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APPLICATION FOR POLLUTION RECOVERY FUND ASSISTANCE

DATE OF APPLICATION: **April 24, 2006**

A. BASIC ASSISTANCE

1. Applicant: The legal name of the applicant/organization, the organizational unit and the complete mailing address of the applicant.

Name: ***Dr. Craig D. Stanley***

Gulf Coast Research and Education Center

Organization: ***University of Florida, IFAS***

Address: ***14625 CR672, Wimauma, FL 33598***

2. Project Manager Information: Give name and title of the representative of the applicant who will be the Environmental Protection Commission's principle contact concerning this application

Name ***Dr. Craig D. Stanley***

Title ***Professor and Associate Center Director***

Address ***14625 CR 672, Wimauma, FL 33598***

Phone Number ***(813)-633-4117***

Project Title ***In Situ Phosphorus Stabilization: Effects of Co-blending of Drinking Water Treatment Residual, Quicklime, And Magnesium by-products on Phosphatic Clay Tailings and Manure-Impacted Soils***

Project Time Start: August 1, 2006 End: July 31, 2009

Total Cost of Project $ $390, 000 This is a 3 – year project

Total EPC share requested $ 120,000 ($40,000/yr)

3. Assistance Type: **New or Renewal** (check one)

☒ New - Award of funds for initial request within the project period.

☐ Renewal - Award of funds for a project beyond the current project period.

4. Project Location: The specific location(s) of the project. (Attach Site Map)

1. Lab work site- Gulf Coast Research and Education Center

2. Field work site – To be determined on phosphate mine site and manure-impacted site

5. Is the Project for:

☒ Restoration of a polluted area

☒ Mitigation of the effects of pollution

☒ Pollution Control Activity to prevent or minimize pollution

☒ Educational

6. Is the Project directed toward restoring an identified "polluted area" (a geographic area destroyed or altered by dredging or filling or contaminated by an emission or discharge), or toward terminating an identified pollution source? Identify and explain:

Yes, project proposes to use waste materials currently generated by municipal water treatment process and using clay from phosphatic mining activities to improve soil productivity and specifically to immobilize phosphorus already present in the soil from entering ground and surface water resources. The impacted soils include reclaimed phosphate mined lands and manure-impacted soils (dairy feedlots)

7. Is the harm or potential harm to health, safety or welfare of the public or wildlife actual or potential? Does the project seek to alleviate actual or potential harm and what is the severity of the harm and the causal relationship between the "pollution" and the harm?

Identify and explain:

Actually, this project proposes to address both the actual generated waste

material and use it to treat impacted soils at the same time and to improve the condition. The severity depends on the impacted water resources and the negative effect of accumulation of excess phosphorus.

8. How long has the pollution existed or how long before any harm will be evident?

This pollution has existed for many years due to mining activities and dairy operations.

9. Identify and describe how the project proposes to alleviate the pollution (addressing technical, practical, and cost effectiveness issues):

The use of water treatment residuals (WTR's) will be used for mined land treatment (as well as waste products of calcium oxide, magnesium oxide, and lime-stabilized sludge) to improve soil structure, water infiltration, plant root growth and general soil productivity and quality. In addition to phosphorus immobilization, heavy metals presents in the soil will be immobilized. The manure-impacted soils will be treated with magnesium oxide, calcium oxide, and calcium sulphate to achieve the overall goal of soil quality.

10. Is the polluted area one which has previously been subject to commission enforcement and, if so, when and what was the result?

N/A

11. If no actual pollution exists and no prior commission enforcement action has occurred, does the project otherwise enhance pollution control activities within the County?

Yes, the project addresses the stabilization of leachable phosphorus present as a result of mining or livestock operations to prevent the off-site movement of phosphorus in waterresources

12. Can this Project be divided into separate and independent parts, and if so,

a) what are they? ***Yes, Laboratory studies followed by field studies***

b) how would the costs be allocated between them? ***70:30 Lab:Field***

Procurement of lab and field supplies, analyses of water and soil samples, labor, graduate student support

c) would the applicant be willing to accept only partial funding? ***Yes,***

If co-funding from another source will be secured (our responsibility)

13. Are other funding sources committed to the project? ***(pending)***

    How much and for what?

    Proposal pending $270,000 (direct project support)

14. What other funding sources may be available and how much?

    FDACs

15. Why do you believe that this Project is of sufficient importance to justify the expenditure of Pollution Recovery Funds?

    Because this research addresses potential water quality contamination issues facing Hillsborough County

16. Will the project enhance the value of private property, and if so, whose?

    Application of the results could help to increase value, usability and the environmental stewardship of the property.

