RESEARCH RECOMMENDATIONS

SOIL AND WATER CONSERVATION ENGINEERING DEPARTMENT

COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY

JUNAGADH AGRICULTURAL UNIVERSITY

JUNAGADH-362001

RECOMMENDATION No. : 1 **Year:** 2003 **Name of the Scientists:** Dr.R. Subbaiah and Er. V. K. Sardhara **End Users:** Scientists
The Scientists of South Saurashtra Agro-Climatic region are advised to adopt the following yearly rainfall runoff relationship equation, Runoff = 197.34 - 0.196187 Rainfall + 0.00038874 Rainfall^2 This equation is valid for rainfall magnitude between 600 mm and 1500 mm.
RECOMMENDATION No. : 2 **Year:** 2003 **Name of the Scientists**: Dr.R. Subbaiah and Er. V. K. Sardhara **End Users:** Scientists
The scientist of South Saurashtra Agro-climatic region are advised to use an exponential relationship between damping depth (d_n), depth (z) and amplitude of Temperature (Cn,z) at a given harmonic component n and a linear relationship in the phase shift (Øn,z) and depth. Saving of water was not observed in plastic mulch.
RECOMMENDATION No. : 3 **Year:** 2004 **Name of the Scientists:** Dr.R. Subbaiah, and Er. V. K. Sardhara **End Users:** Scientists
The Scientists of South Saurashtra Agro-Climatic region are advised to use the optimum depth of tillage for cultivator, M B plow and disc plow was found to be 9 cm, 13 cm and 22 cm respectively for attaining maximum moisture intake and retention time.
RECOMMENDATION No. : 4 **Year:** 2004 **Name of the Scientists:** Dr.R. Subbaiah and Er. V. K. Sardhara **End Users:** Scientists and Farmers
The Scientists of South Saurashtra Agro-climatic region are advised to use wheat mulch @ 4 tons/ha combined with tilling the soil by M B plow to a depth of 20 cm will reduce the evaporation losses by 26.2 percent and increase the crop yield by 17 percent monsoon season.
RECOMMENDATION No. : 5 **Year:** 2009 **Name of the Scientists:** Dr.R. Subbaiah **End Users:** Planners and NGO's
It is recommended to planners and NGO's that in Junagadh and Ghed area, the empirical method applied are giving on an average annual ground water recharge of 15 to 18 percent of the annual rainfall. In these area by measuring rainfall, pre-monsoon water table and using artificial nueral network (architecture 2-5-1), the post ground water table would be predicted

well.

RECOMMENDATION No. : 6

Year: 2013-14

Name of the Scientists: Prof. H. V. Parmar and Dr. R. Subbaiah

End Users: Planners, Designers, NGOs, Field and Government Departments Officers

The Planners, Designers, NGOs, Field Officers, and Government Departments of Junagadh district are recommended to use below given daily rainfall-runoff prediction equations for estimating daily runoff which are derived by JAU, Junagadh using practically derived SCS Curve number (73.03) and adopting Remote Sensing approach. The groundwater contribution for the district can be taken as 12.67% of the above estimated runoff for efficient watershed planning. Additionally the updated Land Capability Classification for Ozat catchment in Junagadh can be taken as provided in the below table.

A) Rainfall – Runoff Relationships for Ozat Catchments (Daily basis)

Sr. No.	Catchment Name	Rainfall (x) – Runoff (y) Equation*	R^2
1	Ambajal Catchment	y = 0.6403x - 11.459	0.9237
2	Motagujariya Catchment	y = 0.4599x - 5.9043	0.8317
3	Zanjeshri Catchment	y = 0.5525x - 7.7979	0.8971
4	Dhrafad Catchment	y = 0.5748x - 8.2758	0.8706
5	Ozat Weir-2 Catchment	y = 0.366x - 3.4271	0.7299
6	Ozat Weir-Shapur Catchment	y = 0.4994x - 5.9403	0.8571
7	Ozat Weir-Vanthli Catchment	y = 0.459x - 5.1273	0.8493
8	Ozat River Catchment	y = 0.5366x - 7.3009	0.8591

* Rainfall and Runoff are in mm

B) Updated Land Capability Classification for Ozat Catchment

Sr. No	Particular	Area, km²	Percent (%)	Remark
1	CLASS - I	975.34	69.22	Cultivable land
2	CLASS - Il	7.67	0.54	
3	CLASS - IV	131.16	9.31	
4	CLASS - V	14.42	1.02	Uncultivable land
5	CLASS - VI	233.12	16.54	
6	Village	20.52	1.46	
7	River, Reservoir	26.93	1.91	
	Total	1409.16	100.00	

RECOMMENDATION No. : 7

Year: 2017-18

Name of the Scientists: Dr. R. J. Patel,Dr. H. D. Rank, Dr. H. R. Vadar, Dr. R. Subbaiah,Dr. H. V. Parmar,Er. P. B. Vekariya and Dr. J. M. Modhvadiya

Name of Scheme: Research on Watershed Management (BH: 12905)

End Users: Farmers

Irrigation scheduling of wheat under high discharge drip irrigation.

