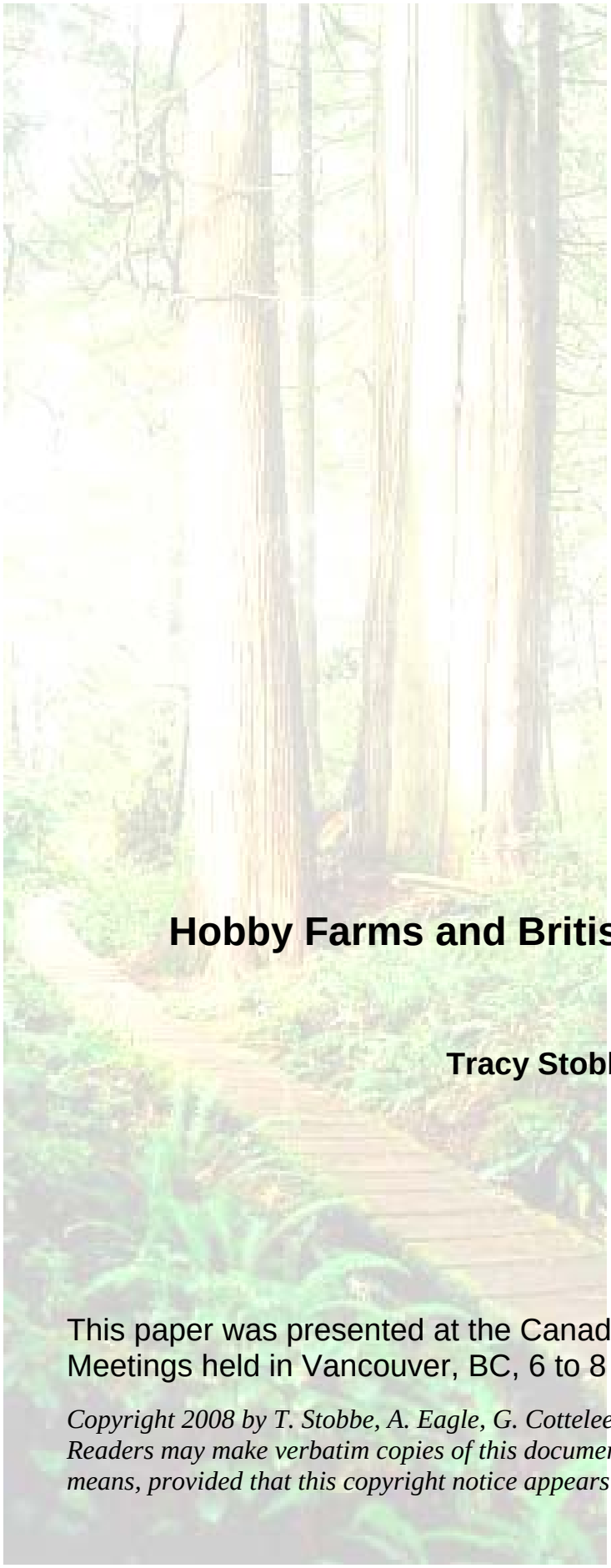

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Hobby Farms and British Columbia's Agricultural Land Reserve

Tracy Stobbe, Alison Eagle, Geerte Cotteleer and G. Cornelis van Kooten

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Hobby Farms and British Columbia's Agricultural Land Reserve

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Abstract

Agricultural land protection near the urban-rural fringe is a goal of many jurisdictions, including British Columbia, Canada, which uses a provincial-wide zoning scheme to prevent subdivisions and non-agricultural uses of the land. Preferential taxes are also used to encourage agricultural use of the land. Small scale hobby farmers are present at the urban fringe near Victoria (the capital), both inside and outside of the Agricultural Land Reserve (ALR). The goal of this paper is to investigate whether hobby farms create problems for agricultural land preservation. We make use of a GIS (geographic information system) model to construct detailed spatial variables and analyse our parcel-level data set using an hedonic pricing model and a limited dependent variable model. The results show that hobby farmers tend to select small parcels that are near open space and relatively close to the city and they tend to support horses and other livestock. In terms of price, farmland is worth more per ha the smaller the parcel is and the closer it is to the city. In general farmland is worth more when it is less fragmented but this appears to be reversed for hobby farms – indicating that hobby farmers may be better adapted to surviving in the urban fringe than conventional farmers. The conclusions drawn from the results in this paper would likely apply to other jurisdictions which seek to protect agricultural land in the urban fringe.

Key Words: Hobby farmers, Agricultural Land Reserve, Geographical Information System, urban-rural fringe, zoning systems, farmland fragmentation.

JEL Categories: R11, R15, C50, R14

1. Introduction

Protection of agricultural land is considered an important public policy objective in many jurisdictions, especially near urban areas. Zoning is the most widely used instrument for protecting agricultural land, and is used in British Columbia (B.C.), Canada, where most agricultural land is in the province's Agricultural Land Reserve (ALR). One of the downsides of zoning is that it creates an incentive for landowners to lobby for variances so they can transfer land from lower-valued agricultural uses to more valuable ones. In jurisdictions where the probability of being granted an exclusion is high enough, those wishing to develop the land or change land uses have bid up the price of farmland beyond its agricultural value. In B.C., the primary policy response to speculation has been to provide landowners with tax breaks (farmland is taxed at much lower rates than developed land) to encourage retention of land in active agriculture. But this creates a whole other set of incentives, especially near urban centres (along the rural-urban interface).

