NAVSARI AGRICULTURAL UNIVERSITY

DEPARTMENT OF NATURAL RESOURCE MANAGEMENT
COLLEGE OF FORESTRY
NAVSARI AGRICULTURAL UNIVERSITY
NAVSARI - 396 450 (GUJARAT)

Activities and Achievements of Natural Resource Management Department

The main aim of the department is to impart education to the students admitted in Forestry, with following specific objectives:

- ✓ To impart education regarding basics of forest resources to the students
- ✓ To make the students aware about activities of watershed management/ climate change/ sustainable development
- ✓ To impart training to the students about Remote Sensing and GIS
- ✓ To educate the students regarding Environmental Conservation and impending threats of Climate Change

Courses offered at B.Sc. (Forestry) level (Vth Dean committee)

Course code	Title of Course	Credits
NRM.3.5	Forest Survey & Engineering	2+1
NRM.5.6	Agrometeorology and Climate Change	2+1
NRM 5.7	Forest Management	2+1
NRM 5.8	Principles of Economics and Marketing	2+1
NRM 5.9	Restoration of Degraded Lands	1+1
NRM 6.10	Forest Laws, Legislation and Policies	2+0
NRM 6.11	Geomatics-Remote Sensing & GIS	1+1
NRM 6.12	Forest Hydrology and Watershed Management	2+1

Courses offered at B.Sc. (Forestry) level (VIth Dean committee)

Sr. No	Title of Course	Credit hours	Total Credit Hours
A) Core courses			
1	Introduction to Forest Resources	2+1	40 (24+16)
2	Forest Measurements and Inventory	2+1	
3	Forest Ecology and Management	2+1	
4	Forest Health and Protection	1+1	
5	Forest Resource Management	1+1	
6	Forest Tribology, Ethno-medicine and Extension	2+1	
7	Forest Landscape Restoration (FLR)	2+0	
8	Forest Policy and Legislation	2+0	
9	Forest Soil and Nutrient Management	1+1	

Courses offered at B.Sc. (Forestry) level (VIth Dean committee)

Cont…

Sr. No	Title of Course	Credit hours	Total Credit Hours
10	Forest Economics and Marketing	1+1	
11	Forest Business Management	1+1	
12	Remote Sensing and GIS	1+1	
13	Forest Microbiology	1+1	
14	Forest Survey and Engineering	1+1	
15	Forest Pest and Diseases	2+1	
16	Watershed Planning and Management	1+1	
17	Statistical Methods	1+1	
B) Value added courses			
1	Environmental studies and Disaster Management	2+1	2+1

Courses offered at M.Sc. (Forestry) Specialization in FRM

Course code	Title of Course	Credits
FRM 501*	Forest Biometry and Management	2+1
FRM 502	Ecology and Management of Forest Soils	2+1
FRM 503*	Remote Sensing and Geographical Information System in Forest Resource Management	2+1
FRM 504	Land Use Planning and Watershed Management	2+1
FRM 505*	Forest Resource Economics	1+1
FRM 506*	Forest Ecosystem Services and Valuation	2+1
FRM 507	Environmental Impact Assessment and Auditing	1+1
FRM 508*	Forest Policy, law and International Conventions	2+0
FRM 509	Global Climate Change Impact, Mitigation and Adaptation	2+0
FRM 510*	Participatory Approaches in Forest Resource Management	1+1
FRM 511	Management of Tree Insect-Pests and Diseases	2+1
FRM 512	Forest Ecology, Biodiversity and Management	2+1

*Compulsory Core Courses

Courses offered at PhD. (Forestry) Specialization in NRM

Course code	Title of Course	Credits
FRM 601*	Forest Management	2+1
FRM 602	Forest Economic Analysis	2+1
FRM 603	Climate Change and Forestry	1+1
FRM 604	Geo-informatics in Forest Resource Management	2+1
FRM 605*	Environmental Impact Analysis and Assessment	2+1
FRM 606	Forest Soil Management Forest Soil Management	2+1
FRM 607	Environmental Modelling and Biostatistics	2+0
FRM 608	Approaches in Forest Resource Assessment	1+1
FRM 609	Forest Hydrology and Watershed Management	2+1
FRM 610	Operational Research and Forest Modeling	1+1