Farmers of South Saurashtra Agro-climatic Zone growing Wheat in medium black soil are recommended to adopt the drip irrigation system having spacing of 1.8m lateral to lateral and 1 m emitter to emitter of 14 liters per hour to irrigate at 150 cbar soil moisture tension to get higher net return with 21.04%

water saving and 4% energy saving. For this, farmers are advised to irrigate the crop with following schedule.

Month	Number of Irrigation	Time of operation	Irrigation Interval
November	1	Flood irrigation	Post sowing
December	2	4 hours and 45 minute	10 Days
January	3	3 hours and 40 minute	6 Days
February	4	5 hours and 40 minute	9 Days

RECOMMENDATION No. : 8

Year: 2017-18

Name of the Scientists: Dr. H. V. Parmar, Dr. H. D. Rank, Dr. N. K. Gontia,Dr. R. Subbahia and Dr. R. J. Patel

Name of Scheme:Centre of Remote Sensing and Geoinformatics in Agriculture (BH: 12024)

End Users: Irrigation Department and Planner

Estimation of irrigation demand using remote sensing and GIS

The irrigation department and planners of Ozat river basin are recommended that based on remote sensing technology, 9 irrigations should be applied for wheat crop in basin apart from pre sowing irrigation at 16, 31, 40, 50, 62, 72, 80, 89 and 96 days after sowing with irrigation depths of 33, 38, 32, 37, 45, 43, 37, 44 and 35 mm respectively.

RECOMMENDATION No. : 9

Year: 2017-18

Name of the Scientists: Dr. H. V. Parmar, Dr. H. D. Rank, Dr. N. K. Gontia,Dr. R. Subbahia and Dr. R. J. Patel

Name of Scheme:Centre of Remote Sensing and Geoinformatics in Agriculture (BH: 12024)

End Users: Planners, NGOs and Government Departments

Relationship between remote sensing based vegetation indices and crop coefficient

The Planners, NGOs and Government Departments are recommended to use the following relationships of crop coefficients of wheat crop with remote sensing images based vegetation indices (Soil Adjusted Vegetation Index (SAVI) and Normalized Difference Vegetation Index (NDVI) to find out the wheat crop coefficient using the value of SAVI or NDVI for the estimation of crop water requirement.

$K_c = 1.2588\ SAVI + 0.4347$

$K_c = 1.6741\ NDVI + 0.5387$

Where, K_c = Crop coefficient of Wheat crop, NDVI = Normalized Difference Vegetation Index, SAVI = Soil Adjusted Vegetation Index.

RECOMMENDATION No. :10

Year: 2022-23

Name of the Scientists: Dr. H. V. Parmar, Dr. N. K. Gontia, H. D. Rank, Dr. R. J. Patel

Name of Scheme: Centre of Remote Sensing and Geoinformatics in Agriculture

End Users: Planners / NGO/ Government department

Soil Moisture based Irrigation Water Management in Canal Command using Remote Sensing Technology

The Planners, NGOs and Government Departments of South Saurashtra Agro Climatic region are recommended to use the following relationships of surface soil moisture with remote sensing images based Temperature Vegetation Dryness Index (TVDI) to find out the spatial surface soil moisture for the estimation of crop water requirement for the agricultural fields.

Surface Soil Moisture (%) = -45.457 TVDI + 43.71

Where,
TVDI = Temperature Vegetation Dryness Index

RECOMMENDATION No. : 11

Year: 2022-23

Name of the Scientists: Dr. R. J. Patel, Dr. J. M. Modhvadia, Dr. H. R. Vadar, Er. P. B. Vekariya, Dr. H. D. Rank, Dr. H. V. Parmar

Name of Scheme: Research on Watershed Management

End Users: Farmers

Influence of crop cultivation method and slope on runoff and soil loss under natural rainfall condition

The farmers of south Saurashtra agro climatic zone growing cotton and groundnut are recommended to keep the land slope upto 0.75% to conserve more water into the medium black soil. In order to reduce the soil loss, they are recommended to cultivate groundnut crop along land slope upto 0.5% and across the land slope upto 0.75%.