The relatively lower tax burden placed on farmland has been partially responsible for the growing number of hobby farms and large rural estates in the urban fringe. In some jurisdictions, the threshold for qualifying for preferential taxation rates is set deliberately low to make agriculture an attractive land use, although this has the unintended consequence of subsidizing wealthy landowners pursuing a rural lifestyle in proximity to the urban area (Cotteleer *et al.* 2008). Given that property taxes account for about 40 per cent of municipal budgets in B.C., residents might not support tax regulations that favour hobby farmers. Nickerson and Lynch (2001) indicate that residents dislike the fact that tax dollars are spent on hobby farmers who do not use the land in pursuit of 'traditional' agricultural activities that provide food for citizens.

When surveyed, B.C. residents show strong support for agricultural land protection; for instance, in 1997, 90 per cent said they favoured limits to urban development to protect farmland (Quayle 1998) and, in 2005, 94 per cent of Central Saanich residents said they felt agriculture contributed greatly to the community (Walker 2005). However, researchers and policy-makers alike should question why so many people favor protection of agricultural land as a matter of principle. If the purpose of agricultural land protection is to slow development and retain open space the expansion of hobby farming might be a positive development, as long as hobby farms are not a first step in the direction of eventual conversion to urban use. If, on the other hand, the purpose of the ALR is to help support a viable farm economy, growth in hobby farming could be considered a step in the wrong direction as it could exert pressure on farmland values within the ALR thereby driving out conventional farmers.

In this research, we study the pattern of hobby farm placement within and in close proximity to the ALR and question whether or not the establishment of hobby farms is detrimental to the goal of agricultural land preservation. We first identify those property characteristics generally preferred by hobby farmers and then ask what implications this has for the effectiveness of the ALR and other policy measures to protect agriculture in the urban fringe. We employ two models to investigate the divergence between conventional and hobby farmers. First, the hedonic pricing model employed by Cotteleer *et al.* (2008) is extended to allow for divergence between the two farming types. Second, a binary choice model is used to determine differences between the characteristics of properties used by conventional versus hobby farmers.

The outline of the remainder of the paper is as follows. In section two, we consider why government intervention is needed to protect farmland and what form

public policies might take. In section three, we provide background information about B.C., the ALR and other policy measures that are in place to preserve agricultural land. The data are discussed in section four, while the regression models and estimation results are provided in section five. The conclusions follow in section six.

2. Government interference and externalities at the urban-rural fringe

Legislation, policies and other instruments to protect farmland are justified on the grounds that such protection is a public good, with farmland being under provided if left to markets and private individuals. The main output from farmland is marketable goods, but farmland also provides a variety of positive 'spillovers'. One might identify four types of value associated with agricultural land protection (Kline and Wichelns 1996): (i) agrarian values relate to food production and protection of the agricultural heritage and traditions of an area; (ii) environmental values concern protection of wildlife habitat, flood prevention and other environmental services; (iii) aesthetic values focus on the preservation of open space; and (iv) anti-growth values see land protection as a safeguard against urban sprawl. Roe *et al.* (2004), Irwin (2002), Curran (2001), and others have shown that citizens are willing to pay significant amounts to protect these amenities.

While positive externalities can be used to justify zoning and other legislation to protect farmland (such as beneficial tax regimes for agricultural producers), it is more difficult to justify protecting agricultural land because society needs to retain the ability to produce farm products in the future (though many make this argument). For example, in a study completed for the provincial government, Quayle (1998) concludes that agricultural land should be preserved at all costs and that golf course development should not be permitted because it violates the ALR mandate. She argues that the magnitude and importance of the province's agricultural sector

represent a sufficient reason to preserve all farmland via the ALR instrument.

Protection of agricultural land for the purpose of maintaining future agricultural production potential cannot be viewed as a public good because, if this is indeed a concern, the value of land in agriculture would rise relative to that in other uses in anticipation, thereby causing more agricultural land to be protected privately. Although agricultural production is important in some jurisdictions, especially where food security is a concern, the impetus for protecting farmland in B.C.'s urban fringe has more to do with a desire to protect a way of life, open space, access to farms for educational purposes, and other factors.

3. Agricultural Land Protection in British Columbia

British Columbia is Canada's westernmost province. It is characterized by rugged terrain, fertile valleys and, in some areas, the country's mildest climates. Its arable regions include part of Canada's grain belt (in the northeast), an intermountain region of livestock grazing and forage production, a Mediterranean inland lake region (the Okanagan Valley) noted for its orchards and vineyards, and wet mild areas in the southwest of the province. The latter consists primarily of the Fraser Valley on the mainland (near Vancouver) and the Saanich Peninsula near Victoria on southern Vancouver Island that offers a climate capable of growing the widest variety of crops in Canada.

Primary agriculture in B.C. generates approximately $2.2 billion in farm gate sales and sustains more than 30,000 jobs (MAFF 2004; MAL 2006). When food processing and other related industries are taken into account, the totals become even more significant for the provincial economy – some $21.9 billion and more than 280,000 jobs. Yet farmland is scarce as only 2.7 per cent of the province is capable of growing a reasonable range of crops (Runka 2006) and much of this land lies near the

rapidly developing urban areas of Victoria, Vancouver and Kelowna, which are under increasing development pressure.

The provincial government created the ALR in 1973 after it was estimated that 6,000 ha of farmland were being lost to development annually. Included in the ALR at inception was all farmland of two or more acres (0.81 ha or more) that was assessed as farmland for tax purposes, zoned as agricultural land by local governments, or rated in land classes one to four according to the Canada Land Inventory.[1] Though ALR lands remain in private hands, owners cannot subdivide them, build more than one dwelling or use them for non-agricultural purposes. The reserve is overseen by the Agricultural Land Commission (ALC) which adjudicates applications for exclusions, subdivisions or non-farm uses of the land. B.C.'s ALR is indicated in Figure 1.

