149.40	0.30	44.82	11.33	33.49	55.81
3.	26th June-30th July	184.05	0.70	128.84	92.26	36.58	60.97
4.	31st July - 3rd Sept.	158.10	1.05	166.01	66.50	99.51	165.85
5.	4 Sept. - 25th Sept.	91.40	0.80	73.12	-	73.12	121.86
	Total			512.79 = 513.00		342.70	571.16

Annexure - 8 (C)

Crop Water Requirement of Maize, Sowing

Date : 25 June (Crop duration 110 days)

1	2	3	4	5	6	7	8
1.	Pre sowing water requirement	-	-	100	-	100.00	167.67
2.	25th June - 15 July	135.15	0.30	40.55	22.73	17.82	29.70
3.	16th July - 20th Aug.	163.35	0.70	114.35	87.50	26.85	44.75
4.	21st Aug.- 24th Sept.	159.18	1.05	167.14	35.33	131.81	219.68
5.	25th Sept - 15 October	73.85	0.80	59.08	4.50	54.58	40.97
	Total			481.12		331.06	552.77
						=	533.00

Annexure - 8 (d)

Crop Water Requirement of Maize, Sowing Date: 10 July Crop duration 110 days

1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	100.00		100.00	166.67
2.	10th July - 30th July	97.80	0.30	29.34	32.25	-	-
3.	30th July - 3rd Sept.	158.10	0.70	110.67	61.50	49.17	81.95
4.	4 Sept. - 9th October	149.42	1.05	156.89	21.00	135.89	226.48
5.	10th Oct.- 30th October	68.00	0.80	54.40	-	54.40	90.67
	Total			451.30		339.46	565.77

ANNEXURE - 9 (a)

Crop Water Requirement of Sorghum

Sowing Date : 20 May (Crop Duration - 125 - 140 days)

S.No.	Crop periods	ETo (mm)	Kc	Etcrop (mm)	Effective rainfall Re*(mm)	NIR= ETc-Re (mm)	GIR = NIR / 0.60 (mm)
1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	100.00	-	100.00	65.10
2.	20 May - 9 June	130.26	0.30	39.08	-	39.08	200.50
3.	10 June - 19th July	249.78	0.70	174.85	54.55	120.30	200.50
4.	20th July - 8th Sept.	229.85	1.00	229.85	89.29	140.56	234.27
5.	9 Sept. - 8 October	127.74	0.75	95.81	5.40	90.41	150.68
	Total			639.57		490.35	817.22

*Effective rainfall is evenly distributed throughout the month for computations.

ANNEXURE - 9 (b)

Crop Water Requirement for sorghum

sowing date: 10 June (Crop duration : 125 - 140 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	100.00	-	100.00	166.67
2.	10 June - 29 June	149.40	0.30	44.82	-	44.82	74.70
3.	30th June - 8 Aug.	195.60	0.70	136.54	98.87	37.67	62.78
4.	9 Aug. - 27 Sept.	226.89	1.00	226.89	46.30	180.59	300.98
5.	28 Sept. - 27th October	105.51	0.75	79.13	-	79.13	131.88
	Total			587.38		442.21	737.01

*Effective rainfall is evenly distributed throuhout the month for computations.

ANNEXURE- 9 (c)

Crop Water Requirement of Sorghum

Sowing Date : 30 June (Crop duration : 125 - 140 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing water requirement	-	-	100.00	-	100.00	166.67
2.	30 June - 19 July	100.38	0.30	30.11	30.65	-	-
3.	20 July - 29 Aug.	184.29	0.70	129.00	75.58	53.50	89.17
4.	30 Aug- 18 October	207.30	1.00	207.30	28.00	179.30	298.83
5.	19 Oct.-18 Nov.	80.76	0.75	60.57	-	60.57	100.95
	Total			526.91		293.37	655.62

*Effective rainfall is evenly distributed throughout the month for computations.

ANNEXURE-9(d)

Crop Water Requirement of Sorghum

Sowing Date : 15 July (Crop duration: 125-140 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing water requirement	-	-	100.00	-	100.00	166.67
2.	15 July - 4 Aug.	96.24	0.30	28.87	26.03	2.84	4.73
3.	5 Aug.-14 Sept.	180.98	0.70	126.69	64.18	62.51	104.18
4.	15 Sept.-3 Nov.	185.18	1.00	185.18	14.00	171.18	285.30
5.	4 Nov.-3 Dec.	65.58	0.75	49.19	-	49.19	81.98.
	Total			489.93		385.72	642.86

* Effective rainfall is evenly distributed throughout the month for computations.

ANNEXURE-10 (a)

Crop Water Requirement of Arhar (Pigeon-Pea)

Sowing Date : 10 May (Crop duration: 210 - 225 days)

S.No.	Crop periods	ETo (mm)	Kc	ETc (mm)	Effective rainfall Re* (mm)	NIR =ETc -Re (mm)	GIR = NIR / 0.60 (mm)
1	2	3	4	5	6	7	8
1	Pre-sowing requirement	-	-	100.00	-	100.00	166.67
2.	10 May - 19 June	262.26	0.40	104.90	-	104.90	174.80
3.	20 June-23 Spet.	478.37	0.70	334.86	178.50	156.36	260.60
4.	24 Sept-22 Nov.	186.37	1.05	195.69	-	195.69	326.15
5.	23 Nov.-23 Dec.	61.00	1.00	61.00	-	61.00	101.67
	Total			796.45		517.95	1029.89

*Effective rainfall is evenly distributed throghout the month for computations.

ANNEXURE-10(b)

Crop Water Requirement of Arhar (Pegeon Pea)

Sowing Date : 20 May (Crop Duration: 210-225 days)

1	2	3	4	5	6	7	8
1	Pre-sowing requirement	-	-	100.00	-	100.00	166.67
2.	20 May-19 June	204.96	0.40	81.91	-	81.91	136.52
3.	20 June-22 Sept.	473.80	0.70	331.66	178.50	153.16	255.27
4.	23 Sept.-22 Nov.	190.80	1.05	200.34	-	200.34	333.90
5.	23 Nov.-22 Dec.	59.12	1.00	59.12	-	59.12	98.53
	Total			773.03		594.53	990.89

*Effective rainfall is evenly distributed throughout the month for computations.

ANNEXURE- 10 (c)

Crop Water Requirement of Arhar(Pigeon Pea)

Sowing Date: 30 May (Crop duration: 210-225 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	100.00	-	100.00	166.67
2.	30 May - 8 July	274.68	0.40	109.87	-	109.87	183.12
3.	9 July- 11 Oct.	426.47	0.70	298.52	178.50	120.02	200.03
4.	12 Oct.-10 Dec.	153.40	1.05	161.07	-	161.07	268.45
5.	11 Dec.-10 Jan.	54.5	1.00	54.50	-	54.50	90.83
	Total			723.96		545.46	909.10

*Effective rainfall is evenly distributed throughout the month for computations.

ANNEXURE-10(d)

Crop Water Requirement of Arhar (Pigeon Pea)

Sowing Date: 15 June (Crop duration : 210-225 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	100.00	-	100.00	166.67
2.	15 June-25 July	234.30	0.40	93.72	49.00	44.72	74.53
3.	26 July - 28 Oct.	396.25	0.70	277.38	102.88	174.50	290.83
4.	29 Oct. - 29 Dec.	128.26	1.05	134.67	-	134.67	224.45
5.	30 Dec. - 29 Jan.	51.08	1.00	51.08	-	51.08	85.13
Total				656.85		504.97	841.61

*Effective rainfall is evenly distributed throhgout the month for computations.

ANNEXURE-11(a)

Crop Water Requirement of Sugarcane

Sowing Date : 15 December (Crop duration: 270-300 days)

Sl. No.	Crop periods	ETo (mm)	Kc	ETc (mm)	Effective rainfall (mm)	NIR = ETc -Re RE* (mm)	GIR = NIR / 0.60 (mm)
1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	150.00	-	150.00	250.00
2.	15 Dec.- 15 Jan.	53.55	0.40	24.42	-	24.42	40.70
3.	16 Jan. - 15 April	292.46	0.70	204.72	-	204.72	341.20
4.	16 April-15 Sept.	838.47	1.00	838.47	172.50	665.97	1109.95
5.	16 Sept.-15 Nov.	207.25	0.75	155.44	30.00	125.44	209.67
	Total			1369.05		1170.55	1950.92

*Effective rainfall is evely distributed throughout the months

ANNEXURE - 11(b)

Crop Water Requirement of Sugarcane

Sowing Date: 15 December Crop duration : 270 - 300 days

1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	150.00	-	150.00	250.00
2.	1st Feb-28 Feb.	72.52	0.40	29.01	-	29.01	48.35
3.	1st Mar.-30 May	443.59	0.70	310.51	-	310.51	517.52
4.	1st June-31st Oct.	757.69	1.00	757.69	187.50	570.19	950.32
5.	1st Nov.-30 Nov.	102.00	0.75	76.50	-	76.50	127.50
	Total			1323.71		1136.21	1893.69

*Effective rainfall is evenly distributed throughout the months.

ANNEXURE-11(c)

Crop Water Requirement of Sugarcane

Sowing Date: 10 March (Crop duration : 270-300 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	150.00	-	150.00	250.00
2.	10 Mar.-9 April	125.85	0.40	50.34	-	50.34	83.90
3.	10 April-9 July	502.28	0.70	351.60	24.01	327.59	545.98
4.	10 July - 9 Dec.	566.11	1.00	566.11	161.08	405.03	675.05
5.	10 Dec. - 10 Jan.	54.50	0.75	40.88	-	40.88	68.13
	Total			1158.93		973.84	1623.06

ANNEXURE-11(d)

Crop Water Requirement of Sugarcane

Sowing Date: 10 March (Crop duration : 270 - 300 days)

1	2	3	4	5	6	7	8
1.	Pre-sowing requirement	-	-	150.00	-	150.00	250.00
2.	20 April-19 May	165.41	0.40	66.16	-	66.16	110.27
3.	20 May - 19 Aug.	524.22	0.70	366.95	131.75	235.20	392.00
4.	20 Aug.-19 Jan.	448.99	1.00	448.99	55.75	393.24	655.40
5.	20 Jan.-20 Feb.	68.70	0.75	51.53	-	51.53	85.88
	Total			1083.63		896.13	1493.55

*Effective rainfall is evenly distributed throughout the month.

ANNEXURE-12(a)

OBSERVATIONS FOR LEAF AREA INDEX (L.A.I.)

Crop: :Paddy

	Tubewell Commands								Canal Commands							
	43 JB Govt.TW				84 KB				45 KB Govt.TW				MM		MM	MM
Sl. No. Date/ Plot No.1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
1. 22.8.91 2.09	3.13	1.88	23.8.91	1.38	2.00	1.47	24.8.91	2.79	3.45	2.53	26.8.91	2.42	25-8-91	2.85	2.24
2. 8.9.91 1.55	2.35	1.45	9.9.91	1.45	1.57	0.90	10.9.91	1.64	2.335	1.84	12.9.91	-	11.9.91	1.60	-
3. 23.9.91 -	-	-	24.9.91	1.43	-	-	25.9.91	-	-	1.39	27.9.91	-	26.9.91	-	-
4. 6.10.91 -	-	-	7.10.91	-	-	-	8.10.91	-	-	-	10.10.91	-	9.10.91	-	-

Crop: Sorghum (Fodder)

Sl. No. Date/- Plot No.1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
1. 22.8.91 2.00	4.98	2.46	23.8.91	1.54	3.28	2.50	24.8.91	2.10	2.22	2.21	26.8.91	1.63	25.8.91	2.67	1.29
2. 8.9.91 1.98	3.12	2.27	9.9.91	1.69	3.26	2.40	10.9.91	2.70	2.29	2.45	12.9.91	2.08	11.9.91	2.317	2.22
3. 23.9.91 2.25	3.48	2.25	24.9.91	1.79	3.02	2.08	25.9.91	2.38	2.08	2.37	27.9.91	1.95	26.9.91	2.17	2.06
4. 6.10.91 2.07	3.15	2.36	7.10.91	1.98	2.80	2.89	9.10.91	2.20	1.95	2.43	10.10.91	1.65	9.10.91	1.98	1.98

Crop: Arhar

Sl.No.Date/ Plot No. 1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
1. 22.8.91 0.34	0.64	1.37	23.8.91	1.40	0.96	1.33	24.8.91	0.64	1.12	0.81	26.8.91	2.40	25.8.91	2.06	2.06
2. 8.9.91 0.31	0.65	1.18	9.9.91	1.36	1.36	1.48	10.9.91	0.67	1.16	0.84	12.9.91	2.33	11.9.91	2.22	2.15
3. 23.9.91 0.63	1.00	1.34	24.9.91	1.95	2.06	1.92	25.9.91	0.88	1.50	1.05	27.9.91	2.68	26.9.91	3.08	3.50
4. 6.10.91 0.94	1.47	1.60	7.10.91	2.00	2.09	2.04	8.10.91	1.01	1.74	1.11	10.10.91	3.02	9.10.91	3.20	3.80

Crop: Sugarcane

	43 JB				84 KB				45 KB				UGC		MGC	
Sl.No.D/P	1	2	3	Date	1	2	3	Date	1	2	3	Date	MM	Date	MM-1	MM-2
1. 22.8.91	3.89	4.52	2.77	23.8.91	3.64	4.50	5.00	24.8.91	4.18	4.92	2.98	26.8.91	4.45	25.8.91	4.62	5.14
2. 8.9.91	4.37	3.78	3.76	9.9.91	3.76	4.67	6.39	10.9.91	4.63	5.27	3.47	12.9.91	4.61	11.9.91	5.32	6.23
3. 23.9.91	5.29	5.48	4.28	24.9.91	4.33	5.80	6.84	25.9.91	5.54	5.52	3.70	27.9.91	5.52	26.9.91	6.72	7.09
4. 6.10.91	5.92	5.65	4.87	7.10.91	4.42	6.11	7.11	9.10.91	5.99	6.10	3.73	10.10.91	5.72	9.10.91	7.11	7.62

MM - Machcauli Minor, LM - Lakhaoti Minor, MBM - Mundi Bakapur Minor

ANNEXURE-12(b)

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DRY MATTER PRODUCT OBSERVATIONS

CROP: Paddy

		Tubewell Commands											Canal Commands				
		43 JB			84 KB			45 KB				UCC mm		MGC LM		
Sl. No.	Date/ Plot No.	1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	MB 2
1.	22.8.91	685	920	555	23.8.91	388	532	419	24.8.91	413	570	449	26.8.91	602	25.8.91	610	740
2.	8.9.91	810	1235	672	9.9.91	434	612	513	10.9.91	520	508	556	12.9.91	-	11.9.91	735	-
3.	23.9.91	-	-	-	24.9.91	502	-	-	25.9.91	-	-	563	27.9.91	-	926.9.91	-	-
4.	6.10.91	-	-	-	7.10.91	-	-	-	8.10.91	-	-	-	10.10.91	-	9.10.91	-	-

CROP: Sorghum(Fodder)

		43 JB Govt.TW			84 KB Govt.T.W.				45 KB Govt.TW				MM		LM	MM
Sl. No.	Date/ Plot No.	1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
1.	22.8.91	672	924	396	23.8.91	260	832	704	24.8.91	905	672	593	26.8.91	680	25.8.91	464	471.
2.	8.9.91	720	1008	523	9.9.91	377	1040	902	10.9.91	1237	813	807	12.9.91	948	11.9.91	524	792
3.	23.9.91	1060	1205	683	24.9.91	548	1270	1034	25.9.91	1332	937	856	27.9.91	1040	26.9.91	622	623
4.	6.10.91	1107	1259	678	7110.	692	1430	1276	8.10.91	1411	1045	936	10.10.91	1080	9.10.91	740	947

Crop: Arhar

	1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
22.8.91	120	168	238	23.8.91	212	217	197	24.8.91	204	180	177	26.8.91	202	25.8.91	251	385
8.9.91	186	792	258	9.9.91	253	948	213	10.9.91	267	289	207	12.9.91	442	11.9.91	292	448
23.9.91	284	214	324	24.9.91	344	472	335	25.9.91	275	310	22	27.9.91	591	26.9.91	392	656
6.10.91	316	312	374	7.10.91	402	486	405	8.10.91	300	369	260	10.10.91	702	9.10.91	464	745

Crop: Sugarcane

Sl. No.	Date/ Plot No.	1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
1.	22.8.91	2812	4496	2785	23.8.91	2820	3350	3958	24.8.91	2170	2610	1724	26.8.91	2728	25.8.91	2610	3626
2.	8.9.91	3110	4779	3607	9.9.91	3082	3720	3638	9.9.91	2345	2970	1700	12.9.91	2960	11.9.91	3020	3868
3.	23.9.91	3615	5072	4025	24.9.91	3547	3975	3828	24.9.91	2650	3106	2860	27.9.91	3172	26.9.91	3102	4104
4.	6.10.91	3814	5287	4304	7.10.91	3613	4152	4035	7.10.91	2865	3324	3050	10.10.91	3466	9.10.91	3496	4302

L
MM = Machcauli Minor, LM - Lakhaoti Minor, MBM - Mundi Bakapur Minor

YIELD RESPONSE TO WATER IN LAKHAOTI COMMAND

IMMAND AREA OF: 43 JB GOVT.TW CROP:MAIZE PLOT NO:1
WING DATE: 20/05/91 HARVEST DATE :08/09/91

RTICULARS	OBSERVATION DATES 22/08/91	08/09/91
e, cal/sq.cm/day	404.033	397.909
,kg/ha/day	474.071	468.230
,kg/ha/day	253.604	250.304
, cal/sq,cm/day	490.252	484.054
mean temp. deg.. C	30.449	30.008
,kg/ha/hr	65.000	65.000
tive LAI	2.090	1.550
days	92.000	110.000
	0.300	0.255
	0.500	0.500
	1.000	1.000
(Rse-0.5 Rs)/0.8 Rse	0.492	0.490
, kg/ha/day	692.919	685.481
p, kg/ha	9562.281	9613.875
p, gm/sq.m	956.228	961.388
served Ym,gm./sq.m	685.000	810.000

MMAND AREA OF: 43 JB GOVT. TW CROP:MAIZE PLOT NO:2
WING DATE: 25/05/91 HARVEST DATE:09/09/91

RTICULARS	OBSERVATION DATES 22/08/91	08/09/91
e, cal/sq.cm/day	404.260	401.526
,kg/ha/day	474.700	472.870
,kg/ha/day	253.759	252.621
, cal/sq,cm/day	485.235	483.828
nean temp. deg. C	30.533	30.342
,kg/ha/hr	65.000	65.000
tive LAI	3.130	2.348
lays	88.000	105.000
	0.410	0.348
	0.500	0.500
	1.000	1.000
(Rse-0.5 Rs)/0.8 Rse	0.500	0.497
, kg/ha/day	688.466	687.559
), kg/ha	12419.920	12561.704
), gm/sq.m	1241.992	1256.170
served Ym,gm./sq.m	820.000	1235.000

1MAND AREA OF: 43 JB GOVT. TW CROP:MAIZE PLOT NO:3
JING DATE: 10/06/91 HARVEST DATE:15/09/91

RTICULARS	OBSERVATION DATES

	22/08/91	08/09/91
Rse, cal/sq.cm/day	403.303	400.261
yc,kg/ha/day	474.385	472.286
yo,kg/ha/day	253.294	252.041
Rs, cal/sq,cm/day	473.278	473.903
T,mean temp. deg. C	30.442	30.233
ym,kg/ha/hr	65.000	65.000
Active LAI	1.880	1.450
G,days	72.000	89.000
cL	0.288	0.245
cN	0.500	0.500
cH	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.517	0.510
Yo, kg/ha/day	677.062	678.146
Ymp, kg/ha	7019.776	7393.488
Ymp, gm/sq.m	701.978	739.349
Observed Ym,gm./sq.m	555.000	672.000

