

**Utilization of Income Multipliers  
To Evaluate Development Pressures on Farmland  
In Canyon County, Idaho**

By:  
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**Abstract**

Historically the United States' and Idaho's economies have been driven by utilization of land for agricultural production. Consequently the value of agricultural land was dependent on its usefulness in the production of food and fiber. However, as population increases and technology continues to enhance the natural productivity of land, less is needed to provide the sustenance required by the world's population. Additionally, as population increases, the demand for land-based amenities grows. These changes can result in substantial conversion of land from agricultural uses to non-agricultural uses. Results reported here suggest that comparative analysis of income multipliers may be a reasonable way to identify and measure, at least ordinally, these development pressures on farmland.

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**Introduction**

Historically the United States' and Idaho's, economies have been driven by utilization of land for agricultural production. Consequently the value of agricultural land was dependent on its usefulness in the production of food and fiber. However, during this past century, rural land use has expanded to include a variety of non-agricultural activities. As population increases and technology continues to enhance the natural productivity of land, less is needed to provide the sustenance required by the world's population. Additionally, as population increases, the demand for land-based amenities continues to grow. This results in an increase in competition for the ownership of agricultural land. In recent years U.S. population increases were accompanied by migration to less urbanized areas, evidenced by population increases in states such as Colorado, Utah and Idaho (10 to 15 percent from 1990 to 1995) (United States Census 1996). Such changes can result in substantial conversion of land from agricultural uses to non-agricultural uses. Moreover, with this conversion there also comes a change in the individuals interested in land values. Traditionally the individuals concerned with agricultural land values included farmers, landlords, lenders, and professional appraisers. However the group of individuals interested in agricultural land values has grown to

comprise a wider variety of entities such as local and state policymakers, investment companies, development corporations, individual speculators, and organizations working to protect farmland from development.

If factors that cause pressures to convert agricultural land to other uses can be separated (individually or in aggregate form) from agricultural factors that affect land values, then maybe the complex and often subtle pressures for farmland conversion can be quantified far enough in advance of the occurrence of substantial land use changes to allow consideration of “whether to?” and “how to?” protect critical lands from conversion.

The purpose of this study is to develop and test procedures and information to help decision makers evaluate economic pressures on agricultural land from non-agricultural sources.

### **Literature review**

The majority of literature examined deals with measuring impacts of various factors, including non-agricultural hedonic factors, on farmland values. There is general agreement in the literature that non-agricultural hedonic factors are important in determining such values. More specifically, McLeod et al. employed GIS information in a hedonic model to measure the impact of recreational and scenic amenities on agricultural land values in western Wyoming. The results of that study indicate that agricultural land values in Wyoming are determined by environmental amenities such as scenic view, elk habitat, and fishery productivity; as well as by agricultural production attributes. Thus the price that a prospective buyer would be willing to pay for

agricultural land is a function of the agricultural output prices, non-land input prices, production skill and site characteristics.

Torrell and Bailey discussed similar findings in a paper presented at the Western Agricultural Economics Association meeting in June of 2000. Their research indicated that even in the most productive rangeland areas of New Mexico, only 27 percent of the value of large ranches was explained by livestock production potential. In less productive, but arguably more scenic areas, only from three to 14 percent of the value of large ranches, and little or none of the value of small ranches, was explained by livestock production potential.

These studies indicate the importance of non-agricultural hedonic factors on land values. However, since they generally used econometric (regression) procedures to evaluate effects of specific hedonic factors, they can only document effects of specific factors in specific situations. They do not address the total pressure of the total set of non-agricultural factors that influence land values. Also, results of such studies cannot usually be generalized to other areas and situations without an intensive data collection and model specification effort. Moreover the majority of public and private sector individuals interested in agricultural land values and non-agricultural pressures on such values lack the expertise to construct and interpret such models.

Researchers at the University of Idaho have tried to address these issues in a study of farmland values in a commercially irrigated agricultural area in South Central Idaho. This area, commonly referred too as the Magic Valley, is approximately 6,500 square miles. The area is experiencing some development pressure, but the economic base is still primarily agricultural. The authors developed simplified regression models for

localized areas. The models were “no intercept” models in which total values of agricultural parcels sold were analyzed as a function of number of acres of irrigated cropland and time. Generally, resulting regression coefficients were significant at the 95 percent confidence level and calculated  $R^2$  terms were 0.85 or higher. Using the results of the regressions and agricultural net returns, capitalization rates (net returns / land value) and income multipliers (1 / capitalization rate) were then calculated. The authors found that capitalization rates and income multipliers could be used effectively to quantify and compare general non-agricultural pressure on farmland values across different areas in the Magic Valley.

