J. OF THE NORTHEASTERN AGR. ECON. COUNCIL VOL. X NO. 2, OCTOBER, 1981

DESIGN OF PROGRAMS USING TRANSFERABLE DEVELOPMENT RIGHTS TO PRESERVE FARMLAND IN THE NORTHEAST

Carl C. Mabbs-Zeno

Permanent conversion of agricultural land to urban uses has concerned both suppliers and demanders of agricultural products in recent years. Although controversy on the importance of the problems associated with this conversion persists among economists (General Accounting Office, Healy, Plaut), policymakers across the nation have accepted the preservation of farmland as a goal requiring government action. All but two States (Georgia and Mississippi) provide some form of preferential property tax assessment for farmland (Davies and Belden). Most localities with zoning authority attempt to protect farmland, and several less common land use management institutions have been implemented with farmland preservation as a principal goal.

The Northeast has led the nation in using the separation of devlopment rights from other interests in land as a mechanism for preserving agriculture. All five states with programs for government purchase of development rights are in the Northeast (Davies and Belden), and all twelve locatities with programs for transfer of development rights to preserve farmland are in the Northeast (National Agricultural Lands Study).

Transferable development rights (TDR's) have been used for a variety of purposes in addition to farmland preservation such as protection of historic sites and of rural open space. Approximately 23 TDR programs have been implemented nationally, the precise number depending on the definition of TDR used. Sixteen of these are in the Northeast (Mabbs-Zeno). Even though some of these programs apparently satisfy their designers, almost no rights have been transferred after the programs were in place. Only six transfers, representing three development projects, were found for the twelve TDR programs designed for farmland preservation (Table 1).

This paper reviews the experience gained in programs based on transfer of development rights and attempts to identify ways to make such programs more effective. The method of analysis focuses on program designs in trying to relate specific features of design to alleviation of the various problems associated with farmland conversion.

MINIMAL DESIGN FEATURES

The simple definition of TDR's used here requires that a land use management institution contain at least two essential feaures in order to be considered a TDR program:

1) Ownership of development rights must be exchangeable among private parties.
2) More than one site must be a legal option for the use of development rights.

Tautologically linked to these characteristics, however, is another feature.

3) The number of development rights must be constrained below the physical capacity of the land.

If development rights are not limited, no transfer of rights is possible because no site could accept any more rights. It is essential to any TDR program that the total amount of development rights be limited.

With three design features, then, a TDR program could be defined, but a fourth feature is necessary if the program is to have any effect on land use.

4) The number of development rights at some location before any rights are transferred in from another location must be less than the number which would be used if a traditional land market were in place.[1]

This condition acknowledges that a TDR program does not have an effect unless there is demand for TDR's. Even the presence of both supply and demand, however, does not generate exchange of TDR's. For exchange, supply and demand functions must intersect and the TDR market must function well enough that suppliers and demanders can find each other. This issue of TDR marketability returns in the evaluation of various TDR program variations as a test of whether the program has any potential for altering land use.

A TDR program containing only the above four features could be implemented and it would impact on several social goals with possible net benefit. No program this simple, however, has ever been implemented. All programs and proposals have attempted to achieve more precise effects than are possible with the basic TDR concept. The idea of TDR has been combined with zoning in most cases and several less used features have been appended in some programs.

THE MERGER OF TDR WITH ZONING

Zoning is a land use management institution which is widely used to affect both quantity and quality of development. Quantity is controlled by specifying density limits on development units. Quality is controlled by specifying what categories of land use are permissible. In both cases, regulations vary according to geographic location as specified on a map. When zoning is merged with TDR's, a management program can control, in part, quantity, quality, and location of

---

Carl C. Mabbs-Zeno is Economist, Economics and Statistics Service, Natural Resource Economics Division, USDA.