COMMAND AREA OF: 84 KB GOVT. TW CROP:MAIZE PLOT NO:1
SOWING DATE: 29/06/91 HARVEST DATE:26/09/91

PARTICULARS	OBSERVATION DATES		
	23/8/91	09/09/91	24/09/91
Rse, cal/sq.cm/day	399.089	390.121	380.935
yc,kg/ha/day	470.070	461.339	452.501
yo,kg/ha/day	251.009	246.162	241.237
Rs, cal/sq,cm/day	462.571	459.717	460.105
T,mean temp. deg. C	29.750	29.184	28.491
ym,kg/ha/hr	65.000	65.000	65.000
Active LAI	1.380	1.450	1.430
G,days	54.000	72.000	87.000
cL	0.238	0.245	0.243
cN	0.500	0.500	0.500
cH	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.526	0.514	0.495
Yo, kg/ha/day	665.187	660.222	658.674
Ymp, kg/ha	4274.490	5823.156	6962.515
Ymp, gm/sq.m	427.449	582.316	696.252
Observed Ym,gm./sq.m	388.000	434.000	502.000

COMMAND AREA OF: 84 KB GOVT. TW CROP:MAIZE PLOT NO:2
SOWING DATE: 05/06/91 HARVEST DATE:10/09/91

PARTICULARS	OBSERVATION DATES	
	23/8/91	09/09/91
Rse, cal/sq.cm/day	403.763	396.161
yc,kg/ha/day	474.861	467.414
yo,kg/ha/day	253.541	249.431
Rs, cal/sq,cm/day	474.731	470.310
T,mean temp. deg. C	30.550	29.976

m,kg/ha/hr	65.000	65.000
ctive LAI	2.000	1.570
,days	78.000	96.000
L	0.300	0.257
N	0.500	0.500
H	1.000	1.000
=(Rse-0.5 Rs)/0.8 Rse	0.515	0.508
o, kg/ha/day	678.641	672.401
mp, kg/ha	7940.100	8294.733
mp, gm/sq.m	794.010	829.473
bserved Ym,gm./sq.m	532.000	612.000

OMMAND AREA OF: 84 KB GOVT. TW CROP:MAIZE PLOT NO:3
OWING DATE: 14/06/91 HARVEST DATE:20/09/91

ARTICULARS /	OBSERVATION DATES 23/8/91	09/09/91
se, cal/sq.cm/day	402.391	394.402
=,kg/ha/day	473.454	465.649
ɔ,kg/ha/day	252.798	248.482
s, cal/sq,cm/day	471.162	467.307
,mean temp. deg. C	30.315	29.735
n,kg/ha/hr	65.000	65.000
ctive LAI	1.470	0.900
,days	69.000	86.000
-	0.247	0.200
N	0.500	0.500
H	1.000	1.000
=(Rse-0.5 Rs)/0.8 Rse	0.518	0.509
ɔ, kg/ha/day	674.694	668.943
mp, kg/ha	5749.409	5752.911
mp, gm/sq.m	574.941	575.291
ɔserved Ym,gm./sq.m	419.000	513.000

)MMAND AREA OF: 45KB GOVT. TW PLOT NO: 1 CROP:MAIZE
)WING DATE: 04/07/91 HARVEST DATE :05/10/91

\RTICULARS /	OBSERVATION DATES 24/08/91	10/09/91
se, cal/sq.cm/day	397.690	382.184
:,kg/ha/day	468.657	452.387
),kg/ha/day	250.238	241.346
s, cal/sq,cm/day	460.342	451.826
mean temp. deg. C	29.674	28.591
),kg/ha/hr	65.000	65.000
:tive LAI	2.790	1.640
days	50.000	67.000
.	0.329	0.264
l	0.500	0.500
l	1.000	1.000

F=(Rse-Ø.5 Rs)/Ø.8 Rse	Ø.527	Ø.511
Yo, kg/ha/day	662.57Ø	648.844
Ymp, kg/ha	5449.637	5738.374
Ymp, gm/sq.m	544.964	573.837
Observed Ym,gm./sq.m	413.ØØØ	52Ø.ØØØ

COMMAND AREA OF: 45KB GOVT. TW PLOT NO: 2
SOWING DATE: 12/Ø6/91 HARVEST DATE :15/Ø9/91

PARTICULARS / OBSERVATION DATES	24/Ø8/91	1Ø/Ø9/91
Rse, cal/sq.cm/day	4Ø2.471	394.2Ø2
yc,kg/ha/day	473.539	465.474
yo,kg/ha/day	252.839	248.376
Rs, cal/sq,cm/day	471.623	468.Ø29
T,mean temp. deg. C	3Ø.358	29.742
ym,kg/ha/hr	65.ØØØ	65.ØØØ
Active LAI	3.45Ø	2.335
G,days	5Ø.ØØØ	67.ØØØ
cL	Ø.436	Ø.33Ø
cN	Ø.5ØØ	Ø.5ØØ
cH	1.ØØØ	1.ØØØ
F=(Rse-Ø.5 Rs)/Ø.8 Rse	Ø.518	Ø.5Ø8
Yo, kg/ha/day	675.178	669.639
Ymp, kg/ha	7359.437	74Ø2.858
Ymp, gm/sq.m	735.944	74Ø.286
Observed Ym,gm./sq.m	57Ø.ØØØ	598.ØØØ

COMMAND AREA OF: 45KB GOVT. TW PLOT NO: 3
SOWING DATE: 25/Ø6/91 HARVEST DATE :28/Ø9/91

PARTICULARS / OBSERVATION DATES	24/Ø8/91	1Ø/Ø9/91	25/Ø9/91
Rse, cal/sq.cm/day	399.868	39Ø.768	389.479
yc,kg/ha/day	47Ø.873	462.Ø24	46Ø.852
yo,kg/ha/day	251.428	246.518	245.852
Rs, cal/sq,cm/day	464.91Ø	462.2Ø3	464.425
T,mean temp. deg. C	29.919	29.296	29.135
ym,kg/ha/hr	65.ØØØ	65.ØØØ	65.ØØØ
Active LAI	2.53Ø	1.84Ø	1.39Ø
G,days	59.ØØØ	76.ØØØ	91.ØØØ
cL	Ø.353	Ø.284	Ø.239
cN	Ø.5ØØ	Ø.5ØØ	Ø.5ØØ
cH	1.ØØØ	1.ØØØ	1.ØØØ
F=(Rse-Ø.5 Rs)/Ø.8 Rse	Ø.523	Ø.511	Ø.5Ø5
Yo, kg/ha/day	667.744	662.917	664.95Ø
Ymp, kg/ha	6953.549	7154.2Ø3	7231.ØØ3
Ymp, gm/sq.m	695.355	715.42Ø	723.1ØØ
Observed Ym,gm./sq.m	449.ØØØ	556.ØØØ	563.ØØØ

COMMAND AREA OF: MACHAKAULI MI. PLOT NO: 1 CROP: MAIZE
SOWING DATE: 10/06/91 HARVEST DATE :11/09/91

PARTICULARS / OBSERVATION DATES	26/09/91		
Rse, cal/sq.cm/day	402.790	0.000	0.000
yc,kg/ha/day	473.866	0.000	0.000
yo,kg/ha/day	253.012	0.000	0.000
Rs, cal/sq,cm/day	472.446	0.000	0.000
T,mean temp. deg. C	30.412	0.000	0.000
ym,kg/ha/hr	65.000	0.000	0.000
Active LAI	2.420	0.000	0.000
G,days	74.000	0.000	0.000
cL	0.342	0.000	0.000
cN	0.500	0.000	0.000
cH	1.000	0.000	0.000
F=(Rse-0.5 Rs)/0.8 Rse	0.517	0.000	0.000
Yo, kg/ha/day	676.089	0.000	0.000
Ymp, kg/ha	8555.233	0.000	0.000
Ymp, gm/sq.m	855.523	0.000	0.000
Observed Ym,gm./sq.m	602.000		

COMMAND AREA OF: LAKHAOTI MI. PLOT NO: 1 CROP: MAIZE
SOWING DATE: 22/06/91 HARVEST DATE :16/09/91

PARTICULARS / OBSERVATION DATES	25/08/91	11/09/91	26/09/91
Rse, cal/sq.cm/day	400.308	390.976	0.000
yc,kg/ha/day	471.328	462.261	0.000
yo,kg/ha/day	251.664	246.634	0.000
Rs, cal/sq,cm/day	466.325	463.696	0.000
T,mean temp. deg. C	30.026	29.359	0.000
ym,kg/ha/hr	65.000	65.000	0.000
Active LAI	2.850	1.600	0.000
G,days	63.000	80.000	0.000
cL	0.385	0.315	0.000
cN	0.500	0.500	0.000
cH	1.000	1.000	0.000
F=(Rse-0.5 Rs)/0.8 Rse	0.522	0.509	0.000
Yo, kg/ha/day	669.281	664.494	0.000
Ymp, kg/ha	8116.707	8372.625	0.000
Ymp, gm/sq.m	811.671	837.263	0.000
Observed Ym,gm./sq.m	610.000	735.000	

COMMAND AREA OF: MUNDIBAKAPUR MI. PLOT NO: 1 CROP: MAIZE
SOWING DATE: 08/06/91 HARVEST DATE 08/09/91

PARTICULARS /	OBSERVATION DATES		
	25/08/91	11/09/91	26/09/91
Rse, cal/sq.cm/day	402.848	0.000	0.000
yc,kg/ha/day	473.930	0.000	0.000
yo,kg/ha/day	253.041	0.000	0.000
Rs, cal/sq,cm/day	472.828	0.000	0.000
T,mean temp. deg. C	30.449	0.000	0.000
ym,kg/ha/hr	65.000	0.000	0.000
Active LAI	2.240	0.000	0.000
G,days	77.000	0.000	0.000
cL	0.324	0.000	0.000
cN	0.500	0.000	0.000
cH	1.000	0.000	0.000
F=(Rse-0.5 Rs)/0.8 Rse	0.516	0.000	0.000
Yo, kg/ha/day	676.487	0.000	0.000
Ymp, kg/ha	8438.495	0.000	0.000
Ymp, gm/sq.m	843.850		
Observed Ym,gm./sq.m	740.000		

COMMAND AREA OF: 43 JB GOVT.TW PLOT NO;1 CROP:SORGHUM [fodder]
SOWING DATE: 10/06/91 HARVEST DATE:

PARTICULARS /	OBSERVATION DATES			
	22/08/91	08/09/91	23/09/91	06/10/91
Rse, cal/sq.cm/day	403.303	395.942	387.418	379.236
yc,kg/ha/day	474.385	467.172	458.937	451.410
yo,kg/ha/day	253.294	249.312	244.738	240.345
Rs, cal/sq,cm/day	473.278	468.931	467.927	467.164
T,mean temp. deg. C	30.442	29.904	29.219	28.907
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.000	1.980	2.250	2.070
G,days	72.000	89.000	105.000	118.000
cL	0.300	0.298	0.325	0.307
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.517	0.510	0.495	0.480
Yo, kg/ha/day	677.062	670.943	668.084	666.033
Ymp, kg/ha	7312.267	8897.377	11399.177	12063.852
Ymp, gm/sq.m	731.227	889.738	1139.918	1206.385
Observed Ym,gm./sq.m	672.000	720.000	1205.000	1107.000

COMMAND AREA OF: 43 JB GOVT.TW PLOT NO:2 CROP: SORGHUM [fodder]
SOWING DATE: 20/06/91 HARVEST DATE:

PARTICULARS /	OBSERVATION DATES			
	22/08/91	08/09/91	23/09/91	06/10/91
Rse, cal/sq.cm/day	401.532	393.621	384.560	372.480
yc,kg/ha/day	472.570	464.834	456.097	444.060
yo,kg/ha/day	252.335	248.055	243.196	236.370
Rs, cal/sq,cm/day	468.631	464.733	464.292	459.605

T,mean temp. deg. C	30.134	29.594	28.886	28.320
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.880	3.120	3.480	3.150
G,days	62.000	79.000	94.000	108.000
cL	0.492	0.420	0.438	0.412
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.521	0.512	0.495	0.479
Yo, kg/ha/day	671.926	666.135	663.745	655.916
Ymp, kg/ha	10248.211	11051.173	13663.856	14592.816
Ymp, gm/sq.m	1024.821	1105.117	1366.386	1459.282
Observed Ym,gm./sq.m	924.000	1008.000	1205.000	1259.000

COMMAND AREA OF: 43 JB GOVT.TW PLOT NO:3 CROP:SORGHUM [fodder]
SOWING DATE: 15/07/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	22/08/91	08/09/91	23/09/91	06/10/91
Rse, cal/sq.cm/day	395.027	385.501	374.923	365.229
yc,kg/ha/day	465.976	456.735	446.592	437.809
yo,kg/ha/day	248.764	243.627	237.969	232.774
Rs, cal/sq,cm/day	456.788	454.814	456.369	457.113
T,mean temp. deg. C	29.609	28.985	28.153	27.876
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.460	2.270	2.250	2.360
G,days	37.000	54.000	69.000	82.000
cL	0.346	0.327	0.325	0.360
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.527	0.513	0.489	0.468
Yo, kg/ha/day	658.279	654.116	653.538	653.044
Ymp, kg/ha	4213.642	5775.191	7327.794	9638.926
Ymp, gm/sq.m	421.364	577.519	732.779	963.893
Observed Ym,gm./sq.m	396.000	523.000	683.000	878.000

COMMAND AREA OF: 84 KB GOVT.TW PLOT NO:1 CROP:SORGHUM [fodder]
SOWING DATE: 14/07/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	23/08/91	09/09/91	24/09/91	07/10/91
Rse, cal/sq.cm/day	395.113	399.315	385.733	373.595
yc,kg/ha/day	466.063	473.220	459.494	448.066
yo,kg/ha/day	248.812	252.408	244.841	238.163
Rs, cal/sq,cm/day	456.902	472.175	469.956	468.518
T,mean temp. deg. C	29.612	30.005	28.952	28.588
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	1.540	1.690	1.790	1.980
G,days	39.000	54.000	69.000	82.000
cL	0.254	0.269	0.279	0.298
cN	0.500	0.500	0.500	0.500

cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.527	0.511	0.489	0.466
Yo, kg/ha/day	658.417	678.781	672.847	669.248
Ymp, kg/ha	3261.139	4929.988	6476.487	8176.875
Ymp, gm/sq.m	326.114	492.999	647.649	817.687
Observed Ym,gm./sq.m	260.000	377.000	548.000	692.000

COMMAND AREA OF: 84 KB GOVT.TW PLOT NO:2 CROP:SORGHUM [fodder]
SOWING DATE: 30/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	23/08/91	09/09/91	24/09/91	07/10/91
Rse, cal/sq.cm/day	404.333	389.491	382.798	375.491
yc,kg/ha/day	475.328	459.272	453.019	446.508
yo,kg/ha/day	253.841	245.136	241.635	237.774
Rs, cal/sq,cm/day	477.858	464.256	463.965	463.659
T,mean temp. deg. C	30.634	29.502	28.950	28.722
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	3.280	3.260	3.020	2.800
G,days	84.000	103.000	118.000	131.000
cL	0.422	0.416	0.402	0.380
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.511	0.505	0.492	0.478
Yo, kg/ha/day	681.785	662.580	661.124	659.941
Ymp, kg/ha	12083.957	14195.107	15680.540	16425.939
Ymp, gm/sq.m	1208.396	1419.511	1568.054	1642.594
Observed Ym,gm./sq.m	832.000	1040.000	1270.000	1430.000

COMMAND AREA OF: 84 KB GOVT.TW PLOT NO:3 CROP:SORGHUM [fodder]
SOWING DATE: 10/06/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	23/08/91	09/09/91	24/09/91	07/10/91
Rse, cal/sq.cm/day	403.043	386.693	379.704	374.869
yc,kg/ha/day	474.122	456.395	449.902	446.550
yo,kg/ha/day	253.151	243.548	239.910	237.695
Rs, cal/sq,cm/day	472.857	458.661	459.125	463.165
T,mean temp. deg. C	30.427	29.202	28.635	28.631
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.500	2.400	2.980	2.890
G,days	73.000	92.000	107.000	120.000
cL	0.350	0.340	0.380	0.389
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.517	0.509	0.494	0.478
Yo, kg/ha/day	676.569	656.139	655.440	660.208
Ymp, kg/ha	8643.167	10262.016	13325.093	15409.263
Ymp, gm/sq.m	864.317	1026.202	1332.509	1540.926
Observed Ym,gm./sq.m	704.000	902.000	1034.000	1276.000

COMMAND AREA OF: 45 KB GOVT TW PLOT NO:1 CROP:SORGHUM [fodder]
SOWING DATE: 20/05/91 HARVEST DATE:

PARTICULARS /	OBSERVATION DATES			
	24/08/91	10/09/91	25/09/91	08/10/91
Rse, cal/sq.cm/day	403.565	396.829	389.743	381.833
yc,kg/ha/day	473.528	467.120	460.383	453.256
yo,kg/ha/day	253.342	249.719	245.926	241.684
Rs, cal/sq,cm/day	490.408	484.701	482.016	480.037
T,mean temp. deg. C	30.406	29.909	29.348	29.121
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.100	2.700	2.381	2.200
G,days	95.000	112.000	127.000	140.000
cL	0.310	0.370	0.338	0.322
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.491	0.487	0.477	0.464
Yo, kg/ha/day	692.862	685.810	681.735	678.707
Ymp, kg/ha	10202.387	14209.977	14632.072	15298.051
Ymp, gm/sq.m	1020.239	1420.998	1463.207	1529.805
Observed Ym,gm./sq.m	905.000	1237.000	1332.000	1411.000

COMMAND AREA OF: 45 KB GOVT TW PLOT NO:2 CROP:SORGHUM [FODDER] SORGHUI
SOWING DATE: 12/06/91 HARVEST DATE:

PARTICULARS /	OBSERVATION DATES			
	24/08/91	10/09/91	25/09/91	08/10/91
Rse, cal/sq.cm/day	402.471	394.202	385.929	376.887
yc,kg/ha/day	473.539	465.474	457.484	449.278
yo,kg/ha/day	252.839	248.376	243.938	239.082
Rs, cal/sq,cm/day	471.623	468.029	467.155	466.438
T,mean temp. deg. C	30.358	29.742	29.081	28.839
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.220	2.290	2.080	1.950
G,days	72.000	89.000	104.000	117.000
cL	0.322	0.329	0.308	0.295
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.518	0.508	0.493	0.476
Yo, kg/ha/day	675.178	669.639	666.979	664.984
Ymp, kg/ha	7826.660	9803.849	10682.328	11475.965
Ymp, gm/sq.m	782.666	980.385	1068.233	1147.597
Observed Ym, gm/sq	672.000	813.000	937.000	1045.000

COMMAND AREA OF: 45 KB GOVT TW PLOT NO;3 CROP:SORGHUM [FODDER] SORGHUI
SOWING DATE: 25/06/91 HARVEST DATE:

PARTICULARS /	OBSERVATION DATES			
	24/08/91	10/09/91	25/09/91	08/10/91

Rse, cal/sq.cm/day	394.825	390.600	383.687	373.804
yc,kg/ha/day	464.765	461.909	454.895	447.896
yo,kg/ha/day	248.658	247.452	243.158	238.987
Rs, cal/sq,cm/day	461.123	463.125	464.568	461.121
T,mean temp. deg. C	29.864	29.876	28.654	28.121
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.210	2.450	2.370	2.430
G,days	59.000	76.000	91.000	104.000
cL	0.321	0.345	0.337	0.343
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.520	0.509	0.493	0.479
Yo, kg/ha/day	661.516	664.606	663.760	661.862
Ymp, kg/ha	6264.226	8712.982	10177.768	11804.964
Ymp, gm/sq.m	626.423	871.298	1017.777	1180.496
Observed Ym, gm/sq	593.000	807.000	856.000	936.000

COMMAND AREA OF: MACHAKAULI MI. PLOT NO:1 CROP:SORGHUM [fodder] SORGHU
SOWING DATE: 30/05/91/ HARVEST DATE:

PARTICULARS /	OBSERVATION DATES			
	26/08/91	12/09/91	27/09/91	10/10/91
Rse, cal/sq.cm/day	394.808	388.985	382.412	374.744
yc,kg/ha/day	464.170	458.799	452.658	445.860
yo,kg/ha/day	247.879	244.871	241.433	237.377
Rs, cal/sq,cm/day	466.466	464.234	463.948	463.628
T,mean temp. deg. C	29.915	29.460	28.918	28.720
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	1.630	2.080	1.950	1.650
G,days	37.000	104.000	119.000	132.000
cL	0.263	0.308	0.295	0.275
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.512	0.504	0.492	0.477
Yo, kg/ha/day	665.644	662.467	661.042	659.845
Ymp, kg/ha	7615.303	10610.078	11602.939	11976.180
Ymp, gm/sq.m	761.530	1061.008	1160.294	1197.618
Observed Ym,gm./sq.m	680.000	948.000	1040.000	1080.000

COMMAND AREA OF: LAKHAOTI MINOR PLOT NO:1 CROP:SORGHUM [fodder] SORGHU
SOWING DATE: 15/07/91 HARVEST DATE:

PARTICULARS /	OBSERVATION DATES			
	25/08/91	11/09/91	26/09/91	
Rse, cal/sq.cm/day	394.478	383.764	373.850	363.126
yc,kg/ha/day	465.424	455.069	445.564	435.979
yo,kg/ha/day	248.461	242.698	237.395	231.645
Rs, cal/sq,cm/day	456.055	455.069	456.527	457.173
T,mean temp. deg. C	29.596	28.848	28.069	27.889
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.670	2.317	2.170	1.980

G,days	39.000	56.000	71.000	84.000
cL	0.367	0.317	0.317	0.298
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.527	0.509	0.487	0.463
Yo, kg/ha/day	657.394	654.009	653.489	652.945
Ymp, kg/ha	4704.639	5804.988	7354.038	8172.262
Ymp, gm/sq.m	470.464	580.499	735.404	817.226
Observed Ym,gm./sq.m	464.000	584.000	712.000	740.000

COMMAND AREA OF: MUNDIBAKAPUR MI. PLOT NO:1 CROP:SORGHUM [fodder] SORGHU
SOWING DATE: 20/06/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	25/08/91	11/09/91	26/09/91	07/10/91
Rse, cal/sq.cm/day	394.825	391.544	383.085	373.804
yc,kg/ha/day	464.765	462.831	454.673	446.277
yo,kg/ha/day	248.161	246.941	242.404	237.421
Rs, cal/sq,cm/day	460.618	464.632	464.221	463.804
T,mean temp. deg. C	29.646	29.432	28.771	28.551
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	1.290	2.200	2.060	1.980
G,days	65.000	82.000	97.000	110.000
cL	0.229	0.323	0.306	0.298
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.521	0.508	0.493	0.475
Yo, kg/ha/day	660.639	665.578	663.365	661.693
Ymp, kg/ha	4916.803	8814.250	9845.006	10845.143
Ymp, gm/sq.m	491.680	881.425	984.501	1084.514
Observed Ym,gm./sq.m	471.000	792.000	823.000	947.000

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COMMAND AREA OF: 43 JB GOVT. TW PLOT NO: 1 CROP: ARHAR
SOWING DATE: 16/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	22/08/91	08/09/91	23/09/91	06/10/91
Rse, cal/sq.cm/day	403.775	397.959	390.852	386.168
yc,kg/ha/day	473.358	467.880	461.159	457.641
yo,kg/ha/day	253.429	250.300	246.498	244.249
Rs, cal/sq,cm/day	495.941	489.167	486.004	486.974
T,mean temp. deg. C	30.354	29.947	29.390	29.294
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	0.340	0.310	0.630	0.940
G,days	97.000	114.000	129.000	142.000
cL	0.200	0.200	0.200	0.200
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.482	0.482	0.473	0.462
Yo, kg/ha/day	257.052	254.043	251.011	249.810

Ymp, kg/ha	2493.406	2896.094	3238.039	3547.306
Ymp, gm/sq.m	249.341	289.609	323.804	354.731
Observed Ym,gm./sq.m	120.000	186.000	284.000	316.000

COMMAND AREA OF: 43 JB GOVT. TW PLOT NO: 2 CROP: ARHAR
SOWING DATE: 25/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	22/08/91	08/09/91	23/09/91	06/10/91
Rse, cal/sq.cm/day	404.260	397.866	390.238	385.297
yc,kg/ha/day	474.700	468.534	461.228	457.465
yo,kg/ha/day	253.759	250.308	246.220	243.846
Rs, cal/sq,cm/day	485.235	479.614	477.408	479.284
T,mean temp. deg. C	30.533	30.062	29.449	29.341
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	0.640	0.650	1.000	1.470
G,days	88.000	105.000	120.000	133.000
cL	0.200	0.200	0.200	0.247
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.500	0.497	0.485	0.473
Yo, kg/ha/day	256.207	253.072	249.931	248.752
Ymp, kg/ha	2254.618	2657.252	2999.173	4085.878
Ymp, gm/sq.m	225.462	265.725	299.917	408.588
Observed Ym,gm./sq.m	168.000	192.000	214.000	312.000

COMMAND AREA OF: 43 JB GOVT. TW PLOT NO: 3 CROP: ARHAR
SOWING DATE: 29/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	22/08/91	08/09/91	23/09/91	06/10/91
Rse, cal/sq.cm/day	404.508	397.819	389.934	384.871
yc,kg/ha/day	475.388	468.863	461.262	457.379
yo,kg/ha/day	253.928	250.313	246.083	243.649
Rs, cal/sq,cm/day	479.740	474.821	473.160	475.522
T,mean temp. deg. C	30.625	30.120	29.479	29.364
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	1.370	1.180	1.340	1.600
G,days	84.000	101.000	116.000	129.000
cL	0.237	0.218	0.234	0.260
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.509	0.504	0.492	0.478
Yo, kg/ha/day	255.766	252.579	249.394	248.231
Ymp, kg/ha	2545.898	2780.648	3384.772	4162.837
Ymp, gm/sq.m	254.590	278.065	338.477	416.284
Observed Ym,gm./sq.m	238.000	258.000	324.000	374.000

COMMAND AREA OF: 84 KB GOVT. TW PLOT NO: 1 CROP: ARHAR
SOWING DATE: 10/06/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	23/08/91	09/09/91	24/09/91	07/10/91
Rse, cal/sq.cm/day	403.043	399.556	390.597	384.480
yc,kg/ha/day	474.122	471.595	462.807	457.976
yo,kg/ha/day	253.151	251.658	246.793	243.781
Rs, cal/sq,cm/day	472.857	473.770	472.084	474.765
T,mean temp. deg. C	30.427	30.177	29.460	29.364
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	1.400	1.360	1.950	2.000
G,days	73.000	90.000	105.000	118.000
cL	0.240	0.236	0.295	0.300
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.517	0.509	0.495	0.478
Yo, kg/ha/day	254.394	253.608	249.942	248.444
Ymp, kg/ha	2228.491	2693.314	3870.984	4397.465
Ymp, gm/sq.m	222.849	269.331	387.098	439.747
Observed Ym,gm./sq.m	212.000	253.000	344.000	402.000

COMMAND AREA OF: 84 KB GOVT. TW PLOT NO: 2 CROP: ARHAR
SOWING DATE: 13/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	23/08/91	09/09/91	24/09/91	07/10/91
Rse, cal/sq.cm/day	403.442	400.725	393.520	388.316
yc,kg/ha/day	472.789	471.053	464.177	460.150
yo,kg/ha/day	253.228	252.078	248.190	245.631
Rs, cal/sq,cm/day	498.521	495.520	491.736	492.153
T,mean temp. deg. C	30.292	30.121	29.561	29.475
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	0.960	1.480	2.060	2.090
G,days	101.000	118.000	133.000	146.000
cL	0.200	0.248	0.306	0.309
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.478	0.477	0.469	0.458
Yo, kg/ha/day	257.157	256.169	252.989	251.510
Ymp, kg/ha	2597.289	3748.258	5148.065	5673.312
Ymp, gm/sq.m	259.729	374.826	514.806	567.331
Observed Ym,gm./sq.m	217.000	348.000	472.000	456.000

COMMAND AREA OF: 84 KB GOVT. TW PLOT NO: 3 CROP: ARHAR
SOWING DATE: 08/06/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	23/08/91	09/09/91	24/09/91	07/10/91

Rse, cal/sq.cm/day	403.342	399.876	391.039	384.977
yc,kg/ha/day	474.429	471.900	463.234	458.437
yo,kg/ha/day	253.313	251.823	247.025	244.039
Rs, cal/sq,cm/day	473.636	474.386	472.645	475.220
T,mean temp. deg. C	30.478	30.224	29.514	29.414
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	1.330	1.330	1.820	2.040
G,days	75.000	92.000	107.000	120.000
cL	0.233	0.233	0.282	0.304
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.516	0.509	0.495	0.478
Yo, kg/ha/day	254.612	253.803	250.178	248.679
Ymp, kg/ha	2224.672	2720.256	3774.441	4535.908
Ymp, gm/sq.m	222.467	272.026	377.444	453.591
Observed Ym,gm./sq.m	187.000	213.000	335.000	405.000

COMMAND AREA OF: 45KB GOVT.TW PLOT NO: 1 CROP: ARHAR
SOWING DATE: 20/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	24/08/91	10/09/91	25/09/91	08/10/91
Rse, cal/sq.cm/day	403.565	400.260	392.769	384.578
yc,kg/ha/day	473.528	471.185	463.968	456.508
yo,kg/ha/day	253.342	251.888	247.838	243.418
Rs, cal/sq,cm/day	490.400	488.652	485.500	483.197
T,mean temp. deg. C	30.406	30.171	29.579	29.331
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	0.640	0.670	0.880	1.010
G,days	95.000	112.000	127.000	140.000
cL	0.200	0.200	0.200	0.201
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.491	0.487	0.477	0.465
Yo, kg/ha/day	256.413	255.344	252.110	248.877
Ymp, kg/ha	2435.924	2859.856	3201.801	3501.701
Ymp, gm/sq.m	243.592	285.986	320.180	350.170
Observed Ym,gm./sq.m	204.000	267.000	275.000	300.000

COMMAND AREA OF: 45KB.GOVT.TW PLOT NO: 2 CROP: ARHAR
SOWING DATE: 10/06/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	24/08/91	10/09/91	25/09/91	08/10/91
Rse, cal/sq.cm/day	402.790	394.644	386.464	377.516
yc,kg/ha/day	473.866	465.917	458.015	449.889
yo,kg/ha/day	253.012	248.615	244.226	239.421
Rs, cal/sq,cm/day	472.446	468.778	467.814	467.037
T,mean temp. deg. C	30.412	29.799	29.143	28.898
ym,kg/ha/hr	5.000	5.000	5.000	5.000

Active LAI	1.120	1.160	1.500	1.740
G,days	74.000	91.000	106.000	119.000
cL	0.212	0.216	0.250	0.274
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.517	0.508	0.493	0.477
Yo, kg/ha/day	254.241	250.654	247.442	244.147
Ymp, kg/ha	1994.269	2463.427	3278.610	3980.329
Ymp, gm/sq.m	199.427	246.343	327.861	398.033
Observed Ym,gm./sq.m	180.000	209.000	300.000	369.000

COMMAND AREA OF: 45KB GOVT.TW PLOT NO: 3 CROP: ARHAR
SOWING DATE: 14/06/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	24/08/91	10/09/91	25/09/91	08/10/91
Rse, cal/sq.cm/day	402.133	393.741	385.373	376.237
yc,kg/ha/day	473.194	465.010	456.932	448.646
yo,kg/ha/day	252.656	248.127	243.637	238.732
Rs, cal/sq,cm/day	470.753	467.246	466.470	465.818
T,mean temp. deg. C	30.301	29.682	29.017	28.778
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	0.810	0.840	1.050	1.110
G,days	70.000	87.000	102.000	115.000
cL	0.200	0.200	0.205	0.211
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.518	0.508	0.493	0.476
Yo, kg/ha/day	253.765	250.106	246.849	243.508
Ymp, kg/ha	1776.358	2175.922	2580.809	2954.357
Ymp, gm/sq.m	177.636	217.592	258.081	295.436
Observed Ym,gm./sq.m	177.000	207.000	225.000	260.000

COMMAND AREA OF: MACHAKAULI MINOR PLOT NO: 1 CROP: ARHAR
SOWING DATE: 11/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	26/08/91	12/09/91	27/09/91	10/10/91
Rse, cal/sq.cm/day	402.818	392.890	386.798	378.923
yc,kg/ha/day	472.054	461.989	456.346	449.435
yo,kg/ha/day	252.877	247.258	244.034	239.837
Rs, cal/sq,cm/day	498.862	489.216	486.254	484.023
T,mean temp. deg. C	30.233	29.498	29.026	28.886
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	2.400	2.330	2.680	3.020
G,days	106.000	123.000	138.000	151.000
cL	0.340	0.323	0.368	0.401
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.476	0.472	0.464	0.452

Yo, kg/ha/day	256.913	251.674	249.100	246.104
Ymp, kg/ha	4629.575	4999.385	6325.152	7450.926
Ymp, gm/sq.m	462.957	499.939	632.515	745.093
Observed Ym,gm./sq.m	402.000	442.000	591.000	702.000

COMMAND AREA OF: LAKHAOTI MINOR PLOT NO: 1 CROP: ARHAR
SOWING DATE: 15/06/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	25/08/91	11/09/91	26/09/91	09/10/91
Rse, cal/sq.cm/day	401.705	384.016	377.078	368.358
yc,kg/ha/day	472.759	453.677	447.266	439.645
yo,kg/ha/day	252.421	242.066	238.468	233.866
Rs, cal/sq,cm/day	469.901	456.613	457.400	457.753
T,mean temp. deg. C	30.259	28.925	28.371	28.233
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	2.060	2.220	3.080	3.200
G,days	70.000	87.000	102.000	115.000
cL	0.306	0.322	0.408	0.416
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.519	0.507	0.492	0.473
Yo, kg/ha/day	253.467	244.119	241.744	238.809
Ymp, kg/ha	2714.849	3419.381	5030.215	5712.321
Ymp, gm/sq.m	271.485	341.938	503.022	571.232
Observed Ym,gm./sq.m	251.000	292.000	392.000	464.000

COMMAND AREA OF: MUNDIBAKAPUR MINOR PLOT NO: 1 CROP: ARHAR
SOWING DATE: 15/05/91 HARVEST DATE:

PARTICULARS / OBSERVATION DATES	25/08/91	11/09/91	26/09/91	09/10/91
Rse, cal/sq.cm/day	403.150	396.414	389.695	379.396
yc,kg/ha/day	472.689	466.345	460.000	450.055
yo,kg/ha/day	253.082	249.468	245.874	240.099
Rs, cal/sq,cm/day	495.390	489.420	486.324	480.862
T,mean temp. deg. C	30.306	29.814	29.289	28.926
ym,kg/ha/hr	5.000	5.000	5.000	5.000
Active LAI	2.060	2.150	3.500	3.800
G,days	101.000	118.000	133.000	146.000
cL	0.306	0.315	0.440	0.464
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5 Rs)/0.8 Rse	0.482	0.478	0.470	0.458
Yo, kg/ha/day	256.721	253.475	250.599	245.938
Ymp, kg/ha	3967.102	4710.834	7332.540	8330.417
Ymp, gm/sq.m	396.710	471.083	733.254	833.042
Observed Ym,gm./sq.m	385.000	448.000	656.000	745.000

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YIELD RESPONSE TO CROP MANAGEMENT, IN LAKHAOTI COMMAND.

COMMAND AREA OF: ^43 JB GOVT.TW CROP: SUGARCANE PLOT NO: ^1
SOWING DATE: 20/02/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	22/08/91	08/09/91	23/09/91	06/10/91
Rse,cal/sq.cm/day	374.074	373.279	370.725	370.458
yc,kg/ha/day	445.912	445.118	442.662	442.387
yo,kg/ha/day	237.424	236.999	235.639	235.496
Rs,cal/sq.cm/day	506.136	501.384	498.622	495.837
T,mean temp.deg.C	26.953	27.011	26.881	26.930
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	3.890	4.370	5.290	5.820
G,DAYS	182.000	199.000	214.000	227.000
cL	0.471	0.487	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.404	0.411	0.409	0.413
Yo,kg/ha/day	703.618	698.657	695.446	692.565
Ymp,kg/ha	30157.763	33854.493	37206.368	39303.064
Ymp, gm/sq.m	3015.776	3385.449	3720.637	3930.306
Observed Ym,gm/sq.m	2812.000	3110.000	3615.000	3814.000

COMMAND AREA OF: ^43 JB GOVT.TW CROP: SUGARCANE PLOT NO:
SOWING DATE: 25/12/90 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	22/08/91	08/09/91	23/09/91	06/10/91
Rse,cal/sq.cm/day	388.471	386.898	384.127	383.300
yc,kg/ha/day	472.158	469.798	466.492	465.181
yo,kg/ha/day	249.501	248.368	246.665	246.046
Rs,cal/sq.cm/day	551.127	544.446	539.880	535.766
T,mean temp.deg.C	27.445	27.457	27.330	27.349
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.520	4.730	5.480	5.650
G,DAYS	239.000	256.000	271.000	284.000
cL	0.491	0.493	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.363	0.370	0.372	0.376
Yo,kg/ha/day	770.251	761.876	755.853	750.727
Ymp,kg/ha	45194.092	48077.416	51209.014	53301.584
Ymp, gm/sq.m	4519.409	4807.742	5120.901	5330.158
Observed Ym,gm/sq.m	4496.000	4779.000	5072.000	5287.000

COMMAND AREA OF: ^43 JB GOVT.TW CROP: SUGARCANE PLOT NO:
SOWING DATE: 25/02/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	22/08/91	08/09/91	23/09/91	06/10/91

Rse,cal/sq.cm/day	445.137	438.095	430.828	423.974
yc,kg/ha/day	526.936	519.022	511.203	504.175
yo,kg/ha/day	281.679	277.365	273.076	269.101
Rs,cal/sq.cm/day	610.567	596.542	586.883	579.516
T,mean temp.deg.C	32.158	31.761	31.287	30.920
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.770	3.760	4.280	4.650
G,DAYS	177.000	194.000	209.000	222.000
cL	0.377	0.461	0.484	0.491
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.393	0.399	0.399	0.396
Yo,kg/ha/day	840.391	823.357	811.127	801.826
Ymp,kg/ha	28039.225	36818.077	41025.197	43700.312
Ymp, gm/sq.m	2803.923	3681.808	4102.520	4370.031
Observed Ym,gm/sq.m	2785.000	3607.000	4025.000	4304.000

YIELD RESPONSE TO CROP MANAGEMENT, IN LAKHAOTI COMMAND.