At the time of its formation, the ALR measured 4,716,516 hectares, but it had grown to 4,759,235 ha by 2007, a net increase of 42,719 ha (ALC 1974 to 2007). These Figures belie the true state of agricultural production protection, however, because most of the land excluded over time has come from the fertile south while most additions have come from the more arid northeast. According to Statistics Canada's (2006) Agricultural Census, the number of farms in B.C. has increased by 7.8 per cent since 1971 – a trend opposite that of the rest of Canada, although some turnaround in this trend was seen in the last agricultural census.[2] This suggests that farms are being subdivided to the extent allowed by the ALC, which is consistent with the observation that more hobby farms are found near major urban areas. As a result,

[1] The Canadian Land Inventory rates land according to soil class on a seven-point scale, where class one land has the highest agricultural capability and class seven land no agricultural capability. Classes one to three constitute prime farmland (Runka 1973; van Kooten 1993, 271-274).

[2] The number of farms in B.C. declined by 2.2 per cent between 2001 and 2006, while the number of farms in Canada declined by 7.2 per cent during the same period, and by 37.3 per cent since 1971 (Statistics Canada 1971, 2001, 2006). So clearly B.C. farms are being lost or amalgamated at a slower rate than the rest of the country.

the increase in farms is not necessarily an indication that the farm sector is thriving, but rather that it is dwindling, especially near urban centers.

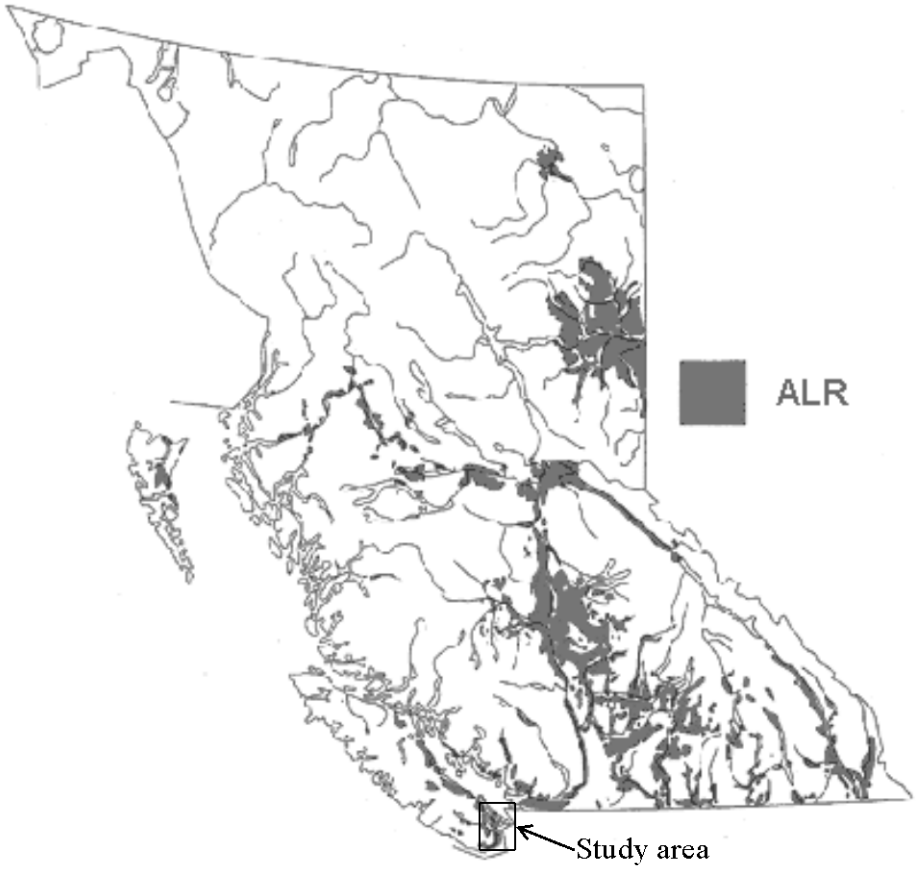

Figure 1: B.C.'s ALR and the study area (Source: Smart Growth B.C. 2004, edited map)

Besides zoning policies to preserve farmland, B.C. also utilizes beneficial property tax regulations to reduce farmers' financial burdens. A farm property attains farm class status (and thus lower taxes) if it meets the restrictions described in Table 1. The gross agricultural income threshold is quite low and a property between 0.8 and 4.0 ha can meet it, for example, by harvesting and selling approximately 0.07 ha of Christmas trees, the eggs from approximately 70 chickens, alfalfa from about 1.2 ha, a few head of livestock (depending on quality and species), or a combination of

products.[3] It is also possible to attain farm status if the land is leased to another operator who meets the threshold, as long as the land makes a "reasonable contribution" to the overall farm operation (B.C. Assessment 2005).

Table 1: Thresholds for properties to qualify for farm class status

Parcel size	Annual revenue threshold to be met once every two years
< 0.8 ha	Gross farm revenues ≥ $10 000
≥ 0.8 ha, < 4 ha	Gross farm revenues ≥ $2 500
≥ 4 ha	Gross farm revenues ≥ $2 500 plus five per cent of land's assessed value

4. Data, Methods and Variables

The Saanich Peninsula study area consists of approximately 17,593 ha north of the provincial capital Victoria, on southern Vancouver Island (see Figure 1). It enjoys Canada's most temperate climate and contains some of the province's best farmland, growing a variety of crops such as fruits, vegetables and floriculture, as well as supporting livestock. In Figure 2, we provide a GIS map of the Saanich Peninsula that highlights land use and shows where hobby farmers are located. In addition, regular farmland is distinguished from all other uses of land including residential, commercial and First Nations' lands (formerly known as Indian reservations).

A variety of GIS and more traditional databases were used to develop the covariates of the regression equations. Data were obtained from, among other sources, the B.C. Ministry of Agriculture and Lands, the B.C. Assessment Authority, other government agencies, the Capital Regional District (CRD), and private sources (such as LandCor). We use ArcGIS to link datasets, calculate distances, and analyze other

[3] This information comes from a 2007/2008 survey of twenty-five Saanich farmers and discussions with various provincial government staff. We discovered a certain laxity in the enforcement of farm status requirements. This may be to prevent developers from making a case before the ALC that some ALR lands should be excluded because they cannot meet minimal farm-status standards.

spatial relationships in the data.

