Proximity Analysis Between Agricultural Production and Existing Structures from Planning Perspective in the State of Iowa, USA

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Abstract

Massive uses of fertilizer and different type of pesticides have become a major concern in recent days all over the world. Use of chemicals in the agricultural fields are increasing the total rate of production, but also causing major health concern to the people. Clear separation distances between residential and agricultural land use according to the planning principles are mandatory to preserve the safe and sound environment. This study has been mainly conducted in three counties of Iowa State, Warren County, Story County and Boone County to find out, whether clear separation distance between agricultural fields and residential uses have been maintained in proper way. Three main agricultural crops of Iowa State corn; apple and grapes have been taken in consideration at this study. According to the planning principle minimum separation distance between residential use and these crop cultivation areas must be 500m.

Objectives

- To find out the design guidelines in case of agricultural fields to make them properly separate from residential uses.
- To find out the present condition of residential areas in Iowa State and the possible future outcome.

Methodology

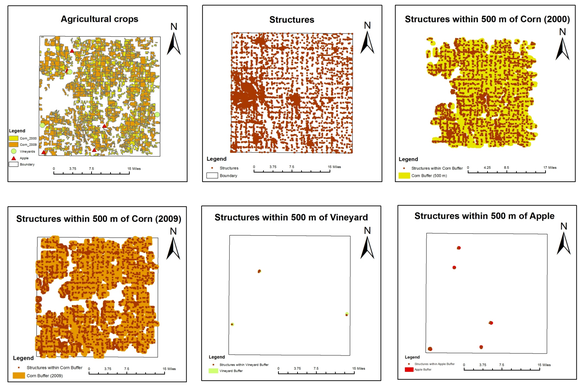
Mainly proximity analysis based on creating 500m buffer around all types of agricultural fields have been used in this study. Selection tool of the ArcGIS 10.1 has been used to find out the number of structures within the range of 500m of all types of agricultural fields. After selecting the structures within the range 500m, they were exported using export data tool of ArcGIS 10.1 software. Some statistical analysis have been conducted after that to find out the present condition of structural facilities in three counties of Iowa State and possible future outcome.

Design Standard

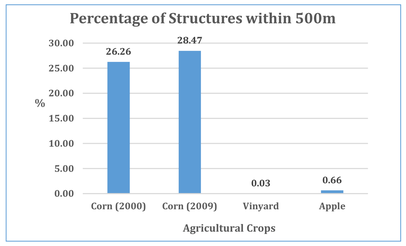
	Duration Threshold	Min Default Distance (m)	Min Design Distance with Buffer Elements (m)
Chemical spray drift	None	300	40
Intermittent odour	>88 hrs/yr	500	500
Intermittent noise	>10 hrs/yr<50 hrs/yr	60 (d) 250 (n)	15 (d) 250 (n)
Long term noise	>50 hrs/yr	500 (d) 1000 (n)	120 (d) 1000 (n)
Dust, smoke and ash	None	150	40

Source: Anonymous, 2012.

Story County, Iowa



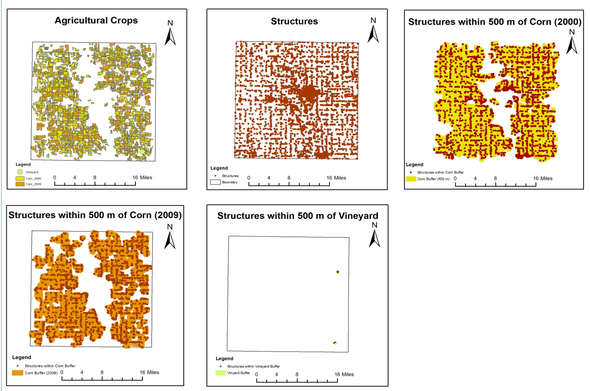
Source: Natural Resources Geographic Information Systems Library, 2014



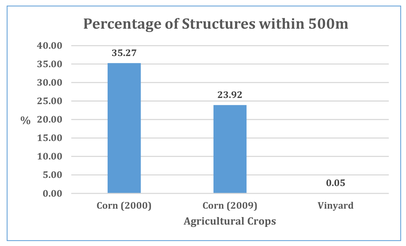
Agricultural Crop	No. of Fields	No. of Structures within 500 m
Corn (2000)	297	6330
Corn (2009)	314	6862
Vinyard	3	7
Apple	5	158