B. ATTACHMENTS

All applicants must submit responses to the following as attachments corresponding to the indicated numbers:

1. Please provide a detailed map of the project site. ***Lab work to be conducted at the Gulf Coast Research and Education Center, field site – TBD manure-impacted and reclaimed phosphate mine sites in Hillsborough County***

2. Principal Investigator and Key Personnel - Present a biographical sketch of the principal Investigator incorporating the following information: Name, Address, Phone Number, Education, Background and other qualifying experience for the project. ***(See Attachments)***
3. Project Narrative - Please provide a narrative statement describing the project that includes the following:

a) Objectives of this Project - Describe the principal and subordinate environmental objectives of the project. Pinpoint any relevant physical, economic, social, financial, institutional or other problems requiring solution. ***(See Attachments)***

b) Results and/or Benefits Expected - Identify specific environmental results and/or benefits to be derived from the project. Include all primary and secondary benefits accruing to the grantee, to the pollution served, and in general, to the public and environment. ***(See Attachments)***

c) General Project Information - Discuss the criteria that will be used to evaluate the results and successes of the project as well its relationship to other work planned, anticipated or underway. ***(See Attachments)***

4. Scope of Work – Provide a detailed scope of work for the proposed project. List in chronological order a schedule of accomplishments, progress, or milestones that are anticipated over the length of the project. ***(See Attachments)***

5. Budget Information – Please itemize expenditures necessary to perform project using the following format:

BUDGET CATEGORIES

	PRF Funds	Federal	Applicant	State	Other
a. Personnel					
1. Graduate student costs	$18,000/yr $54,000 (3 yrs)				
2. Post-doc and Technical help					$60,000 yr $180,000 (3yrs)
b. Administrative					$8,000/yr $24,000 (3yrs)
c. Materials	$8,000/yr $24,000 (3 yrs)				$9,000/yr $27,000 (3yrs)
d. Contractual (Lab costs - Sample analyses)	$6,000/yr $18,000 (3 yrs)				$8,000/yr $24,000 (3yrs)
e. Construction					
f. Other Transportation, travel, misc)	8,000/yr $24,000 (3yrs)				$5000/yr $15,000 (3 yrs)
g. Total Direct Charges (Sum of a. to f.)	$ $40,000/yr $120,000 (3yrs)				$90,000/yr $270,000 (3yrs)

C. SUBMITTAL OF APPLICATION

Please submit a total of five (5) applications (one original and four (4) copies / one of which must be in electronic format as a CD) to:

Environmental Protection Commission of Hillsborough County
Environmental Resources Management Division
Attn: Tom Ash / Pollution Recovery Fund
3629 Queen Palm Dr., Tampa, Florida 33619

Completed applications must be received at the above address by 5:00pm (EDT), May 1, 2006.
Late applications and email applications will not be considered.

www.epchc.org

E-Mail: epcinfo@epchc.org

AN AFFIRMATIVE ACTION – EQUAL OPPORTUNITY EMPLOYER

PRF APPLICATION PROCESS

Instructions

The Hillsborough County Environmental Protection Act (Chapter 84-446, Laws of Florida) has created a pollution recovery fund which is to be supervised and used by the commission to restore polluted areas of the county, as defined by the commission, to the condition they were in before pollution occurred, to mitigate the effects of pollution, or to otherwise enhance pollution control activities within the county.

Application Forms must be submitted on or before the May 1, 2006 deadline.

- There will be a newspaper advertisement, and possibly press releases, specifying the deadline for submitting applications.
- Application forms and instructions can be obtained from Tom Ash, phone 813-627-2600 x1011 or from our website at:: www.epchc.org
- Except under special circumstances, applications submitted earlier than the deadline will be held until the next processing period, and then processed with the others.

Following the deadline, applications will be distributed to staff appropriate to the project for review and recommendation to the Executive Director.

- Staff may contact the applicant upon beginning review, and if a meeting to discuss details is requested or advisable, will schedule it.
- Staff will meet with the Executive Director to discuss all applications in the group and to prioritize and determine recommendations.

A summary of the Executive Director's recommendations will be forwarded to CEAC along with copies of all applications.

- Staff will send a copy of the Executive Director's recommendations to each applicant along with a notice of the meeting date at which CEAC will discuss the applications and its recommendations to the EPC Board.
- Applicants are invited to attend the CEAC meeting and make a brief presentation in support of their project.

Staff and CEAC recommendations will be presented to the Commission for decision.

- The EPC Board meeting will likely be the second meeting following the CEAC meeting so that the information can be properly placed on the agenda.
- The Applicant may attend the EPC meeting and request to speak.

If the project is approved, the applicant must sign a contract before monies will be available.

- EPC Legal will draft the contract with standard terms and conditions, and provide it to the applicant for review and execution.
- EPC Legal will arrange for execution of the contract by the EPC Chair after it is executed by the applicant, and will then forward final copies to the Applicant's Project Manager and the EPC Project Manager.
- The EPC Project Manager will be responsible for ensuring the applicant's compliance with the contract.

Vitae and Publications

Dr. Craig D. Stanley
Professor and Associate Center Director
University of Florida, IFAS
Gulf Coast Research and Education Center
14625 CR 672
Wimauma, FL 33598

EDUCATION: B.S. (Agronomy) 1973 - Iowa State University, Ames, Iowa
M.S. (Agricultural Climatology) 1975 - Iowa State University, Ames, Iowa
Ph.D. (Soil Management) 1978 - Iowa State University, Ames, Iowa

PROFESSIONAL EMPLOYMENT:

4/95 - present	Professor (Soil-Water Relations) University of Florida, IFAS,
9/84- 4/95	Associate Professor (Soil-Water Relations) University of Florida, IFAS,
8/79 - 9/84	Assistant Professor (Soil-Water Relations) University of Florida, IFAS,

PROGRAM DESCRIPTION:

Plan, implement and manage independent research and extension programs dealing with soil and water management problems of commercial ornamental, vegetable, and other crops of south Florida. Specific research areas include: determination of crop water requirements, development and improvement of water conservation alternatives, and development of improved management practices which result in water quality protection. Some current research program areas include:

1) Water management of subirrigated sod using GIS technology
2) Development and improvement of nutrient and water management BMP's for fresh market strawberry production
3) Water requirements for transplant establishment of tomato and pepper seedlings for subirrigated and drip-irrigated growing conditions
4) Non-isothermal fate and transport of drip-chemigated fumigant Methyl isothiocyanate (MITC) in plastic-mulched soil beds: Model development and validation
5) Development of a solar irradiance model for plastic-mulched soil beds during tomato production

RECENT PUBLICATIONS:

McNeal, B. L., C. D. Stanley, L. A. Espinoza, and L. A. Schipper. Nitrogen management for vegetables and citrus: some environmental considerations. Soil and Crop Sci. Soc. Fla. Proc. Vol. 53. 1994. pp.45-51.

McNeal, B. L., C. D. Stanley, W. D. Graham, P. R. Gilreath, D. Downey, and J. F. Creighton. Nutrient-loss trends for vegetables and citrus in west-central Florida. I. Nitrate. J. Environ. Qual. Vol. 24. 1995. pp. 95-100.

Stanley, C. D., McNeal, B. L., P. R. Gilreath, J. F. Creighton, W. D. Graham, and G. Alverio. Nutrient-loss trends for vegetables and citrus in west-central Florida. II. Phosphate. J. Environ. Qual. Vol. 24. 1995. pp.101-106.

Stanley, C. D. and G. A. Clark. 1995. Effect of reduced water table and fertility levels on subirrigated tomato production. Applied Engin. in Agric. Vol. 11. 1995. pp. 385-388.

Clark, G. A. and C. D. Stanley. 1995. Subirrigation using drip irrigation laterals. Proc. 5th Int. Microirrig. Cong.Amer. Soc. Agric. Engin. 1995. pp. 43-48.

Stanley, C. D. and G. A. Clark. 1995. Non-traditional use of microirrigation tubing for water quality protection. Proc. 5th Int. Microirrig. Cong. Amer. Soc. Agric. Engin. pp. 49-53.

Clark, G. A., C. D. Stanley, A. G. Smajstrla, and F. S. Zazueta. 1995. Microirrigation design considerations for sandy soil vegetable production systems. Proc. 5th Int. Microirrig. Cong. Amer. Soc. Agric. Engin. pp. 516-521.

Clark, G.A., D. N. Maynard, and C. D. Stanley. 1996. Drip irrigation management for watermelon in a humid region. Applied Engin. in Agric. 12:335-340.

Clark, G.A., E.E. Albregts, C.D. Stanley, A.G. Smajstrla, and F.S. Zazueta. 1996. Water requirements and crop coefficients of drip irrigated strawberry plants. Trans. Amer. Soc. Agric. Eng. 39:905-913.

Clarke, R. A., C. D. Stanley, B. W. MacLeod, and B. L. McNeal. 1997. Relationship of seasonal water quality to chlorophyll a concentration in Lake Manatee, Florida. J. Lake and Res. Mgnt. 13:253-258.

Scholberg, J.M., B.L. McNeal, J.W. Jones, K.J. Boote, C.D. Stanley, and T.A. Obreza. 2000. Growth and canopy characteristics of field-grown tomatoes. Agronomy J.92:152-159..

Clark, G.A., C.D. Stanley, and D.N. Maynard. 2000. Municipal solid waste (MSWC) as a soil amendment in irrigated vegetable production. Transactions of the Amer. Soc. Agr. Engin. 43(4):847-853.

Stanley, C. D. and B. K. Harbaugh. 2002. Water table depth effect on water use and tuber yield for subirrigated caladium production. HortTech. 12:679-681.

R. A. Clarke, C. D. Stanley, B. L. McNeal and B. W. MacLeod. 2002. Impact of agricultural

land use on nitrate levels in Lake Manatee, Florida. J. Soil Water Conser. 57:106-111.

Stanley, C. D. 2004. Effect of water table depth and irrigation application method on water use for subirrigated fresh market tomato production in Florida. J. Soil water Conser. 59:149-153.

Hochmuth, George, Dan Cantliffe, Craig Chandler, Craig Stanley, Eric Bish, Eric Wlado, Dan Legard, and John Duval. 2006. Containerized strawberry transplants reduce establishment period water use and enhance early growth and flowering compared with bare-root plants. HortTech. 16:46-54.