COMMAND AREA OF: 84 KB GOVT. TW CROP: SUGARCANE PLOT NO:1
SOWING DATE: 24/02/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	23/08/91	09/09/91	24/09/91	07/10/91
Rse,cal/sq.cm/day	376.844	375.555	372.802	369.109
yc,kg/ha/day	448.351	447.103	444.471	441.160
yo,kg/ha/day	238.916	238.227	236.760	234.785
Rs,cal/sq.cm/day	507.861	502.987	500.071	497.797
T,mean temp.deg.C	27.249	27.261	27.111	26.988
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	3.640	3.760	4.330	4.420
G,DAYS	179.000	196.000	211.000	224.000
cL	0.451	0.461	0.486	0.488
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.408	0.413	0.412	0.407
Yo,kg/ha/day	705.546	700.412	697.027	694.416
Ymp,kg/ha	28479.030	31643.219	35738.663	37954.008
Ymp, gm/sq.m	2847.903	3164.322	3573.866	3795.401
Observed Ym,gm/sq.m	2820.000	3082.000	3547.000	3613.000

COMMAND AREA OF: 84 KB GOVT. TW CROP: SUGARCANE PLOT NO:2
SOWING DATE: 24/02/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	23/08/91	09/09/91	24/09/91	07/10/91
Rse,cal/sq.cm/day	364.925	364.692	362.876	360.004
yc,kg/ha/day	437.866	437.558	435.766	433.179
yo,kg/ha/day	238.916	238.287	236.938	235.094
Rs,cal/sq.cm/day	507.866	503.422	500.719	498.587
T,mean temp.deg.C	26.001	26.110	26.048	25.991
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.500	4.670	5.800	6.110
G,DAYS	198.000	215.000	230.000	243.000
cL	0.490	0.493	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.380	0.387	0.388	0.384
Yo,kg/ha/day	708.420	703.540	700.360	697.000
Ymp,kg/ha	34365.454	37285.861	40270.700	42385.094
Ymp, gm/sq.m	3436.545	3728.586	4027.070	4238.509
Observed Ym,gm/sq.m	3350.000	3720.000	3975.000	4152.000

COMMAND AREA OF: 84 KB GOVT. TW CROP: SUGARCANE PLOT NO:3
SOWING DATE: 08/02/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	23/08/91	09/09/91	24/09/91	07/10/91
Rse,cal/sq.cm/day	366.652	366.277	364.332	361.343

yc,kg/ha/day	439.386	438.780	436.883	434.203
yo,kg/ha/day	232.495	232.372	231.396	229.829
Rs,cal/sq.cm/day	498.763	494.986	492.802	491.072
T,mean temp.deg.C	26.187	26.283	26.209	26.143
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	5.000	6.390	6.840	7.110
G,DAYS	195.000	212.000	227.000	240.000
cL	0.500	0.500	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.399	0.405	0.405	0.401
Yo,kg/ha/day	695.182	694.186	688.500	686.548
Ymp,kg/ha	33890.123	36791.858	39072.375	41192.880
Ymp, gm/sq.m	3389.012	3679.186	3907.238	4119.288
Observed Ym,gm/sq.m	3358.000	3638.000	3928.000	4085.000

COMMAND AREA OF: 45KB GOVT. TW CROP: SUGARCANE PLOT NO:1
SOWING DATE: 20/04/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	24/08/91	10/09/91	25/09/91	08/10/91
Rse,cal/sq.cm/day	399.749	394.893	389.347	382.862
yc,kg/ha/day	468.505	464.052	458.895	453.139
yo,kg/ha/day	233.426	232.953	231.486	229.081
Rs,cal/sq.cm/day	512.429	505.291	501.152	498.058
T,mean temp.deg.C	29.761	29.446	29.036	28.749
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.180	4.630	5.540	5.990
G,DAYS	125.000	142.000	157.000	170.000
cL	0.483	0.496	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.449	0.450	0.446	0.437
Yo,kg/ha/day	700.647	694.186	690.240	686.548
Ymp,kg/ha	21895.203	24446.454	27091.920	29178.290
Ymp, gm/sq.m	2189.520	2444.645	2709.192	2917.829
Observed Ym,gm/sq.m	2170.000	2345.000	2650.000	2865.000

COMMAND AREA OF: 45KB GOVT. TW CROP: SUGARCANE PLOT NO:2
SOWING DATE: 25/03/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	24/08/91	10/09/91	25/09/91	08/10/91
Rse,cal/sq.cm/day	391.500	388.230	384.017	378.746
yc,kg/ha/day	464.204	460.876	456.712	451.864
yo,kg/ha/day	251.175	248.979	246.407	243.331
Rs,cal/sq.cm/day	515.299	508.975	505.122	502.175
T,mean temp.deg.C	28.856	28.682	28.393	28.165
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.920	5.270	5.520	6.100
G,DAYS	151.000	168.000	183.000	196.000
cL	0.497	0.500	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000

F=(Rse-0.5Rs)/0.8Rse	0.449	0.431	0.428	0.421
Yo,kg/ha/day	720.515	713.090	708.000	704.309
Ymp,kg/ha	27036.234	29949.780	32391.000	34511.141
Ymp, gm/sq.m	2703.623	2994.978	3239.100	3451.114
Observed Ym,gm/sq.m	2610.000	2970.000	3196.000	3324.000

COMMAND AREA OF: 45KB GOVT. TW CROP: SUGARCANE PLOT NO:3
SOWING DATE: 20/03/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	24/08/91	10/09/91	25/09/91	08/10/91
Rse,cal/sq.cm/day	388.486	385.931	382.014	377.040
yc,kg/ha/day	458.867	456.159	452.483	448.029
yo,kg/ha/day	246.761	245.080	242.887	240.116
Rs,cal/sq.cm/day	514.024	508.008	504.335	501.512
T,mean temp.deg.C	28.563	28.400	28.181	27.898
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	2.288	3.470	3.700	3.730
G,DAYS	156.000	173.000	188.000	201.000
cL	0.329	0.338	0.456	0.458
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.424	0.427	0.425	0.419
Yo,kg/ha/day	713.486	713.090	708.000	704.309
Ymp,kg/ha	18309.478	20848.612	30347.712	32418.639
Ymp, gm/sq.m	1830.948	2084.861	3034.771	3241.864
Observed Ym,gm/sq.m	1724.000	1900.000	2860.000	3050.000

COMMAND AREA OF: MACHAKAULI MINOR CROP: SUGARCANE PLOT NO:
SOWING DATE: 16/03/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	26/08/91	12/09/91	27/09/91	10/10/91
Rse,cal/sq.cm/day	384.804	381.840	378.360	373.145
yc,kg/ha/day	457.085	449.632	446.574	442.146
yo,kg/ha/day	245.339	241.289	239.457	236.671
Rs,cal/sq.cm/day	512.192	506.769	503.305	500.606
T,mean temp.deg.C	28.354	28.191	27.956	27.764
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.450	4.610	5.520	5.720
G,DAYS	162.000	179.000	194.000	207.000
cL	0.489	0.492	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.418	0.421	0.419	0.412
Yo,kg/ha/day	713.486	700.805	697.067	694.141
Ymp,kg/ha	28278.479	30859.247	33807.750	35921.797
Ymp, gm/sq.m	2827.848	3085.925	3380.775	3592.180
Observed Ym,gm/sq.m	2728.000	2960.000	3192.000	3466.000

.....ND AREA OF: MACHAKAULI MINOR CROP: SUGARCANE PLOT NO:1
SOWING DATE: 16/03/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	26/08/91	12/09/91	27/09/91	10/10/91
Rse,cal/sq.cm/day	384.804	381.840	378.360	373.145
yc,kg/ha/day	457.085	449.632	446.574	442.146
yo,kg/ha/day	245.339	241.289	239.457	236.671
Rs,cal/sq.cm/day	512.192	506.769	503.305	500.606
T,mean temp.deg.C	28.354	28.191	27.956	27.764
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.450	4.610	5.520	5.720
G,DAYS	162.000	179.000	194.000	207.000
cL	0.489	0.492	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.418	0.421	0.419	0.412
Yo,kg/ha/day	713.486	700.805	697.067	694.141
Ymp,kg/ha	28278.479	30859.247	33807.750	35921.797
Ymp, gm/sq.m	2827.848	3085.925	3380.775	3592.180
Observed Ym,gm/sq.m	2728.000	2960.000	3192.000	3466.000

COMMAND AREA OF: MUNDIBAKAPUR MINOR CROP: SUGARCANE PLOT NO:1
SOWING DATE: 18/02/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	25/08/91	11/09/91	26/09/91	09/10/91
Rse,cal/sq.cm/day	389.332	386.082	382.153	376.835
yc,kg/ha/day	459.295	456.284	452.597	447.892
yo,kg/ha/day	245.598	243.868	241.772	238.914
Rs,cal/sq.cm/day	513.831	507.947	504.279	501.448
T,mean temp.deg.C	28.625	28.454	28.191	27.981
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	4.620	5.320	6.790	7.110
G,DAYS	156.000	173.000	188.000	201.000
cL	0.492	0.500	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.425	0.428	0.425	0.418
Yo,kg/ha/day	712.246	706.129	701.846	698.541
Ymp,kg/ha	27340.830	30540.079	32986.762	35101.685
Ymp, gm/sq.m	2734.083	3054.008	3298.676	3510.169
Observed Ym,gm/sq.m	2610.000	3020.000	3192.000	3466.000

COMMAND AREA OF: MUNDIBAKAPUR MINOR CROP: SUGARCANE PLOT NO:
SOWING DATE: 25/01/91 HARVEST DATE:

PARTICULARS	OBSERVATION DATES			
	25/08/91	11/09/91	26/09/91	09/10/91
Rse,cal/sq.cm/day	357.766	357.663	356.378	353.512
yc,kg/ha/day	431.471	431.261	429.953	427.408
yo,kg/ha/day	245.598	244.285	242.638	240.351
Rs,cal/sq.cm/day	491.897	489.027	487.331	485.969

T,mean temp.deg.C	25.737	25.823	25.780	25.737
ym,kg/ha/hr	65.000	65.000	65.000	65.000
Active LAI	5.140	6.230	7.080	7.620
G,DAYS	211.000	228.000	243.000	256.000
cL	0.500	0.500	0.500	0.500
cN	0.500	0.500	0.500	0.500
cH	1.000	1.000	1.000	1.000
F=(Rse-0.5Rs)/0.8Rse	0.391	0.395	0.395	0.391
Yo,kg/ha/day	697.799	694.103	691.538	689.487
Ymp,kg/ha	36808.890	39563.852	42010.933	44127.195
Ymp, gm/sq.m	3680.889	3956.385	4201.093	4412.720
Observed Ym,gm/sq.m	3626.000	3868.000	4104.000	4302.000

ANNEXURE-14

Rainfall Records of Bulandshahar R.G. Station
(Dec. 1990 to Sept. 1991) Rainfall in Centimetres

Dates	Rainfall for the Month of				
	Dec.90	Jan.91	Feb.91	March91	April,91
1.	-	-	-	-	-
2.	-	-	-	-	-
3.	-	-	-	-	-
4.	-	-	-	-	-
5.	-	-	-	-	-
6.	-	-	-	-	-
7.	-	-	-	-	-
8.	-	-	-	-	-
9.	-	-	-	-	-
10.	-	-	-	-	-
11.	-	-	-	-	-
12.	-	-	127	-	-
13.	-	-	-	-	-
14.	-	-	-	-	-
15.	-	-	-	-	-
16.	-	-	-	-	-
17.	-	-	-	-	-
18.	-	-	-	-	-
19.	-	-	-	-	-
20.	-	-	-	-	-
21.	-	-	-	-	-
22.	-	-	-	-	-
23.	-	-	-	-	-
24.	-	-	-	-	-
25.	-	-	-	-	-
26.	-	-	0.22	-	-
27.	-	-	-	-	-
28.	-	-	-	-	-
29.	-	-	-	-	-
30.	-	2.77	-	-	-
31.	-	-	-	-	-

Annexure - 14 - Contd,

Sl.No.	May,91	June,91	July,91	Aug.91	Sept.91
1.	-	-	-	-	0.08
2.	-	-	-	-	1.65
3.	-	-	-	6.00	-
4.	-	-	-	6.58	2.02
5.	-	-	-	2.54	-
6.	-	2.00	-	1.27	0.22
7.	-	-	-	1.27	0.22
8.	-	-	-	0.40	0.12
9.	-	-	-	-	0.05
10.	-	-	-	-	-
11.	-	-	-	-	-
12.	-	-	-	-	-
13.	-	-	-	-	-
14.	-	-	-	-	0.35
15.	-	-	-	-	0.20
16.	-	-	-	-	-
17.	-	-	-	-	-
18.	-	-	-	-	-
19.	-	0.31	-	2.54	-
20.	-	-	-	1.97	-
21.	-	-	-	0.22	-
22.	-	-	-	-	-
23.	-	-	-	-	-
24.	-	-	-	0.22	-
25.	-	-	-	0.13	-
26.	-	-	-	0.41	-
27.	-	-	-	10.16	-
28.	-	-	-	7.62	-
29.	-	-	-	5.08	-
30.	-	-	-	1.17	-
31.	-	-	-	1.80	-

Source: Agriculture Training Centre, Bulandshahar

ANNEXURE-15

Root Development (Root Depth) Study - Crop: Maize

Sl. No.	Plot No & Dt.	Tubewells Command: 43 JB 1	2	3	Date	84 KB 1	2	3	Date	45 KB 1	2	3	Date	Canal Commands: MM 1	Date	LM-1 1	MBM-2 2
1.	22.8.91	950	1000	900	23.8.91	800	800	800	24.8.91	650	800	750	26.8.91	800	25.8.91	800	800
2.	8.9.91	950	1000	900	9.9.91	800	900	800	10.9.91	700	800	800	12.9.19	-	11.9.91	-	-
3.	23.9.91	-	-	-	24.9.91	-	900	-	25.9.91	-	-	800	27.9.91	-	26.9.91	-	-
4.	6.10.91	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
									Crop: Sorghum (Fodders)								
1.	22.8.91	800	700	450	23.8.91	500	900	800	24.8.91	800	700	500	26.8.91	650	25.8.91	500	500
2.	8.9.91	900	850	600	9.9.91	700	900	800	10.9.91	850	800	600	12.9.91	800	11.9.91	700	750
3.	23.9.91	900	850	800	24.9.91	750	900	800	25.9.91	850	800	800	27.9.91	800	26.9.91	800	900
4.	6.10.91	900	850	800	7.10.91	750	900	800	8.10.91	850	800	800	10.10.91	800	9.10.91	800	900
									Crop: Arhar (Pigeon-Pea)								
Sl. No.	PlotNo. & Date	1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
1.	22.8.91	700	600	400	23.8.91	450	500	450	24.8.91	500	400	400	26.8.91	400	25.8.91	400	600
2.	8.9.91	800	700	450	9.9.91	500	500	500	10.9.91	500	450	450	12.9.91	500	11.9.91	450	600
3.	23.9.91	800	800	500	24.9.91	500	500	500	25.9.91	500	500	450	27.9.91	500	26.9.91	500	600
4.	6.10.91	800	800	500	7.10.91	500	500	500	8.10.91	550	500	500	10.10.91	500	9.10.91	500	600
									Crop: Sugarcane								
Sl. No.	Plot No. & Date	1	2	3	Date	1	2	3	Date	1	2	3	Date	1	Date	1	2
1.	22.8.91	1200	1500	900	23.8.91	1200	1200	1200	24.8.91	950	1300	1200	26.8.91	1200	25.8.91	1300	1400
2.	8.9.91	1300	1500	1100	9.9.91	1200	1200	1200	10.9.91	1000	1300	1200	12.9.91	1200	11.9.91	1300	1400
3.	23.9.91	1400	1500	1200	24.9.91	1200	1200	1200	25.9.91	1200	1300	1300	27.9.91	1200	26.9.91	1300	1400
4.	6.10.91	1400	15000	1200	7.10.91	1200	1200	1300	8.10.91	1300	1300	1300	10.10.91	1200	9.10.91	1300	1400

MM - Machcauli Minor, LM - Lakhaoti Minor, MBM - Mundi Bakapur Minor

ANNEXURE-16(a)

Water Related Yield Constraint Analysis in Lakhaoti Command
Dist. Bulandshahar

Crop : Maize

Plot No. 43 JB (1)

Sowing Date: 20.5.91

Sl. No.	Particulars	Analysis Dates				
		20/5/91-10/6/91	10/6/91-15/7/91	15/7/91-21/8/91	21/8/91-22/8/91	22/8/91-8/9/91
1.	Duration days	20	35	18	20	17
2.	ETo mm/day	6.60	6.36	4.85	4.50	4.53
3.	Kc	0.30	0.70	1.05	1.05	0.80
4.	ETm mm/day	1.98	4.56	5.09	4.73	3.62
5.	Rainfall mm	20	3.1	-	219.40	300.80
6.	Effective Rainfall(mm)	20	3.1	-	142.44	85
7.	Runoff & Peredation (mm)	-	-	100	76.96	215.8
8.	Net irrigation application(mm)	-	100	100	76.96	215.8
9.	Rooting depth, D (m)	0.25*	0.70*	0.90*	0.95	0.95
10.	Field Capacity (mm/m)	333	304.5	282	333	333
11.	PWP mm/m	116	116	116	116	116
12.	Available soil moisture SA, mm/m	217	188.50	166	217	217
13.	Sa*D mm	54.25	131.95	149.40	206.15	206.15
14.	p fraction table 20FA 033	0.88	0.65	0.60	0.63	0.74
15.	ETa mm/day	1.58	3.59	5.08	4.25	3.60
16.	1-ETa/ETm	0.20	0.23	0.004	0.101	0.005
17.	Ky table 24, FA033	0.40	1.50	0.50	0.50	0.20
18.	1-Ya/Ym fraction	0.08	0.348	0.002	0.05	0.001
19.	Yield decrease due to water deficit in percent	8%	34.8%	Neglegible	5.0%	0.11%
20.	Remarks					

* Interpolated rooting depth

Annexure : 16(a)Contd/---

Crop P: Maize, Plot No. 43 JB (2)
Sowing Date: 25.5.91

Particulars	Analysis Dates			
	25.5.91 to 20.6.91	20.6.91 to 20.7.91	20.7.91 to 22.8.91	23.8.91 t 8.9.91
1. Duration Days	25	30	33	17
2. ETo mm/day	7.12	5.75	4.62	4.54
3. Kc	0.30	0.70	1.05	0.80
4. ETm mm/day	2.14	4.03	4.85	3.63
5. Rainfall mm	20	-	219.40	300.80
6. Effective rainfall mm	20	-	72.75	177.24
7. Runoff and peredation	-	-	73.90	123.56
8. Net irrigation application mm	-	50	50	-
9. Field capacity mm/m	0.30*	0.75*	1.00	1.00
10. Field capacity mm/m	333	330.25	333	333
11. PWP mm/m	116	116	116	116
12. Available soil moisture mm/m	217	214.25	217	217
13 Sa.D. mm	65.10	160.68	217	217
14. p fraction table 20 FA033	0.87	0.70	0.61	0.74
15. ETa mm/day	2.11	4.00	4.72	3.61
16. 1-ETa/ETm	0.01	0.07	0.028	0.05
17. Ky table 24 FA033	0.40	1.50	0.5	0.20
18. 1-Ya/Ym	0.005	0.01	0.013	0.001
19. Yield decreased due to water deficit in perecent	0.56(Negle-gible)	1.11(Negli-ble)	1.34%	0.11%
20. Remarks				

*Interpolated rooting depth

ANNEXURE 16(a)contd/---

Crop : Maize : Plot No. 43 JB(3)

Sowing :Date : 10.6.91

Particulars	Analysis Dates				
	10.6.91 to 30.6.91	30.6.91 to 20.7.91	20.7.91 to 5.8.91	5.8.91 to 22.8.91	22.8.91 to 8.9.
1. Duration days	20	20	15	17	17
2. ETo mm/day	7.47	4.89	4.76	4.50	4.53
3. Kc	0.30	0.70	0.70	1-05	1.05
4. ETm mm/day	2.241	3.42	3.332	4.73	4.76
5. Rainfall mm	-	-	151.20	68.20	300.80
6. Effective rainfall mm	-	-	35.20	49.65	60.18
7. Runoff & percolation	-	-	116	18.55	180.44
8. Net irrigation application	-	-	75	-	-
9. Rooting depth	0.25*	0.60*	0.80*	0.90	0.90
10. F.C. mm/m	333	286.60	333	333	333
11. PWP mm/m	116	116	116	116	116
12. Available soil moisture mm/m	217	172.60	217	217	217
13. Sa.D. mm	54.25	103.56	173.60	195.3	195.3
14. p fraction	0.86	0.76	0.77	0.65	0.65
15. ETa mm/day	2.22	3.29	3.31	3.54	3.60
16. 1-ETa/ETm	0.09	0.038	0.006	0.25	0.243
17. Ky table 24 FA033	0.40	1.50	1.50	0.50	0.50
18. 1-ya/ym	0.0035	0.057	0.01	0.1257	0.1218
19. Yield decrease due to water deficit in percent	0.35%	5.70%	1.00%	12.57%	12.18%
20. Remarks					