[1] A parallel requirement for TDR supply is not appropriate. It is not necessary that the number of development rights at some location before any rights are transferred out to another location be greater than the number which would be used if a traditional land market were in place. TDR's might be bid away from an initial owner because they are more valuable in another location even though they have positive value in their initial location.

Table 1. Use of TDR's to Preserve Agricultural Land

Location of TDR program	Preservation goal	Number of transfers
Birmingham, PA	agricultural land	0
Buckingham, PA	" "	2
Calvert County, MD	" "	1
Chesterfield, NJ	" "	0
Eden, NY	" "	1[a]
Hillsborough, NJ	" "	1
Kennett, PA	" "	0
Montgomery County, MD	" "	0
Southampton, NY	" "	1
Sunderland, MA	" "	0
Upper Makefield, PA	" "	0
Winsor, CT	" "	0
Illinois[b]	historical landmarks	
Montgomery County, MD[c]	" "	
New York, NY	" "	
Washington, DC	" "	
Collier County, FL	freshwater wetlands	
Columbus, OH	floodlands	
Los Angeles, CA	urban environment	
St. George, VT	open space[d]	
St. Petersburg, FL	freshwater wetlands	
San Francisco, CA	urban environment	
Scottsdale, AZ	hillsides	

[a] Construction on a home for the aged has been authorized by the town and begun, but the buildings cannot be occupied until TDR's are obtained by the developer.

[b] Enabling legislation for towns to pass TDR programs.

[c] A historic farmhouse in Montgomery County was preserved as a landmark under a 1972 TDR ordinance. This is independent of the 1980 TDR program to preserve agricultural land.

[d] May include preservation of agricultural land.

development.

If limiting quantity of development across a jurisdiction is the only goal of the management program, the minimal TDR program described above is sufficient. If the quantity of development in part of a jurisdiction is to be constrained, however, a TDR-zoning combination may be appropriate. To facilitate discussion of this case, the jurisdiction is considered to consist of two zones. The area in which development is to be most constrained is termed the preservation zone and the area less constrained in development is termed the development zone.

The various regulations on development quantity which differentiate the two zones are represented by a 2 by 4 matrix in Table 2. Any TDR-zoning program must specify the quantity of development rights in each zone for each of the four program elements listed. The limit on density with TDR ownership (X_1) shows the maximum density allowed in each zone. The limit on density with no TDR ownership (X_2) shows the maximum density allowed by law if the developer owns no TDR's at the time of development. The number of TDR's issued (X_3) shows the number of TDR's given to landowners for each acre they own in

Table 2. Matrix of Rights per Acre and Constraints in a TDR-Zoning Program

	ZONES	
PROGRAM ELEMENTS	preservation	development
Building limit with TDR's (X_1)	p_1	d_1
Building limit without TDR's (X_2)	p_2	d_2
Number of TDR's issued (X_3)	p_3	d_3
Number of development rights (X_4)	p_4	d_4

CONSTRAINTS

$p_1 \geq 0$	$p_1 < d_1$	$p_3 > 0$	$d_2 \geq 0$
$p_1 \geq p_2$	$p_2 = 0$	$p_3 \leq p_4$	$d_3 \geq 0$
$p_1 \leq p_4$	$p_2 \leq d_2$	$p_4 = p_2+p_3$	$d_4 = d_2+d_3$
	$p_2 < p_4$	$d_1 > d_2$	

each zone. The total number of development rights (X_4) is the sum of the TDR's and the building rights without TDR's in each zone. The representation in Table 2 assumes the program goals for development quantity are expressed in building units per acre. Preservation zones are differentiated from development zones by specifying less maximum development in one zone which is portrayed in Table 2 by setting p_1 less than d_1. Thirteen of the existing TDR programs define zones in this manner.[2]

One possible allocation of building rights with TDR's is for the preservation zone to have none ($p_1 = 0$) and for the development zone to have some positive amount consistent with the community plan ($d_1 > 0$). This would result in complete protection from development of land in the preservation zone. Of the programs proposed, three set p_1 equal to zero but none of these programs has been implemented.

