



INTERNATIONAL JOURNAL OF SCIENCE & RESEARCH

www.ijsr.net

ISSN: 2319 - 7064

CrossRef DOI: 10.21275/23197064

Email Your Article to submit@ijsr.net or Submit Online at <http://www.ijsr.net/initsubmit.php>

The **International Journal of Science and Research (IJSR)** is a monthly, open access, peer reviewed international journal with very low research paper publication fee. Being an international journal focused on Engineering, Management, Science and Mathematics, we broadly cover research work on next generation cutting edge technologies and effective marketing strategies. International Journal of Science and Research have the team of Scientists and Academicians who are dedicated to help and improve your skill by providing guidance for writing high quality research papers through peer reviewing. Critical evaluation of each research paper is a prime focus of each member of International Journal of Science and Research (IJSR), Ensuring novelty in each research paper being published in International Journal of Science and Research (IJSR).

Frequency: 12 Issues Per Year

Areas Covered: Multidisciplinary

Type of Articles:

Research Paper, Survey Paper, Informative Article, Case Studies, Review Papers, Comparative Studies, Dissertation Chapters, Research Proposals or Synopsis, M.Tech / M.E / PhD Thesis

Benefits to Author & Members:

- CrossRef DOI is assigned upon request.
- Fast response to Author Queries, 24 x 7 via EMAIL and Live Chat Support System.
- Consistently Publishing since year 2012 with Authors from over 87 Countries an 88+ Subject Areas
- Online Generation of "e-Certificate of Publication" to all Authors of published papers.
- Article is published within 3 Working Days of completing Final Submission.
- Complete Online Processing from Submission to Publication.
- Online Tracking of Certificate Hard Copy Dispatch Status.
- 10 % Discount to Reviewers Panel Members.
- 25 % Discount to Editorial Board Members.
- Online Hosting Partner of International & National Conferences.
- Easy Payment Options with Discount Consideration to our Elite Authors.
- Open Access Index, Authors can download all Papers Free of Charge.
- Globally accepted and is one of the leading International Journals.
- Team of prestigious academic Editors / Reviewers from various Countries.
- We value Author Feedbacks and Improve Accordingly.

With Warm Regards,

International Journal of Science and Research (IJSR)

www.ijsr.net

International Journal of Science and Research(IJSR)

www.ijsr.net

Volume 9 Issue 3, March 2020

Table of Contents

Sr.No.	Article Title	Page No.
1	Clinical Profile of Tuberculosis Patients in a Tertiary Care Hospital in Mangalore	1 - 2
	Authors: Dr Avinash N Shetty, Dr. Don Gregory Mascarenhas, Dr Akshatha Rao Aroor, Country: India	
2	Development of Fragility Curves for Seismic Performance Comparison of Hammerhead and Multicolumn Bridge Pier	3 - 8
	Authors: Bhabuk Raj Aryal, Nabin Chandra Sharma, Country: Nepal	
3	Assessment of Health Supply Chain Risks in Uganda: The Case of Uganda Health Supply Chain Project	9 - 11
	Authors: John Hans Wasswa, Angella Namulindwa, Country: Uganda	
4	Risk Management and Performance of Health Supply Chain Projects in Uganda. The Case of Uganda Health Supply Chain Project	12 - 24
	Authors: John Hans Wasswa, Rose Kwatampora, Godfrey Bwanika, Angella Namulindwa, Country: Uganda	
5	Knowledge of Postnatal Mothers on Breast Milk Expression and Storage in a Selected Hospital of Bhubaneswar, Odisha, India	25 - 26
	Authors: Sugumar .S, Gopinath .S, Country: India	
6	Quarantine of UV-Shine Itself Instead of Quarantine Infectious Agent as a Physical Control Method is the only Ever-Known Effective Method for Stopping the Spreading Potential of 2019-nCoV in China and Later Possibly Disseminate to the Global	27 - 28
	Authors: Yi Yu Lai, Country: Canada	
7	Formulation and Evaluation of Herbal Shampoo	29 - 31
	Authors: Priya D. Gaikwad, Kamini V. Mulay, Madhavee D. Borade, Country: India	
8	Evaluation of Parental Awareness about Association of Premature Loss of Primary Maxillary Anterior Teeth and Speech Changes in Preschool Children: A Survey Study	32 - 36
	Authors: Dr Rahul Lodaya, Dr Soniya Raheja, Dr Laxmi Lakde, Dr Chetan Bhat, Dr Sanket Kunte, Dr Shweta Jajoo, Country: India	
9	To Study Antibiotic Sensitivity Pattern of Uropathogens at a Tertiary Care Hospital in Udaipur, Rajasthan	37 - 39
	Authors: Dr Anshu Sharma, Dr Bhumika Vageriya, Country: India	
10	Water Pollution Minimize to Protect the Life of Human Being	40 - 44
	Authors: Dr. Ratna Roy (Pathak), Country: India	
11	Salivary pH: A Diagnostic Biomarker of Gingivitis and Periodontitis Status	45 - 46
	Authors: Madhvi Gupta, Nimisha Singh, Nandita Dhali, Nisha Agrahari, Nimisha Chaubey, Country: India	
12	Quality of Life of Patients with Irritable Bowel Syndrome	47 - 59
	Authors: W. Smaili, S. Oubaha, K. Krati, Z. Semlani, Country: Morocco	
13	Assessment of Prevalence of Tobacco Smoking and its Determinants among the Male Youth of a Selected Rural Community of Burdwan, West Bengal	51 - 56
	Authors: Indrani Banerjee (Mukherjee), Kasturi Mandal, Dr. Nirmal Kumar Mondal, Country: India	
14	Research on the Stress Test of Credit Risk in City Commercial Banks	57 - 63
	Authors: Mingjun Li, Country: China	
15	India's Journey from Planning Commission to Niti Aayog	64 - 68
	Authors: Dr. Richa Srivastava, Country: India	
16	Solution to Strengthen the Great Unity Block of the Nation in the Current Period	69 - 73
	Authors: Le Trong Tuyen, Country: Vietnam	
17	Social Determinants of Mixed Relations between Midwives and Pregnant Women in the Health District of Abobo-East Abidjan, Cote d'Ivoire	74 - 80
	Authors: KOUADIO Akissi Bernadette, ABE N'Doumy Noel, Country: Ivory Coast	
18	Association between Quality of Life and Self-Efficacy in Mental Health Patients in Vlore, Albania	81 - 84