*Interpolated rooting depth

Annexure 16(a)-Contd/----

Crop : Maize : Plot No. 84 KB(1)
Sowing Date : 29.6.91

Particulars	Analysis Dates			
	29.6.91 to 19.7.91	19.7.91 to 23.8.91	23.8.91 to 9.9.91	9.9.91 to 24.9.91
1. Duration days	20	34	17	15
2. ETo mm/day	4.89	4.56	4.54	4.51
3. Kc	0.30	0.70	1.05	0.80
4. ETm mm/day	1.47	3.19	4.76	3.66
5. Rainfall mm	-	219.40	300.80	-
6. Effective rainfall mm	--	29.40	99.62	-
7. Runoff and percolation mm	-	160.60	201.18	-
8. Net irrigation application mm	-	-	-	-
9. Rooting depth	0.30*	0.50*	0.80	0.80
10. Field capacity FC mm/m	333	333	333	259.56
11. PWP mm/m	116	116	116	116
12. Available soil moisture Sa/mm/m	217	217	217	143.56
13. Sa.D. mm	65.10	108.50	173.60	114.85
14. p. fraction	0.80	0.78	0.63	0.65
15. Ea mm/day	1.47	2.93	4.32	3.27
16. 1-Ea/ETm	-	0.08	0.09	0.106
17. Ky (from Table24)	0.40	1.50	0.50	0.50
18. 1-ya/ym	1.0	0.12	0.046	0.053
19. Yield decrease due to water deficit	Adequate moisture	12.22%	4.62%	5.33%
20. Remarks				

*Rooting depth by interpolation

ANNEXURE 16(a) -Contd/-----

Crop : Maize - Plot No. 84 KB(2)

Sowing Date : 5.6.91

S.No.	Particulars	Analysis Dates						
		5.6.91 to 20.6.91	20.6.91 to 6.7.91	5.7.91 to 15.7.91	15.7.91 to 25.7.91	27.7.91 to 6.8.91	6.8.91 to 23.8.91	23.8.9 to 9.9.9
1.		20	15	10	10	12	17	17
2.		7.47	6.61	4.89	4.89	4.54	4.50	4.53
3.		0.30	0.70	0.70	0.70	1.05	1.05	0.80
4.		2.24	4.63	3.42	3.42	4.76	4.73	3.62
5.		20	3.10	-	-	172.10	56.10	300.80
6.		20	3.10	-	-	64.55	31.68	66.81
7.		-	-	-	-	107.55	24.42	233.99
8.		-	-	50	50	-	-	-
9.		0.30*	0.45*	0.50*	0.60*	0.80	0.90	0.90
10.		333	302.10	286.25	302.45	333	333	333
11.		116	116	116	116	116	116	116
12.		217	186.10	170.25	186.45	217	217	217
13.		65.10	83.745	85.13	11.87	173.60	195.3	195.30
14.		0.86	0.64	0.74	0.74	0.62	0.62	0.74
15.		1.70	4.39	3.38	3.40	2.64	3.93	3.61
16.		0.24	0.05	0.011	0.005	0.44	0.169	0.002
17.		0.40	1.50	1.50	1.5	0.50	0.50	0.20
18.		0.0694	0.0777	0.0175	0.008	0.0222	0.0845	0.0005
19.		6.94%	7.77%	1.75%	0.87%	2.22%	8.46%	Negleg
20.	Remarks							

*Rooting depth of interpolation

ANNEXURE 16(a)-Contd/----

Crop : Maize - Plot No. 84 KB(3)

Sowing Date : 14.6.91

Sl.No.	Particulars	Analysis Dates			
		14.6.91 to 5.7.91	5.7.91 to 10.8.91	10.8.91 to 23.8.91	23.8.91 to 9.9.91
1.		21	35	13	17
2.		6.86	6.62	4.50	4.53
3.		0.30	0.70	1.05	0.80
4.		2.06	4.64	4.73	3.62
5.		3.10	172.70	47.30	300.80
6.		3.10	28.35	47.30	148.77
7.		-	144.35	-	152.03
8.		-	-	-	-
9.		0.30*	0.70*	0.80	0.80
10.		333	333	245.20	333
11.		116	116	116	116
12.		217	217	129.20	217
13.		65.10	151.90	103.36	173.60
14.		0.86	0.64	0.65	0.74
15.		1.35	3.86	4.69	3.62
16.		0.34	0.164	0.008	-
17.		0.40	1.50	0.50	0.50
18.		0.1378	0.2469	0.004	1
19.		13.78%	24.69%	0.42%	-Crop damaged due to excess rainfall
20.	Remarks				

*Rooting depth by interpolation

ANNXURE 16(a)-Contd/-

Crop : Maize - Plot No. 45 KB(1)
Sowing Date: 4.7.91

Sl.No.	Particulars	Analysis Data				
		4.7.91-27.7.91	27.7.91-6.8.91	6.8.91-24.8.91	24.8.91-10.9.91	10.9.91-25.9.91
1.		23	9	18	17	15
2.		4.89	4.63	4.50	4.54	4.57
3.		0.30	0.70	0.70	1.05	1.05
4.		1.47	3.21	3.15	4.77	4.79
5.		-	167.30	57.40	304.60	-
6.		-	33.81	28.89	53.80	-
7.		-	133.49	28.51	248.80	-
8.		-	75	-	-	30
9.		0.30*	0.40*	0.50*	0.65	0.70
10.		333	333	333	333	282.25
11.		116	116	116	116	116
12.		217	217	217	217	166.25
13.		65.10	86.80	108.50	141.05	116.38
14.		0.87	0.78	0.60	0.61	0.61
15.		1.47	3.21	3.10	4.75	4.78
16.		0	0	0.015	0.002	0.0001
17.		0.40	1.50	1.50	0.50	0.50
18.		0	0	0.022	0.001	0.0005
19.		No deficit	No deficit	2.29%	0.14	Neglecte
20.	Remarks	* Rooting depth by interpolation				

ANNEXURE 16(a)-Contd/-

Crop : Maize Plot No. 45 KB(2)

Sowing Date : 12.6.91

Sl.No.	Particulars	Analysis Data					
		12.6.91-22.6.91	22.6.91-3.7.91	3.7.91-20.7.91	20.7.91-4.8.91	4.8.91-24.9.91	24.9.91-10.9.91
1.		10	10	17	14	20	15
2.		5.73	6.70	4.89	4.77	4.56	4.57
3.		0.3	0.3	0.7	0.70	1.05	1.05
4.		1.72	2.01	3.42	3.34	4.79	4.79
5.		3.10	-	-	125.80	94.20	305.90
6.		3.10	-	-	-	-	93
7.		-	-	-	-	-	212.90
8.		-	50	50	50	50	-
9.		0.15*	0.30*	0.50*	0.60*	0.80	0.80
10.		333	333	333	333	333	333
11.		116	116	116	116	116	116
12.		217	217	217	217	217	217
13.		32.55	65.10	108.50	130.20	173.60	173.60
14.		0.87	0.87	0.74	0.74	0.65	0.65
15.		1.72	2.01	2.74	3.34	4.65	3.62
16.		0	0	0.197	0	0.027	0.24
17.		0.40	0.40	1.50	1.50	0.50	0.50
18.		0	0	0.196	0	0.013	0.122
19.		No deficit	No deficit	19.66%	No deficit	1.37%	12.20%
20.	Remarks	* Rooting depth by interpolation					

ANNEXURE 16(a)-Contd/-

Crop : Maize Plot No. 45 KB(3)
Sowing Date : 25.6.91

Sl.No.	Particulars	Analysis Data				
	25.6.91-10.7.91	10.7.91-30.7.91	30.7.91-8.8.91	8.8.91-24.8.91	24.8.91-10.9.91	10.9.91-25.9.91
1.	15	20	9	16	17	15
2.	5.75	4.89	4.50	4.5	4.53	4.57
3.	0.30	0.30	0.70	0.7	0.70	1.05
4.	1.73	1.47	3.15	3.15	3.17	4.78
5.	-	-	172	49.50	304.60	-
6.	-	-	29.40	28.35	50.40	-
7.	-	-	142.60	21.15	254.20	-
8.	-	50	-	-	-	-
9.	0.15*	0.30*	0.70*	0.75	0.80	0.80
10.	333	333	333	333	333	279.11
11.	116	116	116	116	116	116
12.	217	217	217	217	217	163.11
13.	32.55	65.10	151.90	162.75	173.6	130.48
14.	0.87	0.87	0.78	0.78	0.78	0.61
15.	1.67	1.47	3.15	3.15	3.17	4.73
16.	0.031	0	Ø	0	0	0.008
17.	0.40	0.40	1.50	1.5	1.5	0.50
18.	0.012	0	0	0	0	0.004
19.	1.24%	No deficit	No deficit	No deficit	No deficit	0.44%
20. Remarks	* Rooting depth by interpolation					

ANNEXURE 16(a)-Contd/-

Crop : Maize Plot No. Machakauli Minor
Sowing Date : 8.6.91

Sl.No.	Particulars	Analysis Data			
		8.6.91-25.6.91	25.6.91-16.7.91	16.7.91-28.7.91	28.7.91-26.8.91
1.		17.	21	12	28
2.		4.89	5.50	4.89	4.50
3.		0.30	0.70	0.70	1.05
4.		1.47	3.85	3.42	4.73
5.		-	-	-	329.60*
6.		-	-	-	-
7.		-	-	-	329.60
8.		-	100	100	100
9.		0.15+	0.35+	0.50+	0.80
10.		333	333	333	333
11.		116	116	116	116
12.		217	217	217	217
13.		32.55	75.95	108.50	173.60
14.		0.87	0.71	0.74	0.63
15.		1.368	3.30	3.42	4.59
16.		0.069	0.14	0	0.027
17.		0.40	1.50	1.50	0.50
18.		0.0277	0.211	0	0.0139
19.		2.77%	21.12%	No deficit	1.39%
20.	Remarks	* Rainfall is not accounted. Excessive rain damaged crop.			
		+ Rooting depth by interpolation			

ANNEXURE 16(a)-Contd/-

Crop : Maize Plot No.: Lakhaoti Minor

Sowing Date : 10.6.91

Sl.No.	Particulars	Analysis Data				
		10.6.91-26.6.91	26.6.91-10.7.91	10.7.91-25.7.91	25.7.91-14.8.91	14.8.91 25.8.91
1.		16	14	15	19	11
2.		7.47	5.63	4.89	4.60	4.50
3.		0.30	0.30	0.70	0.70	1.05
4.		2.24	1.69	3.42	3.22	4.73
5.		-	-	-	172.70	54.90
6.		-	-	-	-	-
7.		-	-	-	-	-
8.		-	100	100	100	100
9.		0.30*	0.40*	0.50*	0.80*	0.80
10.		333	333	333	333	333
11.		116	116	116	116	116
12.		217	217	217	217	217
13.		65.10	86.80	108.50	173.60	173.60
14.		0.85	0.87	0.74	0,78	0.63
15.		2.24	1.69	3.42	3.22	4.73
16.		0	0	0	0	0
17.		0.40	0.40	1.50	1.50	0.50
18.		0	0	0	0	0
19.		No deficit	No deficit	No deficit	No deficit	No deficit

*Rooting depth by interpolation

ANNEXURE-16(a)-Contd/----

Crop : Maize - Plot No. Mundibakarpur Minor - 1

Sowing Date : 22.6.91

Sl.No.	Particulars	Analysis Data			
		22.6.91-10.7.91	10.7.91-25.7.91	25.7.91-12.8.91	12.8.91-25.8.91
1.		18	15	17	13
2.		6.04	4.89	4.52	4.50
3.		0.30	0.30	0.70	0.70
4.		1.81	1.74	3.16	3.15
5.		-	-	172.10	54.90
6.		-	-	22.05	53.72
7.		-	-	150.05	1.18
8.		-	100	100	100
9.		0.20*	0.40*	0.60*	0.80
10.		333	333	333	333
11.		116	116	116	116
12.		217	217	217	217
13.		43.4	86.80	130.20	173.60
14.		0.87	0.87	0.78	0.78
15.		1.62	1.47	3.16	3.15
16.		0.10	0	0	0
17.		0.40	0.40	1.50	1.50
18.		0.04	0	0	0
19.		4.06%	No Deficit	No Deficit	No Deficit

*Rooting depth by interpolation

Annexure-16(b)

Crop : Sorghum (Fodder) - Plot No. 43 JB(1)
Sowing Date : 10.6.91

Sl.No.	Particulars	Analysis Data					
		10.6.91-30.6.91	30.6.91-3.8.91	3.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91-6.10.91
1.	Duration, days	20	33	19	17	15	13
2.	ETo mm/day	7.47	4.89	4.50	4.54	4.57	3.98
3.	Kc	0.30	0.70	1.00	1.00	1.00	0.75
4.	ETm mm/day	2.24	3.42	4.50	4.54	4.57	2.98
5.	Rainfall mm	3.10	-	219.40	308.10	-	-
6.	Effective rainfall mm	3.10	-	126.77	85.50	-	-
7.	Runoff of percolation mm	-	-	92.63	216.30	-	-
8.	Net Irrigation application mm	-	-	-	-	-	-
9.	Rooting Depth, D/mm	0.20*	0.50*	0.60*	0.80	0.90	0.90
10.	Field Capacity Fc, mm/m	333	291.70	333	333	268.74	205.44
11.	PWP mm/m	116	116	116	116	116	116
12.	Available soil moisture Sa/mm/m	217	175.70	217	217	152.74	89.44
13.	Sa x D. mm	43.40	87.85	130.20	173.60	133.47	80.94
14.	Fraction p	0.84	0.76	0.65	0.65	0.65	0.80
15.	ETa mm/day	2.065	2.59	4.49	3.78	4.22	2.40
16.	1-ETa/ETm	0.0778	0.24	0	0.16	0.076	0.19
17.	Ky from table 24 FA033	0.20	0.55	0;45	0.45	0.45	0.20
18.	1-ya/ym	0.0155	0.1334	0	0.0749	0.0342	0.0385
19.	Yield decrease due to water deficit %	1.55%	13.34%	No Deficit	7.49%	3.42%	3.85%

*Rooting depth by interpolation

ANNEXURE-16(b)

Crop : Sorghum (Fodder)Plot No.43 JB(1)
Sowing Date: 10.6.91

Sl.No.	Particulars	Analysis Date					
		10.6.91-30.6.91	30.6.91-3.8.91	3.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91-6.10.91
1.		20	33	19	17	15	13
2.		7.47	4.89	4.50	4.54	4.57	3.98
3.		0.30	0.70	1.00	1.00	1.00	0.75
4.		2.24	3.42	4.50	4.54	4.57	2.98
5.		3.10	-	219.40	308.10	-	-
6.		3.10	-	126.77	85.50	-	-
7.		-	-	92.63	216.30	-	-
8.		-	-	-	-	-	-
9.		0.20*	0.50*	0.60*	0.80	0.90	0.90
10.		333	291.70	333	333	368.74	205.44
11.		116	116	116	116	116	116
12.		217	175.70	217	217	152.74	89.44
13.		43.40	87.85	130.20	173.60	137.47	80.49
14.		0.84	0.76	0.45	0.65	0.45	0.80
15.		2.065	2.59	4.49	3.78	4.22	2.40
16.		0.0778	0.24	0.12	0.16	0.076	0.19
17.		0.20	0.55	0.45	0.45	0.45	0.20
18.		0.0155	0.1334	0	0.0749	0.0342	0.0385
19.		1.55%	13.34%	No deficit	7.49%	3.42%	3.85%

Remarks * Rooting depth by interpolation

Crop : Sorghum - Plot No. 43 JB(2)

Sowing Date: 20.6.91

Sl.No.	Particulars	Analysis Dates				
	26.6.91-10.7.91	10.7.91-31.7.91	31.7.91-24.8.91	24.8.91-8.9.91	8.9.91-24.9.91	24.9.91-6.10.91
1.	14	31	24	15	16	13
2.	5.62	4.89	4.50	4.54	4.57	3.98
3.	0.30	0.70	0.85	1.00	1.00	1.00
4.	1.69	3.42	3.83	4.54	4.57	3.98
5.	-	-	220	305.40	-	-
6.	-	-	96.95	88.56	-	-
7.	-	-	123.05	216.84	-	-
8.	-	-	-	-	-	-
9.	0.15*	0.40*	0.70	0.85	0.85	0.85
10.	333	313.24	333	333	292.65	226.25
11.	116	116	116	116	116	116
12.	217	197.26	217	217	176.65	110.25
13.	32.55	78.90	151.90	184.45	150.125	93.71
14.	0.87	0.76	0.71	0.65	0.65	0.70
15.	1.41	2.49	3.69	2.69	4.15	3.66
16.	0.16	0.27	0.035	0.40	0.095	0.078
17.	0.20	0.55	0.50	0.45	0.45	0.20
18.	0.032	0.149	0.0177	0.1827	0.0411	0.0156
19.	3.24%	14.93%	1.77%	18.27%	4.11%	1.56%

Remarks *Rooting depth by interpolation

ANNEXURE 16(b)-Contd/-

Crop: Sorghum - Plot No. 43 JB(3)
Sowing Date : 20.6.91

Sl.No.	Particulars		Analysis Dates			
	15.7.91-27.7.91	27-7.91 5.8.91	5.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91-6.10.91
1.	12	9	17	17	15	13
2.	7.47	4.70	4.50	4.54	4.57	3.98
3.	0.30	0.30	0.70	0.70	1.00	1.00
4.	2.24	1.41	3.15	3.19	4.57	3.98
5.	-	163.90	52.21	307.60	-	-
6.	-	26.76	12.69	36.04	-	-
7.	-	137.14	39.52	271.56	-	-
8.	-	50	-	-	-	-
9.	0.15*	0.30*	0.45	0.60	0.80	0.80
10.	333	333	333	333	278.77	213.52
11.	116	116	116	116	116	116
12.	217	217	217	217	162.77	97.52
13.	32.55	65.10	97.65	130.20	130.22	78.02
14.	0.85	0.87	0.78	0.78	0.65	0.70
15.	2.23	1.41	2.12	3.19	4.35	3.96
16.	0.002	0	0.32	0	0.046	0.003
17.	0.20	0.20	0.55	0.55	0.45	0.45
18.	0.0005	0	0.179	0	0.021	0.0015
19.	No deficit	No Deficit	17.93%	No Deficit	2.1%	No Deficit

Remarks * Rooting depth by interpolation

ANNEXURE 16 (b) - Contd/-

Crop : Sorghum (Fodder) - Plot No. 84(KB -1)
Sowing Date: 14.7.91

Sl.No.	Particulars	Analysis Dates			
	14.7.91- 31.7.91	31.7.91 23.8.91	23.8.91- 9.9.91	9.9.91 - 24.9.91	24.9.91 7.10.91
1.	17	23	17	15	13
2	4.89	4.50	4.54	4.57	3.98
3.	0.30	0.70			1.00
4.	1.47	3.15	3.18	4.57	3.98
5.	-	220	307.60	-	-
6.	-	24.99	71.53	-	-
7.	-	195.10	236.07	-	-
8.	-	-	-	-	-
9.	0.15*	0.40	0.50	0.70	0.75
10.	333	333	333	278.94	210.84
11.	116	116	116	116	116
12.	217	217	217	162.94	94.84
13.	65.10	86.10	108.50	114.06	71.13
14.	0.87	0.77	3.18	0.65	0.70
15.	1.47	3.11	3.18	4.54	3.97
16.	-	0.01	0	0.005	0.0016
17.	0.20	0.55	0.55	0.45	0.45
18.	0	0.006	0	0.002	0.0007
19.	No deficit	0.65	No deficit	0.26 No deficit	0.07 No deficit

