Chapter X

GIS-Based Site Suitability Decision Support System for Planning Confined Animal Feeding Operations in Iowa

Ramanathan Sugumaran, University of Northern Iowa, USA
Brian Bakker, Aerial Services, Inc., USA

Abstract

Confined animal feeding operations (CAFOs) are becoming increasingly common on the Iowa landscape. They produce large amounts of byproducts that can cause a threat to the surrounding environment of the areas of production. Thus, there is a need for careful planning, particularly the selection of suitable locations for future CAFO development. In addition to Iowa state regulations, selection of locations for CAFOs require multiple parameters like, locations of manmade structures that include roads, residences, businesses, wells, and so forth, and location of natural features such as rivers and lakes. Currently, locations for CAFOs are chosen manually using paper hard copies with producer’s preference and are restricted by state of Iowa guidelines. There is no decision support system available to aid in
selecting an appropriate location for the development of future CAFO structures. The purpose of this chapter is to demonstrate how a decision support tool was developed to aid CAFO managers and producers in selecting appropriate locations for animal confinement using geographic information system (GIS) technology and CAFO regulations in Iowa.

**Background**

In the past half century, the production of livestock has gone from being an activity carried out on small family farms, to an industrialized activity completed by very large corporations using specialized labor and confinement facilities. The number of farms in America has been reduced drastically from over 5,500,000 in 1950, to just over 2,000,000 at the end of the 1990s (Hallberg, 2001). While the number of farms decreased, production per farm increased to keep up with food demands. Much animal production is now carried out in CAFO facilities. These confinement facilities are generally very large and are often hundreds of feet long and can contain hundreds or even thousands of animals. It is commonly known throughout the Midwest United States that these large factory-style CAFOs create many benefits to local economies while also creating many threats to the environment where they are located. Rural areas are in desperate need of the economic benefits that animal feeding operations bring to local communities. Research shows that an estimated 89,000 jobs in the state of Iowa are directly or indirectly related to the hog industry, and an estimated $700 million of income is earned by farmers and workers directly employed in the hog production and processing industry, while an additional $1.4 billion of personal income is indirectly linked to Iowa’s hog industry (Otto, Orazam, & Huffman, 1998).

Despite the positive economic benefits created by CAFOs, many environmental concerns have been raised. Many individuals are concerned about air and water pollution created by animal confinements. Several studies have examined and reported the environmental impacts of livestock production on neighboring communities (Abeles-Allison, 1990; Kim, Goldsmith, & Thomas, 2005; Taff, Tiffany, & Weisberg, 1996). Researchers have also found various problems associated with air pollution caused by CAFOs (Wing & Wolf, 1999). Their results show that persons living near the hog farms where smell is noticeable had increased feelings of tension, depression, anger, fatigue, and confusion as compared to a control group (Schiffman, Miller, Suggs, & Graham, 1994). Physical symptoms have also been linked to air pollution from CAFOs, showing that persons living near large hog farms suffer from significantly higher levels of upper respiratory and gastrointestinal ailments than people living near large cattle farms or in non-livestock farming areas (Wing & Wolf, 1999). Surface and ground water is also impacted by the CAFO.
GeoCache: A Cache for GML Geographical Data
www.igi-global.com/chapter/geocache-cache-gml-geographical-data/20422?camid=4v1a