	Authors: Gentiana Xhelili, Country: Albania	
19	Modern Approach to Vulnerable Plaque and Bifurcation Stenting	85 - 90
	Authors: Alexander Viller, Viacheslav Solomannikov, Country: Russia	
20	Importance of Motivation in Education	91 - 93
	Authors: Gopal Shrestha, Country: Nepal	
21	An Evaluation of Road Safety Performance for Selected Road Stretches in Kolhapur City	94 - 96
	Authors: Swati Prakash Mane, S. B. Patil, Country: India	
22	Ultrasound Imaging of Temporomandibular Joint Disorder - Review	97 - 101
	Authors: Dr. M. Shanthi, Country: India	
23	The Significance of Auditing in Project Management	102 - 106
	Authors: Crispin George, Country: Sierra Leone	
24	Understanding the Concept of Project Termination in the Management of Projects	107 - 111
	Authors: Crispin George, Country: Sierra Leone	
25	Study of Perinatal Outcome of a Tertiary Care Hospital in Urban Area	112 - 115
	Authors: Dr. Shraddha Satav, Dr. Manaskumar Behera, Country: India	
26	Clinical Study of Neonatal Respiratory Distress Syndrome	116 - 119
	Authors: Kaustubh Chaudhari, Manas Kumar Behera, Country: India	
27	Application of Livelihood Vulnerability Index in Assessing Local Vulnerabilities to Rapid Environment Change: A Case Study of South -Western Coastal Bangladesh	120 - 127
	Authors: Alamgir Kabir, Sharif Nehal Rahman, Hosney Jahan Sraboni, Country: Bangladesh	
28	A Study on Consumer Brand Emotional Attachment towards Grooming Product	128 - 139
	Authors: Dr. Anupama Sundar D, Country: India	
29	A Study on Effectiveness of Agricultural Marketing Information System	140 - 148
	Authors: Dr. Anupama Sundar D, Country: India	
30	English Punctuation Marks	149 - 167
	Authors: Najat Abdul Muttalib M. Jawad, Country: Iraq	
31	A Geographical Analysis of Water Supply in Katraj Area of Pune City, Maharashtra	168 - 170
	Authors: Dr. Shalini M. Guldeokar, Country: India	
32	In Vitro Anti-Hyaluronidase Activity Test of Alpiniazarumbet Rhizome Extract (Alpiniazarumbet (Pers.) B.L. Burt& R.M. Sm) and Preparation of Solid Lipid Nanoparticle	171 - 175
	Authors: Siti Umrah Noor, Deni Rahmat, Reyvi Denira, Dian Ratih L, Wahono Sumaryono, Country: Indonesia	
33	A Study on Assessment of Knowledge Regarding Causes and Early Symptoms of Depression among Rural Women in a Selected Community at Gonda to Develop an Information Booklet	176 - 178
	Authors: Aspin .R, Shalini Rai, Country: India	
34	Fuzzy Logic to Evaluate the Factors affecting the Promotion of Fashion Products through Social Media	179 - 183
	Authors: Afroza Rahman, Nusrat Hossain Zerine, Md. Liaqut Hossain, Abhi Mishra Das, Country: Bangladesh	
35	Case Report: A Rare Presentation of Quadriplegia as Gitelman Syndrome	184 - 185
	Authors: Dr L S Patil, Dr Yudhishther Kuntal, Country: India	
36	Intra-Oral Fibro-Lipoma of the Palate: A Case Report	186 - 188
	Authors: Dr. S Vinod Thangaswamy, Dr. Prasanna Kumar P, Dr. Jambukeshwar Kumar B, Dr. P. I. Nainan, Dr. Shreya B Malapur, Dr. Patel Mohmed Talib Abdul Rashid, Dr. Sarath K, Country: India	
37	Unravelling the Critical Role of Project Manager in Project Management Success	189 - 194
	Authors: Crispin George, Country: Sierra Leone	
38	Formulation and Evaluation of Aripiprazole-IR Tablets by Direct Compression Method	195 - 200
	Authors: T. Lepakshi, A. Balakrishna, P. Sivakumar, M. Surendra, G. Sabjith, Country: India	
39	Nutrient Intake Analysis of African Giant Land Snail (Archachatina marginata) Fed Formulated Concentrate Diet and Municipal Organic Waste	201 - 205

	Authors: Eneruvie B.E, Umekwe P.N., Ajayi M.A, Country: Nigeria	
40	Emergency Medical Service System in the Developing Nations: Kenyan Case	206 - 207
	Authors: Sum Jerotich Tecla, Country: Kenya	
41	The Impact of Non-Mandatory Employee Benefits on Organization's Employee Turnover Intention: The Mediating Role of Organizational Commitment	208 - 218
	Authors: Victor Kutsaira, Wu Cisheng, Country: China	
42	Effects of 'Garcinia Kola' and 'Cola Nitida' on Human Behaviour: Epidemiological Investigation	219 - 224
	Authors: Augustin N'da Kouassi Kangah, Koffi Mathias YAO, Kakou luc GBALOU, Paterson Valery DISSEKA, Djoman Prisca Joelle DOUBRAN, Neme Antoine TAKO, Country: Ivory Coast	
43	Hindrances and Opportunities to Effective Linking of Local Community and National Disaster Risk Reduction Strategies in Zimbabwe: Lessons from Rural Communities in Mhondoro-Ngezi District	225 - 232
	Authors: Farai Ngwaru, Elliott P. Niboye, Country: Zimbabwe	
44	Role of MRI in Evaluation of Young Adults Present with Back Pain and its Association with their Occupation	233 - 236
	Authors: Dr Shilpa Chudasama, Dr Divyesh Sarvaiya, Country: India	
45	Infrequent Case of Aneurysmal Bone Cyst in First Decade with Femur Neck Fracture and its Management Strategy	237 - 238
	Authors: Tiwari V, Shetty V, Country: India	
46	Construction of the Moscow-Simferopol Highway through the Territory Of Ukraine as a Factor of Integration of the Crimea into the Economic Complex of the Ukrssr (1948-1949)	239 - 245
	Authors: Satskyi Pavlo, Country: Ukraine	
47	Comparative Qualitative and Quantitative Phytochemical Evaluation of Embelia ribes Burm F Obtained from Different Sources	246 - 251
	Authors: Syed Asadulla, Salma Khanam, Zeeshan Afsar, Country: India	
48	School Promotion to Smoking-Related Knowledge, Attitude, Self-Efficacy and Practice of Sundanese Students in Indonesia	252 - 256
	Authors: Laili Rahayuwati, Eleanor C. Castillo, Country: Indonesia	
49	Opportunities and Constraints Affecting Service Delivery of Basic Emergency Obstetrics and Neonatal Care (BEmONC) in Resource Constrained Environment: West Pokot Kenya	257 - 262
	Authors: Sum Jerotich Tecla, Country: Kenya	
50	The Effectiveness of Enhanced Recasts in Education Structure	263 - 265
	Authors: Rachna Juyal, Country: India	
51	Non-Performing Loan Determining Factors on Buku 4 Banks Listed on the Indonesia Stock Exchange	266 - 271
	Authors: Nindya Ayunita, Hermanto Siregar, Moch Hadi Santoso, Country: Indonesia	
52	Comprehensive Assessment, Diagnosis and Treatment Planning of Severe Periodontal Disease: A Clinical Case Report	272 - 280
	Authors: Dr Shabana Lone, Dr Jacob Thomas, Country: Kuwait	
53	Newer Anti Epileptic Drugs	281 - 285
	Authors: Dr. Neera Chaudhry, Dr. Abhilekh Srivastava, Dr. Cankatika Choudhury, Country: India	
54	DNA-Chaos S-Box Generation for Modified Lightweight AES Algorithm for Data Packet Protection in MANET	286 - 291
	Authors: Muntaha A. Hatem, Haider K. Hoomod, Country: Iraq	
55	Dietetic Cross Section Study on Vitamin D Deficiency in Tobruk, Libya	292 - 296
	Authors: Amal Rajab Agila, Country: Libya	
56	Assessment of Level of Stress and Anxiety among Patients Suffering from CKD in a Tertiary Care Hospital	297 - 299
	Authors: Lt Col Soniya Saklani, Lt Neha Agnihotri, Lt Deepti Yadav, Lt Kanchan Verma, Lt Benazir Alam, Lt Neha, Country: India	
57	History of the Trade Union Organization of Karakalpakstan and its Personnel Policy in the 1930-? Years of the XX-Century	300 - 301
	Authors: T.A. Kudyarova, Country: Uzbekistan	
58	Research of Adaptive Mechanisms of System of Circulation of Blood for Children in the Conditions of Southern Priaralie	302 - 303
	Authors: Mirametova Nadira Purkhanatdinovna, Country: Uzbekistan	
59	Assess the Risk of Obstructive Sleep Apnea Syndrome (OSAS) among Middle Aged Adults in Decided on Tertiary Area, Madurai, Tamilnadu, India	304 - 305
	Authors: Jeenamol Joseph, Gopinath Subramanian, Country: India	