Remarks* Rooting depth by interpolation

ANNEXURE-16(b)-Contd/-

Crop: Sorghum(Fodder), Plot No. 84 KB(2)

Sowing Date: 30.5.91

Sl.No.	Particulars	Analysis Dates					
1	30.5.91-10.6.91	10.6.91-25.6.91	25.6.91-20.7.91	20.7.91-24.8.91	24.8.91-9.9.91	9.9.91-24.9.91	24.9.91-7.10.91
1.	10	15	25	35	17	15	13
2.	7.47	7.47	5.41	4.62	4.54	4.57	3.98
3.	0.30	0.30	0.70	1.00	1.00	0.75	0.75
4.	2.24	2.24	3.79	4.62	4.54	3.42	2.99
5.	20	3.10	-	220	307.60	-	-
6.	20	-	-	94.50	153.65	-	-
7.	-	-	-	125.50	153.95	-	-
8.	-	50	50	50	-	-	-
9.	0.15*	0.30*	0.60*	0.90	0.90	0.90	0.90
10.	333	333	333	333	333	276.50	238.76
11.	116	116	116	116	116	116	116
12.	217	217	217	217	217	160.56	122.76
13.	32.55	65.10	130.20	105.30	195.30	144.50	110.48
14.	0.85	0.85	0.72	0.64	0.64	0.64	0.78
15.	1.81	2.24	3.78	4.39	3.32	2.52	2.99
16.	0.187	0	0	0.05	0.26	0.261	0
17.	0.20	0.20	0.55	0.45	0.45	0.45	0.20
18.	0.037	0	0	0.025	0.1205	0.1178	0
19.	3.75%	No deficit	No deficit	2.25%	12.05%	11.78%	No deficit

Remarks * Rooting depth by interpolation

ANNEXURE 16(b)-Contd/-

Crop: Sorghum(Fodder) - Plot No. 84 KB(3)

Sowing Date:

Sl.No.	Particulars		Analysis Dates			
	10.6.91-30.6.91	30.6.91-3.8.91	3.8.91-23.8.91	23.8.91-9.9.91	9.9.91-24.9.91	24.9.91-7.10.91
1	20	33	20	17	15	13
2.	7.47	4.79	4.50	4.54	4.57	3.94
3.	0.30	0.70	1	1	1	0.75
4.	2.24	3.35	4.50	4.54	4.57	2.96
5.	3.10	-	219.40	307.60	-	-
6.	3.10	-	118.95	218.90	-	-
7.	-	-	100.45	218.90	-	-
8.	-	-	-	-	-	-
9.	0.20*	0.45*	0.70	0.80	0.80	0.80
10.	333	291.60	333	333	255.82	187.57
11.	116	116	116	116	116	116
12.	217	175.60	217	217	139.82	71.57
13.	43.40	79.02	151.90	173.60	111.856	57.25
14.	0.85	0.76	0.65	0.65	0.65	0.80
15.	2.07	2.35	4.46	4.54	4.55	2.73
16.	0.074	0.297	0.008	0	0.003	0.076
17.	0.20	0.55	0.45	0.45	0.45	0.20
18.	0.0148	0.163	0.0037	0	0.0015	0.015
19.	1.48%	16.34%	0.37 No deficit	0 No Deficit	No Deficit	1.52%

Remarks * Rooting depth by interpolation

ANNEXURE-16(b)-Contd/----

Crop : Sorghum (Fodder) - Plot No. 45 KB(1)
Sowing Date : 20.5.91

Sl.No.	Particulars	Analysis Dates					
	25-5-91- 10.6.91	10.6.91- 20.7.91	20.7.91- 2.8.91	2.8.91- 24.8.91	24.8.91- 10.9.91	10.9.91- 25.9.91	25.9.91- 8.10.91
1.	20	40	13	22	17	15	13
2.	6.60	6.18	4.88	4.50	4.54	4.57	3.98
3.	0.30	0.70	1	1	1	0.75	0.75
4.	1.98	4.33	4.88	4.50	4.54	3.43	2.99
5.	20.00	3.10	-	221.60	306	-	-
6.	20.00	3.10	-	169.42	97.24	-	-
7.	-	-	-	52.18	208.76	-	-
8.	-	-	-	-	-	-	-
9.	0.20*	0.45*	0.60*	0.80	0.85	0.85	0.85
10.	333	296.50	216.10	333	333	255.82	214.42
11.	116	116	116	116	116	116	116
12.	217	180.90	100.10	217	217	139.82	98.42
13.	43.40	8.41	60.06	173.60	184.45	18.85	83.66
14.	0.87	0.66	0.61	0.65	0.65	0.65	0.70
15.	1.96	2.02	4.04	4.42	4.54	2.76	2.20
16.	0.006	0.53	0.17	0.01	0	0.193	0.262
17.	0.20	0.55	0.45	0.45	0.45	0.20	0.20
18.	0.001	0.2926	0.0768	0.007	0	0.03	0.05
19.	No Deficit	29.26%	6.68%	0.77% No deficit	0 No deficit	3.86%	5.25%

Remarks *Rooting depth by interpolation

ANNEXURE-16(b)-Contd/----

Crop : Sorghum (Fodder), Plot No: 45 KB(2)

Sowing Date: 12.6.91

Sl.No.	Particulars	Analysis Dates						
	12.6.91-22.6.91	22.6.91-3.7.91	3.7.91-20.7.91	20.7.91-4.8.91	4.8.91-24.8.91	24.8.91-10.9.91	10.9.91-25.9.91	25.9.91-8.10.91
1.	10	11	17	15	20	17	15	13
2.	7.47	6.76	4.89	4.47	4.50	4.54	4.57	3.98
3.	0.30	0.30	0.70	0.00	1.00	1.00	1.00	0.75
4.	2.24	2.03	3.42	3.13	4.50	4.54	4.57	2.99
5.	3.10	-	-	-	221.60	306.00	-	-
6.	3.10	-	-	-	38.95	89.20	-	-
7.	-	-	-	-	182.65	216.80	-	-
8.	-	50	50	50	50	-	-	-
9.	0.15*	0.35*	0.43*	0.50*	0.70	0.80	0.80	0.80
10.	333	333	333	332	333	333	255.82	193.27
11.	116	116	116	116	116	116	116	116
12.	217	217	217	216	217	217	139.82	77.27
13.	32.53	65.10	97.65	108	151.90	173.60	111.86	61.82
14.	0.85	0.87	0.76	0.65	0.65	0.65	0.65	0.80
15.	1.81	2.03	3.00	2.53	4.46	4.54	4.17	2.51
16.	0.18	0	0.12	0.18	0.008	0	0.087	0.157
17.	0.20	0.20	0.55	0.55	0.45	0.45	0.45	0.20
18.	0.03	0	0.0664	0.1039	0.003	0	0.039	0.0316
19.	3.75%	0	6.64%	10.39%	0.39%	0	3.91%	3.16%
		No deficit				No deficit	No deficit	

Remarks *Rooting depth by interpolation

ANNEXURE-16(b)-Contd/----

Crop : Sorghum (Fooder) - Plot No. 45 KB(3)
Sowing Date : 25.6.91

Sl.No.	Particulars	Analysis Dates				
	25.6.91-15.7.91	15.7.91-2.8.91	3.8.91-25.8.91	25.8.91-11.9.91	1.9 .91-26.9.91	26.9.91-9.10.91
1.	20	18	22	17	15	13
2.	5.54	4.89	4.50	4.54	4.57	3.98
3.	0.30	0.70	0.70	1.00	1.00	1.00
4.	1.66	3.42	3.15	4.54	4.57	3.98
5.	-	-	221.60	306	-	-
6.	-	-	85.22	62.92	-	-
7.	-	-	136.38	243.08	-	-
8.	-	-	-	-	-	-
9.	0.15*	0.30*	0.50	0.60	0.80	0.80
10.	333	299.80	333	333	256.30	188.25
11.	116	116	116	116	116	116
12.	217	182.80	217	217	140.50	72.25
13.	32.55	55.14	108.50	130.20	112.40	57.80
14.	0.87	0.76	0.78	0.65	0.65	0.70
15.	1.66	2.89	2.86	4.50	4.55	3.75
16.	0	0.15	0.08	0.008	0.0039	0.05
17.	0.20	0.55	0.55	0.45	0.45	0.45
18.	0	0.0841	0.0489	0.0037	0.0017	0.025
19.	No deficit	8.41%	4.89%	0.37% No deficit	0.17% No deficit	2.59%

Remarks *Rooting depth by interpolation

ANNEXURE-16(b)-Contd/----

Crop: Sorghum - Plot No. Machakauli Minor-1

Sowing Date: 25.5.91

Sl.No.	Particulars	Analysis Dates						
	25.5.91-10.6.91	10.6.91-20.6.91	-20.6.91-31.7.91	1.8.91-26.8.91	26.8.91-12.9.91	12.9.91-27.9.91	27.9.91 10.10.9
1.	15	10	41	25	17	15	13
2.	6.89	7.47	5.52	4.50	4.54	4.57	3.98
3.	0.30	0.30	0.70	0.70	1.00	1.00	0.75
4.	2.07	2.24	3.86	3.15	4.54	4.57	2.98
5.	20	3.10	-	227.60	300.50*	-	-
6.	20	3.10	-	108.24	75.0	-	-
7.	-	-	-	119.36	225.0	-	-
8.	-	100	100	-	-	-	-
9.	0.10*	0.20*	0.50*	0.65	0.80	0.80	0.80
10.	333	333	333	333	333	255.82	187.57
11.	116	116	116	116	116	116	116
12.	217	217	217	217	217	139.82	71.57
13.	21.70	43.20	108.50	141.05	173.60	11.86	57.25
14.	0.87	0.86	0.71	0.68	0.65	0.65	0.80
15.	1.44	2.24	2.64	3.00	4.54*	4.55	1.49
16.	0.30	0	0.31	0.047	0	0.003	0.499
17.	0.20	0.20	0.55	0.45	0.45	0.45	0.20
18.	0.06	0	0.173	0.02	0	0.0015	0.099
19.	6.64%	0 No deficit	17.30%	2.12%	0 *Rainfall was distributive over the whole period	0.15 No deficit	9.99%

Remarks *Rooting depth by interpolation

ANNEXURE-16(b)-Contd/-

Crop: Sorghum (Fodder) - Plot No. LakhaotiMinor-1

Sowing Date : 15.7.91

Sl.No.	Particulars	Analysis Dates				
	15.7.91-31.7.91	31.7.91-10.8.91	10.8.91-20.8.91	20.8.91-11.9.19	11.9.91 26.9.91	26.9.1991 9.10.91
1.	15	10	10	22	15	13
2.	4.89	4.50	4.50	4.54	4.57	3.98
3.	0.30	0.30	0.70	0.70	1.00	1.00
4.	1.47	1.35	3.15	3.18	4.57	3.98
5.	-	172.70	45.10	310.30	-	-
6.	-	20.70	13.50	31.50	-	-
7.	-	152.00	31.60	278.80	-	-
8.	-	-	100	100	-	100
9.	0.10*	0.20*	0.30*	0.50	0.70	0.80
10.	333	333	333	333	333	333
11.	116	116	116	116	116	116
12.	217	217	217	217	217	217
13.	21.70	43.40	65.10	108.5	151.90	173.60
14.	0.87	0.87	0.77	0.77	0.65	0.70
15.	1.38	1.35	3.15	3.18	3.87	3.98
16.	0.05	0	0	0	0.15	0
17.	0.20	0.20	0.55	0.55	0.45	0.45
18.	0.011	0	0	0	0.068	0
19.	1.14%	No deficit	No deficit	No deficit Rainfall was distributive over the period	6.85%	

Remarks : *Rooting depth by interpolation

ANNEXURE-16 (b)-Contd/-

Crop: Sorghum(Fodder) - Plot No. Mundi Minor-1

Sowing Date : 18.6.1991.

Sl.No.	Particulars	Analylis Dates				
	18.6.91-10.7.91	10.7.91-2.8.91	2.8.91-25.8.91	25.8.91-11.9.91	11.9.91-26.9.91	26.9.91-9.10.91
1.	22	23	23	17	15	13
2.	6.18	4.88	4.50	4.54	4.57	3.98
3.	0.30	070	0.70	1.00	1.00	1.00
4.	1.85	3.42	3.15	4.54	4.57	3.98
5.	3.10	-	227.60	300.50*	-	-
6.	3.10	-	75.44	68.54	-	-
7.	-	-	152.16	231.96	-	-
8.	-	100	-	-	-	100
9.	0.15*	0.40*	0.50	0.75	0.90	0.90
10.	333	333	333	333	255.82	333
11.	116	116	116	116	116	116
12.	217	217	217	217	139.82	217
13.	32.55	86.80	108.50	162.75	125.84	195.30
14.	0.87	0.76	0.78	0.65	0.65	0.70
15.	1.46	3.28	2.98	4.54	4.42	3.98
16.	0.20	0.04	0.05	0	0.032	0
17.	0.20	0.55	0.55	0.45	0.45	0.45
18.	0.0411	0.0222	0.028	0	0.014	0
19.	4.11%	2.22%	2.81%	No deficit	1.44%	0
				*Rainfall was distributive over the period		No deficit

* Rooting depth by percolation

ANNEXURE 16(c)

Crop : Arhar Plot No.43 JB(1)

Sowing Date : 16.5.1991

Sl.No. Particulars	Analysis Dates					
	16.5.91 -1.7.91	1.7.91- 2.8.91	2.8.91- 22.8.91	22.8.91 -8.9.91	8.9.91- 23.9.91	23.9.91 -6.10.91
1. Duration, days	45	31	20	17	15	13
2. ETo mm/day	6.68	4.89	4.50	4.54	4.57	3.98
3. Kc	0.40	0.70	0.70	0.70	0.70	1.00
4. ETm mm/day	2.76	3.42	3.15	3.18	3.20	3.98
5. Rainfall mm	-	-	219.40	300.80	-	-
6. Effective rainfall (mm)	-	-	122.25	62	-	-
7. Percolation and Runoff mm	-	-	97.15	238.80	-	-
8. Net irrigation application	-	50	-	-	-	-
9. Rooting depth mm	0.40*	0.50*	0.60	0.70	0.80	0.80
10. Field Capacity mm/m	333	300.65	333	333	278.94	232.44
11. PWP mm/m	116	116	116	116	116	116
12. Available soil moisture mm/m(Sa)	217	184.65	217	217	162.94	116.44
13. SaxD. mm	65.10	110.79	130.30	151.90	130.35	93.15
14. Fraction p	0.60	0.533	0.56	0.56	0.47	0.47
15. ETa mm	1.83	2.90	3.10	3.18	3.10	3.93
16. 1-ETa/ETm	0.33	0.15	0.01	0	0.13	0.008
17. Ky	0.20	0.9	0.90	0.90	0.7	0.70
18. 1-Ya/Ym	0.067	0.1366	0.0129	0	0.0198	0.0082
19. Yield decrease due to water deficit (%)	6.72%	13.66%	1.29%	0	1.98%	0.82
			No deficit	No deficit rainfall was distributive over the period		No deficit

* Rooting depth by interpolation

ANNEXURE 16(c)-Cond...

Crop : Arhar Plot No. 43JB(2)
Sowing Date : 25.5.91

Sl.No.	Particulars	Analysis Dates					
	25.5.91-15.6.91	15.6.91-15.7.91	15.7.91-2.8.91	2.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91-6.10.9
1.	20	30	17	20	17	15	13
2.	6.89	6.18	6.49	4.50	4.54	4.57	3.98
3.	0.40	0.40	0.70	0.70	0.70	0.70	1.00
4.	2.75	2.47	3.42	3.15	3.18	3.20	3.78
5.	-	-	-	219.4	300.80	-	-
6.	23.10	-	-	111.67	63	-	-
7.	23.10	-	-	107.73	237.80	-	-
8.	-	75	-	-	-	-	-
9.	0.20*	0.30*	0.45*	0.60	0.70	0.70	0.80
10.	333	333	274.20	333	333	278.94	233.79
11.	116	116	116	116	116	116	116
12.	217	217	158.20	217	217	162.94	117.79
13.	43.40	65.10	71.19	130.20	151.90	114.58	94.23
14.	0.60	0.63	0.53	0.56	0.56	0.56	0.60
15.	2.00	1.96	3.11	3.15	3.18	3.01	3.72
16.	0.27	0.20	0.08	0	0	0.058	0.015
17,	0.20	0.20	1.1	1.10	1.10	1.10	1.10
18.	0.054	0.04	0.0794	0	0	0.0524	0.014
19.	5.40%	4.075%	7.94%	No deficit	No deficit	5.24%	1.42%

Remarks : * Rooting depth by interpolation

ANNEXURE 16(c)-Contd...

Crop : Arhar Plot No. 43JB(3)

Sowing Date : 29.5.91

Sl.No.	Particulars	Analysis Dates					
	29.5.91-17.6.91	18.6.91-30.6.91	30.6.91-2.8.91	2.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91-6.10.91
1.	18	14	32	20	17	15	13
2.	7.47	7.47	4.89	4.50	4.54	4.57	3.98
3.	0.40	0.40	0.70	0.70	0.70	0.70	0.70
4.	2.98	2.98	3.42	3.15	3.18	3.20	2.78
5.	23.10	-	-	219.40	300.80	-	-
6.	23.10	-	-	146.42	63.00	-	-
7.	-	-	-	72.98	237.80	-	-
8.	-	50	-	-	-	-	-
9.	0.15*	0.20*	0.30*	0.40	0.45	0.50	0.50
10.	333	333	295.06	333	333	278.94	232.14
11.	116	116	116	116	116	116	116
12.	217	217	179.06	217	217	162.98	116.41
13.	32.55	43.40	71.62	108.50	151.90	81.47	58.07
14.	0.70	0.70	0.66	0.68	0.68	0.68	0.72
15.	1.78	2.71	3.39	3.15	3.18	3.12	2.69
16.	0.40	0.09	0.006	0	0	0.02	0.03
17.	0.20	0.20	1.1	1.1	1.1	1.1	1.1
18.	0.0801	0.018	0.0066	0	0	0.0265	0.0339
19.	8.01%	1.8%	0.66% No deficit	No Rainfall was distributive over the period	No deficit rainfall was distributive over the period	2.65%	3.39%

Remarks : *Rooting depth by interpolation

ANNEXURE-16(c)-Contd/-

Crop : Arhar - Plot No. 84 KB(1)
Sowing Date : 10.6.91

Sl.No.	Particulars	Analysis Dates				
	10.6.91-10.7.91	10.7.91-2.8.91	2.8.91-23.8.91	23.8.91-9.9.91	9.9.91-24.9.91	24.9.91-7.10.91
1.	30	22	21	17	15	13
2.	6.61	4.89	4.50	4.54	4.57	3.98
3.	0.40	0.40	0.70	0.70	0.70	0.70
4.	2.64	1.95	3.15	3.18	3.20	2.78
5.	3.10	-	219.40	300.80	-	-
6.	3.10		105.10	66.15	-	-
7.	-	-	-	234.65	-	-
8.	-	-	-	-	-	-
9.	0.30*	0.35*	0.40*	0.45	0.50	0.50
10.	333	270.90	333	333	278.94	232.14
11.	116	116	116	116	116	116
12.	217	154.90	217	217	162.94	116.14
13.	43.40	54.22	86.80	97.65	81.47	58.07
14.	0.74	0.80	0.68	0.68	0.68	0.72
15.	2.07	1.94	3.15	3.18	3.12	2.69
16.	0.21	0	0	0	0.02	0.03
17.	0.20	0.20	1.10	1:10	1.10	1.10
18.	0.42	0	0	0	0.0265	0.0339
19.	4.24%	No Deficit	No Deficit	No Deficit	2.65%	3.39%

Remarks : *Rooting depth by interpolation

ANNEXURE-16(c)-Contd/-

Crop: Ahbar - Plot No. 84 KB(2)

