Staff Paper

ANALYSIS OF ALTERNATIVE PAYMENT DESIGNS FOR FARMLAND DEVELOPMENT RIGHTS

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SUMMARY

Four alternative payment rules were examined to evaluate their ability to accomplish the objectives of the development rights purchase program. Paying the true economic value for the development rights does not allow the program to target high quality agricultural land. Modifying the payment strategy by offering a minimum payment will provide some extra incentive for high quality agricultural land in areas with little development pressure, but will provide little help in areas with high development pressure. Indexing the payment to a representative agricultural-use value for an area will provide premiums to high quality agricultural land and discounts to low quality agricultural land which provides additional incentives (disincentives) for high (low) quality land to enter the program. This representative payment rule can be modified in order to increase the participation incentives to owners of targeted land.

(12 Total Pages)

ALTERATIVE PAYMENT DESIGNS FOR FARMLAND DEVELOPMENT RIGHTS: COMMENTS AND ANALYSIS

An important issue faced by the DNR subcommittee is how to structure the development right purchase payments so that is accomplishes the legislative objectives. There are many possible payment rules that could be used to implement the program. However, the particular structure of each payment rule will impact the type and location of farmland that participates in the program. The payment rule selected should be consistent with the goals of the program.

The discussion in previous meetings suggest the committee feels its objectives are:

1. protect agricultural land from development for nonagricultural uses; and

2. give priority to protecting "high quality" agricultural land from development.

These objectives suggest that any payment rule should be designed so that payments for development rights increase as development pressure increases and as the agricultural-use "quality" of the land increases. Let's examine several alternative payment rules and their abilities to accomplish the above objectives.

Development Value Rule

The most obvious payment rule to purchase development rights is to simply pay landowners an amount equal to the difference between the market value and the agricultural-use value of the land. The payment rule is

(1)
$$p = (M_f - A_f)$$

where M_f is the market value of the land for farm f which includes the right to develop the land in the future and A_f is the agricultural-use value of the land for farm f if no development option is available in the future.

This payment rule is attractive because it compensates the landowner for the true economic value from forfeiting the right to develop the land in the future. This also makes the rule easy to defend.

The drawback is that land with high agricultural-use value will receive smaller payments than land with low agricultural-use value when both have the same market value. In theory the rule should provide exactly equal incentives for all participants to enter the program regardless of the agricultural-use value of the land. However, some landowners may difficulty with the concept that their payment for the development rights of their land are lower than their neighbors simply because they have better land. In addition, there are a variety of factors which may cause a farmer to place a higher value on the development rights of the land than the "true" payment calculated using (1). The pure development value rule provides no mechanism to deal with special circumstances or to target land with high agricultural-use value.

Development Value Rule with a Minimum Floor Payment

A second alternative that has been discussed is similar the development value rule but provides minimum payment equal to the lower of the market value of the land or some predetermined floor payment value. The rule is

(2) $$p = \max[M_f - A_f, \min(M_f, F)]$$

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where F is the predetermined floor value.

This rule has many of the same features as the development value rule in (1) but also provides some additional incentives for landowners with high agricultural-use values to participate in the program. For example, if the value of the minimum payment value of $\min(M_f, F)$ is greater than the increment value of the land $(M_f - A_f)$ then the landowner receives a premium equal to the difference between $\min(M_f, F) - (M_f - A_f)$. This means that farmers with higher agricultural-use values will receive a larger premium which is consistent with the objective of attracting higher quality agricultural land.

The drawback of the rule is the extra incentive is only available to landowners whose development value is below the minimum payment level. Unfortunately, this is most likely to occur in areas with little development pressure. Landowners in areas with high development pressure will essentially operate under the development value rule in (1). So a likely result from this type of rule is to get a disproportionately high level of participation by landowners with high quality farmland in areas with little development pressure.

Representative Development Value Rule

Another rule would be to base the payment on the difference between the market value of the land and a representative agricultural-use value for a region. The payment rule would be

(3) $$p = M_f - A_r$$

where A_r is the representative agricultural-use value for an area.

This rule would no longer require the agricultural-use value of each individual farm to be calculated (the market value would still have to be determined). It would require the determintion

of a representative agricultural-use value for each region. The rule provides a premium over the true economic value to landowner's whose agricultural-use value is greater than the representative agricultural-use value for the area equal to $A_f - A_r$. However, land owners whose agricultural-use value is below the representative value would be paid less than the true economic value by an amount $A_r - A_f$. The rule will tend to attract high quality agricultural land into the program in all areas; while low quality land will have a decreased incentive to enter the program. The representative value for a particular area can be adjusted (lowered) to increase the incentive for high quality land to enter the program and lower the threshold where it becomes attractive for lower quality land to enter the program.