60	Troubles and Determinants in Using ATMs: An Exploratory Study of a Sample Clients Opinions of the Iraqi Trade Bank - Dhi Qar branch	306 - 313
	Authors: Wafaa Chitheer Mezaal, Husham Abdulkhudhur Sukkar Alothman, Country: Iraq	
61	Issues in Child Development in Nigeria	314 - 317
	Authors: Barr. BerthaNnenna Otunta, Joy N. Ezeilo, Country: Nigeria	
62	The Prevalence of Malocclusion in the Patient Reported to the Dental OPD of Tertiary Care Centre, Bihar: A Retrospective Cross-Sectional Study	318 - 320
	Authors: Dr. Sanjay Kumar, Dr. A.K Sharma, Dr. Ashish Pranab, Dr Jawed Iqbal, Country: India	
63	Maria vs. Maria	321 - 323
	Authors: Rosemarie Villapana Amaro, Country: Philippines	
64	Normative Values of Spino-Pelvic Parameters in Healthy Delhi State Population	324 - 326
	Authors: Piyush Joshi, Shantilal Sankhla, V Vipin, Country: India	
65	Origin of the Action	327 - 330
	Authors: Prof. Ing. Sisto Firrao, Country: Italy	
66	Comparative Study on the Drone Policies of India, Norway and United States of America	331 - 333
	Authors: Varun VM, Country: India	
67	Study on Efficacy of Nasal Steroids in Adenoid Hypertrophy and Otitis Media with Effusion in Pediatric Age Group	334 - 337
	Authors: Dr KumKum Bora, Dr Nabanita Ghosh, Country: India	
68	A Study on Usage of Vaccination Alerts by Hospitals with Respect to MedeG	338 - 339
	Authors: CH. Srikanth, R. Srujan Kumar, Dr. V. Vishnu Vandhana, Country: India	
69	Meta-Analysis: A Higher Quality of Evidence in Clinical Research Pyramid	340 - 349
	Authors: Dr. Sonal Jain, Country: India	
70	A Study of Aseptic Practices Related to Selected Nursing Care Activities Performed by Staff Nurses Working in an ICU of a Selected Hospital in Order to Develop and Administer a Need based On The Job Training (OJT) Program and Prepare a Booklet	350 - 353
	Authors: Hari Singh Nagar, Country: India	
71	A Unique Case Report of Acromegaly in Post-Partum Woman	354 - 357
	Authors: Dr Jainam Shah, Dr Amit Shah, Country: India	
72	A Study to Assess Knowledge and Attitude among Parents of Epileptic Children Regarding Epilepsy with a View to Develop an Information Guide Sheet at Selected Hospitals, Gonda	358 - 362
	Authors: Aspin .R, Pradeepita Rani, Country: India	
73	Human Development is an Engine of Sustainable Development - With Special Reference to Rural Housing Schemes in Mandya District	363 - 367
	Authors: Dr. Kiran Kumar P, Country: India	
74	Hepatoprotective Effect of Cassia Auriculata in Ethanol Induced Albino Rats	368 - 371
	Authors: Aarthi BL, Sendhilvadvu M, Country: India	
75	Histopathological Studies of Hepatoprotective Effect of Cassia Auriculata in Ethanol Induced Albino Rats	372 - 376
	Authors: Aarthi BL, Sendhilvadvu M, Country: India	
76	Drought as a Disaster in the Namibian Context	377 - 386
	Authors: Ndapewa Fenny Nakanyete, Rosemary, N. Shikangalah, Absai Vatuva, Country: Namibia	
77	Impact of Globalization on Higher Education in North-East Region	387 - 389
	Authors: Bijoylakshmi Das, Country: India	
78	Association between Total Bilirubin Levels and Diabetic Retinopathy in Patients with Type 2 Diabetes Mellitus	390 - 392
	Authors: Dr. Kushagra Sharma, Dr. V K Malik, Dr. Sanjay Sharma, Country: India	
79	Self Help Groups: A Mechanism for Social Entrepreneurship	393 - 395
	Authors: Dr. Gaonkar Gopalakrishna M, Manjunatha M, Country: India	
80	Ideal Direct Posterior Restoration: Yellow / Black / White - A Review	396 - 400

	Authors: Dr. Palani Selvi Kamaraj, Country: India	
81	The Effect of the Instructors' Emotional Intelligence on Undergraduates' Academic Achievement in Major Elective Courses at LJU	401 - 417
	Authors: Salam Y. Syagha, Country: Lebanon	
82	Mahasweta Devi: Life and Achievements	418 - 422
	Authors: Kumar Madar, Country: India	
83	Identifying State-Level Policy and Provision Domains for Physical Education and Physical Activity in High School	423 - 428
	Authors: Dr. Pramod Madhavrao Vikhe, Country: India	
84	COVID -19 A Once-in-a-Century Pandemic?	429 - 431
	Authors: Melba Elizabeth K, Lintamol Thomas, Aisley Jacob Varghese, Country: India	
85	Study of Fragility Syndrome in Elderly from an University Open to Third Age	432 - 439
	Authors: Filho Celso A. B., Nascimento Henrique A, Morais Lanna T. G. De, Amorim Rayane C. De, Silva Victoria R., Fernandes Luciana C., Viviane Lemos Silva Fernandes, Country: Brazil	
86	Predicting Factors of Post Operative Visual Outcome of Pediatric Cataract	440 - 443
	Authors: S. K. Rajak, A. Chaudhary, S. P. Singh, Arti Singh, Country: India	
87	Evolving Options and Challenges in the Management of Traumatic Perforation of Tympanic Membrane, Pondicherry India, 2016	444 - 449
	Authors: Dr Shyamala D, Dr Jagadeeswaran VU, Dr Shanmuganathan R, Tony Fredrick, Yuvaraj Jayaraman, Joseph k David, Country: India	
88	Challenges in the Management of Epistaxis with Limited Resources Pondicherry India, 2016	450 - 454
	Authors: Dr Sivasankar K, Dr Jagadeeswaran VU, Tony Fredrick, Yuvaraj Jayaraman, Joseph K David, Country: India	
89	Successful Conservative Therapy in Patient with Cholelithiasis and Acute Cholecystitis with Elevated Liver Enzymes: A Case Report	455 - 459
	Authors: Marco Rahardja, Dewi Catur Wulandari, Country: Indonesia	
90	Sputum Conversion as a Predictor to Treatment Outcome in Tuberculosis Control in Kenya	460 - 465
	Authors: Richard Kiplimo, Ann Mwangi, Mathew Kosgei, Elizabeth Onyango, Joseph Koske, Country: Kenya	
91	Relation Between the Last Terms and Common Ratios of Two Different Geometric Progressions [S1 and S2] [For Finite Number of Terms]	466 - 467
	Authors: Chirag Gupta, Country: India	
92	Changing Land Use / Land Cover Analysis in Contai (Kanthi) Coastal Belt, West Bengal and Odisha	468 - 473
	Authors: Swapan Kumar Tala, Country: India	
93	Dynamic Changes of Vegetable Cover under Act of Anthropogenic and Technogenic Factors in the Conditions of Karakalpakstan	474 - 475
	Authors: Serekeeva Gulayim Abdiganieva, Dosjanova Gaukhar Daryabaeva, Country: Uzbekistan	
94	Effectiveness of XP-EndoFinisher, Ultrasonic and EndoActivator on Debris and Smear Layer Removal in Curved Root Canals: A Scanning Electron Microscope Study	476 - 481
	Authors: Neha Saxena, Laxmikant Kamatagi, Prahlad A. Saraf, Malasiddappa S. Metri, Prem Prakash Kar, Sneha S. Vanaki, Country: India	
95	Evaluating the Plant Growth Promoting Efficiency of Freshwater Cyanobacteria using Maize (Zea mays L.) as an Experimental Crop	482 - 487
	Authors: Krishna Moorthy Sivalingam, Country: Ethiopia	
96	Dog Breed Identification Using Convolution Neural Network and Web Scraping	488 - 491
	Authors: Mohamed Sultan M, Naveen S, Praveen Kumar C, Arun Manicka Raja M, Country: India	
97	Prediction of MS Graduate Admissions using Decision Tree Algorithm	492 - 495
	Authors: Janani P, Hema Priya V, Monisha Priya S, Country: India	
98	Gynecological Problems and Barriers to Health Seeking Behaviour among Women Working in Industrial Units of a Selected Panchayat in Thrissur	496 - 498
	Authors: Shalu Varghese, Indu P.C, Country: India	
99	Vanillylacetone Improves the Defense of Wheat Against Salt Stress	499 - 504
	Authors: Huseyin BULUT, Country: Turkey	
100	Role of Ultrasonography and Computed Tomography in Diagnosis of Pancreatitis	505 - 508