*Ha, W., Ajwa, H. A., Mansell, R. S. & Stanley, C. D. 200?. "Two-dimensional simulation of non-isothermal fate and transport of a drip-applied fumigant in plastic- mulched soil beds. II. Metam sodium.." Soil Science Society of America journal. **In Progress.**

*Ha, W., Mansell, R. S., Stanley, C. D. & Ajwa, H. A. 200?. "Two-dimensional simulation of non-isothermal fate and transport of a drip-applied fumigant in plastic- mulched soil beds. I. Model development and verification.." Soil Science Society of America journal. **In Progress.**

Ha, W., Stanley, C. D. & Mansell, R. S. 200?. "Two-dimensional simulation of non-isothermal fate and transport of drip-applied fumigants in plastic- mulched soil beds. III. Sensitivity analysis and model application.." Soil Science Society of America journal. **In Progress.**

DR JACK EDWARD RECHCIGL

BUSINESS ADDRESS:

University of Florida
Gulf Coast REC
14625 CR 672
Wimauma, FL 34203
Phone: (813) 633-4111
FAX: (813) 634-0001

HOME ADDRESS:

10606 Riverbank Terrace
Bradenton, FL 34212
Phone: (941) 745-1809
email: rechcigl@mail.ifas.ufl.edu

AREAS OF SPECIALIZATION:

Soil Fertility	Fertilizers	Water Quality	Industrial By-products
Forages	Organic Wastes	Plant Nutrition	Soil Quality

EDUCATIONAL BACKGROUND

Institution	Discipline	Degree	Date
Virginia Polytechnic Institute & State University	Soil Science	Ph.D.	1986
Virginia Polytechnic Institute & State University	Soil Science	M.S.	1983
University of Delaware	Plant Science	B.S.	1982

ADMINISTRATIVE TRAINING:

Harvard Graduate School of Education, Administrative Training for Directors, Chairs and Deans, Cambridge, MA, June 16-28, 2001.

State University System Department Chairpersons Workshop, Institute for Academic Leadership,
A. Palm Coast, Fla., June, 2002.
B. Howey-in-the-Hills, Fla., October, 2000.

U.S.D.A. Administrators Workshop, University of Nebraska-Lincoln, May 30-June 2, 2000.

ESCOP/ACOP Leadership Development Program, Class 10,
A. Gainesville, Fla., internship in Dean's Office, September, 2000-July, 2001.
B. Washington D.C., June, 2001.
C. University Place, Indianapolis, Ind., September, 2000.

LEAD IFAS, University of Florida Administrative Training Program, FFA Leadership Training Center, Haines City, FL
A. Leadership Strategies, October, 2001.
B. Personnel Management, March, 2001.

C. EXCEL Program on Management and Leadership, August, 2000.
D. Managerial Assessment of Proficiency (MAP), FL, April, 2000.
University of Florida Supervisory Training, Gainesville, Fla., 1998-1999.

EMPLOYMENT:

Position	Location	Date
Professor and Director	University of Florida, Gulf Coast Research & Education Center, Bradenton, Fla.	2001-Present
Research Foundation Professor and Associate Director	University of Florida, Gulf Coast Research & Education Center, Bradenton, Fla.	2000- 2001
Research Foundation Professor	University of Florida, Range Cattle Research and Education Center, Ona, Fla.	1999-2000
Professor	University of Florida, Range Cattle Research and Education Center, Ona, Fla.	1996-2000
Associate Professor	University of Florida, Range Cattle Research and Education Center, Ona, Fla.	1991-1996
Assistant Professor	University of Florida, Range Cattle Research and Education Center, Ona, Fla.	1986-1991
Research Assistant	Virginia Polytechnic Institute and State University, Agronomy Department, Blacksburg, Va.	1982-1986
Research Assistant	University of Delaware, Plant Science Department, Newark, Del.	1979-1982

TEACHING/TRAINING:

Visiting Professors: 9
Post Doctoral Fellows: 10
M.S. and Ph.D. Students: 6

Honors:
Fellow, Czechoslovak Society of Arts and Sciences, 2003.
Honorary Professor, Czech Agricultural University, Prague, 1999.
Research Foundation Professor, University of Florida, 1999.
Presidential Citation for Outstanding Achievement Award, University of Delaware, 1999.
Fellow, Soil Science Society of America, 1999.
Interdisciplinary Extension Team Award, University of Florida/IFAS, 1999.
Fellow, American Society of Agronomy, 1998.
Research Award, University of Philippines, 1994.

Research Honor Award, University of Florida, 1992.
Research Achievement Award, University of Florida, 1991.
Research Award, Sigma Xi, 1982.
Research Award, University of Delaware, 1981.

Listings in Professional Biographical Dictionary:

American Men and Woman of Science, 1994-Present.
Marquis's Who's Who in the World, 1994-Present.
Marquis's Who's Who in America, 1994-Present.
Marquis's Who's Who in Science and Engineering, 1992-Present.

Honorary Society Memberships:

Honorary Society of Gamma Sigma Delta, 1990-Present.
Honorary Society of Sigma Xi, 1981-Present.
Honorary Society of Gamma Beta Phi, 1981-Present.
Honorary Society of Phi Sigma, 1981-Present.

Professional Societies:
American Society for Horticultural Science, 2001-Present.
Research Center Administrators Society, 2000-Present.
International Society of Soil Science, 1993-Present.
Florida Fertilizer & Agrichemical Association, 1987-Present.
Soil and Crop Science Society of Florida, 1986-Present.
Soil Science Society of America, 1984-Present.
American Society of Agronomy, 1984-Present.
Czechoslovak Society of Arts and Sciences, 1984-Present.

Editorial Activities:

Editorial Board: International Journal of Food, Agric. and Environment, 2002-Present.
Associate Editor: Soil and Crop Science Society of Florida Proc., 1999-2000.
Associate Editor: Journal of Environmental Quality, 1993- 1997.
Editor-in-Chief: Agricultural and Environmental Book Series, Lewis Publishers, 1993- Present.