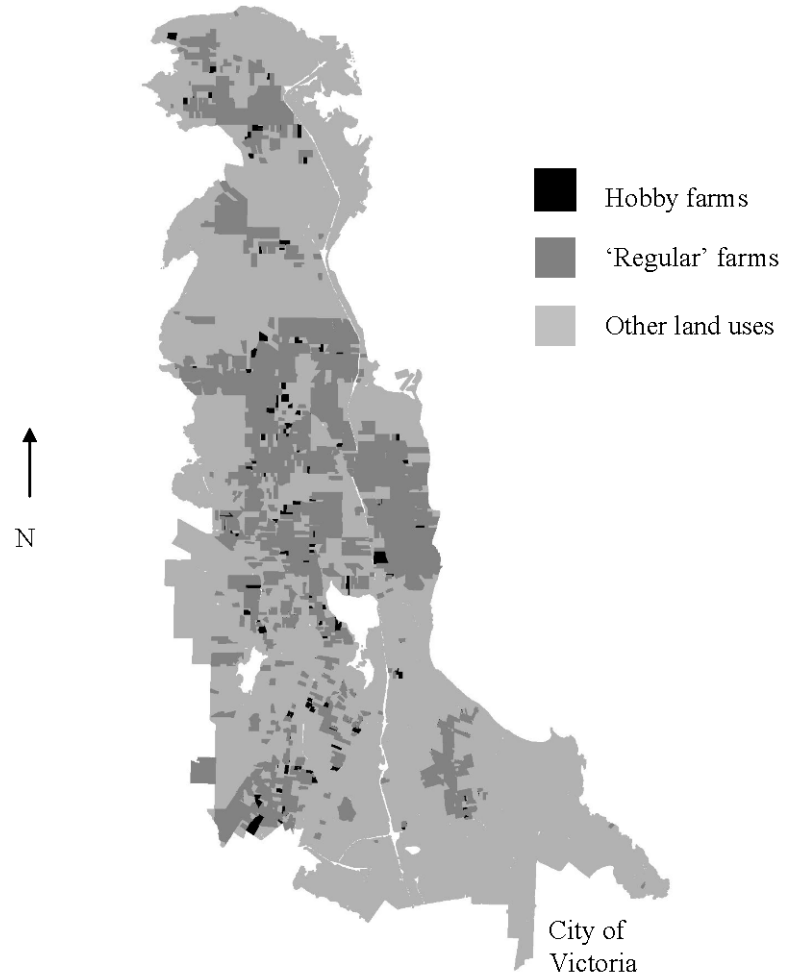

Figure 2: Distribution of land use on the Saanich Peninsula, Vancouver Island (Source: Ministry of Agriculture and Lands and the Capital Regional District, edited map)

Two models are employed to investigate the presence of hobby farmers on the urban fringe. The first is a logit model that distinguishes factors that discriminate between hobby farmers and other agricultural producers. The second model is an OLS regression that estimates a hedonic price function. Hedonic price functions are used to parse out effects of covariates that determine the prices of farmland to derive shadow prices for property characteristics. In the model, we include a dummy variable indicating whether a farm parcel is inside the ALR or not and one indicating whether

the farm is a conventional or a hobby farm. We include both dummies in the hedonic pricing model to highlight price differences paid by disparate types of farm operations and landowners inside or outside the ALR. We also include an interaction term between the ALR and the hobby farm dummy variable to test whether the use of land for hobby purposes affects land prices differently within than outside the ALR.

If the farmland has development rights so that it could be converted to residential use at any time, there is a potential endogeneity problem in the hedonic price equation (Lynch, *et al.* 2007). That is, the distribution of land use for residential versus agricultural purposes might be an endogenous process. Endogeneity with respect to the ALR variable is not considered a problem however, because of historical factors and the fact that the ALR is a zoning ordinance that prohibits subdivision and non-agricultural uses. Subsequently, in Saanich until 2006, there had been only 16 applications to the ALC to remove land from the ALR, constituting a total of 228 ha; while 13 applications were successful, total exclusions amounted to only 76 ha (as the ALC might not grant a request to remove the full amount in the application). Clearly, land cannot be easily converted to residential use nor has a large proportion of the ALR in the study area been in land use flux.

We also might worry about the potential endogeneity of the hobby farm variable. It is possible that hobby farmers select parcels to buy based on unobserved characteristics that are also affecting the prices of those parcels directly. This issue was of key interest to Stobbe *et al*. (2008) who used the same dataset as here but a different approach in order to focus on this potential problem. The results of that study ruled out endogeneity as a problem in the current dataset.

The dependent variable in the logit model (and also a variable of interest in the hedonic price model) is a binary variable that takes on a value of one if the land parcel

is used for hobby purposes and zero if it is used for conventional farming. Although there is no one universally accepted definition of a hobby farm, Statistics Canada classifies a hobby farm as one in which the main operator reported 190 or more days of off-farm work and no other labor was employed year-round (Boyd 1998). In Canada, hobby farmers tend to cluster around certain crops and animals as evidenced by the fact that 35 per cent of all horse operators were labeled as hobby farms in 1991, and more than 30 per cent of all sheep and goat enterprises were hobby farms; among hobby farms, cattle rearing is most pronounced, accounting for 30.8 per cent of hobby farmers, followed by wheat (12.2%) and horses (9.7%) (Boyd 1998). Other studies have used different definitions of what constitutes a hobby farmer, generally based on farm size or gross receipts. The 2006 Agricultural Census found that 9,466 of B.C.'s 19,844 farms reported less than $10,000 in gross farm receipts and that 5,335 were less than 4 hectares in size (Statistics Canada 2006).