Total number of Structures in Story County: 24105

Boone County, Iowa



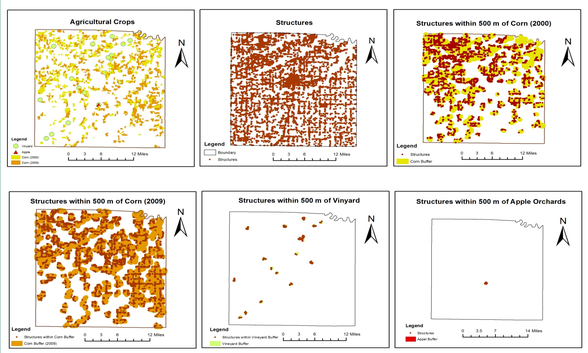
Source: Natural Resources Geographic Information Systems Library, 2014



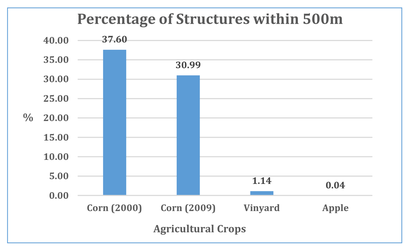
Agricultural Crop	No. of Fields	No. of Structures within 500 m
Corn (2000)	276	3676
Corn (2009)	169	2493
Vinyard	2	5

Total number of Structures in Boone County: 10422

Warren County, Iowa



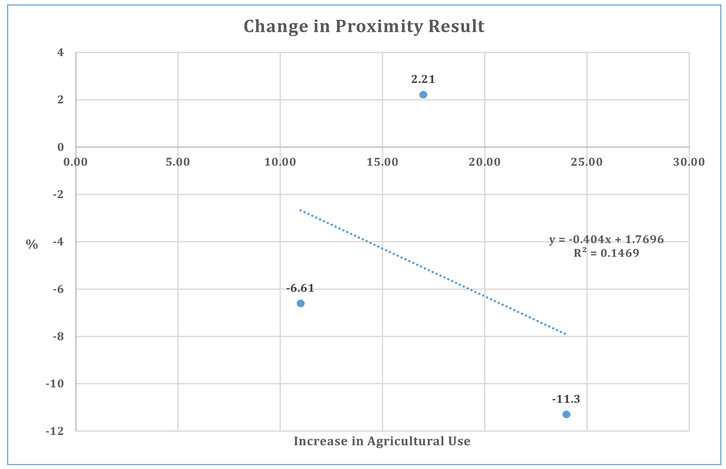
Source: Natural Resources Geographic Information Systems Library, 2014



Agricultural Crop	No. of Fields	No. of Structures within 500 m
Corn (2000)	360	6098
Corn (2009)	371	5026
Vinyard	18	185
Apple	1	7

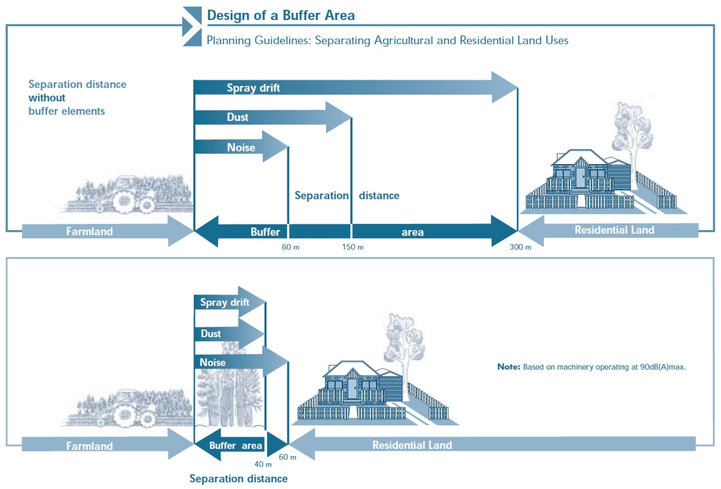
Total number of Structures in Warren County: 16217

Recent Change



Decrease in the violation of planning guidelines from corn production at recent days

Standard Scenario



Conclusion

Maintenance of the clear separation distance is the only solution of the present problem. To protect residential residents from field spray, noise, insects etc. planning recommendation must be followed in proper way. Consideration needs to be given during selecting an area for mixed use development. Although study had some limitations like same data base of same years were not possible to use in this study, it shows quite alarming scenario at the same time some positive aspects, like percentage of violation is decreasing in recent days at corn production.

References

- Anonymous (2012), "Guidelines for Seperation of Agricultural and Residential Land Uses: Establishment of Buffer Areas", Government of Western Australia: Department of Public Health.
- Bernatz, G. (2013), "Apples, Bananas and Oranges: Using GIS to Determine Distance Traveled, Energy Use and Emissions from Imported Fruit", Department of Resource Analysis, Saint Mary's University of Minnesota, Winona, MN 55987.
- Igsb (2013), "Natural Resources Geographic Information Systems Library", URL: http:// www.igsb.uiowa.edu/nrgislibx/ accessed on March 3rd, 2014.