Magnified Development Value Rule

A modification of the representative development value rule is to multiple the payout in (3) by the ratio of the agricultural-use value to the representative value for the area. The rule can be written as

(4) $$p \ = \ \min[(M_f \ - \ A_r)(A_f/A_r), U]$$

where U is the maximum allowable payment.

This payment rule is similar to indexed incremental value rule in (3) except that is magnifies the premiums paid to landowners whose farmland's agricultural-use value is above the representative value for the area. Likewise, the payment rule magnifies the discount to land owners whose land has an agricultural-use value below the area's representative value. This rule will provide strong incentives for high quality farmland in all areas to participate and little incentive for low quality land to participate. Again, the representative value can be adjusted downward to increase

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participation. It is possible that the payment could exceed the market value if A_r is set at a low value and so an upper limit, U, would be placed on the payment level at or below the market value.

An alternative is to **customize** the development value payment by setting the representative farm value equal to $(M_f)(A_m)/(U\ +\ A_m)$ where A_m is the maximum agricultural-use value in the area. This will ensure no payments can exceed the U and that only the highest quality land in the area will receive a payment equal to U. Each farm receives its own customized representative value rule ensuring that its payment won't exceed U. Setting U equal the farms market value results in farmland with the highest agriculture-use value in each area receiving a payment equal to the land's market value; which means the best land in the region receives premium equal to its agriculture-use value.

Application of the alternative methods

Each valuation method is illustrated in Tables 1 and 2. Table 1 illustrates the payments under each method as the market value and agricultural-use value changes; while Table 2 show the premium each method provides over and above the "true" economic development value. The floor value is set at $1,000; the representative agricultural-use value is set at $1,000; and the maximum allowable payment is set at the market value. The development value rule shows the true economic value that would compensate land owners for forgoing their rights to develop the land in the future. Adding the floor to the rule only increases the value when the market value and agriculture-use value are close together (within $1,000 in the example). This tends to provide incentives for farmers with good farmland in areas with little development pressure to participate in the program. For example, the farmer with a $2,000 market value and a $1,500 agriculture-use

value receives a payment of $1,000 which is premium of $500 over and above the true economic development rights value; while, on the other hand, the farmer with $4,000 market value and $1,500 agriculture-use value receives no premium.

The representative value rule provides a constant payment to all land owners with the same market value for a given representative agricultural-use value. For example, all the farms with $2,000 market values would receive a $1,000 payment regardless of their individual agricultural-use value. As a result, farms with agricultural-use values below the representative value of $1,000 are under paid, while farms with agricultural-use values above the representative value are over paid. For example, when the market value is $2,000 and the farm value is $500, the payment is $500 below the true economic value of $1,500; while a farm with a $1,500 agricultural value receives a $500 premium over and above the true economic value of $500.

The magnified representative value rule simply increases the premium (discount) payments to land with high (low) agricultural-use values. For example, the farm with a $500 agricultural-use value and a market value of $2,000 would now only receive a payment of $500 which is $1,000 below the true economic value of the development rights. On the other hand, the land with a $1,500 agricultural-use value would receive a payment of $1,500, a $1,000 premium over and above the true economic value of the development rights. This rule accelerates the premiums (discounts) to farmers as the quality of farmland increases.

The customized representative value rule sets a separate representative value for each individual farmer based on the land's market value and maximum agricultural-use value in the area. If the land's agricultural-use value is above this customized representative value, the payment will include premium. The rule ensures that the best farm land in an area receives a payment equal to the land's total market value; which means the best farmland in the area will

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always receive a premium qual to the land's agriculture-use value. For example, if the best land in an area has an agriculture-use value of $1,500 and the market value is $4,000, the representative agriculture-use value is $1,091 for the area. Farmland in this area with an agriculture-use value above (below) $1,091 will receive a premium (discount). Any land in the area with a market value of $1,500 will receive the market value; in this case $4,000 which is a premium of $1,500 over and above the true value of the development rights.

Tables 3 and 4 shows the payments and the premium (discount) each payment rule provides for the three farm case studies using the Mulvaney values. The results assume the farms are in the same region and that farm A is the maximum agriculture-use value in the area.