*Compulsory Core Courses

PG (M. Sc Forestry) passed out students

Sr. No	Student's Name	Major Guide	Thesis Title	Specialization	Year
1.	Surendra Kumar	Dr. P. K. Shrivastava	Evaluation of farm pond constructed in campus, watershed	Watershed Management	2012
2.	Revale Amit Ankush	Dr. K. G. Patel	Natural resource characterization of Vanarasi area	Watershed Management	2012
3.	Surve Nilam Vijay	Dr. P. K. Shrivastava	Evaluation of changes in micro watersheds of NAU campus during last decade	Watershed Management	2013
4.	Rahul kumar Patel	Dr. P. K. Shrivastava	Evaluation of micro-watershed of Navsari taluka	Watershed Management	2016
5.	Bhavin Bhandari	Dr. P. K. Shrivastava	Study of coastal micro-watersheds near Dandi	Watershed Management	2016
6.	Haripriya S.	Dr. P. K. Shrivastava	Feasibility of *Schizostachyum pergracile* in gravity drip irrigation in water scarce forested watersheds of South Gujarat	Natural Resource Management	2021
7.	Sudha Hubballi	Dr. S. V. Viyol	Decomposition and nutrient release pattern of leaf litter of selected tree species in South Gujarat	Forest Resource Management	2024
8.	Rishi Ram Paudel	Dr. P. K. Shrivastava	Feasibility of water availability to wild ungulates in Vansda National Park	Forest Resource Management	2024

Research Projects

Ongoing Projects

Sr. No.	Title of project	Type	Agency
1.	Strategies to Mitigate the Impact of Climate Change, Navsari (Merge with Establishment of Center on Environmental Studies)	Plan	GoG
2.	Centre for Geospatial Research Education and Training (GREAT)	Plan	GoG

Completed Projects

3.	Development of methodology for identification and discrimination of biotic stress in Tectona grandis L. (CoPI: Dileswar Nayak)	Other Agency	DST, GoI
4.	Forest Resource Survey of Rajpipla Forest Division (CoPI: Dileswar Nayak)	Other Agency	GFRI, Gandhinagar
5.	Demonstration of site specific water conservation technologies for improving deteriorating soil and water quality in the coastal south Gujarat.	Other Agency	DST, GoI

On going research Studies

- Impact of tree densities on growth and yield of Ardu (*Ailanthus excelsa* Roxb
- Tree selection, evaluation and clonal propagation of Ardu (*Ailanthus excelsa* Roxb.) germpalsm.
- Assessment of different water salinity levels on *Albizia species*
- Air pollution tolerance index (APTI) of trees of other cities in south Gujarat
- Removal of Chromium ions from aqueous solutions by Bamboo wastes
- Study the temporal and spatial changes in water quality of NAU Campus
- Evaluation of Ailanthus based agroforestry systems in South Gujarat
- Evaluation of different classification methods for identification of tree plantation using Remote Sensing and GIS
- Assessment of Vegetation Phenology and Soil Moisture in Dang Forest
- Remote Sensing-Based Mapping of Forest Canopy Height in The Dang District of Gujarat, India
- Spatio-temporal pattern of land use land cover and its effects on land surface temperature using RS and GIS techniques in Navsari district of Gujarat, India

Recommendations

1	Pitcher irrigation in young mango plants The farmers of AES— II of South Gujarat heavy rainfall zone are advised to adopt pitcher method of irrigation in newly planted mango orchard. They are recommended to fill either 1 pitcher of 10 L capacity or 2 pitchers of 7 L capacity per week, resulting in 50 % and 30 % water saving respectively, as compared to ring method of irrigation.	III Combined Joint AGRESCO, 2007
2	Percolation pit for clay soils of South Gujarat The farmers of coastal areas of South Gujarat are recommended to construct a percolation pit near their bore well, in the available natural depression/monsoon drain. The pit of size 4.0 m x 3.0 m x 2.0 m (for a field of about 2 ha) along with 200 mm PVC strainer pipe, inserted before digging the pit upto first aquifer (about 12 m depth) for improving the ground water quality. The pipe should be about 0.6 m above ground with cap on top.	VI Combined Joint AGRESCO, 2010
3	Rain Water Harvesting for sustaining ground water quality in coastal South Gujarat Farmers of the South Gujarat coastal region are recommended to harvest as much rain water as possible to maintain ground water quality below (EC=2 dS/m) as per catchment area as tabulated below. The suggested modes of harvesting in decreasing order of preference could be Pond, Check dam, Percolation pit, Percolation well, Trenches and Sub soiling, as per availability of land, catchment area, water demands, financial capacity, topography, rainfall pattern, soil type, vegetative cover and nearness to sea Sr. no — Area (ha) — Mode of Harvesting 1 — >2 — Pond & Check Dam 2 — 2 to 1 — Percolation pit 3 — 1 to 2 — Percolation well 4 — < 0.5 — Trenches & Sub soiling	VIII Combined Joint AGRESCO, 2012

