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Phosphate Clay-Ponds Prove to be Productive Agricultural Lands

by: P. MISLEVY, W. G. BLUE, C.E.ROESSLER

Agricultural Research and Education Center

For questions or comments regarding this publication contact  Pual Mislevy

Florida produces about 25 percent of the phosphate in the world, and 80 percent in the U.S. Most of this production comes from mining operations located in southwest, central Florida. In the past 90 years, approximately 200,000 acres have been mined.

Phosphate mining in Florida is conducted using strip mining methods. The surface six to 40 feet of soil called overburden is removed to expose the underlying matrix (six to 30 feet) which consists of equal proportions of phosphate, sand and clay. During processing, phosphate is separated from the matrix, yielding two by-products, waste-clays and sand tailings.

Sand tailings are pumped to mined-out or other areas for reclamation fill. Clays are pumped into settling ponds which make up about 50 percent of the mined area. The dewatering of waste-clay is one of the most difficult problems associated with reclamation. Historically, 10 to 15 years have been required before even the surface layer reaches 50 to 60 percent solid content, a physical condition where man and equipment can work. After 40 years some clayponds have reached less than 35 percent solids in areas reclaimed using previous techniques. Recently, dewater time has been shortened to three to five years through the use of specialized equipment that allows the construction and maintenance of ditches to remove water as it is released from the clay.

Studies conducted on dry clayponds revealed dry matter yields of most crops grown on the clay were equal or higher than the same crops grown on unmined flatwoods soil (see table). All crops, with the exception of sweet and forage sorghum had excellent crude protein and TDN content (see table).

Nutrient concentration (P, K, Ca, Mg, and Fe) found in whole-plant tissue far exceeded the requirements for beef cattle. However, Cu and Zn concentrations in the forage were borderline.

Research studies conducted over a four year period revealed soil analyses were high to extremely high for most nutrients, with the exception of Mn, Cu, Zn and Fe which were marginal to deficient. Soil pH averaged 7.3. Consequently, grass production on these soils required only the addition of nitrogen, with legume production requiring no fertilizer. The addition of Mn, Cu, Zn and Fe may be beneficial as future crop production intensifies.

Whole plant forage samples growing on waste-clay were analyzed for radium-226 and compared with plants grown on unmined soils. Concentrations of radium-226 found in forages grown on waste-clays were elevated three times above forages grown on unmined soils. However, the increment of radiation dose to humans consuming beef and milk from animals fed these forages would be negligible. Radium-226 concentrations in sorghum and corn grain samples were only two and 20 percent the concentrations found in the forage of the same crops.

These data indicate that excellent forage yields can be produced on a dry clay-pond. All forages are of excellent quality and generally contain adequate to high concentrations of plant nutrients. Since these clays are extremely fertile and have high moisture-holding capacity, legumes like white clover and alfalfa thrive after surface moisture is removed.

In summary, our studies show that phosphate clay-ponds in central Florida offer excellent areas for producing forages and grains for beef and dairy cattle. These forages and grains do not present health problems to cattle consuming them, nor to humans that would ultimately consume beef or milk.

Dry matter yield and quality of forage crops grown on a dry clay-pond.

Crop	**Yield**	**Crude**	**TDN**
		Protein	
	t/a	**%**	**%**
Sweet sorghum	**13.0**	**3.8**	**58.0**
Forage sorghum	**17.0**	**3.9**	**51.8**
Bahiagrass + N	**6.3**	**11.4**	**58.9**
Bahiagrass +WC	**5.8**	**21.5**	**74.0**

Florico stargrass + N	**6.3**	**12.0**	**64.7**
Florico stargrass + WC	**5.5**	**23.3**	**76.9**
Floralta hemarthria + N	**9.3**	**10.4**	**65.1**
Floralta hemarthria + WC	**6.7**	**21.1**	**75.1**
Florona stargrass + N	**8.2**	**11.8**	**60.2**
Florona stargrass + WC	**5.1**	**15.6**	**66.1**
Florona stargrass + Alf	**7.9**	**19.9**	**68.3**
+N=nitrogen; WC=white clover and Alf=alfalfa			