The Agricultural Land Use Inventory (2004) compiled by the former B.C. Ministry of Agriculture, Food and Fisheries provides information about whether or not properties are hobby farms. Their description of a hobby farm is a property "with agricultural activity, but for amenity use only, i.e. no indication of farm products for sale (e.g. residential property with one horse)." The distinction between hobby and conventional farms is determined somewhat arbitrarily, but, given no other information, we must rely on the government's own assessment.

The dependent variable in the hedonic price model is the logarithm of farmland price per ha adjusted for inflation using the Consumer Price Index with base year 2005. The hedonic price model also included dummy variables to capture price variation over time. Explanatory variables in both the hedonic price model and the logit model are roughly similar and include, among others, size of the farmland

parcel, topographical features of the land, distance to Victoria, distance to the highway, and an ALR dummy variable. Also included in the model are dummy variables indicating the type of agricultural activity occurring on the parcel in 2004.

A farm fragmentation index was also constructed for use as an explanatory variable in both models. Although fragmentation indices have previously been used to study wildlife habitat in the natural sciences, they have not been adapted for use in a farmland context. It hypothesized that hobby farms might be more prevalent under highly fragmented conditions where farmland blocks are broken up by other uses. A fragmented landscape reduces the agricultural productivity of an area. (Brabec and Smith 2002; Nelson 1992) The constructed index is designed to capture the importance of both adjacency to other farms and the total size of the farm block to which the parcel is connected. This index is calculated as follows:

FI = proportion of perimeter bordering other farmland × size of total farm block of all adjacent farmland measured in ha

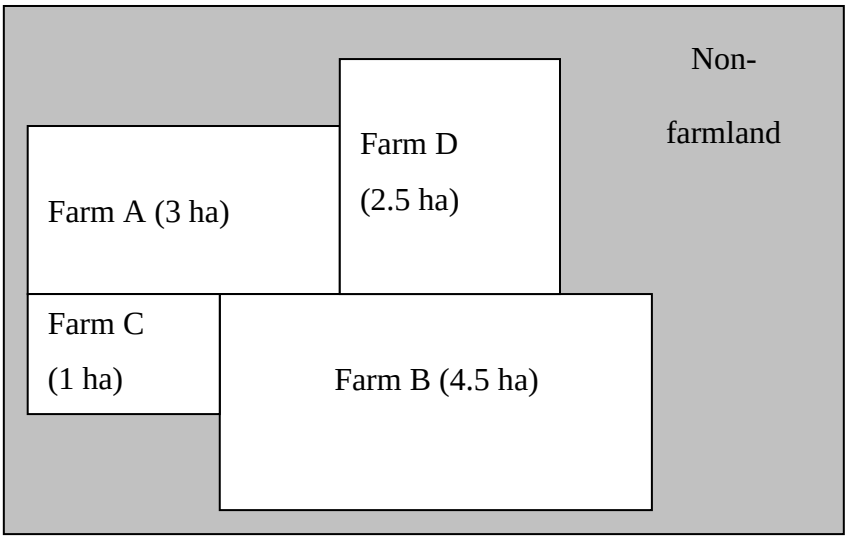

Figure 3: Scenario to illustrate farmland fragmentation

An example of the construction and interpretation of the fragmentation index is given in Figure 3 and Table 2. Higher numbers on the fragmentation index indicate

less fragmented landscapes for agriculture while a score of zero would indicate a completely isolated agricultural parcel.

Table 2: Value of the fragmentation index for different parcels

Parcel(s)	Size (ha)	Attached farmland (ha)	Proportion of perimeter bordering other farmland	Index
A	3.0	8.0 (B, C & D)	0.50	4.0
B	4.5	6.5 (A, C & D)	0.34	2.2
C	1.0	10.0 (A, B & D)	0.50	5.5
D	2.5	9.5 (A, B & C)	0.42	4.0
A & D	5.5	5.5 (B & C)	0.34	1.9
A, B, C & D	11.0	0.0	0.00	0.0

Based on codes recorded by B.C. Assessment, a total of 1,017 parcels of agricultural land on the Saanich peninsula are included in the analysis. We had to exclude parcels due to linking problems with other datasets or because the full set of explanatory variables was not available for each observation. In addition, sales of multiple parcels bundled together were excluded because it was not clear how we could attribute the total price to the separate parcels in the bundle. The final dataset comprised 893 observations of sales that took place in the period 1973-2006 for use in the hedonic pricing model and 934 observations of parcels for use in the logit model.

Several alternative hedonic pricing models are examined in order to sort out various explanations of land prices. One restriction imposed in some cases is that only the most recent sale is included when the parcel was sold multiple times between 1974 and 2006. The reason for this is that the status of the land may have changed over time because the information on agricultural activities and on whether or not it is a hobby farm comes from the 2004 Land Use Inventory. (It is reasonable to assume that if the current owner is a hobby farmer, they likely purchased the property with that aim in mind.) By including various alternative explanations, we also investigate if the results of the restricted model, which has a higher degree of certainty, differ from

the results of the full model, where we are less certain about the status of the land in the past.

5. Empirical results

We first discuss some summary statistics regarding hobby farms versus conventional ones. Then we provide results of a binary choice (logit) model that estimates the likelihood that a property is used by a conventional versus a hobby farmer. Finally, the results of the extended hedonic pricing model are considered.

Of the 934 observations of farmland that were used in the logit model, 119 are categorized as hobby farms, with the remainder considered conventional farms. Hobby farmers seem to differ from conventional farmers in several ways. One is that hobby farmers are more often located outside the ALR than conventional ones. From Table 3, we see that 78.2 per cent of all hobby farmers use non-ALR land compared to 16.8 per cent of regular farmers. This result provides one important clue to a question concerning the ALR: How do (numerically) so many farms survive outside the ALR? The reason appears to be that many farms outside the ALR are not commercial enterprises but hobby farms.

