IS POLICY ANALYSIS RELATED TO POLICY?

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ABSTRACT

This paper compares two policy analyses--the first and second RCA appraisals--with the economic climate in which each was conducted. The results of the analysis supporting the updated National Conservation Program are presented.

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Early in the authors' careers (more than a decade ago) not many professionals were writing about problems of excess capacity, farm foreclosures, or land retirement. The period from 1973 to 1981, from the oil embargo to the Agricultural Food Act, was one of remarkable hysteria in the natural resources establishment. Starvation in Africa was on the nightly news and farmers were beseeched to farm "fencerow to fencerow." The Limits to Growth and Global 2000 Report warned of serious resource limitations well within our lifetimes. The Seventies was a decade of perceived shortages.

Ruttan (1986) writes that this "scarcity scare" was but a manifestation of recurring cycles of pessimism and hope beginning with the dismal Malthus two centuries ago. These cycles now seem to be increasing in frequency--with three since World War II--because of the greater interdependence of world economies. Ruttan also chides the policy analysts of the seventies for being "influenced by an intellectual environment that would have regarded more optimistic projections as 'out of touch with reality.' "

In 1977, scarcity thinking was such that Congress passed the Soil and Water Resources Conservation Act (P.L. 95-192) or RCA. RCA required a continuing appraisal of the status, conditions, and trends of soil and water resources. The results of the appraisal were then to be articulated in a formal USDA conservation program. The first appraisal report was published in 1981, the first program in 1982, and the second appraisal report (public review draft) in 1987. The updated conservation program is nearing completion.

What is remarkable is the manner in which the two appraisal reports (and presumably, the resulting conservation programs) reflect the thinking of their times. The first appraisal, in process from 1978 through 1980, expressed serious concern over resource adequacy, particularly the long range projections. The tone of the second appraisal was considerably moderated; the projections were almost the total antithesis of the the earlier appraisal. The analysts here could very well be guilty of the same undue influence by current events that Ruttan criticized earlier.

However, an analysis was incorporated in the second appraisal which demonstrated the impacts of using outlier projections rather than central trend projections for policy analysis. It is the questions posed by and the information resulting from these alternatives which should be of particular interest to students of conservation policy.

The purpose of this paper is to discuss the conservation policy choices that seem relevant in today's economic climate with particular reference to the results of the second RCA appraisal. Special reference will be made to the influence of the most recent years in the analytical and policy decision making process and how this influence can (or should) be taken into consideration in developing conservation policy.

The next section will discuss the first and second RCA appraisals and the reasons for their differences in outlook. The following section will discuss the implications of making long term policy decisions based on the crisis of the moment, and the final section offers some opinions on the relationship between appropriate policy analysis and appropriate policy.

The RCA Appraisal

Of the major trends affecting resource use, three were given primary consideration in the second RCA appraisal. These were technological change, land availability, and export demands. Other parameters were analyzed in the course of things but these three were found to have the greatest impact on resource scarcity.

The intermediate case is an extrapolation of known current trends of resource availability and quality, commodity needs, technological change, and the public policy environment. Should any of these important parameters deviate from the long range trend--a likely event--resource needs and resource use will also deviate from the path projected in the intermediate case. Two extreme scenarios also were developed with the reasoning that the high and low limits of resource use would be reached <u>if all parameters deviated in concert</u>. The adequacy of the resource base would be tested in the high stress scenario; the implications of very low returns to agricultural resources would be explored in the low stress scenario.

Though subjective probability can be attached to each parameter, this quickly becomes an exercise in futility, and results in an infinite number of possible scenarios. With limited time and budget a reasonable alternative means for allowing for parameter changes must be sought.

The high stress ("pessimistic") scenario addresses the scarce resource question: "What if" everything goes wrong at once? The analysis set out to see if there would be enough cropland and water under these pessimistic assumptions. If increased world food and fiber needs combined with a low rate of productivity increase, would we test the limits of our resource base? The high stress scenario was designed to test that supposition. High export demands were combined with low rates of technology improvements along with other aspects of restricted supply and degraded resource quality.