A more common allocation of building rights with TDR's is to allow the landowners in the preservation zone to use their TDR's by building on their land. In this case p_1 equals p_4. Not all land in the preservation zone would necessarily be preserved but a maximum overall density is guaranteed. At least nine of the TDR programs currently in place allow landowners in a preservation zone to use their TDR's.

An intermediate position has been adopted in at least seven localities. In this case some, but not all, of the TDR's owned by landowners in the preservation zone may be used to develop in the preservation zone. Of course this is equivalent to the condition that landowners in the preservation zone have more rights to exchange than they can use for development or p_1 is less than p_4.

Preservation goals are met in a TDR-zoning program by setting appropriate density levels for development both with and without TDR's, that is, by setting p_1 and p_2. All of the programs have set the development rights limit without TDR (p_2) at zero in the preservation zone. This is reasonable since no preservation purpose is served by making some rights nontransferable in that zone. Several programs allow development in the development zone even without TDR's ($d_2>0$). This is done to allow landowners in the development zone to retain some or all of the rights they owned prior to the introduction of a TDR program even if no TDR's are issued to landowners in that zone.

The number of TDR's issued must be coordinated with other program elements to provide the desired development levels, but the level of development achieved under a program is also sensitive to the preexisting level of development rights. The change in number of development rights each person owns is regarded as an important measure of whether compensation must be paid to landowners even if the value of those rights has changed. It is possible to issue TDR's such that the total number of development rights (X_4) is unchanged in one zone from the levels existing before the program while still setting actual development levels (X_1 and X_2) much lower than before. It is also possible to set the total number of rights initially owned for

[2] For a listing of which programs exhibit this characteristic or characteristics mentioned below, see Mabbs-Zeno (1981).

each acre of land at the same level for landowners in the preservation zone and the development zone ($p_4 = d_4$) while allowing less development to occur in the preservation zone. In fact the preexisting number of development rights owned by any landowner can be retained or increased while preserving land in one zone by limiting use of TDR's in that zone.

Another set of design options results when the assumption is relaxed that development rights are defined as building units per acre. The notion of building units has been replaced in some programs by qualitative parameters of development. As in conventional zoning, development for residential, commercial, or industrial purposes may be prohibited in specified areas, but, with TDR's, tradeoffs among such classifications may be specified. In a particular zone one TDR may be required for a residence and two TDR's for a store. The regulation scheme can easily become complex when such tradeoffs are used although public control over development is enhanced.

A similar notion applied to the pre-development land use guides the definition of development rights in at least one proposal. The tradeoffs in public value of losing various classes of land may be specified in the TDR. To develop an acre of prime agricultural land might require three development rights and to develop an acre of coastal wetlands might require four rights.

ISSUANCE OF TDR's

Regulations regarding use of development rights, whether transferable or not, limit eventual land use. The mechanism by which TDR's are issued, however, has an impact primarily on distribution of rights and the legality of the regulations. One of two basic rules has been applied in issuing TDR's under all the programs studied. Most programs issue development rights to landowners in proportion to the number of acres each owns. The main alternative is to link the number of rights an owner receives to the value of the land each owns.

Under the acreage criterion, the distribution of development rights may be unchanged by the introduction of a TDR program. If land is initially zoned such that different rights exist in different zones, the ratio of TDR's issued could reflect these differences.

Under the value criterion, the distribution of wealth tends to be little changed by the new program. If TDR's were issued according to the assessed value of the development rights each landowner owns, the distribution of wealth would remain constant. If land value in an area is due entirely to its potential for development, the two assessments are equivalent. In most cases land value includes some value for uses which do not require development and some value for development. Both of these values typically vary among sites within a region so either would result in a different allocation of rights than would allocation on an acreage criterion.