### **Study Area and Data**

In this study, an effort was made to extend the general procedures tested in the South Central Idaho study to Canyon County, a smaller area in southwestern Idaho that is under very substantial development pressure associated with the rapid growth of the City of Boise. Canyon County is approximately thirty miles long by twenty-five miles wide and covers six hundred square miles. The Snake River runs through the southwestern part of the county, and when combined with an extensive canal system provides an ample water supply for agricultural irrigation. The climate and soil in Canyon County are well suited for a number of agricultural enterprises. Some of the more prevalent commodities produced include alfalfa, barley, corn, beans, oats, potatoes, sugarbeets, wheat, livestock, fruit and a variety of other more specialized crops.

The data utilized in this study were provided by Farm Credit Services and consist of information on transacted sales. The data include individual tract information on many

variables including sale price, total acreage, land use allocations, value of improvements and net and gross returns to land (agricultural rents) for the years 1993 through 2000.

### **Methods and Procedures**

The initial model utilized for this analysis was adopted from the Magic Valley study. However efforts to develop simplified regression models of farmland values in Canyon County did not work out due to too few observations and lack of capability in defining differentiable agricultural areas within the county. Yet visual inspection of the development situation in the county made it obvious that several local areas were influenced by hedonic factors that could potentially and substantially impact land values. Some of the factors that appear to be influencing Canyon County farmland values include access to Boise and proximity to other communities, access to recreation (especially wildlife), esthetically appealing sites, etc. To provide more information to researchers and to public and private decision makers, income multipliers for specific parcels were calculated and plotted on a map of the county, site visits were made to each parcel, and hedonic characteristics of each parcel were noted. The authors found this process to be insightful. Discussion of what was learned and implications for better understanding and modeling of economic pressures encouraging conversion of farmland to other uses is presented below.

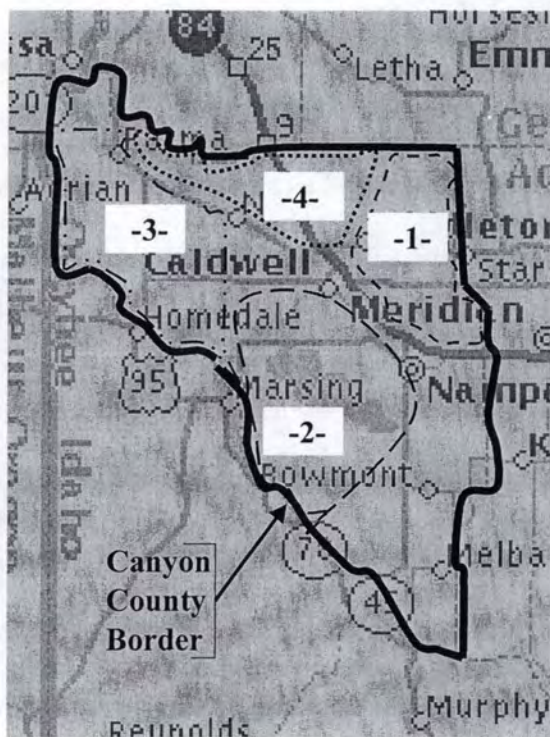
### **Results**

Individual income multipliers and capitalization rates were developed for each transaction in the data set for the year 1997. By taking the total sale price of the individual parcel, net of any improvement value, and dividing that number by the number of acres sold, the per acre price of the land was determined. It is important to note that

sale prices and number of acres sold were net of any dollars or acres, respectively, associated with improvements (i.e. farmstead acres). Once per acre prices of land were established for individual parcels, corresponding net returns to landowners (net rents) were used to determine individual income multipliers and capitalization rates. A summary of this multiplier information for transactions in Canyon County in 1997 is presented in Figure 1.<sup>1</sup>

**Figure 1. Income multiplier (IM) information for farmland sales, Canyon County Idaho, 1997**

-1-	Area 1 -- 3 high IMs.
-2-	Area 2 -- 5 medium IMs, 1 low IM.
-3-	Area 3 -- 9 medium IMs, 4 low IMs.
-4-	Area 4 -- 4 medium IMs, 2 low IMs.



The income multipliers offer some insight into the different levels of development pressures experienced in different areas. As presented in Figure 1, the highest level of development pressure (income multipliers of 40 to 50) occurred in three instances in the northeast part of the county (Area 1 in Figure 1). Two of those cases were located in or

<sup>1</sup> Information is presented in summary form to avoid disclosure of information on specific transactions.

very near the Nampa-Caldwell area. This is not a surprise, since in recent years the Boise metropolitan area (including Nampa and Caldwell) has been experiencing rapid growth and expansion. The third parcel that exhibited a high-income multiplier was located approximately six miles north of Nampa. On the map this seems to be a relatively remote region. However there are several subdivisions in the area surrounding the parcel. So it is in an area where development pressure is high.