What if events unfold the other way? Suppose world demands for our agricultural commodities are lower than expected, either because of reduced demand or because of increased world food supplies. Suppose also that technological change occurs more rapidly than expected; that biotechnology and other forms of technological discoveries occur sooner than previously thought. Or perhaps entrepreneurship will serve to bring new technology to practical application sooner than expected. The questions these suppositions pose are equally as troubling as those in the high stress scenario. The low stress scenario was designed to explore the implications of farmer stress rather than resource stress. Lower demand and increased supply will be accompanied by extreme financial and economic stress in the farm sector. Returns to resource ownership will not be great enough to keep cropland in production--or farmers in business.

The Modeling Framework

The primary analytical tool used in the Resources Conservation Act is the Agricultural Resource Interregional Modelling System (ARIMS) Developed at Iowa State's Center for Agricultural and Rural Development (CARD). This system of models consists of descriptive models and a large national interregional programming model. The descriptive models use existing data bases and output from other models and convert the information into programming coefficients or resource constraint levels. The linear programming model consists of 105 producing areas, 31 market regions, and 34 ecosystems. Livestock and forage production, in addition to crop production, is simulated through the 120,000+ activities within the programming model. Six major data sets, numerous smaller data sets, and four major models are used to develop the coefficients required by ARIMS (table 1, page 12). Time and space limitations disallow a full discussion of these procedures. Some 3,000 pages of documentation have been written detailing the uses of these data and models within ARIMS. Further information can be found in English, Smith, and Oamek (1988).

Further information on the demand and technology levels are required to promote an understanding of the three cases evaluated in this paper. The technology levels for all three cases were developed from the collective judgement of more than 300 prominent members of such disciplines as animal science, agronomy, soil science, agricultural engineering, entomology, sociology, farming, and, yes, agricultural economics. Industry, land grant institutions, federal government, and environmental groups were represented. This collective set of individuals estimated future yields for both crop and livestock enterprises (table 2).

The baseline demand levels were developed by Economic Research Service's National Interregional Agricultural Projection System. The second appraisal incorporated ERS' lower level export projections in the intermediate case. The high stress case used ERS high projections and the low stress case used an export level below the intermediate case.

Results of the Analysis

This section describes the results and impacts on resources of each of the two extreme scenarios described in the previous sections. The extreme scenarios and their impacts on the resource base were analyzed with the aid of the analytical system developed for the RCA appraisal. The implications posed by these scenarios for land use, production, input use, cost, and the environment were explored using the detailed resource accounting structure of the ARIMS modeling system.

Land Use: Where the intermediate scenario meets foreign and domestic needs by the year 2030 with 218.5 million acres, the low stress scenario, with lower demands, can do it with 160.6 million acres. The high stress scenario requires, on the other hand, 345.8 million acres which is virtually all cropland that is available save for the 40 million acres in the Conservation Reserve. The low stress scenario only requires 45% of all cropland available nationally to meet projected food and fiber needs; the high stress scenario requires just under 100% (99.57). Under the low stress scenario, cropland used as a percent of that available is greatest in the Pacific and Delta regions and least in the Mountain and Northern Plains regions. The remaining six regions, the Southern Plains and the eastern U.S., require only 40% to 60% of their cropland to be in production. The intermediate scenario requires 63% of all cropland to be in production on a national basis with the eastern U.S. bearing most of the increase in crop acres. The high stress scenario requires all available land to be in production throughout the country.

Production: Total national production is assumed to be equivalent to total demands, which were projected outside the system. The changes in land use, however, are related not only to final demand for commodities but also to final crop yields which in turn depend upon technological advance, weather, irrigation efficiency, and quality of available cropland. Therefore, production patterns will not exactly match the land use patterns described in the previous section.

Starting with the high stress scenario, for each of the three major crops (corn,wheat, and soybeans), the distribution reflects the physical limit of productive capacity in each region without regard to economic considerations. For example, the Corn Belt has about 45%, 47%, and 3% of the physical productive capacity of corn, soybeans, and wheat in the U.S. When the physical stress is eased, however, under the intermediate case, we find that lower demand and prices make the Corn Belt relatively more important economically than physically. This is is because of such economic considerations as productivity and proximity to markets relative to other regions.

