NDSU NORTH DAKOTA STATE UNIVERSITY

GRANT APPLICATION TRANSMITTAL

This page indicates university endorsement of the referenced proposal and is intended to be submitted to the sponsor organization.

Sponsor Organization: Flood Diversion Board of Authority

Project Title: *Revised Assessment of the Agricultural Risk of Temporary Water Storage for FM Diversion*

Project Director: Dean A. Bangsund

Department: Ag. Business and Applied Economics

Project Budget:

Total Direct Costs		$ 66,540
F&A/In-direct Costs		$ 29,943
F&A/IDC Rate	45%	
Total Requested		$ 96,483

Authorized University Representative:

Title: Amy Scott, Assistant Director; Jill Mackenzie, Award and Program Officer

Address: Office of Sponsored Programs Administration
North Dakota State University
NDSU Dept. 4000, PO Box 6050
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Signature: Jill Mackenzie

Date: 6/19/17

Any future notifications regarding this proposal, including award notices, should be directed to the authorized university representative at the address listed above.
Thank you.

Revised Assessment of the Agricultural Risk of Temporary Water Storage for FM Diversion

Discussion Document

Fargo-Moorhead Diversion Authority

Principal Investigators
Nancy Hodur, PhD
Dean Bangsund
Saleem Shaik, PhD
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May, 2017

NDSU NORTH DAKOTA STATE UNIVERSITY

Project Title: Revised Assessment of the Agricultural Risk of Temporary Water Storage for FM Diversion

Introduction: The Department of Agribusiness and Applied Economics at North Dakota State University previously examined the potential economic effects of temporary water storage on crop yields on land affected by operation of the FM Diversion in two separate studies. The first study had a geographic scope defined by the FM Diversion Authority (Bangsund et al. 2015). The second study had an expanded geographic scope based on input from the North Dakota Legislature and the North Dakota State Water Commission (Bangsund et al. 2016).

Previous studies used hydrology data indicating the onset of flooding, duration of flooding, and the length of time for flood waters to recede on land south of the FM Diversion embankment. The geographic scope of the hydrology data has varied based on thresholds of flood inundation. The 2015 study used data that largely coincided with tracks of land that may experience 1 foot or more of flood water inundation in a 100-year event and omitted acreage along the rivers and tributaries in the region.

Concerns that the potential economic losses to producers and landowners resulting from operating the FM Diversion could extend to lands that receive less than 1 foot of flooding, prompted the North Dakota State legislature to direct the North Dakota State Water Commission to expand the original study area. The North Dakota State Legislature subsequently directed the study area to include lands impacted by water storage of 6 inches or more. Therefore, the geographic scope in the 2016 study included additional land farther upstream of the embankment that may experience 6 inches or more of inundation and included land along rivers and tributaries, which was omitted in the first assessment.

A stochastic model was used in the 2015 and 2016 studies to determine the additional potential planting delays cause by the operation of the FM Diversion in flood events equal to or larger than a 10-year flood. A Monte Carlo simulation used historical data on when floods typically occur, when planting generally begins, and yield decline functions associated with delayed planting to predict economic effects associated with diversion operations. The previous studies revealed considerable variability in the potential range of economic losses, while the mean or average losses were generally

modest. Variation in the economic losses makes generalizations of the potential economic losses difficult.

The predicted timing, duration and receding of flood waters on lands south of the FM Diversion embankment have undergone nearly continual refinement since the 2015 study as knowledge of project details improved and as additional typography, flowage, and hydraulic data became incorporated into the engineering processes.

As the FM Diversion Authority and the US Army Corps of Engineers move towards negotiating easements on lands in the staging area, the processes used to estimate appropriate compensation necessitate the use of Federal Emergency Management Agency approved flood plain designations and project flooding.

Refinements to hydrology data and an expectation that compensation estimates be based on the best available data suggest that the economic effects associated with delayed planting need to be re-assessed.

Objectives: The study will examine the potential economic losses associated with planting delays on lands that may experience flooding from operation of the FM Diversion. This overriding objective contains two goals:

1) Replicate the 2016 study using the same economic processes with the most recent hydrology data.

2) Update key economic inputs as data availability allows.

Methods: The economic assessment will apply the previous studies' existing methodology with updated economic parameters to storage areas identified by the FM Diversion Authority. Hydrology data will be supplied to the research team in the same format as prior hydrology data, and will be evaluated using the same methods for estimating the timing of flooding, duration of flooding, and the removal of flood waters. The economic effects of temporary water storage on those land tracts will be presented and reported using the same factors, groupings, and economic metrics as used in the previous studies.

Timeline: Findings in the form of updated document tables will be provided to the FM Diversion authority within three months after receipt of updated hydrology modeling data. Provision of the findings prior to document completion will allow the study sponsor use of the material to begin without potential delays due to publication of the final document. A final, published report and a published summary report will be delivered by October 30, 2017.

Deliverables: Updated document tables will be provided within three months of receipt of hydrology data. A written report will be published that contains the same scope of economic results provided in the previous studies. Presentations will be made to study sponsors and interested stakeholders as appropriate and as needed. A summary document highlighting key findings and implications will also be prepared.

Personnel: The research team consists of Dean Bangsund, Dr. Saleem Shaik, David Saxowsky, and Elvis Ndembe in the Department of Agribusiness and Applied Economics and Dr. Nancy Hodur, Center for Social Research, at North Dakota State University. All members of the research team have been involved in the two previous studies.

Budget:

Department of Agribusiness and Applied Economics			
	----------dollars----------		
Wages and Salaries:			
Wages Research Scientist (2 months)	16,694		
Benefits Research Scientist (1 month)	5,175		
Wages Research Associate	16,000		
Benefits Research Associate	6,880		
Summer Salary	17,325		
Benefits Summer Salary	3,465		
Subtotal Wages and Benefits	65,540	65,540	
Other expenses:			
Printing, paper, and publication		750	
Communication		250	
Total Direct Costs		66,540	66,540
Indirect Cost (45%)			29,943
Total Costs			96,483

Budget Narrative: Wages and salaries associated with Research Scientist, Research Associate and Associate Professor will be for data analysis, interpretation and document preparation. Monthly wages for Research Scientists at $8,347, benefits calculated at 31 percent. Monthly wages for Research Associate at $4,000, benefits calculated at 43 percent. Monthly summer salary for Associate Professor at $11,550, benefits calculated at 20 percent.

Contract Terms: One-fourth payable upon contract execution, one fourth at project midpoint and the remainder payable upon project completion.

Cited Works:

Bangsund, Dean A., Saleem Shaik, David Saxowsky, Nancy M. Hodur, and Elvis Ndembe. 2016. *Expanded Geographic Assessment of the Agricultural Risk of Temporary Water Storage for FM Diversion*. AAE 754. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo

Bangsund, Dean A., Saleem Shaik, David Saxowsky, and Nancy M. Hodur. 2015. *Initial Assessment of the Agricultural Risk of Temporary Water Storage for FM Diversion*. AAE 745. Department of Agribusiness and Applied Economics, North Dakota State University, Fargo