PUBLICATIONS

Books: 6
Book chapters: 19
Monographs: 10
Refereed Publications: 45
Popular Articles: 175

DR MARTIN B. ADJEI
Univ. of Florida, Range Cattle REC, 3401 Experiment Station, Ona, FL 33865
Telephone 863-735-1314; Fax 863-7351930; Email mba@ufl.edu

Educational Qualifications:

University of Ghana	Animal Science	B.S.	1973
University of Florida	Agronomy/Soil Science	M.S.	1975
University of Florida	Agronomy	PhD.	1978
University of Florida	Soil-Plant-Animal relations	Postdoc	1985-1990

Appointments:

Associate Professor, Range Cattle Research & Education Center, University of Florida, February 2003-Present:

Management of biosolids/manure for pasture fertilization; Nutrient management to improved efficiency of pasture fertilization. Phosphorus phytoremediation of dairy manure-impacted soils; Pasture insect control, Grazing management, Forage agronomy extension education.

Assistant Professor, Range Cattle Research & Education Center, University of Florida, Jan 1997-February 2003:

Established multi-county demonstration grass plots to develop and promote management practices that improved efficiency of use of fertilizers and biosolids on pasture. Conducted on-farm research on sustainable cattle-forage production systems based on complementary use of perennial grass-legume mixtures. Conduct research on biological and nutritional causes for bahiagrass pasture decline and promoted integrated management practices for pasture pest control.

Research Associate Professor, Agricultural Experiment Station (AES), University of the Virgin Islands, St. Croix, USVI, July 1995-Dec 1996:

Research Assistant Professor, Agricultural Experiment Station, University of the Virgin Islands, St. Croix, USVI, April 1990 - June 1995:

Evaluated management systems for forage conservation in the Caribbean including sorghum/legume alley cropping for silage, clipping management of dwarf elephantgrass/leucaena forage bank and urea-ammoniation of hay to improve forage quality. Developed sustainable forage-livestock feeding programs cooperatively with Caribbean farmers through on-farm research

Postdoctoral Research Associate, Agricultural Research & Education Center, University of Florida, Jan. 1985 - March 1990:

Worked closely with forage and animal scientists. Assisted in the design and conduct of grazing trials to determine forage yield, quality and persistence of tropical perennial grasses, and animal performance at various stocking rates and grazing frequencies. Forage evaluation included small plot and mob-grazing trials.

Lecturer/Research Officer, University of Ghana, Legon-Accra, Aug. 1978 – July 1984:

As a Lecturer in the Department of Animal Science, developed course material and taught classes in Animal Nutrition, Statistics, Pasture and Fodder Science and Advanced Pasture Science

Selected Publications

Refereed

Adjei, M.B., G.C. Smart, Jr., J.H. Frank, and N.C. Leppla. 2006. Distribution of beneficial nematodes for the control of pest mole crickets (Othoptera: Gryllotalpidae) on pasture. J. Econ Entomol. (in press).

Kalmbacher, R.S., M.B. Adjei, I. Ezenwa and F. Martin. 2005. Fertilization of creeping signalgrass and bahiagrass under grazing in Florida. Trop. Grassld. 39:75-87.

Sigua, G, M.B. Adjei and J.E. Rechcigl. 2004. Cumulative and residual effects of repeated sewage sludge applications: Forage productivity and soil quality implications in south Florida. Environ. Sci. & Pollution.(OnlineFirst):1-9. (URL: http://dx.doi.org/10.1065/espr2004.10.220).

Pant, H.K., M.B. Adjei, J.M.S. Scholberg, C.G. Chambliss and J.E. Rechcigl. 2004. Forage production and phosphorus phytoremediation in manure-impacted soils. Agron. J. 96:1780-1786.

Adjei, M.B., J.H. Frank, and C.S. Gardner. 2003. Survey of pest mole cricket (Orthoptera: Gryllotalpidae) activity on pasture in south-central Florida. Florida Entomologist. 86:199-205.

Adjei, M.B., and J.E. Rechcigl. 2002. Bahiagrass production and nutritive value as affected by domestic wastewater residuals. Agron. J. 94:1400-1410.

Valencia, E., M.B. Adjei, and J. Martin (2001) Aquaculture effluent as a water and nutrient resource in the seasonally dry tropics. Comm. in Soil Sci. Plant Anal. 32: (1293-1301).

Adjei, M. B., P. Mislevy, and C. Chason. 2000. Timing, defoliation management and nitrogen effects on seed yield of Argentine bahiagrass. Agron. J. 92:36-41.

Brown, W.F., and M.B. Adjei. 2001 Protein supplementation for calves grazing limpograss (*Hemarthria altissima)* pasture. J. Anim. Sci.. 79:3170-3176.

Non-Refereed:

Adjei, M. B. and J.E. Rechcigl. 2006. Response of warm season grasses to sources of nitrogen fertilizer. Soil and Crop Sci. Soc. Fla Proc. 64 (in press).

Adjei, M.B. and J.E. Rechcigl 2004. Interactive effect lime and nitrogen on bahiagrass pasture. Soil and Crop Sci. Soc. Fla Proc. 63:52-56.

Adjei, M.B., and J.E. Rechcigl. 2002. Environmental issues on use of sludge on pastures. The Florida Cattleman and Livestock Journal 66(7): 13-16.