Table 3: Summary statistics for farmland parcel sizes, conventional and hobby farms in and outside the ALR

	Number of observations	Mean size (ha)	Standard Deviation	Minimum	Maximum
Hobby farms					
Within the ALR	26	1.7520	1.0341	0.2954	5.2610
Outside the ALR	93	2.0121	1.1381	0.3399	6.7178
Conventional farms					
Within the ALR	678	5.1836	6.6912	0.0486	71.556
Outside the ALR	137	2.3095	2.5369	0.0850	16.260

Another way that hobby farms differ from other farms is in the amount of land they occupy. Hobby farms tend to be smaller than conventional farms as indicated by

the summary statistics in Table 3. There is no significant difference between the sizes of hobby farms within the ALR and outside the ALR, but the opposite is true for conventional farms; average farm parcel sizes are larger when they are located in the ALR (5.2 ha) than when they are located outside the ALR (2.3 ha). Likely in response to tax incentives, there is a tendency for hobby farms to fall in the size range of 0.8 to 4.0 ha (85% of all hobby farmers versus only 59% of all conventional farmers).

Not unexpectedly, it appears that the optimal size of hobby farms is smaller than that of conventional farms, even though the conventional farmer may be unable to earn sufficient income to cover the opportunity costs of land. There is also considerably more variation in parcel size for conventional than hobby farms with a standard deviation of 2.54 ha to 6.69 ha for regular farms and 1.03 ha to 1.14 ha for hobby farms.

From the logit model results provided in Table 4, we find that hobby farmers are significantly less likely to be located inside the ALR. This is likely due to the lack of appropriately sized parcels since hobby farmers seem to gravitate toward smaller parcels based on the summary statistics. When hobby farms are located inside the ALR, the land tends to be located farther from the ALR-boundary (i.e. deeper in the ALR) than for conventional farmers, but they tend to be closer to the boundary than conventional farmers when they are located outside the ALR. A potential explanation for this result relates to the value of open space. Hobby farms almost exclusively support country residences and owners prefer to live near farmland (open space) that is unlikely to be developed in the future. [4] Since being near the ALR boundary or being surrounded by ALR land offers this type of protection, hobby farmers seem to prefer unimpeded views that are at least quasi-protected.

[4] The vacant land variable is statistically insignificant in all models and is highly negatively correlated with hobby farms as vacant hobby farms are a rarity.

Table 4: Logit regression model comparing hobby farmers with regular farmers, Saanich Peninsula (n = 934) and marginal effects evaluated with ALR=0 and ALR=1. Note: ***significant at the 1 per cent; **significant at the 5 per cent; and *significant at the 10 per cent critical levels.

Dependent variable: Hobby farms (=1) and regular farmers (=0)	Parameter estimates	p-value	Marginal Effects ALR parcels	Marginal Effects Non-ALR parcels
ALR (= 1 if parcel is located within the ALR, 0 otherwise)	-3.2607***	0.000		
Distance to ALR boundary (km) from inside the ALR, 0 otherwise	1.7362***	0.003	.02579	
Distance to ALR boundary (km) from outside the ALR, 0 otherwise	-1.1244**	0.043		-.22926
Fragmentation index	-.2852***	0.006	-.00424	-.05815
Horse	1.0244***	0.001	.02185	.23169
Other livestock	1.8870***	0.000	.06571	.43771
Distance to Victoria city centre (City Hall) (km)	-2.017***	0.000	-.02996	-.41120
Distance to highway (km)	.10035	0.288		
Log lot size (ha)	.11094	0.567		
Maximum elevation level (m)	.00065	0.890		
Slope (difference in elevation) (m)	.02034	0.238		
Constant	17.841***	0.000		
LR $\chi^2(11)$	280.98			
Log likelihood	-215.766			
Pseudo R^2	0.3944			

With respect to farm type, we find that hobby farmers are likely to have horses and other livestock (such as sheep, llama and goats). This is consistent with the trend found by Statistics Canada when examining hobby farms (Boyd 1998). Hobby farmers also appear to not mind being fragmented from other farmland, as indicated by the negative coefficient on the fragmentation index. This may indicate that hobby farmers are better able to survive in the urban-fringe than conventional farms.

Finally, we conclude from the binary choice model that hobby farmers are located closer to the city centre of Victoria than conventional farms. This result is consistent with the notion that hobby farmers are relatively wealthy ex-urbanities who want to pursue a rural lifestyle but still earn most of their income off-farm. Nearness

to Victoria implies a shorter commute. On the other hand, the estimated coefficient on distance to the highway is not significant, which may imply that, while some hobby farmers prefer to reduce their commute time by living close to it, others wish to avoid the noise and air pollution associated with traffic and prefer to live farther from the highway.

For all the variables with statistical significance in the binary choice model, the marginal effects are calculated for two different scenarios: when the parcel is in the ALR and when the parcel is outside the ALR. (See Table 4) These effects can be interpreted as the change in the likelihood (expressed as percentage) that the land is a hobby farm from a change in one unit of the associated variable. These marginal effects are useful because they provide a sense of the magnitude of the effect of the independent variable on the dependent variable. They show that for farms in the ALR, as you increase the distance from the ALR boundary by one km, there is an increased chance of being a hobby farm of 2.6%. For farms not in the ALR, as you increase the distance from the ALR boundary, it decreases the chance of being a hobby farm by 22.9%. This is consistent with the interpretation above that hobby farmers value open space and those outside the ALR desire land which is near other land which has some assurance of remaining undeveloped in the future (i.e. the ALR boundary).