RECOMMENDATION No. : 12

Year: 2022-23

Name of the Scientists: Dr. R. J. Patel, Dr. J. M. Modhvadia, Dr. H. R. Vadar, Er. P. B. Vekariya, Dr. H. D. Rank, Dr. H. V. Parmar

Name of Scheme: Research on Watershed Management

End Users: Scientific community

Influence of crop cultivation method and slope on runoff and soil loss under natural rainfall condition

On availability of daily rainfall data, the following empirical rainfall-runoff models are proposed for the hydrologic design of water

harvesting/conservation structures to estimate the runoff from the field of cotton and groundnut crop cultivation either along or across the land slope up to 1% for medium black soil.

Crop	Cultivation practices	Rainfall-runoff model	R^2
Cotton	Along	RO = 0.6307(RF) - 7.7509	0.901
Cotton	Across	RO = 0.5908(RF) - 7.3239	0.898
Groundnut	Along	RO = 0.5752(RF) - 7.1512	0.895
Groundnut	Across	RO = 0.5195(RF) - 6.4703	0.888
Where, RO is daily runoff (mm) and RF is the daily rainfall (mm)			

On the availability of daily rainfall and land slope data, following empirical models are proposed to estimate the runoff from the fields of cotton and groundnut crop cultivation either along or across the land slope up to 1% for medium black soil.

Cultivation practices	Model	R^2
Cotton Along	$RO = 0.2546\ (RF)^{1.1787}\ (S)^{0.2450}$	0.885
Cotton Across	$RO = 0.2404\ (RF)^{1.1787}\ (S)^{0.2759}$	0.882
Groundnut Along	$RO = 0.2535\ (RF)^{1.1774}\ (S)^{0.3900}$	0.878
Groundnut Across	$RO = 0.2167\ (RF)^{1.1720}\ (S)^{0.2571}$	0.866
Where, RO is the predicted daily runoff (mm), RF is the daily rainfall (mm) and S is the slope of the bed (%).		

RECOMMENDATION No. : 13

Year: 2022-23

Name of the Scientists: Dr. R. J. Patel, Dr. J. M. Modhvadia, Dr. H. R. Vadar, Er. P. B. Vekariya, Dr. H. D. Rank, Dr. H. V. Parmar

Name of Scheme: Research on Watershed Management

End Users: Scientific community

Influence of crop cultivation method and slope on runoff and soil loss under natural rainfall condition

On the availability of annual rainfall and land slope data, the following empirical models are proposed to estimate the annual soil loss from the fields of cotton and groundnut crop cultivation either along or across the land slope up to 1% for medium black soil.

Cultivation practices	Model	R^2
Cotton Along	$AS_L = 1.1669(ARF)^{0.2281}\ (S)^{0.2269}$	0.904
Cotton Across	$AS_L = 2.0660(ARF)^{0.1356}\ (S)^{0.2397}$	0.961
Groundnut Along	$AS_L = 1.1016(ARF)^{0.2277}\ (S)^{0.3603}$	0.951
Groundnut Across	$AS_L = 0.6235(ARF)^{0.2910}\ (S)^{0.2532}$	0.956
Where, AS_L is the annual soil loss (ton/ha/year), S is the slope of the bed (%) and ARF is the annual rainfall (mm).		

RECOMMENDATION No. : 14

Year: 2023-24

Name of the Scientists: Dr. N K Gontia, Dr. K. C. Patel, Dr. Punil P.

Gajjar; Dr. P. K. Gupta, Mr. Rohit Pradhan **Name of Scheme: ISRO, Project** **End Users: Scientific community**
River flow simulations integrating satellite data in a forested catchment
In assessing the spatial soil wetness condition of a catchment, microwave remote sensing proves to be an invaluable tool. However, it is advised the scientific community to exercise caution when applying scatterometer data for estimating river water levels in forested catchments. The presence of a dense forest canopy can lead to reduced radar backscatter, potentially affecting the accuracy of the estimates.
RECOMMENDATION No. : 15 **Year: 2023-24** **Name of the Scientists: Dr. N K Gontia, Dr. K. C. Patel, Dr. Punil P. Gajjar; Dr. P. K. Gupta, Mr. Rohit Pradhan** **Name of Scheme: ISRO Project** **End Users: Scientific community**
River flow simulations integrating satellite data in a forested catchment
It is recommended to use the following power function relationship as a tool for estimating downstream discharge (outlet discharge) based on water level measurements. Y = a*X^b (where, a = 17.308, b = 2.4514, X = river water level, meter and Y = discharge in Cumec) This equation offers invaluable assistance to forest planners in effectively managing available water resources. By employing this relationship, planners can make informed decisions, ensuring sustainable and efficient water allocation within forested regions, thereby contributing to sound environmental stewardship and resource conservation.