4	Time series analysis of weather parameters in relation to crop productivity Scientific Community The monsoon onset is delayed by a week and recedes a week early. Higher evaporation of 8 % and 18 % were observed during summer and rabi seasons respectively Therefore, scientists are recommended to Evolve shorter duration crop varieties suitable for delayed monsoon and re assess the crop water requirements for South Gujarat region.	VIII Combined Joint AGRESCO, 2012
5	Roof top rain water harvesting for potable use Roof top rain water harvesting for potable use is recommended. Storage capacity of tank should be approximately 1000 L/ capita/yr., constructed in such a way that no light or air enters inside to prevent bacterial growth and the tank may at least 0.5 m above ground level to prevent direct entry of runoff water. Water from the tank could be pumped out by means of hand pump or electric operated self priming shallow lift pump. Precautions to be adopted are: ➢ Roof tops and conveyance pipes should be thoroughly cleaned at the time of onset of monsoon. First flush of rain water should be allowed to bypass the storage tank, as well as during long gaps between two rainy events. ➢ Roof water may be allowed to pass through gravel — sand filter, consisting of layers (30 -50 cm) of coarse sand, 25 mm gravel, 50 mm gravel to remove organic impurity. ➢ Calcium Carbonate powder kept in earthen pots (7 L capacity / 5000 L), tied with muslin cloth on the mouth may be submerged into the storage tank. ➢ Walls of tank could be white washed with lime solution. ➢ Anaerobic bacteria may develop with time which could be removed by boiling / adding 0.5 g tablet of chlorine in 20 L of water / storage of water in copper vessel for 8 —10 hrs / by using commercially available UV filter.	X Combined Joint AGRESCO, 2014
6	Disinfecting drinking water against any microbial activity by storing water in a copper vessel To disinfect drinking water against any microbial activity, water could be safely stored in a copper vessel for 12 hrs and 24 h to reduce Total AGRESCO, 2014 Coliform by 85% and 90 % and total bacterial count by 67 and 81 % respectively.	X Combined Joint AGRESCO, 2014

7	Study on influence of different temperature regimes on growth and yield of rice On the basis of two season experiment in controlled environmental conditions, it is recommended that there is need to develop new rice varieties in context of future global warming. The significant yield reduction was recorded in all the three rice varieties viz. Jaya, Gurjari and GNR-2. The yield reduction was up to the tune of 18% and 36.6% when rice crop experienced rise of only 1.3°C and 2.7°C respectively, in average daily temperature above 10 years of average temperature	X Combined Joint AGRESCO, 2014
8	Rainfall based crop planning for Dediapada 1. Farmers of Dediapada taluka are recommended to proceed for sowing operations from 27th SMW. 2. Farmers are advised for in-situ moisture conservation and runoff collection in ponds for providing supplemental irrigation at the critical stages of rainfed crops after withdrawal of rainfall i. e. 36th SMW to get maximum production form rainfed crops. Scientific Community: 27th SMW receives 24 mm, 26 mm and 35 mm rainfall amount at 75 %, 71 % and 60% probability respectively. The length of monsoon season is 112, 105 and 70 days at 50 %, 60 % and 75 % probability respectively. Rainfall is withdrawn after 39th, 38th and 36th SMW at 50 %, 60 % and 75 % probability respectively. There are 60 and 75 % probability to get sufficient rainfall for rainfed crops (> 10 mm) for continuous 11 SMW (77 days) from 27th to 37th week and 10 SMW (70 days) from 27th to 36th week respectively.	X Combined Joint AGRESCO, 2014
9	Assessment of pollution tolerance index of some plants In industrial areas of tropical region, it is recommended to plant Forest specie *Cassia fistula*, as it showed maximum APTI value as compared to other species. In addition, species *S. indica* and *S. cumini* are also found to be tolerant for plantation in industrial areas.	X Combined Joint AGRESCO, 2014