Income multipliers ranging from 20 to 30 were found in several areas of Canyon County. A notable area of such mid-level development pressure is around Lake Lowell in the southeastern portion of the county (Area 2 in Figure 1). However, the transacted parcel nearest to Lake Lowell had a low-level income multiplier (less than 20). On-site inspection of these parcels yielded an explanation for this apparent anomaly. Three of the mid-level income multiplier transactions were adjacent to the wildlife preserve surrounding the lake. Two other mid-level multiplier transactions were on a ridge overlooking the lake. The low-level multiplier transaction was very near the lake, but surrounded by other farmland and in a low spot with no view of either the lake or the wild life preserve.

Data on farmland sales in the area northwest of Lake Lowell, to the Oregon state line (Area 3 in Figure 1), show a mix of mid-level and low-income multipliers. A typical first impression of this area might be flat agricultural land with few readily evident attributes that would make it appealing to developers or individuals looking for upscale homesites (no lakes, few streams, few views, relatively poor roads). However, nine transacted parcels in this area had mid-level agricultural income multipliers. Six of these were in the range from 27 to 38. Only three had low-level multipliers. It was determined



on a visit to the area that the mid-level multiplier parcels are touched or crossed by the Boise River in the northwest part of the area, or have views of the Snake River in the southern part of the area, or are on hills and are either adjacent to or have views of orchards or vineyards (there are several small wineries in the area). The esthetic qualities of these parcels are quite evident when observed, and in many cases nice houses are built on neighboring parcels. There are some very esthetic building sites in the area, they are just somewhat out of the way. All four of the low-level income multiplier parcels were on level farmland with no views of surrounding property.

Visits to farmland transaction sites in the north-central area of Canyon County (Area 4 in Figure 1) (4 medium multipliers, 2 low multipliers) yielded similar information to that gained from the other areas in the county. That is, esthetic aspects of sites seem to cause property to have higher value relative to expected returns to land from agricultural use (income multipliers are higher for nice home sites than for good farm land). In addition, the north-central area data seemed to show a strong trend of income multipliers increasing from west to east (as distance to the built up area of Boise decreases).

### **Conclusions and Implications**

Comparative analysis of income multipliers seems to be a reasonable way to identify and measure, at least in an ordinal sense, non-agricultural development pressures on farmland. A strength of such analysis is that it facilitates consideration of the complete set of factors that cause pressures on farmland conversion. Such analysis, however, yields no quantifiable measure of the effects of specific variables on farmland prices and conversion of farmland to non-agricultural uses.

The practical applicability of comparative analysis of income multipliers to evaluate farmland conversion pressures can be further tested by replication over time of the effort documented in this paper (evaluate Canyon County farmland income multipliers over several consecutive years). Such testing is planned.

In addition, the method of analysis could be tested by running hedonic regressions on the same farmland sales data, or on income multipliers calculated from the data, to determine if substantial amounts of the farmland conversion pressures implied by analysis of income multipliers can be attributed to specific independent variables. If good results can be obtained from running hedonic regressions, then it seems an argument can be made for using income multipliers as direct measures of development pressures on farmland.

The estimation of land and its associated value is a complex process that involves a variety of influences. By analyzing the implications that time, agricultural returns and urbanization pressures have on the value of land; investors can make better-informed decisions regarding the inclusion of agricultural land in their portfolios. However, besides the implications that this study has for investors, such analysis can also be useful to local government planners, tax assessors, road builders, appraisers etc, who have interests in such issues as determining base values for farmland and determining what areas surrounding an urban area are experiencing the most developmental pressures.

If income multipliers are reliable measures of development pressures on farmland, they can be utilized to estimate the portions of a parcel's value attributable to agricultural use value and to development pressure. Agricultural use value of a parcel is simply the net agricultural income (net rent) from the parcel multiplied by an income multiplier for a

comparable property that is under no development pressure. Then, the proportion of the parcel's value attributable to development pressure is total market value for the parcel minus the calculated agricultural use value. Of course, each of these values is, conceptually, a measure of present value of anticipated net returns (adjusted for risk).

Comparative analyses of agricultural income multipliers for land for which farming is truly the highest and best use and of agricultural multipliers for farmland that is under high pressure for conversion to development should yield good estimates of the "development value" and "agricultural value" components of the land with development potential. This information could be quite useful to local government officials and decision makers with nonprofit entities who are working to preserve farmland and agricultural areas by use of such mechanisms as purchasable development rights, transferable development rights and farmland trusts.

If additional research can further support the validity of analysis of income multipliers to evaluate farmland conversion pressures, application of such multipliers can have much significant use. The concept of income multipliers is simple. However, economists and public and private decision-makers concerned with land values should not assume that conceptual simplicity implies lack of usefulness and applicability.

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