Adjei, M.B., and J.P. Muir. 2000 Current developments from tropical forage research in Africa. A. Sotomayor-Rios and W. D. Pitman (ed.). Tropical forage plants: Development and use. CRC Press, Boca Raton, FL. Chapter 18, p 331-355.

Adjei, M. B., R. S. Kalmbacher, and J. E. Rechcigl. 2000. Effect of P and K fertilizer on forage yield and nutritive value of Floralta limpograss. Soil Crop Sci. Soc. Fla. Proc. 60:9-14.

Adjei, M. B., C. S. Gardner, D. Mayo, T. Seawright, and. E. Jennings. 1999. Fertilizer treatment effects on forage yield and quality of tropical pasture grasses. Soil Crop Sci. Soc. Fla. Proc. 59:32-37.

MIYITTAH K. MICHAEL

Gulf Coast Research and Education Center, 14625 CR 672, Wimauma, 33598. Email: miyittah@gmail.com, phone: 813-634-0000 ext. 3116

EDUCATIONAL BACKGROUND

Bsc, (1993): University of Ghana, Legon, Accra
Mphil, (2002): Chiba University, Tokyo, Japan
MSc, (2004): University of Florida, Gainesville
PhD, University of Florida (in progress)

PROFESSIONAL EXPERIENCE

2003-present Graduate Research Assistant, University of Florida, Gainesville

- Research on the application of chemical amendments

1997-2002 Graduate Research Assistant, Chiba University, Tokyo, Japan
- Research on biochemical processing of compost

TECHNICAL EXPERTISE AND AWARDS
- Excellent working knowledge on Inductive couple plasma spectrometry, TOC analyzer, lab data analyses
- Excellent in Microsoft applications (power points, word, excel etc)
- Working knowledge on SAS applications (Statically Analysis Package)
- A wards from Japanese Government Scholarship (Monbusho)
- University of Ghana bursary

HONORS AND PROFFESIONAL ACTIVITIES
- Member of American soil science society.
- Past member of Japanese soil science society
- Delta Epsilon (Academic Honor)
- Alpha Zeta (Academic Honor)

RELATED PUBLICATIONS
- Silveira, M.L., M.K. Miyittah, and G.A. O'Connor (2006): Phosphorus release from a manure-impacted spodosol: Effects of a water treatment residual. *J. Environ. Qual. 35: 529-541*
- Miyittah, M.K. 2004. Phosphorus immobilization in manure-impacted soil with aluminum treatment residual, MSc. Thesis, University of Florida, Gainesville.
- Miyittah, M and K. Inubushi (2003): Decomposition and CO_2-C evolution of Okara, sewage sludge, cow, poultry manure composts in soils. *Soil science and Plant nutrition. 49:61-68*

ATTACHMENT

Project Narrative

ABSTRACT

Application No:

Project Title:

In situ phosphorus stabilization: Effects of co-blending of drinking water treatment residual, quicklime, and magnesium by-products on phosphatic clay tailings and manure impacted soils in Florida

Principal Investigators:
Dr C.D. Stanley, Professor and Associate Center Director
Dr. J. E. Rechcigl, Center Director
University of Florida
Gulf Coast Research and Education Center
14625 CR 672, Wimauma, Fl. 33598
Phone: (813)-633-4117
Fax: (813)-634-0001
Email: CDSTANLEY@mail.ifas.ufl.edu

Dr. M. Adjei, Professor
University of Florida
Range Cattle Research and Education Center
Ona, FL

Michael K. Miyittah
Graduate Student, PhD
University of Florida
Gulf Coast Research and Education Center
14625 CR 672, Wimauma, Fl. 33598
Phone:(813)-634-0000 ext, 3116
Email: miyittah@ufl.edu

Focus Categories:
Non-point Pollution, Water Quality, Land Reclamation

Keywords:
Phosphatic clay tailings, Water treatment residuals, Adsorption, Soil Chemistry

Technical Abstract:

Phosphorus pollution has been implicated in phosphatic clay tailings and manure-impacted soils. Reclamation of phosphatic-mined land for intensive agriculture and pastures would improve the environmental conditions of the area. Manure-impacted Spodosols retain phosphorus poorly. Due to excess phosphorus inherently available through manure addition, which far exceeds P removal by plants, Spodosols consistently releases phosphorus in solution to surface, sub-surface and leaching affecting water bodies. The result is eutrophication and water quality degradation of lakes and rivers. Disposal of phosphatic clays tailings has caused environmental problems for the industry in regards to water pollution and land reclamation. Besides, the high clay content makes the soil prone to water logging, adhering to machinery, and making seedbed preparation difficult. This study will employ various soil amendments such as quicklime, water treatment residuals and magnesium waste. The effects of the amendments are stabilization of the plastic nature of phosphatic clay soils, and changing the soil chemistry to a suitable value. Similarly, potential pollutants of heavy metals and phosphorus will also be assessed. On the other hand, in manure-impacted soils, phosphorus in solution will be stabilized, immobilized and its negative influence on water quality will be attenuated. It is anticipated that, application of the amendments will not only help to develop best management practices (BMP) for phosphatic clay tailings and manure-impacted soils, particularly in Florida, but also aid in finding suitable uses for the amendments disposal.