	Authors: Dr. Jainex Patel, Dr. Purvi Desai, Country: India	
101	Getting Viscous Additives from Heavy Oil Fraction	509 - 510
	Authors: Elmurod Yakhshiboevich Yalgashev, Ozoda Abdullaevna Salikhova, Country: Uzbekistan	
102	Dependency between Stock Movements Using the Clayton Copula Method (Ghana Stock Exchange)	511 - 518
	Authors: Adikah Israel, Hu Yue, Chen Lanlan, Country: China	
103	Sparse Representation of Image with Immune Clone Algorithm based on Harmonic Wavelet Packet Dictionary	519 - 528
	Authors: WANG Li, WANG Wei, LIU Boni, Country: China	
104	Implementation of Run Length Encoding Using Verilog HDL	529 - 532
	Authors: Hayder Waleed Shnain, Mohammed Najm Abdullah, Hassan Awheed Jeiad, Country: Iraq	
105	Territorial Decentralization in the Democratic Republic of Congo and Local Development in the City of Likasi	533 - 537
	Authors: Yav Musolo, Country: Congo	
106	Survey on Different Methods on Mammogram Image Classification	538 - 541
	Authors: Dr. Ashoka S B, Nirmala Y, Country: India	
107	Functional Styles of the English Language	542 - 545
	Authors: Oniani T. G., Country: Georgia	
108	Effect of Six Months of Naturopathy Practice on Psychological Parameters in Hypothyroid Patients	546 - 552
	Authors: Ranjna Chawla, Rukamani Nair, Somnath Mukherjee, Country: India	
109	Voice for the Voiceless - A Text to Speech and Graphic to Speech Converter	553 - 555
	Authors: Hamza Khan, Country: India	
110	Effects of the Therapeutic Diagrams on the Biological Parameters of the Patients under Antiretroviral Treatment during the Monitoring Integrated Centre for Bioclinical Research of Abidjan (Cote d'Ivoire)	556 - 562
	Authors: KAMAGATE Soualio, KOKORE Angoua Baudouin, OUATTARA Howele, BLEYERE Nahounou Mathieu, YAPO Angoue Paul, Country: Ivory Coast	
111	FIN Tech	563 - 565
	Authors: Pillamari Bharath Kumar, Country: India	
112	Automated Waste Segregator Using IoT	566 - 567
	Authors: A. Pradeep, C. Gowsalya, S. Manimozhi, R. Ragavi, K. Visali, Country: India	
113	The Right Therapy for Radiation Poisoning	568 - 575
	Authors: Ilija Lakicevic, Country: Serbia	
114	Prevalence of Helicobacter Pylori Infection among Adults undergoing Gastrointestinal Endoscopy	576 - 578
	Authors: Rohini Suryawanshi, Country: India	
115	Remimazolam: Revolutionizing Tiva	579 - 581
	Authors: Dr Chandrasekhar Krishnamurti, Country: India	
116	Anesthetic Considerations for Interventional Radiology in Acute Ischemic Cerebral Stroke (AIS)	582 - 587
	Authors: Dr Chandraskhar Krishnamurti, Country: India	
117	Industrie 4.0 - Advanced Engineering of Smart Products and Smart Production	588 - 595
	Authors: Sreedhara C J, Country: India	
118	Cystic Artery Pseudoaneurysm Secondary to Xanthogranulomatous Cholecystitis: A Rare Manifestation	596 - 598
	Authors: Kritesh Goel, Divya Nijhawan, Rajul Goel, Kanika Bhargava, Country: India	
119	Two Cases of Unsuspected Presence of Foreign Body in Ear, Nose & Throat Region	599 - 601
	Authors: Dr. R. Madhumittha, Dr. P. Vishwanathan, Country: India	
120	Evaluate the Effects of Silodosin and Solifenacin Combination with Silodosin Alone in Reducing DJ Stent Related Symptoms	602 - 605
	Authors: Dr. Prashant Lavania, Dr. Akash Sharma, Dr. Nikhil Singh, Country: India	
121	Business Intelligence	606 - 607
	Authors: Manda Sreeja, Country: India	
122	Evaluation of Human Behavior Weaknesses in Social Engineering	608 - 610

	Authors: Said Masihullah Hashimi, Komal, Country: India	
123	Impact of MDA on Prevalence of Bancroftianfilariasis in 19 Villages of Hingnataluka of Nagpur District (Maharashtra)	611 - 613
	Authors: Dr Vivek Saxena, Milind Ganvir, Country: India	
124	The Sound of Om Theory	614 - 614
	Authors: Nishikant M. Verma, Country: India	
125	Indirect Sexism: Linguistic Representation of Women in Selected Egesa and Minto FM Call - In Shows	615 - 621
	Authors: Naftal Nyakundi, Country: Kenya	
126	FNAC & Histopathological Correlation of Benign Breast Lesions	622 - 624
	Authors: Dr. Sanjay G. Surase, Dr. Rakesh T. Shedge, Dr. Disha Jalan, Country: India	
127	Laser Diffraction Analysis Application on the Grain Size Analysis of Mati River Delta Sediments (Albania)	625 - 630
	Authors: Emiriana Xhaferri, Country: Albania	
128	End-End Authentication and Cryptography based on Mobile Number and Mac Address	631 - 634
	Authors: S Shunmuga Sundaram, Country: India	
129	A Study of Pre-Operative Predictors of Difficult Laparoscopic Cholecystectomy	635 - 639
	Authors: Dr S Thirumuruganand M.S., Dr Harish Manivannan M.S., Country: India	
130	A Study of Maternal and Perinatal Death at Western Regional Hospital, Ramghat, Pokhara, Nepal	640 - 643
	Authors: Dr. Yagya Raj Sigdel, Country: Nepal	
131	Stress Management	644 - 646
	Authors: Pothagoni Gowtham Goud, Country: India	
132	Utilization of Solar Tunnel Dryer for Drying of Fodder Crop	647 - 652
	Authors: Chavan P.P., Patil M.B., Shirame H.Y., Dhande K.G., Country: India	
133	The Role of Disinfection in the Prevention and Control of Healthcare Associated Infections in Operation Theatre	653 - 657
	Authors: Dr. Rakhi Dighe, Dr. Imran Memon, Dr. Tahur Shaikh, Idris Khan and Surjeet Samanta, Country: India	
134	Microbiological Characteristics of Veillonella spp. in the Composition of Endodontic Infections	658 - 660
	Authors: D. Karayasheva, E. Radeva, Country: Bulgaria	
135	Food Choice in Rural Families of Andhra Pradesh	661 - 665
	Authors: C. Anjali Devi, Country: Indonesia	
136	Clinical Study and Management of Complications of Acute Pancreatitis	666 - 672
	Authors: Dr. D Jahagirdar, Dr. Sneha Joshi, Dr. Kaustubh Deshmukh, Country: India	
137	A Common Fixed Point Theorem for Weakly Compatible Maps In complex Valued-b-Metric Space	673 - 681
	Authors: Venkatesh Bhatt, Giniswamy, Jeyanthi C., Country: India	
138	Laparoscopic Pyeloplasty: Technique, Morphological and Functional Outcome in Uretero-Pelvic Junction Obstruction	682 - 686
	Authors: Dr. Dinesh Prasad, Dr. Shivamshekhar Singh, Country: India	
139	Characterization of Sediments and Surface Waters of the Oued Guigou Watershed	687 - 692
	Authors: Akil Abboudi, Driss Zouhri, Abderrahim Lahrach, Hassan Tabyaoui, Country: Morocco	
140	Influence of Contamination of Environment on the State of Health of Population in Southern Aral Sea Area	693 - 694
	Authors: Paluanova Gulmira, Country: Uzbekistan	
141	Dental Care of Persons with Autism Spectrum Disorders in India	695 - 696
	Authors: Swapna V Thampi, Country: India	
142	To Study the Salinity Effect on the Chlorophyll Content of Different Species of Momordicaccharantia L at Different Stages of Growth and Development under Different Salinity Levels in Pot Culture	697 - 699
	Authors: Dr. Nishtha Srivastava, Country: India	
143	Program Educational Objectives Attainment: The Process	700 - 703
	Authors: Sumana Jayaprakash, Country: India	
144	A Review: Contribution of Vitamin B17 as Oncological Inhibitor and its Pharmacological Ameliorative Activity	704 - 708