Lynch (1973) has proposed that TDR's be issued periodically so that timing of development could be controlled more closely. Annual or other periodic reevaluation of development needs would allow public planners to compensate for previous underestimation of optimal development levels. Because this mechanism only permits correction of underestimation, the public agency which issues rights might intentionally issue fewer rights than the expected optimal level.

Another method of determining who is issued TDR's is to sell the rights to the highest bidder. This concept is similar to one applied to land development in Britain. Under the British program, all development rights outside cities were controlled by the government and any development required purchase of rights from the government. Various rules guided the price of development rights and none, apparently, proved workable. The program was adopted in 1947, abolished in 1953, adopted in modified form in 1967 and abolished again in 1971 (Levin, et al.).

AIDS TO TDR EXCHANGE

Nearly all attempts to implement the use of TDR's have recognized that the TDR market might fail to function due to poor understanding of the TDR mechanism. Most programs and proposals, therefore, provide for information dissemination by the government. This requirement is met with various degrees of formality and focuses on various types of information. Government initiative may be needed to inform prospective landowners and developers that TDR's exist. The market might further require government assistance to provide information on who owns TDR's and on how they can be used. It has been suggested that government directly set the price of TDR's in some programs so that landowners are compensated "fairly" or to avoid the problems of price discovery in a new market. In Montgomery County, Maryland, the planning agency met with landowners, developers and economists before the TDR program began in order to suggest what the market price would be.

Government participates directly in some TDR programs although the government role in some cases seems to preclude classifying the program as a TDR scheme. In Los Angeles, for example, the city "transfers" development rights from city parks to office buildings (Ord). Since the city did not intend to develop the parks, their "transfer" of rights amounts to little more than a justification for selling rezoning. Similar use of public TDR's arises in the Maryland proposal and the New York program.

Government purchase of TDR's is suggested in some plans as a means of preserving land while paying just compensation to landowners. Government ownership in some cases is regarded as a way to influence the level of development by bidding the price of TDR's up or down according to policy objectives. The concept of government participation in a TDR market is expanded by the Chicago proposal to set up a development rights bank. The bank would guide development by selling rights to selected sites and by buying rights on historic landmarks (Costonis).

A different form of TDR bank is included in the new program in Montgomery County, Maryland. In addition to government purchase of TDR's through a county "revolving fund," the Montgomery

County program provides loans to developers as an inducement to use TDR's and thereby to compensate landowners in the preservation zone.

CONSTRAINTS ON TDR EXCHANGE

Although no TDR programs recognize a goal of limiting exchange of TDR's, several programs contain features which have that effect. In some cases, however, the constraint on TDR exchange is more than incidental since it may contribute to the primary goal of preservation of existing land uses. Four existing TDR programs do not allow landowners in preservation zones to purchase TDR's. Under some of these plans, landowners in a preservation zone are permitted to use some or all of their land, but once the TDR's are traded to a landowner in the development zone the preservation land is forever preserved. The TDR's in this case are associated with the land more strongly than with the landowner. TDR exchange is constrained because landowners in the preservation zone lose the option to develop their own land when they sell their TDR's, but the TDR buyer does not receive the value of that option. TDR sellers therefore require a higher minimum price than they would if the TDR's could be bought back, while TDR buyers are willing to pay a lower maximum price.

Other programs also constrain TDR exchange by limiting TDR ownership to landowners. The reason for this linkage seems to be generally to simplify administration and enforcement of the program. The designers of these TDR systems seem to find it more administratively tractable to retain traditional views about the association of development rights with land ownership. Therefore they shift TDR's among land locations rather than to assign TDR ownership to individuals who may or may not own land which can use the TDR.

Another mechanism which constrains TDR exchange in some programs and which results from institutional linkages of TDR ownership to the land has been termed the transferable development credit (TDC) system (National Agricultural Lands Study). Under a TDC system, development rights are ostensibly transferable among parcels belonging to a single landowner. An easement preserving the land from which development rights were transferred is deeded to the government in order to earn density credits legally. If the preserved parcel is then sold, the effect of the TDC is similar to the more conventional TDR schemes although the TDC incurs more transaction cost. Four TDC systems are currently in place.