10	Investigation on Tree ring analysis of Teak Recommendation for Scientific Community: It is informed to the scientific community and state forest department that the mean ring-width-index chronologies of teak developed for Naysari from AD 1991-2015, Valsad from AD 1867-2012 and Dang from 1912-2012 of South Gujarat are useful in reconstruction of past climate mainly the rainfall patterns during drought years. Furthermore, it also indicates the major El Nifio and drought years of India. These ring-width-index chronologies developed for the particular time periods at the three sites are also helpful in determining the unknown year in which the teak tree was felled. Recommendation for Farmers: To enhance the radial growth in teak (*Tectona grandis* L.), the farmers of South Gujarat Heavy Rainfall Agroclimatic Zone-1 (AES-I & Ill) growing teak in their plantations may give light irrigation during March and normal irrigation during peak growth period from June to July, especially, when there is a moisture stress due to deficient rainfall.	XII Combined Joint AGRESCO, 2016
11	Estimation of Green House Gases (GHGs) emission from paddy fields The rice grown under SRI method with 100 % RDN through urea retards the emission of CH4 as well as total GHGs (CH4 + N20 as CO2 eq.) which increases rice productivity. However, this superiority does not exist with respect to emission of N20. Rice cultivation with normal transplanting and direct seeded methods emitted the CH4 gas to a greater extent and emission was more pronounced when Farm Yard manure added to the soil. Application of organics alone or in combination with inorganic fertilizers improves the rice yield and soil properties but favored more emission of GHGs from the rice field.	XIII Combined Joint AGRESCO, 2017

12	Effect of 75% green agro-net on production, reproduction and stress parameters in Surti buffaloes Farmers of South Gujarat region are recommended to use 75% green agro shed-net at 10 feet height to reduce 10-150C floor temperature of the open paddock between 2- 5 PM in hot-dry season (April end to first week of June) and also to reduce heat stress by lowering THI in hot-humid season (mid June to July end) for the comfort of Surti buffaloes".	XIII Combined Joint AGRESCO, 2017
13	Evaluation of Eucalyptus Clones for growth and physiological characters Farmers of south Gujarat heavy rainfall zone-1 are recommended to harvest Eucalyptus (Nilgiri) clone G 283 (at 2 X 2 m spacing) after four years for better biomass production or pulp wood.	XIII Combined Joint AGRESCO, 2017
14	Development of integrated rainwater resource management (iRaM) module for coastal areas of South Gujarat Farmers of South Gujarat coast are recommended to construct ponds in lower depressions of their field, to harvest rain water for improving ground water quality along with rearing of fresh water fish (Grass carp, Catla, Rohu and Mrigal). The pond may be constructed in 10 % area with 3.0 m depth including 0.5m free board. They may rear fresh water fish even by collecting rain water or excess canal water by adopting "iRaM" (Integrated rainwater resource management) model.	IVX Combined Joint AGRESCO, 2018

<table>
<tr>
<td>15</td>
<td>Irrigation scheduling of teak seedlings grown in nurseries
It is recommended to farmers/state forest department raising teak stump in net house nurseries to irrigate the seedlings on every alternate day, for getting seedlings with superior growth. The approximate quantity of water application (ml) in poly-bags of 10 kg size, during different months should be as follows:
<table>
<tr><th>Nov</th><th>Dec</th><th>Jan</th><th>Feb</th><th>Mar</th><th>A</th><th>M</th><th>Jun</th></tr>
<tr><td>300</td><td>20</td><td>20</td><td>300</td><td>300</td><td>4</td><td>4</td><td>30</td></tr>
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</td>
<td>IVX Combined Joint AGRESCO, 2018</td>
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<tr>
<td>16</td>
<td>Assessment of land use / land cover changes in South Gujarat using remote sensing and geographical information system
It is observed, from 2000 to 2010, that Surat district recorded major shift (18.25 %) from forest area to Orchards, plantations and gardens. Marshy lands have increased in Navsari (28.90 %) and Bharuch (2.38 %) district. Built up areas significantly increased in Navsari (69.09 %) followed by Narmada (44.40 %) district. The barren land may be planted with suitable forest / fruit species which will provide environmentally sustainable economic growth of the region. Therefore, policy makers, state Agriculture and Forest departments are suggested to utilize the technique of Remote Sensing and GIS for assessing the changes in land use, at regular basis, to maintain the vegetative cover, essentially required to sustain the ecological balance of the region.
Effect of different salinity levels of irrigation water on young teak plants
Scientific community is hereby informed that the critical limit of irrigation saline water for teak clones viz., CPT-262, CPT-266 and local is EC 4.0 dSm-1.</td>
<td>IVX Combined Joint AGRESCO, 2018</td>
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</table>