	Authors: Priyanka Pal, Urvashi Sharma, Vinod Kumar Gupta, Country: India	
145	Information Technology for India in the New Millennium: Scaling Up the Technology	709 - 713
	Authors: Dr. Sanjay Arora, Country: India	
146	Microbiological Analysis, Physical-Chemical Analysis, and Acceptability of Deep Well Water of NEUST-SIC Tabon	714 - 718
	Authors: Junil A. Constantino, Teresita C. Vega, Country: Philippines	
147	A Prospective Study to Correlate Glycosylated Hemoglobin (HBA1C) with Central Corneal Thickness (CCT) and Intraocular Pressure (IOP) in Type 2 Diabetic Patients	719 - 722
	Authors: Abhijaat Chaturvedi, Kirti Jain, Malay Chaturvedi, Country: India	
148	IT Risk Register and Responses	723 - 726
	Authors: Anshuman Awasthi, Country: United States of America	
149	Experimental Investigation on the Modal Response of FRP Composites	727 - 730
	Authors: D Raviteja, Country: India	
150	A Review on Bio-inspired Airfoil: Inspiration from Nature	731 - 733
	Authors: Md. Shafiqul Islam, Md Alamgir Kabir, Country: Bangladesh	
151	Effectiveness of Structured Teaching Program on Knowledge Regarding Menstrual Blood Stem Cells Banking among Nursing Students	734 - 737
	Authors: Ajitha TP, Kabita Baishya, M J ayalakshmi, Country: India	
152	Impact of Foreign Exchange Currency Market	738 - 741
	Authors: Vattem Mythri, Country: India	
153	Girl-Child Education in the Western Area Rural District of Sierra Leone	742 - 746
	Authors: Crispin George, Country: Sierra Leone	
154	Corporate Governance in Medium Size Organizations	747 - 750
	Authors: Raghav Dhingra, Country: India	
155	Vendor Satisfaction with Reference to Sai Deepa Rock Drilling Tools	751 - 753
	Authors: V. Shilpa, S. Geethanjali, Dr. Sd. Mansoor Pasha, Country: India	
156	Mysterious Mass in the Retroperitoneum Space: Case Report (Retroperitoneal Extra Adrenal Paraganglioma)	754 - 756
	Authors: Dr. Rakshith, Dr. Jagadeesha BVC, Dr. Mahesh Kariyappa, Country: India	
157	Breast Cancer Incidence in Diabetes Mellitus Patients on Insulin Glargine Compared with Human Neutral Protamine Hagedorn Insulin Treatment	757 - 759
	Authors: Noviana Joenputri, Nia Novianti Siregar, Country: Indonesia	
158	Assessment of Skin Effective Dose and Radiation Risk for Chest, Abdomen and Pelvic During Conventional X-Ray Examinations	760 - 761
	Authors: Taha .T .M, Country: Saudi Arabia	
159	Surgical Repair of Traumatic Crop Fistula in a Yellow Footed Green Pigeon	762 - 763
	Authors: N. G. Amith, Country: India	
160	Current Development on Meat Tenderization	764 - 769
	Authors: Divyani Madarkar, Country: India	
161	The Perceived Value of Project Management Office Practices from Various Industries in Indonesia	770 - 774
	Authors: Mohammad Ichsana, Country: Indonesia	
162	Consideration of Pre-Formulation Parameters to Develop Solid Dosage Form	775 - 780
	Authors: Keshav Jindal, Manjot Narula, Country: India	
163	Response Spectrum-Based Pushover Analysis for Predicting Earthquake Induced Forces in Buildings	781 - 786
	Authors: Madhusudhan Reddy N, Kesava Rao B, Country: India	
164	Analytical Analysis of IEEE 802.11 MAC	787 - 794
	Authors: Vikas Pachisia, Annappa, Country: India	
165	Marketing Mix	795 - 796

	Authors: Earaboyina Karunakar Yadav, Country: India	
166	Deconstruction of The Yellow Wall Paper by Charlotte Perkins Gilman	797 - 800
	Authors: Ercument Yasar, Country: Turkey	
167	Research and Practice on Key Technology of Drilling Ultra-deep Horizontal Wells at Southeast Block in Gulf of Mexico	801 - 806
	Authors: Wang Dou, Lin Zhu, Xiangqing Meng, Country: China	
168	Modelling and Control of Hybrid Microgrid Based on Renewable Energy (PV and Wind Turbine) by Using Battery Management System with Help of Fuzzy Logic and PWM Inverter	807 - 810
	Authors: Reena Patel, Manish Kurre, Country: India	
169	Green and Sustainable Supply Chain Management (GSCM and SSCM): A Comparative Literature Analysis of Definitions and the Identification of the Relationship between Environmental and Economic Pillars in GSCM	811 - 819
	Authors: K. Amrani Souhli, J. El Hilaly, A. Ennadi, Country: Morocco	
170	A Study of Incidence of Ovarian Tumors in Oophorectomy Cases with Special Emphasis on Tribal Population of Jharkhand	820 - 825
	Authors: Dr. Sanjeev Kumar, Dr. Md. Alimuddin Ansari, Dr. Sunil Kumar Mahto, Dr. Nidhi P A Barla, Country: India	
171	The Empirical Antibiotic Use in Bacterial Infection in General Hospital Jayanagar with Reference to ICMR Treatment Guidelines for Antimicrobial Use in Common Syndromes 2019	826 - 828
	Authors: Yogendra Shrestha, Ramesh M Tambat, K. M. Veeranna Gowda, Country: India	
172	Studies of Cerium Doped L-Alanine Alaninium Nitrate NLO Crystal	829 - 832
	Authors: M. Esthaku Peter, Seblewongel Getachew, Betelhem Alemu, Eleni Binalfeus, Getahun Leliso, Tirngo Abay, Country: India	
173	Cricket Celebrated as the Only Sports in India: An Analysis	833 - 837
	Authors: Puneet Hooda, Country: India	
174	Investigating the Influence of Ejection Diameter Size Parameter to Liquid Ejection by Molecular Dynamics Simulation Method	838 - 841
	Authors: Van Quang Nguyen, Trong Ly Nguyen, Country: Vietnam	
175	Turnover Intention Influencing Factors of Employees: An Empirical Study of Commercial Joint Stock Bank in Vietnam	842 - 849
	Authors: Nguyen Van Thuy, Country: Vietnam	
176	Common Fixed Point Theorems under Some Contractive Conditions	850 - 851
	Authors: Reena, Country: India	
177	Case Report of Acute Myocarditis due to Mycoplasma Pneumoniae in a Healthy Adolescent in Saudi Arabia	852 - 855
	Authors: Rbab Taha, Abdulmoim Alqarni, Mohammad Al-Qahtani, Fayssal Farahat, Abdulhakeem Al-Thaqafi, Country: Saudi Arabia	
178	Knowledge and Practice of Documentation among Nurses in TM University Teaching Hospital Moradabad, UP	856 - 860
	Authors: Sheuli Sen, Country: India	
179	Nursing Student Affiliates' Level of Compliance with the Key Components of Standard Precautions for Infection Prevention and Control in a Selected Hospital: Basis for Proposed Guidelines for Curriculum Enrichment	861 - 885
	Authors: Amparo T. Miguel, Lina A. Salarda, Country: Philippines	
180	ICT in Teacher Education: Prospects and Challenges of E-Teaching in Nigeria	886 - 889
	Authors: Anthony, Johnson Ukwumonu, Country: Nigeria	
181	Study of Job Anxiety among Post Graduate Teachers in Dehradun	890 - 892
	Authors: Bharat Kumar, Country: India	
182	Application of SWAT Model for Estimating Runoff of Nethravathi River Basin using Sequential Uncertainty Fitting Technique	893 - 902
	Authors: Geethu Krishnan, Kuduluru Srinivas Kumar, Rejani R, Country: India	
183	Volatile Flavour Compounds in the Tenderloin of the Donkey, Pork, Mutton and Beef and their Meat Flavour Nucleotide Contents	903 - 908
	Authors: Dauda Sa-adu Abiola, Xiang-Rong Cheng, Country: China	
184	Prospective Observational Study to Determine the Correlation between Iron Deficiency Anemia and Simple Febrile Seizures in Children	909 - 912
	Authors: Sri Raksha .S, Krishnappa J, Country: India	
185	Government Schemes Available for Developing Women Entrepreneurship in India	913 - 915
	Authors: U. Rajeswari, Country: India	