The marginal effect on the fragmentation index shows that while both types of hobby farms (inside and outside the ALR) don't mind fragmentation, the effect of increasing fragmentation leads to much higher probabilities that the parcel is a hobby farm outside the ALR – the effect is almost 14 times stronger. The marginal effects on land use also show differentiated effects with the presence of horses and other livestock translating into a 23.2% and a 43.8% chance respectively of being a hobby farm outside the ALR, compared to just a 2.2% and 6.6% chance inside the ALR. The

final marginal effect, on distance to Victoria, indicates that increasing the distance to Victoria has a much more pronounced effect on a farm's chances of being a hobby farm outside the ALR than within it.

To provide a more complete examination of hobby farming, a hedonic pricing regression model was used to decompose agricultural land prices into their constituent parts. The results are provided in Table 5, which is an extended version of the hedonic pricing model constructed by Cotteleer *et al.* (2008). In this extended model, additional information about hobby versus conventional farmers is taken into account. In particular, we introduce cross-product terms between the hobby farms and some of the other covariates in the model. In general, the estimated coefficients in the hedonic pricing model indicate whether or not farmers are willing to pay more or less for certain land characteristics. Positive coefficients indicate that farmers are willing to pay more if the amount of a certain characteristic is increased, whereas negative coefficients indicate the opposite. Multiple models are presented due to uncertainty in the data, as discussed in section 4. Model 1 presents the full model with sales from the entire time frame examined. Model 2 restricts the data set to just the most recent sale on a property when it was sold more than once. Finally, models 3 and 4 contain no interaction terms and only one interaction term respectively since the number of interaction terms included in the model significantly affected the results for one of the main variables of interest – the hobby farm dummy. Note that time is an important factor in this equation and more than thirty dummy variables (one for each year) were created and run with every alternative model of the hedonic price model to account for the effects of time. A majority of these dummies were significant but since there is no important interpretation to them beyond that they capture the effects of time, they are not presented in Table 5.

Table 5: Regression results of the hedonic pricing model, Saanich Peninsula, with robust standard errors. Note: ***significant at the 1 per cent, **significant at the 5 per cent, and *significant at the 10 per cent critical levels.

Dependent variable: Log of price per ha	Model 1 n=893	p-value	Model 2 n=515	p-value	Model 3 n=515	p-value	Model 4 n=515	p-value
Hobby farm (=1 if a hobby farm, 0 otherwise)	.43602***	0.012	.04247	0.836	.06831	0.203	.13347*	0.084
Log of parcel size (ha)	-.72015***	0.000	-.74939***	0.000	-.71438***	0.000	.71197***	0.000
Log of parcel size × Hobby farm	.13785	0.149	.33085***	0.003				
ALR (= 1 if parcel located in the ALR, 0 otherwise)	.16160**	0.047	.26582**	0.030	.28481**	0.014	.29161**	0.011
ALR × Hobby farm	.09154	0.230	.25620**	0.013				
Distance to ALR boundary from inside the ALR (km)	.15995***	0.001	.19297***	0.002	.18528***	0.003	.18983***	0.002
Distance to ALR boundary from outside the ALR (km)	-.39335***	0.002	-.27706*	0.080	-.27568*	0.089	-.27663*	0.085
Fragmentation index	.01442**	0.015	.02047***	0.007	.01489**	0.042	.01479**	0.043
Fragmentation index × Hobby farm	-7.94 e-06**	0.019	-.00002***	0.001			-3.89 e-06	0.169
Horse	.08842***	0.001	.11235***	0.004	.09729**	0.011	.09932***	0.009
Other livestock	.06397	0.104	.06253	0.258				
Vegetable	-.14216***	0.005	-.18107**	0.011	-.18262**	0.011	-.18760***	0.009
Vacant	-.49550***	0.000	-.46318***	0.000	-.47554***	0.000	-.47136***	0.000
Log of distance to Victoria	-.10540**	0.012	-.10414**	0.050	-.11174**	0.030	-.11136**	0.031
Log of distance to highway	.02788***	0.003	.01728	0.199	.01404	0.272	.0147845	0.246
Log of distance to highway × Hobby farm	-.05528**	0.022	-.00084	0.977				
ALR × Year	-.01382***	0.000	-.01748***	0.000	-.01720***	0.000	-.01733***	0.000
Slope of parcel	.00091	0.715	.00450	0.137	.00445	0.143	.00438	0.146
Maximum elevation of parcel	.00165***	0.001	.00188***	0.010	.00184**	0.012	.00185**	0.011

Dependent variable: Log of price per ha	**n=893**	**p-value**	**n=515**	**p-value**	**n=515 restricted**	**p-value**	**n=515 restricted**	**p-value**
Log of interest rates	-.52362***	0.000	-.48346***	0.000	-.52076***	0.000	-.51396***	0.000
Older sale (=1 if not most recent sale, 0 otherwise)	-.00644	0.800	----------n/a----------					
Cash sale (=1 if noncash sale, 0 other wise)	-.03265	0.514	-.07832	0.320	-.06250	0.436	-.06212	0.439
Constant	15.1198***	0.000	15.11031***	0.000	15.2499***	0.000	15.214***	0.000
R-squared	0.7756		0.7988		0.7921		0.7927	

We conclude from model 1 that hobby farms sell for significantly higher prices than conventional farms per ha and that smaller parcels sell for more per ha than larger parcels. The ALR designation appears to have a counterintuitive effect on land prices. We would expect that land which is restricted is worth less than unrestricted land but the positive coefficient on ALR seems to indicate the opposite. However, the ALR designation does not have a linear effect on prices over time. In the earlier days of the zoning scheme, farmland in the ALR was worth more, but this effect reversed in the 1980s. To account for changes over time, another variable (ALR × Year) was included which shows the expected negative trend. (This was also found in Cotteleer *et al.* (2008).) The highly significant negative affect of parcel size on land price is also shown in models 2, 3 and 4.