Sowing Date : 13.5.91

Sl.No.	Particulars	Analysis Dates					
	13.5.91-15.6.91	15.6.91-5.7.91	5.7.91-2.8.91	2.8.91-23.8.91	23.8.91-9.9.91	9.9.91-24.9.91	24.9.91-7.10.91
1.	32	20	28	21	17	15	13
2.	6.60	6.83	4.89	4.50	4.54	4.57	3.98
3.	0.40	0.40	0.70	0.70	0.70	0.70	1.00
4.	2.64	2.73	3.42	3.15	3.18	3.20	3.98
5.	23.10	-	-	219.40	300.80	-	-
6.	23.10	-	-	65.10	65.10	-	-
7.	-	-	-	154.30	235.70	-	-
8.	-	75	50	-	-	-	-
9.	0.25*	0.30*	0.50*	0.50	0.50	0.50	0.50
10.	333	333	333	333	333	278.94	232.14
11.	116	116	116	116	116	116	116
12.	217	217	217	217	217	162.92	116.14
13.	54.25	65.10	108.50	108.50	108.50	89.62	58.07
14.	0.74	0.52	0.66	0.68	0.68	0.68	0.60
15.	1.67	2.45	3.19	3.10	3.18	3.12	3.60
16.	0.36	0.10	0.067	0.013	0	0.02	0.09
17.	0.20	0.20	1.1	1.1	1.1	1.1	0.75
18.	0.073	0.02	0.0738	0.015	0	0.0264	0.079
19.	7.30%	2.04%	7.38%	1.50%	No deficit	2.64%	7.09%

Remarks : *Rooting depth by interpolation

ANNEXURE-16(c)-Contd/---

Crop : Arhar - Plot No. 84 KB(3)
Sowing Date : 8.6.91

Sl.No.	Particulars	Analysis Dates				
	8.6.91-18.7.91	18.7.91-2.8.91	2.8.91-23.8.91	23.8.91-9.9.91	9.9.91-24.9.91	24.9.91-7.10.91
1.	40	14	21	17	15	13
2.	6.31	4.89	4.50	4.57	4.57	3.98
3.	0.40	0.70	0.7	0.7	0.70	0.70
4.	2.52	3.42	3.15	3.20	3.20	2.78
5.	3.10	-	219.40	300.80	-	-
6.	3.10	-	108.44	65.10	-	-
7.	-	-	110.96	235.70	-	-
8.	-	-	-	-	-	-
9.	0.30*	0.35*	0.40*	0.45	0.50	0.50
10.	333	268.6	333	333	278.60	231.80
11.	116	116	116	116	116	116
12.	217	152.60	217	217	162.60	115.80
13.	65.10	53.41	86.80	97.65	81.30	57.90
14.	0.75	0.66	0.68	0.68	0.68	0.72
15.	1.61	3.16	3.10	3.20	3.12	2.69
16.	0.36	0.07	0.012	0	0.023	0.029
17.	0.20	1.10	1.10	1.10	1.10	1.10
18.	0.0721	0.081	0.0139	0	0.0257	0.0325
19.	7.21%	8.10%	1.39%	0	2.57	3.25%
				No deficit rainfall was distributive over the period		

polation Remarks : *Rooting depth by Interpolation

ANNEXURE-16(c)-Contd/-

Crop: Arhar - Plot No. 45 KB(1)

Sowing Date : 20.5.91

Sl.No.	Particulars	Analysis Dates					
	20.5.91-6.6.91	6.6.91-8.7.91	8.7.91-2.8.91	2.8.91-24.8.91	24.8.91-10.9.91	10.9.91-25.9.91	25.9.91-8.10.91
1.	16	32	24	22	17	15	13
2.	6.38	6.87	4.89	4.50	4.54	4.57	3.98
3.	0.40	0.40	0.70	0.70	0.70	0.70	1.00
4.	2.55	2.73	3.42	3.15	3.18	3.20	3.98
5.	20.00	-	-	219.40	300.80	-	-
6.	20.00	-	-	78.72	68.86	-	-
7.	-	-	-	140.68	231.94	-	-
8.	-	-	75	-	-	-	-
9.	0.15*	0.30*	0.45*	0.50	0.50	0.50	0.50
10.	333	301.80	333	333	333	278.94	232.14
11.	116	116	116	116	116	116	116
12.	217	185.8	217	217	217	162.94	116.14
13.	32.55	55.74	92.65	108.50	108.50	89.62	63.88
14.	0.74	0.72	0.66	0.68	0.68	0.68	0.60
15.	1.45	1.71	3.28	3.13	3.18	3.12	3.75
16.	0.23	0.37	0.04	0.004	0	0.02	0.057
17.	0.20	0.20	1.1	1.1	1.	1.1	0.75
18.	0.0463	0.0741	0.0048	0.004	0	0.0265	0.0431
19.	4.63%	7.41%	4.48%	0.4%	0	2.65%	4.31%
				No deficit	No deficit Rainfall was distributive over the period		

Remarks : *Rooting depth by Interpolation

ANNEXURE-16(c)-Contd/---

Crop: Arhar - Plot No. 45 (KB-2)

Sowing Date : 10.6.91

Sl.No.	Particulars	Analysis Dates				
	10.6.91-15.7.91	15.7.91-2.8.91	2.8.91-24.8.91	24.8.91-10.9.91	10.9.91-25.9.91	25.9.91-8.10.91
1.	35	18	22	17	15	13
2.	6.34	4.89	4.50	4.54	4.57	3.98
3.	0.40	0.70	0.70	0.70	0.70	0.70
4.	2.54	3.42	3.15	3.28	3.20	2.78
5.	3.10	-	219.40	300.80	-	-
6.	3.10	-	59.22	67.54	-	-
7.	-	-	160.18	233.26	-	-
8.	-	75	-	-	-	-
9.	0.30*	0.35*	0.40*	0.45	0.50	0.50
10.	333	333	333	333	278.94	232.14
11.	116	116	116	116	116	116
12.	217	217	217	217	162.94	116.14
13.	65.10	75.95	86.80	97.65	81.49	38.07
14.	0.75	0.66	0.68	0.68	0.68	0.72
15.	1.82	3.29	3.07	3.18	3.12	2.69
16.	0.28	0.035	0.02	0	0.024	0.03
17.	0.20	1.1	1.1	1.1	1.1	1.1
18.	0.0566	0.0392	0.267	0	0.0285	0.0339
19.	5.66%	3.92%	2.67%	0 No deficit rainfall was distributive over the period	2.65	3.39%

Remarks: *Rooting depth by Interpolation

ANNEXURE-16(c)-Contd/---

Crop: Arhar - Plot No. 45 KB (3)

Sowing Date : 14.6.91

Sl.No.	Particulars	Analysis Dates				
	14.6.91-20.7.91	20.7.91-2.8.91	2.8.91-24.8.91	24.8.91-10.9.91	10.9.91-25.9.91	25.9.91-8.10.91
1.	36	12	22	17	15	17
2.	6.18	4.89	4.50	4.55	4.57	3.98
3.	0.40	0.70	0.70	0.70	0.70	0.70
4.	2.47	3.42	3.15	3.19	3.20	2.78
5.	-	-	219.40	300.80	-	-
6.	-	-	103.92		-	-
7.	-	-	115.48	233.26	-	-
8.	-	-	-	-	-	-
9.	0.30*	0.35*	0.40	0.45	0.45	0.50
10.	333	269.28	333	333	278.77	230.92
11.	116	116	116	116	116	116
12.	217	153.28	217	217	162.77	114.92
13.	65.10	53.65	86.8	97.65	73.24	57.46
14.	0.75	0.66	0.68	0.68	0.68	0.72
15.	1.77	3.35	3.07	3.19	3.19	2.70
16.	0,28	0.019	0.02	0	0	0.02
17.	0.20	1.10	1.1	1.1	1.1	1.1
18.	0.0566	0.0211	0.0267	0	0	0.028
19.	5.66%	2.11%	2.67	No deficit 0 Rainfall was distributive over the period	No deficit	2.89%

Remarks : *Rooting depth by Interpolation

ANNEXURE-16(c)-Contd/-

Crop: Arhar - Plot No. Machakanli Minor
Sowing Date: 11.5.91

Sl.No.	Particulars	Analysis Dates					
	11.5.91-10.6.91	10.6.91-25.6.91	25.6.91-31.7.91	31.7.91-26.8.91	26.8.91-12.9.91	12.9.91-27.9.91	27.9.91-10.10.9
1.	30	15	36	26	17	15	13
2.	6.31	7.47	5.24	4.50	4.55	4.57	3.67
3.	0.40	0.40	0.70	0.70	0.70	0.70	1.00
4.	2.52	2.49	3.67	3.15	3.18	3.20	3.67
5.	20.00	-	-	219.40	300.80	-	-
6.	20.00	-	-	130.32	-	-	-
7.	-	-	-	89.08	-	-	-
8.	-	75	75	60	-	-	-
9.	0.30*	0.32*	0.35*	0.40	0.50	0.50	0.50
10.	333	333	333	333	333	278.94	232.14
11.	116	116	116	116	116	116	116
12.	217	217	217	217	217	162.94	116.14
13.	65.10	69.44	75.95	86.80	108.50	81.47	58.07
14.	0.75	0.70	0.66	0.68	0.68	0.68	0.63
15.	2.06	2.96	3.62	3.15	3.18	3.12	3.48
16.	0.18	0.008	0.013	0	0	0.24	0.05
17.	0.20	0.20	1.1	1.10	1.10	1.10	1.10
18.	0.036	0.001	0.014	0	0	0.265	0.0563
19.	3.60%	0.16%	1.49%	No Deficiti	No Deficit Irrigation and rainfall was distributed over the period	2.65%	5.63%

Remarks: *Rooting depth by Interpolation

ANNEXURE-16(c)-Contd/-

Crop : Arhar - Plot No. Lakhaoti Minor -1
Sowing Date: 15.6.91

Sl. No.	Particulars	Analysis Dates			
	15.6.91-20.7.91	20.7.91-25.8.1991	25.8.91-11.9.91	11.9.91-26.9.91	26.9.91-9.10.91
1.	35	35	17	15	13
2.	5.99	4.61	4.55	4.57	3.67
3.	0.40	0.70	0.7	0.70	0.70
4.	2.40	3.28	3.18	3.20	2.57
5.	-	219.40	300.80	-	-
6.	-	63.35	113.05	-	-
7.	-	155.65	187.75	-	-
8.	-	75	-	-	-
9.	0.30*	0.35*	0.40	0.45	0.50
10.	333	333	333	278.94	231.09
11.	116	116	116	116	116
12.	217	217	217	162.94	115.09
13.	65.10	75.95	86.90	73.32	57.45
14.	0.76	0.67	0.68	0.68	0.64
15.	1.81	3.23	3.18	3.19	2.54
16.	0.0245	0	0	0.0015	0.008
17.	0.20	1.1	1.1	1.1	1.1
18.	0.049	0	0	0.00177	0.0094
19.	4.9%	0	0	0.17%	0.94
		No deficit Irrigation & Rainfall was distributed the period	No deficit rainfall was distributed the over the period	No deficit	No deficit

Remarks: *Rooting depth by Interpolation

ANNEXURE-16(c)-Contd//---

Crop: Arhar - Plot No. Mundi Minor-1
Sowing Date: 15.5.91

Sl.No.	Particulars	Analysis Dates						
		15.5.91-5.6.91	5.6.91-30.6.91	30.6.91-2.8.91	2.8.91-25.8.91	25.8.91-11.9.91	11.9.91 26.9.91	26.9.91 -9.10.91
1.		20	25	33	23	17	15	13
2.		6.17	7.47	4.89	4.50	4.55	4.57	3.67
3.		0.40	0.40	0.70	0.70	0.70	0.70	1.00
4.		2.49	2.99	3.42	3.15	3.19	3.20	3.67
5.		-	23.10	-	223.50	300.50	-	-
6.		-	23.10	-	105.93	72.45	-	-
7.		-	0	-	117.57	228.05	-	-
8.		-	50	75	-	-	-	-
9.		0.20*	0.35*	0.50*	0.60	0.60	0.60	0.60
10.		333	333	333	333	333	278.77	232.7
11.		116	116	116	116	116	116	116
12.		217	217	217	217	217	162.77	139.6
13.		43.40	75.95	108.50	130.20	130.20	97.66	83.78
14.		0.75	0.70	0.66	0.68	0.68	0.68	0.63
15.		2.05	2.68	3.21	3.15	3.19	3.07	3.63
16.		0.167	0.102	0.05	0	0	0.040	0.009
17.		0.20	0.20	1.1	1.1	1.1	1.1	1.1
18.		0.0335	0.0204	0.0658	0	0	0.044	0.010
19.		3.35%	2.04%	6.58%	0	0	4.46%	1.01%
					Rainfall was distributed over the period	No deficit rainfall was distributive over the period		

Remarks: *Interpolated rooting depth

Crop : Sugarcane Plot No.43 JB(1)
Sowing Date : 20.2.1991

Sl.No.	Particulars	Analysis Dates							
		20.2.91-25.3.91	25.3.91-10.5.91	10.5.91-10.6.91	10.6.91-4.7.91	4.7.91-3.8.91	3.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91-6.10.91
1.		33	46	30	24	30	19	17	15	13
2.		3.45	5.10	6.31	7.04	4.89	4.57	4.54	4.57	3.98
3.		0.40	0.70	0.70	0.80	1	1	1	1	1
4.		0.40	3.56	4.42	5.63	4.89	4.57	4.54	4.57	3.98
5.		-	-	20.0	-	-	223.50	300.80	-	-
6.		-	-	-	-	-	192.28	73.53	-	-
7.		-	-	-	-	-	31.22	227.27	-	-
8.		-	100	100	100	100	-	-	-	-
9.		0.25*	0.60*	0.75*	0.90*	0.10*	1.15	1.20	1.30	1.40
10.		333	333	327.42	304.72	278.72	333	333	255.82	202.39
11.		116	116	116	116	116	116	116	116	116
12.		217	217	211.42	188.72	162.72	217	217	139.82	86.39
13.		54.25	130.20	148.00	169.85	178.99	249.55	260.40	181.77	120.95
14.		0.87	0.75	0.66	0.56	0.61	0.65	0.65	0.65	0.70
15.		1.39	2.73	4.09	5.25	4.60	3.87	4.54	4.11	3.58
16.		0.001	0.23	0.07	0.066	0.057	0.15	0	0.10	0.10
17.		0.75	0.50	0.75	0.50	0.50	0.50	0.50	0.50	0.50
18.		0.001	0.115	0.055	0.033	0.028	0.0761	0	0.05	0.05
19.		0.12%	11.50%	5.50%	3.30%	2.89%	7.61%	0	5.02%	5.02%
								Rainfall was distributed over the period		

* Interpolated rooting depth

ANNEXURE 16(d)-Contd...

Crop : Sugarcane Plot No. : 43JB(2)
Sowing Date : 25.12.1990

Sl.No.	Particulars	Analysis Dates												
		25.12.90-20.1.91	20.1.91-22.3.91	22.3.91-24.4.91	24.4.91-12.5.91	12.5.91-25.5.91	25.5.91-10.6.91	10.6.91-25.6.91	25.6.91-8.7.91	8.7.91-24.7.91	24.7.91-2.8.91	2.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91-6.10.91
1.		26	61	32	18	12	15	15	13	16	8	20	17	15	13
2.		1.73	2.86	4.80	5.30	5.73	6.89	7.47	6.18	4.89	5.89	4.50	4.54	5.57	3.98
3.		0.40	0.70	0.70	1	1	1	1	1	1	1	1	1	1	0.75
4.		0.69	2.00	2.36	5.30	5.73	6.89	7.47	6.18	4.89	4.89	4.50	4.54	4.57	3.00
5.		-	-	-	-	-	20.00	-	-	-	-	233.50	300.80	-	-
6.		-	-	-	-	-	-	-	-	-	-	103.36	90	-	-
7.		-	-	-	-	-	-	-	-	-	-	103.14	210.80	-	-
8.		-	100	100	100	100	100	100	100	100	-	-	-	-	100
9.		0.30*	0.50*	0.60*	0.70*	0.80*	0.90*	1.00*	1.15*	1.20*	1.25*	1.50	1.50	1.50	1.50
10.		333	333	326.25	320.65	326.51	333	329.80	318.35	333	266.60	333	333	255.82	294.47
11.		116	116	116	116	116	116	116	116	116	116	116	116	116	116
12.		217	217	210.25	204.65	210.51	217	213.80	202.35	217	150.60	217	217	139.82	178.45
13.		65.10	108.50	126.15	143.26	167.41	195.30	213.80	242.80	260.40	188.25	325.50	325.50	209.73	267.70
14.		0.87	0.87	0.77	0.58	0.55	0.51	0.47	0.59	0.60	0.60	0.65	0.65	0.65	0.80
15.		0.69	1.75	3.30	5.23	5.54	6.88	7.43	5.66	4.15	4.62	4.50	4.54	4.09	3.00
16.		0	0.012	0.01	0.01	0.03	0.0007	0.005	0.008	0.15	0.05	0	0	0.10	0
17.		0.75	0.50	0.50	0.50	0.50	0.50	0.5	0.50	0.50	0.50	0.50	0.50	0.50	0.10
18.		0	0.0634	0.007	0.006	0.15	0.0003	0.0025	0.04	0.07	0.0276	0	0	0.051	0
19.		0	6.3%	0.70%	0.60%	1.58%	0.03%	0.25%	4.17%	7.60%	2.78%	0	0	5.16%	0
		No deficit										Rainfal distributed over the period	Rainfall distributed over the period		No deficit

* Interpolated rooting depth

ANNEXURE-16(d)-Contd/-

Crop : Sugarcane - Plot No. 43 JB(3)
Sowing Date : 25.2.91

Sl. No.	Particulars	Analysis Dates							
		25.2.91-30.3.91	30.3.91-15.4.91	15.4.91-20.5.91	20.5.91-21.6.91	21.6.91-7.8.91	7.8.91-22.8.91	22.8.91-8.9.91	8.9.91-23.9.91	23.9.91 6.10.91
1.		33	46	35	31	48	15	17	15	13
2.		3.79	5.14	5.47	6.90	5.37	4.50	4.54	4.57	3.98
3.		0.40	0.70	0.70	0.	.80	1	1	1	1
4.		1.52	3.60	3.83	4.83	4.29	4.50	4.54	4.57	3.98
5.		-	-	-	20.00	172.70	50.80	300.80	-	-
6.		-	-	-	-	129.58	50.80	67.50	-	-
7.		-	-	-	-	43.12	-	233.30	-	-
8.		-	-	100	100	100	100	1pp	-	100
9.		0.30*	0.35*	0.60*	0.70*	0.85*	0.90	1.10	1.20	1.20
10.		333	286.18	331.18	333	333	333	333	265.50	296.95
11.		116	116	116	116	116	116	116	116	116
12.		217	170.14	215.18	217	217	217	217	149.50	160.95
13.		65.10	59.55	129.11	151.90	184.45	195.30	238.7	179.40	217.14
14.		0.87	0.74	0.72	0.62	0.67	0.65	0.65	0.65	0.70
15.		1.42	3.31	3.36	4.18	4.29	4.50	4.54	4.47	3.98
16.		0.066	0.079	0.0123	0.132	0	0	0	0.021	0
17.		0.75	0.5	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0.048	0.039	0.06	0.0663	0	0	0	0.010	0
19.		4.80%	3.9%	6.1%	6.63	0	0	0	1.08%	0
					A	Irrigation(A) and rainfall was distributed over the period		(A)		No deficit

Remarks : *Interpolated rooting depth

ANNEXURE-16(d)-Contd/----

Crop: Sugarcane - Plot No. 84 KB(1)