Other Modifications and Targets

The are a virtually unlimited set of alternatives payment rules that can be developed. Each alternative rule will provide different incentives and accomplish different objectives. The "best" rule design will depend on the objectives of the program. For example, suppose in addition to attracting high quality agriculture land into the program it is desired that large tracts of land be given some incentive to participate. Then a rule(s) could be developed which provides incentive to attract both high quality land and large tracts of land into the program. To illustrate, a simple rule might be a modification of the representative development value rule such as:

$$(5) \qquad\qquad p = \min[(M_f - A_r)(s_f/s_r), \ U]$$

where s_f is the number of acres of farmland and s_r is the representative value. Under this rule

farmland tracts that are larger (smaller) than some representative level receive a larger (smaller)

premium or discount.

Table 1. Illustration of Alternative Payment Rules

Case		Payment Design				
Market Value	Agriculture-Use Value	Development Rights Value	Development Rights Value w/Floor (F=$1,000)	Representative Development Rights Value ($A_r = \$1\ 000$)	Magnified, Representative Development Right Value ($A_r = \$1,000$)	Customized Representative Development Rights Value (A_r = custom)
$2,000	$500	**$1,500**	$1,500	$1,000	$500	$666
	750	**1250**	1,250	1,000	750	1,000
	1,000	**1,000**	1,000	1,000	1,000	1,333
	1,250	**750**	1,000	1,000	1,250	1,667
	1,500	**500**	1,000	1,000	1,500	2,000
$4,000	$500	**$3,500**	$3,500	$3,000	$1,500	1,333
	750	**3,250**	3,250	3,000	2,250	2,000
	1,000	**3,000**	3,000	3,000	3,000	2,667
	1,250	**2,750**	2,750	3,000	3,750	3,333
	1,500	**2,500**	2,500	3,000	4,000*	4,000

Notes: The payment designated with asterisks are constrained by the upper payment limit of M_f.

The customized value for A_r = $857 when M_f = $2,000 and the maximum A_f = $1,500. When M_f = $4,000 and the maximum A_f = $1,500 the customized value for A_f = $1,091.

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Table 2. Premiums Paid Under Each Alternative

Case		Payment Design				
Market Value	Agriculture-Use Value	Development Rights Value	Development Rights Value w/Floor (F=$1,000)	Representative Development Rights Value (A_r = $1,000)	Magnified, Representative Development Right Value (A_r = $1,000)	Magnified Representative Development Rights Value (A_r = custom)
$2,000	$500	**$0**	$0	-$500	-$1,000	-$834
	750	**0**	0	-250	-500	-250
	$1,000	**0**	0	0	0	333
	1,250	**0**	250	250	500	917
	1,500	**0**	500	500	1,000	1,500
$4,000	$500	**$0**	$0	-$500	-$2,000	-$2,167
	750	**0**	0	-250	-1,000	1,250
	1,000	**0**	0	0	0	-333
	1,250	**0**	0	250	1,000	583
	1,500	**0**	0	500	1,500*	1,500

Notes: The payment designated with asterisks are constrained by the upper payment limit of M_f.

The customized value for A_r = $857 when M_f = $2,000 and the maximum A_f = $1,500. When M_f = $4,000 and the maximum A_f = $1,500 the customized value for A_f = $1,091.

**Table 3. Application to Development Rights Cases Assuming
A Single Representative Area**

	Case			Payment Design			
Applicant	Market Value	Agriculture-Use Value	Development Rights Value	Development Rights Value w/Floor (F=$1,000)	Representative Development Rights Value ($A_r = \$1\ 000$	Magnified, Representative Development Right Value ($A_r = \$1,000$)	Customized Representative Development Rights Value (A_r = custom)
A	$4,776	$1,437	**$3,337**	$3,337	$3,776	$4,776	$4,776
B	1,634	840	**794**	1,000	634	532	954
C	1,523	1,224	**299**	1,000	523	640	1,295

Note: The payment designated with asterisks are constrained by the upper payment limit of M_f.

The customized values for A_r are $1,105 for Case A, $765 for Case B, and $739 for Case C.

**Table 4. Premiums for Development Rights Cases Assuming
a Single Representative**

Case			Payment Design				
Applicant	Market Value	Agriculture-Use Value	Development Rights Value	Development Rights Value w/Floor (F=$1,000)	Representative Development Rights Value ($A_r = \$1\ 000$	Magnified, Representative Development Right Value ($A_r = \$1,000$)	Customized Representative Development Rights Value (A_r = custom)
A			**$0**	$0	$439	$4,439*	$1,439
B			**0**	206	-160	-262	160
C			**0**	701	224	341	996

Note: The payment designated with asterisks are constrained by the upper payment limit of M_f.

The customized values for A_r are $1,105 for Case A, $765 for Case B, and $739 for Case C.