The insignificant findings on the "hobby farm" coefficient in models 2 and 3 imply that hobby farmers operate under the same market conditions as regular farmers and their land is not more valuable per ha than that of conventional farms. However, when more sales observations are included (model 1) or the interaction between fragmentation and hobby farms is considered (model 4), the hobby farm coefficient becomes significant. This interaction term was the only one that proved to be significant in the full model, so its inclusion can be deemed relevant. Regarding the inclusion of multiple sales of the same property, even if the farm-type status of the land has changed over time, the major characteristics of the parcel have not, so including all available sales is a viable option and provides more data points. Therefore, the best available models do indicate a real difference in pricing structure between the two types of farms.

The distance variables are consistent across models. In every permutation, farmland is worth more when it closer to the ALR boundary when it is outside the

ALR and it is worth more in the ALR when it is deeper inside the ALR. This makes sense as farmers wish to minimize the negative externalities that they experience and that they cause when operating near residential areas. The fragmentation index also supports this as it points out that less fragmented farmland fetches significantly higher prices. The negative coefficient on the interaction term with hobby farm supports the results from the logit model; hobby farmers pay higher prices for more fragmented land. This finding indicates that perhaps hobby farmers do not experience negative spillovers from urban areas to the same extent as conventional farmers, and thus might survive more easily in an environment where urban areas are expanding at the cost of agricultural areas. Also note that some open space uses, such as golf courses, are permitted within the ALR; these do not constitute farmland and thus reduce a parcel's fragmentation score, but may be favoured by hobby farmers in search of open space while avoided by conventional farmers due to the externalities associated with them.

The coefficients on distance to Victoria are negative and significant across all models which indicates that farmland is worth more when it is closer to the city. This is undoubtedly due to commuting distance and the effect of land speculation on farmland by developers and those who believe the land's value will increase as the city expands. The effect of distance to the highway is only significant in model 1, with the interaction term indicating hobby farms are slightly more valuable when they are located closer to the highway compared to conventional farms.

Finally, we can conclude that land prices respond significantly to changes in the interest rate. When interest rates increase, the willingness to pay for land appears to decrease.

6. Conclusions and Discussion

In this research, we investigated the revealed preferences of hobby farmers in terms of spatial location and parcel characteristics with the goal of answering questions about whether the instruments used to protect farmland, such as the ALR and preferential tax regulations for farmers, are economically efficient and whether the establishment of hobby farms is problematic in this context. The empirical findings shed light on some average preferences and trends in hobby farming in B.C. The average hobby farm tends to be relatively small, lies outside the ALR and often supports some livestock. Hobby farmers do not seem to mind fragmentation of agricultural land as much as conventional farmers although they do seem to have a preference for near open space, as evidenced by the fact they prefer to be closer to the ALR boundary when they are outside it or to be deeper inside the ALR. Since the ALR provides reasonable assurance of farmland preservation, hobby farmers likely prefer situating near the ALR to guarantee their open space views are protected.

The negative externalities facing agricultural producers living in the urban-rural fringe do not seem to bother hobby farmers as much as conventional farmers. They likely receive fewer complaints due to the less-intense nature of the enterprise. This indicates that hobby farming may be able to survive more easily in the rural-urban fringe in the long run, compared to commercial farming. The fact that hobby farmers are more often than not located outside the ALR means they currently contribute to open space preservation even without the ALR zoning ordinances, even though the regulatory structure provides little guarantee of long-term continuation.

Furthermore, hobby farmers benefit from B.C.'s favourable property tax treatment of agricultural land, which sets a low threshold for obtaining tax reductions. Indeed, it is clear that hobby farmers seek parcels that place them in the land-size

category with the lowest threshold for qualifying for farm class status; thus, they tend to avoid parcels smaller than 0.8 ha that would place them into the category with the highest taxes. These factors all point to a picture of hobby farmers as active seekers of farm class status to reduce their property tax burdens.

When surveyed, B.C. residents show strong support for protection of agricultural land, but it is not clear how they would rank various values and reasons for preserving farmland. Kline and Wilchens (1996) provide a useful framework for defining agricultural land values (agrarian, environmental, aesthetic and anti-growth), but it is clear that sometimes these values can be in conflict. For instance, agrarian values are satisfied by highly productive greenhouse agriculture, but at the cost of environmental and aesthetic values; golf courses are desirable land uses from an aesthetic point of view, but not in terms of agrarian or anti-growth values. It is not clear which values B.C. residents hold most strongly with regard to the ALR, both in terms of the province as a whole and in the urban-fringe. Determining this is the subject of future research.

We argued that reasons to protect agriculture related to food production are not justifiable from an economic perspective. Agricultural production is a primary output and not an externality, and government intervention is only justified when there is market failure. Therefore, the argument that hobby farming should be looked upon as a negative development, since they take land out of full-scale production and limit opportunities for conventional farms to expand, does not hold. On the contrary, if aesthetic values are most important, then hobby farming is a practice to be encouraged and the low threshold for achieving farm class status is to be applauded. It is also the case that hobby farms play a role in slowing urban sprawl, thus reducing conflicts and externalities imposed upon conventional farmers.

It remains an open question as to whether hobby farming should be promoted in the rural-urban interface as an alternative to more productive, commercial types of agricultural enterprises. Clearly, high land prices make it difficult to support a viable agricultural industry, perhaps even hobby farming. While hobby farming is not a new development, its scale in British Columbia in recent years is unprecedented. It is not entirely clear whether hobby farming is something to be encouraged because of the benefits that it provides society, or whether it simply constitutes 'rurbanization' of the countryside (urban development of rural areas subject to minimum lot size constraints) with all pretence of farming disappearing as farms roll over and local governments seek to expand their tax base. Further research and monitoring of this phenomenon is certainly warranted.

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