17	Effect of different salinity levels of irrigation water on clones of *Casuarina equisetifolia* Scientific community is hereby informed that, *Casuarina equisetifolia* cuttings could be grown successfully up to the EC 8.0 dSm-1 saline irrigation water, without any remarkable reduction in biomass. Among the tested clones, IFGTBCE-1 clone is found to be more salt tolerant and could be grown up to EC 12.0 dSm-1of saline irrigation water. The critical limit of salinity of irrigation water, for *Casuarina equisetifolia* is recorded EC 16.0 dSm1.	IVX Combined Joint AGRESCO, 2018
18	Evaluation of Eucalyptus Clones for growth and biomass It is recommended that Eucalyptus camaldulensis clone 115 (IFGTBEC-1) grown in south Gujarat Heavy Rainfall Agro-climatic Zone-1, (AES 11)1 can be used for further breeding/ improvement programme for better productivity at 3 m x 1.5 m spacing. Effect of heat ameliorative measures (fans, foggers and green net) on physiological, haematological, biochemical and productive performance of lactating Surti buffaloes: Surti buffalo keepers of South Gujarat region are recommended to house Surti 191 buffaloes in shed having fans, foggers and rooftop whitewashed with lime for decreasing heat stress during summer season from 9 am to 5 pm (temperature decreases upto 3°C) which is beneficial in sustaining milk production.	IVX Combined Joint AGRESCO, 2018
19	Calibration and validation of DSSAT model for sugarcane crop for South Gujarat region: Calibrated genetic coefficients of two sugarcane cultivars (Co 86032 and Co 99004) furnished in the following table* can be used to run DSSAT model to simulate sugarcane yield under south Gujarat condition.	XV Combined Joint AGRESCO, 2019

20	Calibration and validation of DSSAT model for sugarcane crop for South Gujarat region: Calibrated genetic coefficients of two sugarcane cultivars (Co 86032 and Co 99004) furnished in the following table* can be used to run DSSAT model to simulate sugarcane yield under south Gujarat condition.	XV Combined Joint AGRESCO, 2019
21	Influence of climate on the wood production and anatomical variations in teak trees Teak growing in dry and moist deciduous forests varied in terms of wood production and its quality, which are influenced by radial growth, basic density and anatomical properties viz., fiber length, cell wall thickness, vessel diameter and vessel density. Further, fiber length is positively influenced by rainfall, whereas cell wall thickness positively and vessel density negatively influenced by both rainfall and temperature. However, vessel diameter negatively influenced by temperature and positively influenced by rainfall.	XV Combined Joint AGRESCO, 2019
22	Effect of supplementary cooling on body temperature, behavior, milk composition and haemato-biochemical changes in hot dry and hot humid season in lactating Surti buffaloes. Tympanic temperature is a non invasive and sensitive parameter that can be used for measurement of body temperature during heat stress in Surti buffaloes	XV Combined Joint AGRESCO, 2019
23	Effect of supplementary cooling on body temperature, behaviour, milk composition and haemato-biochemical changes in hot dry and hot humid season in lactating Surti buffaloes Tumor necrosis factor-a can be used as an additional bio-marker of heat stress in Surti buffaloes.	XV Combined Joint AGRESCO, 2019