186	Design of Character-Based Learning in Islamic Elementary Schools with a Full Day System	916 - 924
	Authors: Dr. Prim Masrokan Mutohar, Dr. Hikmah Eva Trisnantari, Dr. Sulastrri Rini Rindrayani, Country: Indonesia	
187	Network Marketing	925 - 926
	Authors: Maroju Bharath Kumar Chary, Country: India	
188	From e-Government to Public Value Creation	927 - 933
	Authors: Dr. Panagiota Xanthopoulou, Country: Greece	
189	Training & Development: A Review of its Outcome to Productivity in the Tea Industry in Sri Lanka	934 - 935
	Authors: Waruna de Silva, Country: Sri Lanka	
190	Web-based Learning: Characteristics, Practices, Challenges and Recommendations	936 - 943
	Authors: Dr. Khalid Soussi, Country: United Arab Emirates	
191	A Study on the Individual Differences in Employee Work Behaviour in Contemporary Business Organizations	944 - 947
	Authors: Nisha Kumari, Country: India	
192	Comparative Study of Anti - Diabetic Effects of Ginger Lily (Costus afer Ker Gawl) Leaf and Snail (Archachatinamarginata) Slime on Alloxan Induced Swiss Albino Rat and their Absorptivity Characteristics	948 - 952
	Authors: Agu Matthew Onyema, Country: Nigeria	
193	A Rare Case Report on Kaposiform Hemangioendothelioma with Kasabach Meritt Syndrome	953 - 955
	Authors: Dr. Ajay Vaid, Dr. Amar Singh Thakur, Dr. Mohit Bajaj, Country: India	
194	The Effect of Internet Addiction on Emotional Maturity of Collage Going Students	956 - 960
	Authors: Dr Afsana A. Sama, Country: India	
195	A Study of Palm-Coein Classification of Abnormal Uterine Bleeding & its Clinical-Histopathological Correlation in Perimenopausal Women at Umaid Hospital	961 - 963
	Authors: Krishna Soni, B.S Jodha, Country: India	
196	Empirical Study on Endogeneity of Money Supply in China	964 - 966
	Authors: Kailin Chen, Yaoqun Zheng, Country: China	
197	Land Degradation and Cotton Growing in Farming Communities in Benin	967 - 970
	Authors: Alfred B. K. Dossa, Country: Benin	
198	Terminological Synonymy: Corpus-Driven Translation	971 - 973
	Authors: Svitlana Matvieieva, Country: Ukraine	
199	The Influence of Distributed Leadership towards PLC Implementation in Kelantan Residential Secondary School	974 - 982
	Authors: Zalina Binti Zakaria, Siti Noor Binti Ismail, Kamaruddin Bin Hassan, Country: Malaysia	
200	Energy-Efficient Technology Based on Nucleate Boiling Heat Transfer	983 - 985
	Authors: Zhiyi Duan, Tao Jia, Di Gao, Zhigang Cui, Country: China	
201	Social Characterization of Morbidities and Complications Related to Maternity: Case of the Baoule-Oualebo of Sakassou	986 - 991
	Authors: EKRA Amenan Marie-Noelle, ABE N'Doumy Noel, Country: Ivory Coast	

INTERNATIONAL JOURNAL OF SCIENCE & RESEARCH



ISSN:2319-7064

Certificate of Publication

www.ijsr.net

This is to Certify that the paper ID: SR20313145050 entitled

Land Degradation and Cotton Growing in Farming Communities in Benin

Authored

By

Alfred B. K. Dossa

has been published in Volume 9 Issue 3, March 2020

in

International Journal of Science and Research (IJSR)

The mentioned paper is measured upto the required standard.

R. M. Deshmukh
www.ijsr.net
ISSN (Online): 2319-7064

Editor in Chief, International Journal of Science and Research, India



Land Degradation and Cotton Growing in Farming Communities in Benin

Alfred B. K. Dossa

Centre Béninois de la Recherche Scientifique et de l'Innovation (CBRSI), 03 BP 1665 Cotonou (Bénin)

Abstract: *The municipality of Kérouis an agricultural community characterized by land impoverishment due to cotton monoculture and rudimentary agricultural technology¹. Land degradation in the municipality of Kérouis therefore a worrying situation that has a negative impact on soil fertility, crop yields and can lead to long-term food in security and poverty². The model developed by the soil scientists of the FAO³ and the World Bank^{4 and 5} is used to calculate from 2013-2014 the accumulated land losses (Pt) of 2.79 to 10.45 t/ha/year, following cotton growing in the municipality of Kérou.*

Keywords: Quantification, land degradation, cottongrowing, Kérou

1. Introduction

Land degradation affects 33% of the world's land area, affecting more than 2.6 billion people in over 100 countries⁶. Developing countries are the most affected (90% of the world's affected population are in developing countries). Two (2) hectares of land were available per capita in 1900 worldwide compared to less than 0.5 hectares in 2010. Each year, an estimated 24 billion tons of fertile soil disappears (Adams and Eswaram, 2000).

Half of Africa's cultivated land is affected by soil degradation and erosion and up to 80 percent of pasture land is showing signs of deterioration. Of the 660 million hectares of forest in Africa, 3.2 million hectares are being lost annually, and the rate of deforestation is 29 times higher than that of reforestation. Arable land is declining at a rate of about 5-10 million hectares per year⁷.

Five major soil types characterize Benin, 66% of which are degraded. Extremely degraded soils account for 16 percent, while moderately degraded soils account for 40 percent, of which 24 percent are in the extreme northern Sudano-Sahelian zone and 16 percent in the northern and north-eastern zone⁸. Soil erosion in Benin represents an annual loss of 30 million tons of soil⁹. This figure is well below the actual loss of land, and the Environmental Action Plan (PAE) needs to be updated. A simulation carried out by the Centre National d'Agro-Pédologie (CENAP), now the Laboratoire des Sciences du Sol, de l'Eau et de l'Environnement (LSSEE) of the Institut de Recherches Agricoles du Bénin (INRAB) confirmed the seriousness of the environmental problems foreseeable in the medium term. According to its conclusions, if nothing is done, soil erosion and degradation are likely to double in intensity and the availability of arable land will diminish faster than expected, depending on population growth¹⁰.

In Atacora, soil degradation has reached an unprecedented level¹¹. In a morpho-pedological study, Azontondé¹⁰ showed that the observed loss of soil nutrients is largely due to soil erosion and overexploitation. Most of the Atacora is severely degraded and requires emergency intervention⁹. Land degradation and soil infertility affect 45% and 72% of households in the Atacora, respectively¹². As for soil

erosion, it represents an annual loss of just over 3 million tons of land in this department¹³.

In Kérou, one of the nine (09) municipalities of the Atacora Department, there are moderately degraded tropical ferruginous and hydromorphic soils (degradation rate = 24%,⁸). With a population of 100197 inhabitants (or 1% of the population of Benin: RGP4), and a land occupation of 374475 hectares, 91% of the population is agricultural, with cotton cultivation as its main economic activity¹⁴. However,¹⁵ found that cotton cultivation has negative effects on the environment and causes soil degradation. Indeed, the Municipality of Kérouis characterized by land impoverishment due to cotton monoculture and rudimentary agricultural technology¹. Land degradation in the Municipality of Kérouis therefore a worrying situation that negatively influences soil fertility and crop yields and can cause food in security and poverty in the long term². In fact, the decrease in food crops due to soil in fertility is a sign of the low food availability that is common in the municipality. The classification of the Food and Agriculture Organization of the United Nations The FAO (FAO), by the same logic, indicates that, if nothing is done in the next few decades, land degradation will become "very severe" in the municipality of Kérou¹⁶. This fact sheet consists of a quantitative assessment of land degradation through cotton cultivation in the municipality of Kérou in northwest Benin.

2. Experimental Section

2.1 Physical setting

Located in the North-East of the Atacora department, the Municipality of Kérouis bordered to the North by the Republic of Burkina Faso, to the East by the municipalities of Banikoara and Gogounou in the Alibori department, to the South-East by the municipality of Sinendé in the Borgou department and to the South by the municipality of Péhuncou. To the west, it borders the commune of Kouandé and to the north-west it is bordered by the municipality of Tanguiéta. The municipality of Kérouis located between the Alibori valleys in the East, the Atacora mountain range in the West and the Pendjari river in the North-West. It is one of the nine (09) municipalities of the Atacora department. Comprising between 10° 15' and 11° 09' North latitude and 1° 43' and 2°

17° East longitude, the municipality of Kérou covers an area of 3,745 km². It has four (04) districts and twenty-eight (28) villages and city districts for a total population of 100,197

inhabitants¹⁴. The geographical and administrative situation of the municipality of Kérou is presented in figure 1.