Justification of the research

The release of phosphorus from land use activities (phosphatic mined lands) and nonpoint sources (manure-impacted soils) have been implicated in water bodies impairment. At the current mining rate, approximately, 100 000 Mg d^{-1} of the phosphatic clay waste is generated. Phosphatic clays settling occupy about 70% of the mined sites. In addition, the soils are prone to water logging, adhering to machinery, and making seedbed preparation difficult. This has created pressure from environmental groups for land restoration. Abundant clay minerals such as attapulgite, montmorillonite, kaolinites exist in phosphatic clay tailings. Reactions of the clay minerals with quicklime and magnesium waste have not being investigated in stabilization of the phosphatic clay mined for agricultural activities. The combinations of quicklime and magnesium waste would not only help to stabilize the clay tailings but will change the soil chemistry suitable for plant growth and immobilize potential heavy metals and phosphorus.

Furthermore, the additions of drinking water treatment residual modify with combinations of quicklime and magnesium waste to manure-impacted soil will completely immobilize phosphorus responsible for water bodies contamination. This is because, an ideal sorbing material should effectively immobilize the P from slightly acidic to slightly alkaline pH range (6 to 8.5).

The combination of the additives would create the right pH range for effective sorption. Currently, no other sorbing material is available for such effective and complete sorption reactions at an inexpensive cost. The residual from water treatment industry is abundant as well as that of magnesium oxide from coal processing plants. Finding suitable use will reduce the growing scarcity of landfill sites. The use of geochemical modeling would also be employed as a tool that will help in answering questions regarding the constituents concentration levels

meeting the EPA threshold values over compliance period of several years.
Thus we propose to establish trial experiments with phosphatic clay tailings and trial plots after restoration to investigate the impacts of the amendments on land reclamation. The impacts of the new soil created on pasture and sod production will also be investigated. The overall objective of this study would be to conduct a comprehensive study investigating the stabilization of phosphatic clay soils suitable for agricultural activities, as well as immobilization of phosphorus in manure-impacted soils.

Objectives of Research

1. To determine the leacheability and immobilization of phosphorus, and other ions. Compare soils stabilize by amendment to the non-amendment soils. Quantify the relationship between the measures of P solubility.

2. Examine the new solids phases formed as a result of co-blending of chemical amendments, and validation of various chemical species formed as a result of the solid phases.

3. Examine the effects of the various combinations of the amendments on phosphorus immobilization.

4. To phytoremediate P and characterize various forage species suitable on the new created phosphatic clay soil due to quicklime addition.

Materials and Methods

Experiments will be conducted at Gulf Coast Research and Education Center, Soil and Water quality laboratory. Soil samples will be taken from two different manure-impacted, and phosphatic mined sites. Physical and chemical characterization will be conducted on the impacted soils as well as on the various amendments.
A column leaching study will be conducted on the manure-impacted and phosphatic clay soil created. Leachates collected will be analysed for soluble reactive phosphorus (SRP), total dissolved phosphorus (TDP) and total phosphorus. The effects of the amendments on heavy metal immobilization in phosphatic mined soil will be given special attention.
Sorption kinetic study will also be conducted to see the overall trend of phosphorus immobilization with time and the effects as a result of changes in soil pH.
The use of X- ray diffraction (XRD) will be employ before and after the amendments incorporation for determination of any observable minerals present. The observed minerals will be validated using chemical speciation modeling (MinteqA2). MinteqA2 is an equilibrium speciation model and the results indicate thermodynamically most stable species. Various cations (Ca, Mg, Na, K, Fe, and Al) will be determined using inductively coupled plasma-optimal emission spectroscopy (ICP-OES, Perkin-Elmer Plasma 2100DV), as well as anions will be analysed as inputs for the speciation modeling.
Trial experiments will be conducted on the phosphatic mined land, and manure-impacted soil

with lysimeter to ascertain the overall effects of amendments application mixture on groundwater quality and subsurface water. Lysimeter will be installed at different depths after the application of the additives.

Timeline of Activities

Months 1-6: Purchase supplies, obtain soils, waste/byproducts, phosphatic clay tailings, and plants; begin characterization of soils and waste products; setup, begin and finish screening of plants materials and waste materials in the lab as well as in the greenhouse; collect and begin analysis of soil and leachate samples, begin sorption studies.
Months 7-12: Finish leachate P analysis; NH_4-N, NO_3^-, Cl^- and SO_4^{-2}; Ca, Mg, Al, and Fe; finish sorption studies, begin and finish desorption studies on waste-amended soils; finish data analysis, submit final report and prepare journal articles.
(2) Present data in state, regional and national meetings, prepare extension publication; recommend future work.
Months 13-18: Begin and finish screening of plants suitable on phosphatic mine lands. Trial planting, and phyto-remediation by plants on field sites. Use of X-ray to validate experimental data from year one, co-blending on waste from the results obtained in year one, collection of field leachates, analysis of samples; determination of moisture characteristics curves of the new soil form on phosphatic mined clay soil, plants suitability.
Months 19-24: Finish field leachate P and Ca, Mg, Fe and other metals analysis. Use leachate data on NH_4-N, NO_3^-, Cl^- and SO_4^{-2} from months 1-6 as wells as that of field data in geochemical modeling.
Months 25-30: Finish data analysis; submit final report (2) and prepare journal articles Present data in state, regional and national meetings, prepare extension publication; recommendation for future work.