Sowing Date : 8.3.91

Sl.No.	Particulars	Analysis Dates								
		8.3.91-15.4.91	15.4.91-20.5.91	20.5.91-20.6.91	20.6.91-20.7.91	20.7.91-2.8.91	2.8.91-23.8.91	23.8.91-9.9.91	9.9.91-24.9.91	24.9.91-7.10.91
1.		38	35	30	30	13	21	17	15	13
2.		4.32	5.48	6.89	5.75	4.89	4.50	4.54	4.57	3.98
3.		0.40	0.70	0.70	0.8	1	1	1	1	1
4.		1.72	3.83	4.82	4.60	4.89	4.50	4.54	4.57	3.98
5.		-	-	23.10	-	-	172.70	351.60	-	-
6.		-	-	23.10	-	-	172.70	126.19	-	-
7.		-	-	-	-	-	-	225.41	-	-
8.		-	100	100	100	-	-	-	-	-
9.		0.30*	0.60*	0.80*	1.00*	1.10*	1.20	1.20	1.20	1.20
10.		333	333	333	297.10	162.70	288.08	333	255.82	187.87
11.		116	116	116	116	116	116	116	116	116
12.		217	217	217	181.10	46.70	172.08	217	139.82	71.87
13.		65.10	130.20	173.60	181.10	51.37	206.49	260.40	167.78	86.24
14.		0.87	0.72	0.62	0.64	0.61	0.65	0.65	0.65	0.70
15.		1.63	3.37	4.53	4.48	3.64	3.87	3.54	4.53	3.85
16.		0.05	0.118	0.059	0.024	0.254	0.134	0	0.008	0.03
17.		0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0.037	0.05	0.0299	0.012	0.127	0.0699	0	0.004	0.015
19.		3.76%	5.93%	2.99%	1.21%	12.74%	6.99%	0	0.42%	1.56%

Rainfall was distributive over the period

*Interpolated rooting depth

ANNEXURE-16(d)-Contd/----

Crop: Sugarcane : Plote No. 84 KB(2)
Sowing Date : 5.2.91

Sl.No.	Particulars	Analysis Dates										
		5.2.91-1.3.91	1.3.91-10.3.91	10.3.91-2.4.91	2.4.91-15.4.91	15.4.91-20.5.91	20.5.91-10.6.91	10.6.91-1.7.91	1.7.91-2.8.91	2.8.91-23.8.91	23.8.91-9.9.91	9.9.91-24.9.91	24.9.91-7.10.91
1.		24	9	23	13	35	20	20	33	21	17	15	13
2.		2.59	3.79	3.80	5.14	5.45	6.60	7.47	4.89	4.50	4.54	4.57	3.98
3.		0.40	0.40	0.70	0.70	0.70	0.70	1.0	1.0	1.0	1.0	1.00	1.00
4.		1.04	1.51	2.66	3.60	3.80	4.62	7.47	4.89	4.50	4.54	4.57	3.98
5.		-	-	-	-	-	-	23.10	-	172.70	351.60	-	-
6.		-	-	-	-	-	-	23.10	-	172.70	136.40	-	-
7.		-	-	-	-	-	-	-	-	-	215.20	-	-
8.		-	75	75	75	75	75	75	75	-	-	-	75
9.		0.20*	0.30*	0.40*	0.45*	0.60*	0.70*	1.00*	1.00*	1.20	1.20	1.20	1.20
10.		333	333	333	333	333	290.40	298.30	240.50	288.79	333	265.50	276.40
11.		116	116	116	116	116	116	116	116	116	116	116	116
12.		217	217	217	217	217	174.40	182.30	124.50	172.79	217	149.50	162.40
13.		43.4	65.10	86.80	97.65	130.20	122.08	182.30	136.95	207.35	260.40	179.40	194.88
14.		0.87	0.87	0.83	0.74	0.72	0.64	0.48	0.61	0.65	0.65	0.65	0.70
15.		1.04	1.51	2.43	3.44	3.36	4.51	6.640	3.77	4.39	4.54	4.14	3.98
16.		0	0	0.08	0.042	0.05	0.02	0.11	0.22	0.62	0	0.09	0
17.		0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		C	0	0.042	0.02	0.0572	0.011	0.055	0.1142	0.01	0	0.0465	0
19.		0	0	4.20%	2.10%	5.72%	1.13%	5.50%	11.42%	1.16%	0	4.65%	0
			No deficit	No deficit							No deficit Rainfall distributed over the period		No deficit

Remarks : * Interpolated Rooting Depths

ANNEXURE-16(d)-Contd/-

Crop: Sugarcane - Plot No. 84 KB(3)

Sowing Date: 8.2.1991

Sl.No.	Particulars	Analysis Dates								
		8.2.91- 10.3.91	10.3.91- 15.4.91	15.4.91- 30.5.91	30.5.91- 5.7.91	5.7.91- 18.7.91	18.7.91- 2.8.91	2.8.91- 23.8.91	23.8.91- 9.9.91	9.9.91- 24.9.91	24.9.91 7.10.91
1.		30	35	45	35	13	14	23	17	15	13
2.		2.99	4.06	5.3	7.47	4.89	4.89	4.5	4.54	4.57	4.00
3.		0.40	0.70	0.70	0.80	1	1	1	1	1	1
4.		1.20	2.84	3.87	5.98	4.89	4.85	4.50	4.54	4.57	4.00
5.		-	-	-	23.10	-	-	172.70	351.60	-	-
6.		-	-	-	-	-	-	97.54	76.50	-	-
7.		-	-	-	-	-	-	74.96	275.10	-	-
8.		-	75	100	150	100	100	100	100	100	100
9.		0.30*	0.40*	0.90*	1.00*	1.10*	1.20*	1.20	1.20	1.30	1.30
10.		33	333	333	333	255.20	293.19	333	333	333	333
11.		116	116	116	116	116	116	116	116	116	116
12.		217	217	217	217	139.20	117.19	217	217	217	217
13.		65.10	86.80	195.30	217	153.12	212.63	260.4	260.40	282.10	282.10
14.		0.87	0.81	0.71	0.55	0.61	0.62	0.65	0.65	0.65	0.70
15.		1.20	2.39	3.66	5.08	4.77	4.11	4.50	4.54	4.57	4.00
16.		0	0.155	0.05	0.148	0.023	0.15	0	0	0	0
17.		0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0	0.077	0.0261	0.0744	0.011	0.0758	0	0	0	0
19.		0	7.7%	2.61%	7.44%	1.18%	7.58%	0	0	0	0
		No deficit						No deficit	No deficit Irrigation and Rainfall distributed over the period	No deficit	No deficit

Remarks : *Interpolated rooting depths.

ANNEXURE-16(d)-Contd/-

Crop Sugarcane : Plot No. 45 KB(1)
Sowing Date: 20.4.91

Sl.No.	Particulars	Analysis Dates					
	20.4.91-13.5.91	13.5.91-10.6.91	10.6.91-28.7.91	28.7.91-24.8.91	24.8.91 10.9.91	10.9.91 25.9.91	25.9.91 8.10.91
1.	23	27,	48	26	17	15	13
2.	5.47	6.37	5.97	4.52	4.54	4.57	4.00
3.	0.40	0.70	0.70	0.80	1	1	1
4.	2.19	4.46	4.17	3.62	4.54	4.57	4.00
5.	-	20.31	-	172.70	351.60	-	-
6.	-	20.31	-	57.19	94.12	-	-
7.	-	-	-	115.51	257.48	-	-
8.	-	100	100	100	-	-	-
9.	0.30*	0.60*	0.75*	0.95	1.00	1.25	1.30
10.	333	333	232.65	333	333	255.82	198.42
11.	116	116	116	116	116	116	116
12.	217	217	207.65	217	217	139.82	80.42
13.	65.10	130.20	155.74	195.30	217	187.78	104.55
14.	0.86	0.65	0.68	0.74	0;65	0.65	0.70
15.	2.09	4.05	3.08	3.62	4.54	3.96	3.68
16.	0.042	0.091	0.0259	0	0	0.13	0.077
17.	0.75	0.50	0.50	0.50	0.50	0.50	0.50
18.	0.0319	0.0456	10.1247	0	0	0.066	0.038
19.	3.19%	4.56%	12.97%	0	0	6.61%	3.88%
				No deficit	Rainfall continued over the period		

*Interpolated rooting depth

ANNEXURE-16(d)-Contd/-----

Crop: Sugarcane, Plot No. 45 KB (2)

Sowing Date: 25.3.1991

Sl.No.	Particulars	Analysis Dates								
		25.3.91-15.4.91	15.4.91-5.5.91	5.5.91-25.5.91	25.5.91-15.6.91	15.6.91-5.7.91	5.7.91-10.8.19	10.8.91-24.8.91	24.8.91-10.9.91	10.9.91-25.9.91	25.9.91-8.10.91
1.		20	20	20	20	20	35	14	17	15	13
2.		4.99	5.29	5.73	7.47	4.89	6.62	4.50	4.54	4.57	4.00
3.		0.40	0.60	0.70	0.70	0.70	0.80	1	1	1	1
4.		2.00	3.17	4.01	5.23	3.42	5.29	4.50	4.54	4.57	4.00
5.		-	-	-	23.10	-	172.70	52.8	300.8	-	-
6.		-	-	-	23.10	-	68.40	52.80	194.23	-	-
7.		-	-	-	-	-	104.30	-	106.57	-	-
8.		-	75	100	100	100	100	-	-	75	100
9.		0.30*	0.40*	0.60*	0.80*	1.00*	1.20*	1.30	1.30	1.30	1.30
10.		333	333	333	333	333	333	200.65	333	333	333
11.		116	116	116	116	116	116	116	116	116	116
12.		217	217	217	217	217	217	84.65	217	217	217
13.		65.1	86.80	130.20	173.60	217	260.40	110.04	282.10	282.10	282.10
14.		0.37	0.78	0.70	0.59	0.66	0.59	0.65	0.65	0.65	0.70
15.		2.00	3.14	3.92	5.22	3.42	5.29	4.42	4.54	4.57	4.00
16.		0	0.008	0.02	0.0009	0	0	0.016	0	0	0
17.		0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0.0	0.006	0.01	0.005	0	0	0.008	0	0	0
19.		0	0.61%	1.05%	0.05%	0 No deficit	0 No deficit Rainfall & Irrigation was distributing over the period	0.80%	0 Continue over rainfall over the period	0 No deficit	0 No deficit

Remarks: *Interpolated rooting depth.

ANNEXURE-16(d)-Contd/---

Crop: Sugarcane : Plot No. 45 KB(3)
Sowing Date : 20.3.91

Sl.No.	Particulars	Analysis Dates									
		20.3.91-10.4.91	10.4.91-25.4.91	25.4.91-10.5.91	10.5.91-29.5.91	29.5.91-20.6.91	20.6.91-10.7.91	10.7.91-5.8.91	5.8.91-20.8.91	24.8.91-10.9.91	10.9.91-25.9.91	25.9.91-8.10.91
1.		21	15	15	19	21	20	26	19	17	15	13
2.		4.47	5.14	5.63	5.73	7.47	6.18	4.85	4.50	4.54	4.57	4.00
3.		0.40	0.40	0.70	0.80	0.70	0.70	0.80	1	1	1	1
4.		1.79	2.06	3.94	4.01	5.23	4.33	3.88	4.50	4.54	4.57	4.00
5.		-	-	-	-	23.10	-	151.20	68.80	300.80	-	-
6.		-	-	-	-	23.10	-	86.60	68.80	109.98	-	-
7.		-	-	-	-	-	-	-	-	190.82	-	-
8.		-	100	100	150	75	100	75	-	-	75	-
9.		0.30*	0.40*	0.50*	0.60*	0.80*	1.00*	1.10*	1.20	1.20	1.30	1.30
10.		333	333	333	333	333	333	333	300.92	333	333	273.59
11.		116	116	116	116	116	116	116	116	116	116	116
12.		217	217	217	217	217	217	217	184.92	217	217	157.59
13.		65.19	86.10	108.50	130.20	173.60	217	238.70	221.90	260.40	282.10	204.867
14.		0.87	0.89	0.70	0.70	0.78	0.67	0.69	0.65	0.65	0.65	0.70
15.		1.79	2.06	3.59	3.83	4.71	4.33	3.88	4.10	4.54	4.57	4.00
16.		0	0	0.08	0.04	0.09	0	0	0.088	0	0	0
17.		0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0	0	0.041	0.021	0.0493	0	0	0.0447	0	0	0
19.		0	4.41%	2.14%	4.93%	0	0	4.43%	0	0	0	0
		No Deficit	No Deficit						Continuous Rain over the period			No deficit

* Interpolated rooting depth

ANNEXURE-16(d)-Contd/--

Crop : Sugarcane : Plot No. Machakauli Minor -1
Sowing Date : 16.3.91

Sl. No.	Particulars	Analysis Dates									
		16.3.91-16.4.91	16.4.91-5.5.91	5.5.91-25.5.91	25.5.91-3.6.91	3.6.91-15.6.91	15.6.91-15.7.91	15.7.91-2.8.91	2.8.91-26.8.91	26.8.91-12.9.91	12.9.91-27.9.91	27.9.91-10.10.91
1.		30	20	20	8	12	30	18	24	17	15	13
2.		4.46	5.53	5.73	6.60	7.47	6.18	4.89	4.50	4.55	4.57	4.00
3.		0.40	0.70	0.70	0.70	0.70	0.80	1	1	1	1	1
4.		1.78	3.72	4.01	4.62	5.23	4.94	4.89	4.50	4.55	4.57	4.00
5.		-	-	-	-	23.10	-	-	227.60	380.50	-	-
6.		-	-	-	-	-	-	-	216.02	108.0	-	-
7.		-	-	-	-	-	-	-	11.58	192.50	-	-
8.		-	100	150	150	150	150	-	-	-	-	150
9.		0.30*	0.50*	0.60*	0.70*	0.80*	1.00*	1.10*	1.20	1.20	1.20	1.20
10.		333	333	333	333	333	333	184.80	333	333	256.50	333
11.		116	116	116	116	116	116	116	116	116	116	116
12.		217	217	217	217	217	217	68.80	217	217	140.50	217
13.		6.510	108.50	130.20	151.90	173.60	217	75.68	260.40	260.40	168.60	260.40
14.		0.87	0.73	0.70	0.63	0.59	0.60	0.59	0.65	0.65	0.65	0.70
15.		1.75	3.70	2.93	4.62	5.23	4.88	3.77	4.50	4.55	3.35	4.00
16.		0.013	0.005	0.02	0.	0	0.011	0.22	0	0	0.0266	0
17.		0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0.009	0.0279	0.0105	0	0	0.0058	0.1136	0	0	0.133	0
19.		0.99%	0.27%	1.05%	0	0	0.58%	11.36%	0	0	13.30%	0
									Continous rain over the period	Continuous rain over the period		

*Interpolated rooting depth

ANNEXURE-16(d)-Contd/--

Crop: Sugarcane : Plot No. Mundi Minor-1
Sowing Date : 18.2.91

Sl.No.	Particulars	Analysis Dates													
		18.2.91-8.3.91	8.3.-18.3.-	18.3.-30.3.	30.3.-15.4.	15.4.91-25.4.91	25.4.-10.5.	10.5.91-20.5.91	20.5.91-5.6.91	5.6.91-15.6.91	15.6.91-25.6.91	25.6.91-8.7.91	8.7.91-25.8.91	25.8.91-11.9.91	11.9.91-26.9.91	26.9.91-9.10.91
1.		18	10	12	15	10	15	10	15	10	10	13	48	17	15	13
2.		3.19	3.79	3.79	5.14	5.14	5.53	5.73	6.31	7.47	7.47	6.18	4.70	4.54	4.57	4.00
3.		0.40	0.40	0.70	0.70	0.70	0.70	0.70	0.70	0.80	1	1	1	1	1	1
4.		1.28	1.52	2.65	3.60	3.60	3.87	4.01	4.42	5.23	3.98	6.18	4.70	4.54	4.57	4.00
5.		-	-	-	-	-	-	-	-	23.10	-	-	227.60	300.50	-	-
6.		-	-	-	-	-	-	-	-	-	-	-	80.34	-	-	-
7.		-	-	-	-	-	-	-	-	-	-	-	147.76	300.50	-	-
8.		-	100	100	100	100	100	125	125	125	100	100	150	-	100	-
9.		0.25*	0.35*	0.40*	0.50*	0.60*	0.65*	0.70*	0.80*	1.00*	1.05*	1.20*	1.30	1.30	1.30	1.30
10.		333	333	333	333	333	333	333	333	333	333	333	333	333	333	264.45
11.		116	116	116	116	116	116	116	116	116	116	116	116	116	116	116
12.		217	217	217	217	217	217	217	217	217	217	217	217	217	217	148.45
13.		54.25	75-95	86.80	108.50	130.20	141.05	151.90	173.60	217	227.85	260.40	282.10	282.10	282.10	192.98
14.		0.87	0.87	0.81	0.74	0.74	0.71	0.70	0.65	0.58	0.55	0.54	0.63	0.65	0.65	0.70
15.		1.28	1.52	2.65	3.60	3.60	3.87	4.01	4.42	5.32	5.98	6.18	4.70	4.54	4.50	4.00
17.		0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19.		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*Interpolated rooting depth.

Irrigation and rainfall
heavy fall was rain
continous from 24.8.91 to
30.8.91

ANNEXURE-16(d)-Contd/--

Crop : Sugarcane : Plot No. Mundi Minor-2
Sowing Date : 25.1.91

Sl.No.	Particulars	Analysis Dates													
		25.1.91-20.2.91	20.2.91-10.3.91	10.3.-25.3.-	25.3.-10.4.91	10.4-20.4.	20.4.9 1.5.	1.5.-11.6.	11.6.-25.6.91	25.6.91-5.7.91	5.7.91-20.7.91	20.7.91-10.8.91	10.8.91-25.8.91	25.8.91-11.9.91	11.9.91-25.9.91	26.9.91-9.10.91
1		26	18	15	15	10	11	41	14	12	15	21	15	17	15	13
2.		2.59	3.19	3.79	4.69	5.14	5.14	6.20	7.47	6.18	4.89	4.70	4.50	4.54	4.57	4.00
3.		0.40	0.70	0.70	0.70	0.70	0.70	0.80	1	1	1	1	1	1	1	1
4.		1.04	2.23	2.65	3.28	3.60	3.60	4.96	7.47	6.18	4.89	4.70	4.50	4.54	4.57	4.00
5.		-	-	-	-	-	-	-	23.10	-	-	172.70	54.90	300.50	-	-
6.		-	-	-	-	-	-	-	-	-	-	167.09	54.90	111.30	-	-
7.		-	-	-	-	-	-	-	-	-	-	5.61	-	189.20	-	-
8.		-	75	100	100	100	75	75	75	75	100	100	-	-	100	100
9.		0.20*	0.40*	0.50*	0.60*	0.70*	0.75*	1.00*	1.20*	1.30*	1.40*	1.40*	1.40	1.40	1.40	1.40
10.		333	333	333	333	333	333	333	227.74	208.38	235.06	333	289.20	333	333	333
11.		116	116	116	116	116	116	116	116	116	116	116	116	116	116	116
12.		217	217	217	217	217	217	217	111.74	92.38	119.06	217	173.20	217	217	217
13.		43.40	56.80	108.50	130.20	151.90	162.75	217	134.09	120.09	154.78	303.80	242.48	303.80	303.80	303.80
14.		0.87	0.86	0.83	0.77	0.74	0.74	0.60	0.47	0.54	0.61	0.63	0.65	0.65	0.65	0.70
15.		1.04	2.23	2.65	3.28	3.60	3.60	4.38	6.74	6.11	4.61	4.70	4.50	4.54	4.57	4.00
16.		0	0	0	0	0	0	0.11	0.09	0.01	0.056	0	0	0	0	0
17.		0.75	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
18.		0	0	0	0	0	0	0.058	0.0482	0.005	0.0282	0	0	0	0	0
19.		0	0	0	0	0	0	5.80%	0.50%	0.50%	2.82%	0	0	0	0	0
												Continous rain over the period with irrigation		Continous heavy rain over the period		

*Interpolated rooting depth.