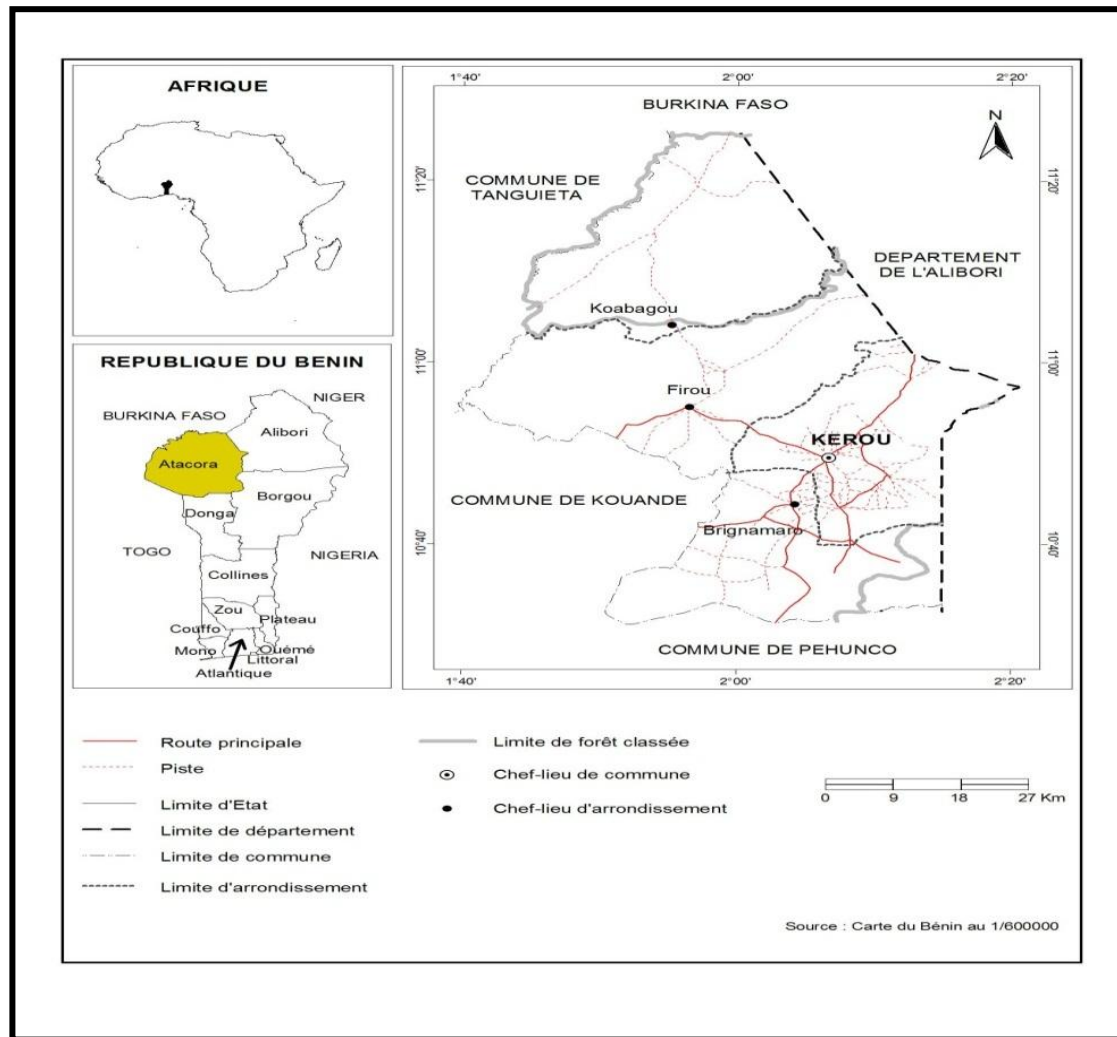


Figure 1: Geographic and administrative situation of the municipality of Kerou

2.2 Land use

The commune of Kérou has three types of soils, namely tropical ferruginous soils, ferrallitic soils and hydromorphic soils found in swampy areas and lowlands. It also has very rich black soils found in the areas of classified forests such as the localities of Pikiré, Fêtékou and Kaobagou. Apart from these localities invaded by cotton crops, the soils of the commune are very poor. Agriculture being the main activity in the commune with cotton as the predominant crop, a significant part of the territory is now sown for this activity. The areas under cultivation and the areas under agricultural control together occupy 23.13 percent of the territory of Kerou. It should be noted that in the 23.13 percent of the areas under agricultural control, 20 to 24 per cent are degraded⁸. Rock out crops occupy about 5.4 percent, while roads and towns occupy only about 0.48 percent. The total percentage of these completely bare areas is 29 percent. There is an intermediate zone represented by wooded and shrub by savannas that occupy the largest part of the territory, i.e. 46.56% (Table 1).

Table 1: Land use in the municipality of Kerou

Land use elements	Area	Percentage (%)
Forest gallery	13 034	3,48
Dry dense forest	1 433	0,38
Open forest and wooded savannah	77 021	20,56
Wooded and shrub by savannah	174 385	46,56
Saxicolous savannah / outcrop	20 209	5,40
Savannah with agricultural rights-of-way	56 987	15, 23
Mosaic of crops and fallow land	29 586	7, 9
Agglomerations and roads	1 820	0,49
Total	374 475	100,00

Source: PRODECOM, 2006

2.3 Land degradation quantification model

Generally speaking, the process of land degradation is carried out by decreasing selectivity of the richest soil elements. The model developed by the soil scientists of the FAO³ and the World Bank^{4 and 5} will be used to calculate the accumulated land losses in the commune of Kerou.

$$R_t = R_o \cdot e^{aPt}, \text{ and land losses: } (Pt) = \frac{\log\left(\frac{R_t}{R_o}\right)}{a};$$

$$Pt(\text{Min}) = \begin{cases} Pt(\text{Max}) = \frac{\log\left(\frac{R_t}{R_o}\right)}{0,04} = \frac{\log(R_t) - \log(R_o)}{0,04}; \\ \frac{\log\left(\frac{R_t}{R_o}\right)}{0,15} = \frac{\log(R_t) - \log(R_o)}{0,15}; \text{ where,} \end{cases} \quad (1)$$

Rt: the yield of the year in tons per hectare (t/ha);

Ro: the initial yield in tons per hectare (t/ha);

a: a constant defined by the FAO (1994), varying from 0.04 to 0.15;

Pt: accumulated land losses per year in tons per hectare (t/ha). They are maximum

Pt (Max) or minimum Pt (Min).

Log = Nerianlogarithm (ln)

3. Results and discussion

Data of Support Programme for the starting-up of municipalities (PRODECOM) in 2006¹⁷ and from the Regional Action Centre for Rural Development (CARDER) of Atacora-Dongain 2014, on the evolution of the area, production and yield of cotton in the municipality of Kérouf from 1998 to 2014 confirmed the problem of land degradation. In fact, the areas and production are in fact increasing over the period indicated, while yields are practically constant, even decreasing in places over the same period (Table 2).