The TDR system in New York City constrains exchange of TDR's by limiting transfer to properties contiguous to the site from which rights are transferred. The motivation for this feature in the New York program seems to be the avoidance of transferring traffic and congestion. If building density is transferred only to adjoining sites, the impact of that transfer is relatively small.

TAXATION OF TDR's

The issue of whether TDR's should be taxed like real estate has concerned the designers of most TDR programs. It has often been resolved by treating TDR's as real property but such treatment introduces several legal and administrative problems. Taxation of separable interests in land has not been the usual approach by government. Easements, for example, are not ordinarily taxed like other forms of real property. Additionally assessment of TDR value is especially difficult without some history of exchanges to establish a consistent market price. The purposes of taxing TDR's are generally to preserve the tax base and to distribute the tax burden according to the value of rights in land owned. Since most states currently tax some undeveloped land without considering its development value, taxation of TDR's would result in an increase in the tax base and a shifting of the tax burden in those cases. What purpose may be served by taxation varies with the institutional environment and must be evaluated in the context of each particular plan.

CONCLUSIONS

A point which emerges clearly from this research is that all TDR programs have impacts on many social goals. Any effort based on TDR's to preserve agricultural land should consider what tradeoffs are acceptable or desirable among redistribution goals, economic development goals and equity goals. Explicit agreement on the optimal weighting of social goals by policymakers prior to adoption of a TDR program is not necessary (and not likely) as long as the implications of the proposal for all social goals is clear to all policymakers.

The experience of existing TDR programs provides little guidance on the potential of TDR's in general. No program has generated an ongoing market for TDR's so many of the theoretical benefits of TDR's cannot be tested. A limited number of design elements have been incorporated by current TDR programs but some insight into their performance has been gained. Considerable potential remains for use of TDR's but the designers of future programs cannot rely on extensive data nor even limited economic data from the existing TDR experiments. Future TDR designers should accept that TDR's are not yet a proven institutional innovation and that continued creativity and risk will accompany the realization of the institution's potential.

REFERENCES

Costonis, John J. Space Adrift: Saving Urban Landmarks Through the Chicago Plan. University of Illinois Press, Urbana, 1974.

Davies, Bob and Joe Belden. A Survey of State Programs to Preserve Farmland. Council of Environmental Quality, U.S. Government Printing Office, Washington, DC, 1979.

General Accounting Office, Comptroller General. Preserving American's Farmland--A Goal the Federal Government Should Support, CED-79-109, U.S. Government Printing Office, Washington, DC, 1979.

Healy, Robert. The Market for Rural Land. Conservation Foundation, Washington, DC, 1981.

Levin, Melvin R., Jerome G. Rose, and Joseph S. Slavet. New Approaches to State Land-Use Policies. D.C. Heath and Company, Lexington, Massachusetts, 1974.

Lynch, Kevin. "Controlling the Location and Timing of Development by the Distribution of Marketable Development Rights," Transfer of Development Rights, Jerome Rose, ed. Center for Urban Policy Research, Rutgers, New Brunswick, New Jersey, 1975, pp. 259-64.

Mabbs-Zeno, Carl C. "The Economics and Design of Transferable Development Rights." U.S. Department of Agriculture, Economics and Statistics Service, working paper, 1981.

National agricultural lands study--final report. U.S. Government Printing Office, Washington, DC, January 18, 1981.

Ord, Timothy. "Building a City for 100 Suburbs." Business Week, November 24, 1980, pp. 34D-34F

Plaut, Thomas R. "Urban Expansion and the Loss of Farmland in the United States: Implications for the Future," American Journal of Agricultural Economics, 62(1980):537:42.