Outline of expected results and benefits

The information derived from the propose work will be critical to the state (e.g. FL, Department of Environmental Protection) and local authorities (e.g. Hillsborough county governments and other counties experiencing poor water qualities).
Among the anticipated benefits from successful completion of this project are:

- In situ immobilization of bioavailable phosphorus from manure-impacted and phosphatic mined soils, and P loss to surface and groundwaters.
- Changing the soil chemistry of phosphatic mined land from plastic nature to a suitable one for agricultural activities.
- Better understanding of the mechanisms controlling phosphorus solubility would be attained.
- Vast land resources from phosphate mining may be useable for forage, sod production and creation of satisfactory environmental lands.
- Alternative uses will be obtained for the residual and waste products besides landfill, thus reduction of cost to manufacturers of the wastes.
- The above experimental approach is also applicable for immobilizing bioavailable phosphorus in animal manure and biosolids before application to agricultural lands.

PROJECT EVALUATION

- Aside from laboratory investigations, field application and evaluation of the samples collected will be analysed periodically. Results will be evaluated subject to meeting EPA standards requirements.
- Data generated from the work would be published in high impact factor peer review journals.
- We anticipate producing at least four journal articles, an annual report, several abstracts, and will have gathered information, which will significantly contribute, to a doctorial thesis. Completed journal articles, reports, abstracts and doctoral thesis will be public domain. The results will also be presented in national soil science meetings, state of Florida water quality meetings. As part of the Soil and Water Science graduate program requirement (professional development initiative), the graduate student will work with IFAS extension service to publish the relevant findings in extension literature.

Preliminary Results of the amendments

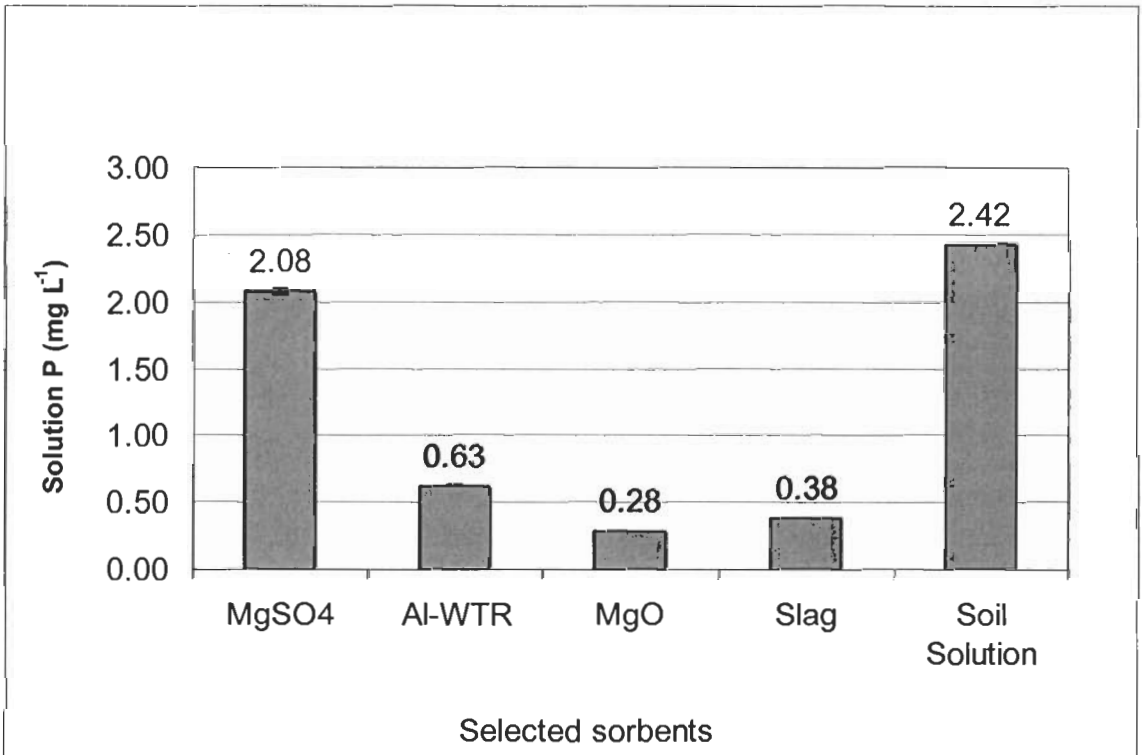

Fig. 1 Soil solution extract as a function of sorbents (1:500) solid solution ratio at 8hrs equilibration. Values are means of three replicates.

The amendments effect on phosphorus immobilization was evaluated as shown in Fig. 1 above. The extracted soil solution contains 2.42 mg L^{-1} phosphorus from manure-impacted soil. Byproducts where added to see their effect on phosphorus removal from solution. MgO material immobilizes 88.4% P in solution within 8 hrs of reaction. This was followed by slag material immobilizing 84.3%. Thirdly, Al-WTR removed from solution 74% of the total soluble P in solution. This suggests clearly the effectiveness of the byproducts in stabilizing phosphorus, which will otherwise leach to affect nearby water bodies. Further research is ongoing.