Table 2: Evolution of cotton cultivation from 1998 to 2014 in Kerou

Cotton season	Area in hectare (ha)	Production in tonne (t)	Yield (kg/ha)
1997-1998	8 829	12 104	1 371
1998-1999	10 832	12 173	1 124
1999-2000	10 413	15 989	1 535
2000-2001	12 734	16 964	1 332
2001-2002	15 173	19 744	1 301
2002-2003	16 400	22 092	1 347
2003-2004	16 003	16 221	1 014
2004-2005	13 596	22 431	901
2005-2006	7 770	7 023	904
2006-2007	10 838	14 372	1 326
2007-2008	12 717	20 882	1 642
2008-2009	16 558	19 451	1 175
2009-2010	11 553	13 197	1 142
2010-2011	16 150	12 710	787
2011-2012	17 277	17 458	1 010
2012-2013	27 483	21 536	784
2013-2014	27 209	32 409	1 191

Source: PRODECOM, 2006, and CARDER Atacora-Donga, 2014

The soil scientist model of the FAO³, the World Bank⁴ and⁵ and Table 2 are used to quantify land degradation. Thus, if: Rt = 1191 t/ha and Ro = 784 t/ha represent the yields of 2013 and 2014 respectively (see Table 2).

$$Pt(\text{Max}) = \frac{\log\left(\frac{R_t}{R_o}\right)}{0,04} = \frac{\log(R_t) - \log(R_o)}{0,04} = \frac{\log(1191) - \log(784)}{0,04} = 10,45$$

$$Pt(\text{Min}) = \frac{\log\left(\frac{R_t}{R_o}\right)}{0,15} = \frac{\log(R_t) - \log(R_o)}{0,15} = \frac{\log(1191) - \log(784)}{0,15} = 2,79$$

Thus, from 2013 to 2014, the municipality of Kerouf recorded a loss of accumulated land (Pt) of 2.79 to 10.45 t/ha/year, as a result of cotton cultivation. This result was earlier confirmed by research by¹⁸ in his thesis entitled: "Cotton cultivation and soil degradation in Mouhoun (Burkina Faso)". Similarly, Brüntrup¹⁵, in analysing the environmental effects of cotton production, wonders whether the replacement of cotton production by other crops would be a viable alternative to the production of cotton.

Will cash crop cultivation with food crops be part of sustainable agriculture? He notes, as in the framework of research in the commune of Kerouf, that cotton cultivation has negative effects on the environment, promotes soil degradation and causes a drop in yields of food crops. The loss of accumulated land (Pt) of 2.79 to 10.45 t/ha/year obtained against 1 to 12 t/ha/year tolerated³ shows that the commune of Kerouf is not immune to severe land degradation. On the contrary, the process of severe degradation has begun. Moreover, Zinzindohoué² noted that this situation of land loss negatively influences soil fertility and causes food insecurity and poverty in the long term. The FAO¹⁶ classification indicates that, if nothing is done in a few decades, land degradation will become "very severe" in the commune of Kerouf, following a multiplier effect. Thus, land degradation is a problem that today compromises development and even the survival of the populations. It occurs in several forms and in different proportions in Benin. It has multiple consequences on agricultural and even economic development (reduced fertility and low soil yield, food insecurity, poverty). For Brüntrup¹⁵, modernisation of cotton production is a medium-term development perspective and probably the surest way to achieve sustainable agriculture in northern Benin.

4. Conclusion

The 1/200,000-scale soil map of Benin was carried out between 1968 and 1969. Nearly half a century later, it is imperative to remake this Benin soils map in order to better determine their characteristics on the one hand, and on the other hand, circumscribe degraded soils in different agro-ecological zones in order to correct their nutrient deficiencies. To achieve this, an assessment of the loss of accumulated land in these different agro-ecological zones of Benin is required. The results of the evaluation of land degradation in the municipality of Kerouf have determined a loss of accumulated land (Pt) of 2.79 to 10.45 t/ha/year. This loss is, however, lower than the soil loss tolerance set by FAO³. The tolerance for soil loss is erosion that does not cause a significant drop in land productivity. It varies from 1 to 12 t/ha/year depending on climate, rock type and soil thickness³. Despite this low tolerance in soil loss, the worst is to be feared because it takes 1000 to 100,000 years under

certain conditions to form one metre of soil¹⁹. Soil is therefore regarded as a non-renewable resource on a human scale.

References

- [1] **Commune de Kérou (CK), (2010)**; *Plan de Développement Communal*. MDGLAAT. République du Bénin, 113 p.
- [2] **Zinzindohoué, E., (2012)**; *Etat des lieux de la sécurité alimentaire dans le département de l'Atacora (au Nord-Ouest du Bénin) et analyse des politiques publiques*. Master of Advanced Studies en Action Humanitaire. Centre d'Enseignement et de Recherche en Action Humanitaire de Genève (CERAHGENEVE). Université de Genève. 46 p.
- [3] **FAO, (1994)**; *La dégradation des terres en Asie du Sud: sa gravité, les causes et les effets sur les personnes*. Soil World Ressources Rapports. Rome, 1994. 150 p.
- [4] **World Bank, (2003a.)**; Evaluation du coût de la dégradation de l'environnement. Royaume du Maroc. *Rapport METAP*. 40 p.
- [5] **World Bank, (2003b)**; Evaluation du coût de la dégradation de l'environnement. République Tunisienne. *Rapport METAP*. 19 p.
- [6] **Adams, C.R. et H. Eswaran (2000)**; "Global land resources in the context of food and environmental security." In S.P. Gawande et al., éd. "Advances in Land Resources Management for the 20th Century," *Soil Conservation Society of India, New Delhi*; pp.35–50.
- [7] **Cleaver, K. M., (1993)**; Existe-t-il une synergie entre croissance démographique, développement agricole et environnement en Afrique sub-saharienne ? *Congrès et Colloques 13*. Paris, INED, pp. 83-94.
- [8] **République du Bénin, (2008)**; Lutte contre la désertification et la dégradation des terres au Bénin. In « *Diagnostic de l'Auto-évaluation Nationale des Capacités à Renforcer pour la Gestion de l'Environnement Mondial du Bénin* » (ANCR-GEM). Rapport National. PNUD, CNDD, MEPN; pp.64-82.
- [9] **Plan d'Action Environnemental (PAE), (1993)**; *Document final*, Cotonou, Bénin, 134 p.
- [10] **Azontondé, H. A., (1990)**; Effets de la culture attelée sur l'érosion et la conservation des sols au nord Bénin. *Centre d'Etude National d'Agro pédologique (CENAP)-SOLTROP 89- Cotonou – BENIN*, pp. 457-472.
- [11] **Dossa, A., (2018)**; Régression économétrique de l'influence de la population sur la dégradation des terres. *J. Rech. Sci. Univ. Lomé (Togo), 2018, 20 (3)*; pp. 105-117
- [12] **Dossa, A., Igué, A. M., Biaou, G. and al., (2015)**; Coût monétaire de la dégradation des terres dans la commune de Kérou, au Nord-Ouest du Bénin. *BenGéo / FLASH / UAC, N°17, juin 2015*, pp. 149 - 165.
- [13] **Alinsato, A.S., (2006)**; *Analyse des déterminants du consentement à payer pour la conservation des sols*. Unité de Formation et de Recherche en Sciences Economiques et de Gestion UFR-SEG/Cocody/Abidjan, Faculté des Sciences Economiques et de Gestion – Université d'Abomey-Calavi – Bénin. 25p.
- [14] **INSAE (2015)**; *Quatrième Recensement Général de la Population et de l'Habitation (RGPH4) : Que retenir des effectifs de population en 2013 ?* Juin 2015, MDAEP/RB, 33 p.
- [15] **Brüntrup, M., (1995)**; La production du coton et l'environnement : quelques considérations pour les zones de savane dans le Nord du Bénin. In Leo De Haan et Peter Ton (eds), « *A la recherche de l'agriculture durable au Bénin* ». *Instituutvoor Sociale Geografie, UvA N°18*, pp. 94-103.
- [16] **FAO, (2003)**; *Economie de l'agriculture de conservation*. Service de la gestion des terres et de la nutrition des plantes. Division de la mise en valeur des terres et des eaux. Rome, 2003. 67 p.
- [17] **Programme d'Appui au Démarrage des Communes (PRODECOM), (2006)**; *Schéma directeur d'aménagement de la commune de Kérou*. Département de l'Atacora et de la Donga, commune de Kérou, République du Bénin ; 103 p.
- [18] **Hauchart, V., (2005)**; *Culture du coton et dégradation des sols dans le Mouhoun (Burkina Faso)*. Thèse de Doctorat en Géographie. Ecole Doctorale des Sciences de l'Homme et de la Société, Université de Reims-Champagne-Ardenne, 467 p.
- [19] **Lavelle, P. (2013)**; Les sols. Livret sur l'environnement, *Académie des sciences*, pp. 1-3.