24	Study of carbon sequestration potential of important tree species Farmers are recommended to grow tree species such as Casuarina, Eucalyptus and 8 flasal for obtaining higher biomass and carbon sequestration under South Gujarat.	XV Combined Joint AGRESCO, 2019
25	Determination of critical limit of water salinity for *Ailanthus spp*. (Arduso) seedlings Scientific community is hereby informed that *Ailanthus species* (i.e. *A. excelsa* and *A. triphysa*) are salt tolerant and the critical limit for irrigating with saline water is 8.0 dS/m. Further, it is advised that Na/K ratio could be used as an indirect indicator for salt tolerance in the Ailanthus species.	XVI Combined Joint AGRESCO, 2020
26	Mapping of degraded lands using Remote sensing and GIS technique in coastal south Gujarat Scientific community is hereby informed that, Policy maker, state agriculture and forest departments are suggested to utilize the technique of remote sensing and GIS for assessing the land degradation at regular basis to ascertain the land sustainability. The sustainable utilization of unutilized land may be done as per land capability classification essentially required for nourishing ecological balance and food security of the region.	XVII Combined Joint AGRESCO, 2021
27.	APTI values from lowest to highest is observed as follows: *Samanea samen* Jacq.. < *Streculia foetida* L. < *Ficus benghalensis* L. < *Syzygium cumini* L. < *Cassia fistula* L.< *Kigelia pinnata* Roxb. < *Acacia auriculiformis* A. Cunn.< *Azadirichta indica* A. Juss < *Ficus religiosa* L.. Trees showing intermediate tolerance *i.e Ficus religiosa* along with *Azadirichta indica* and *Acacia auriculiformis* can be promoted for plantation to combat the pollution.	XIX Combined Joint AGRESCO, 2023

Recommendations

<table>
<tr><td>28</td><td>The farmers of South Gujarat, who intend to grow and Ailanthus triphysa are recommended to grown under Ailanthus excelsa well drain soil where the water logging conditions may hold up to two days. These tree should not be grown in the land which is filled with water for more than two days.</td><td>XX Combine Joint AGRESCO 2024</td></tr>
<tr><td>29</td><td>The farmers of South Gujarat, who intend to grow Ardusa (Ailanthus excelsa) are recommended to irrigate their tree through drip irrigation at 1.0 PEF for first three years and 1.2PEF onwards for achieving higher biomass and net return along with 66-72 % saving in water.
System details:
Tree spacing : 3m X 2m
Lateral spacing : 3m
Dripper spacing : 2 Drippers/tree
Dripper discharge : 8 LPH
Operating pressure : 1.2 kg/cm 2
Operating time: Alternate day (Minutes)
<table><tr><td></td><td>October-November</td><td>December-January</td><td>February-March</td><td>April-May</td></tr><tr><td>1st Year</td><td>25-29</td><td>20-22</td><td>35-40</td><td>54-58</td></tr><tr><td>2nd Year</td><td>35-40</td><td>25-32</td><td>46-53</td><td>60-76</td></tr><tr><td>3rd Year</td><td>40-44</td><td>34-40</td><td>55-64</td><td>80-90</td></tr><tr><td>After 3 Years</td><td>71-81</td><td>62-71</td><td>77-85</td><td>100-110</td></tr></table></td><td>XX Combine Joint AGRESCO 2024</td></tr>
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Important published Research Articles

Duda B. Balas, Nirav K. Pampaniya, S.V. Viyol, Ram J. Mevada and D.P. Patel (2025). Assessment of Village-Level Flood-Affected Areas in The Ghed Region of Saurashtra, Gujarat. *Plant Archives*, 25(sp. Issue): 205 – 210.

Pampaniya, Nirav K., Duda B. Balas, S. V. Viyol, Ram J. Mevada, D. P. Patel, Nilam Surve, Bhavin Ram, and Devrajsinh I. Thakor. (2025). District-Level Assessment of Water Body Areas Across Different Regions of Gujarat, India. *Journal of Geography, Environment and Earth Science International,* 29(2): 66-79.

Champaneri, D. D., Desai, K. D., Ahlawat, T. R., Shrivastava, A., & Pampaniya, N. K. (2024). Assessment of CROPWAT 8.0 model accuracy under deficit irrigation scheduling: A sustainable path toward smart water supply. *Water Supply*, *24*(10): 3423-3437.

Pampaniya, N. K., Nayak, D., Viyol, S. V., Shrivastava, P. K., & Mevada, R. J. (2023). Surface water mapping using google earth engine (GEE) for south Gujarat forest. *Indian Journal of Ecology*, *50*(5), 1408-1412.

Manojkumar, S., Behera, L. K., Mehta, A. A., Nayak, D., & Patel, S. M. (2023). Community structure of lesser known tree species, *Dalbergia lanceolaria* L. f., in tropical deciduous forest. *Indian Journal of Ecology*, *50*(5), 1348-1352.

D.R. Prajapati, N.S. Thakur*, V.R. Patel , R.P. Gunaga, Lalit Mahatma and D.P. Patel (2022). Influence of Spatial Configurations on Quantitative Melia dubia and Qualitative Performance of Hybrid Napier (*Pennisetum purpureum* x *P. americanum*) and Soil Biota Status. *Indian Journal of Ecology*, 49(1): 9-20.

Mevada, R. J., Nayak, D., Patel, D. P., & Tandel, M. B. (2021). Potential of tasar silkworm (*Antheraea mylitta*) excreta as fertilizer on growth, yield and quality of rice. *Journal of Environmental Biology*, 42(4), 1070-1.

Dwivedi, D.K. and Shrivastava, P.K. (2021). Assessment of roof water harvesting potential of Navsari city of Gujarat State, India by Remote Sensing and Geographic Information System (GIS), *Journal of Applied and Natural Science*,13(3),1143-1150.

Patel, D. S., Kirti, B., Dhiraji, P. P., Vipulkumar, P., Suchismita, J., Ajay, V. N., & Harshadkumar, N. C. (2021). Does plant root architecture respond to potassium under water stress? A case from rice seedling root responses. *Current Science*, 120(6), 1050-1056.

Bhandei, B.N., Shrivastava, P.K., Dileswar Nayak and Patel, D.P. (2020). Evaluation of Micro Watersheds of Coastal Navsari, *Int. J Curr. Microbiol. App.Sci.,* 11, 28-43.

Shrivastava, P. K., Nayak, D., Patel, D. P., Viyol, S. V., & Thakare, H. S. (2020). Integrated Rainwater Resource Management (iRaM) Model for Coastal South Gujarat. *Current Journal of Applied Science and Technology*, 39(17), 1-12

Shedage Swati, Shrivastava, P. K. and Behara, L. K. (2019). Carbon Rich Mangrove Forests: Overview for Stategic Management and Climate Change Mitigation. *Advances in Research*,18 (2),1-9.

Shedage Swati, Shrivastava, P. K. and Narendra Singh. (2019). Influence of Regional Weather Changes on Major Fruit Production and Productivity of Navsari District of Gujarat State, India , *Current Journal of Applied Science and Technology*, 35(3),1-8.

Dwivedi D. K. and Shrivastava P. K. (2019). Rainfall and runoff estimation of micro watersheds of coastal Navsari, *Journal of Soil and Water Conservation*, 8(1), 43-51.

Shrivastava P. K., Patel D. P., Dileswar Nayak, Satasiya K. F. and Patel D. C. (2019). Harvesting and Potable Use of Rooftop Rain Water to Tackle Imminent Drinking Water Crisis in Coastal Gujarat, India, *Current Journal of Applied Sciences and Technology*, 35(6),1-10.

Dwivedi D K and Shrivastava P. K. (2019). Time series modeling of monthly temperature and reference evapotranspiration for Navsari (Gujarat), India, *Current Journal of Applied Sciences and Technology*, 35(6),1-13.

Thakur, N. S., Suvera, A. H., Jha, S. K., & Patel, D. P. (2019). Growth Performance, Essential Oil Recovery and Financial Flows of Ocimum spp. Under *Pongamia pinnata-Ocimum spp*. Based Silvi-Medicinal Agroforestry Systems. *Agroforestry for Climate Resilience and Rural Livelihood*, 335.

Bhalawe, S., Nayak, D., & Jadeja, D. B. (2019). Carbon sequestration potential of agroforestry systems in South Gujarat conditions. *Green Farming*, 10(1), 35-40.

Nongmaithem Raju Singh, A. Arunachalam, D.P. Patel and S. Viyol (2019). Seasonal Dynamics of Litter Accumulation in Agroforestry Systems of Navsari District, Gujarat. *Climate Change and Environmental Sustainability*, 7(2):123-129.

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