When demand and price become very low, as in the low stress scenario, we find the Corn Belt's share of corn production lower and wheat production higher than the intermediate case; soybean production is about the same. Here, again, economic forces supplant physical productivity as the impetus for the distribution of production. In this case, wheat price is too low to remain economically viable in many parts of Appalachia and the southeast states making such areas as the Delta states and the Corn Belt relatively more important. In the case of the Corn Belt, wheat production becomes relatively more important than corn production.

The spatial production of livestock, too, is heavily dependent upon economic rather than physical factors. In addition to those economic considerations discussed under crops, above--relative productivity and proximity to markets, for example--livestock production depends upon proximity to feed supplies which of course are in turn dependent on the same economic considerations as other crops.

Under the "fencerow-to-fencerow" conditions implied by the high stress scenario, the Corn Belt would produce only 12% of the nation's beef. The western regions all would produce more, having an "absolute advantage" in physical production capability. Under the two low price scenarios, however, we see that the Corn Belt produces more of the nation's beef supply than any of the other production regions. The Corn Belt, then, has a "comparative advantage" over all other regions in beef production when economic considerations are taken into account.

Cost: The portion of national effort devoted to the production and consumption of food and natural fiber is one measure of the level of economic development. The resources--natural, financial, human--utilized in the production of these basic needs are precluded from productive use elsewhere in the economy. This nation has been very successful at freeing agricultural resources, moving from 72% to 2% of the population in agricultural pursuits in the past 100 years. What do the scenarios indicate for the next 50 years?

Production Cost: In the RCA analysis, GNP was projected to increase 243% in real terms between 1980 and 2030 (USDA 1987, p. 4). In the intermediate scenario, total agricultural production cost (excluding land and management cost) was projected to decrease by 11% in the same time period. The low stress scenario indicated that production costs would decrease by 27%. Only in the high stress scenario were production costs projected to increase, in this case by 31%. All three scenarios indicate that, because of technological change, agricultural production will require relatively less national effort in the future.

Marginal Cost: The marginal cost of production is the dollar value of resources utilized in producing the last unit of each commodity to meet the required demands. Under competitive conditions this marginal cost is the same as the market-clearing commodity price at the farm gate. These prices vary directly with resource stress and, indeed, in studies of this type, are often used as "stress indicators". Should future conditions approach those depicted in one of the three scenarios, then actual market prices (sans government programs) would tend to converge on these marginal costs. From the low stress to high stress scenarios, corn marginal cost, for example, ranged from $0.83 to $4.24, soybeans ranged from $1.42 to $11.65, and wheat from $1.43 to $9.72.

Consumer Cost: Cost to consumers, too, varies directly with resource stress. This cost is the value placed on agricultural commodities (marginal cost) at the market place rather than at the farm gate. In the low stress scenario this was estimated at $36.5 billion; the intermediate scenario at $41.6 billion, and the high stress scenario at $103.5 billion.

Erosion: Erosion, as with other important variables, depends on land in crops and cropping intensity. The conditions implied by the high stress scenario, with demands being just met by the resources at hand, would preclude the establishment of policy that detracts from maximized production. In this scenario erosion is quite high.

The other two scenarios include the "cross compliance" provisions of the 1985 Food Security Act as an integral part of the analysis. These restrictions serve to keep erosion at much lower levels. This suggests that these provisions will ultimately be successful
as long as resources remain in surfeit.

Chemicals: Agricultural chemicals--fertilizers and pesticides--are an integral part of today's farming scene. Their use in protecting and augmenting yields can have deleterious effects and unintended impacts onsite as well as offsite. The most serious offsite impact is, of course, water pollution.

The RCA analysis was not designed to evaluate the agro-environmental interactions implied by the future use of farm chemicals. New modeling techniques are being developed at CARD to look at the impacts of chemicals on production, the environment, and human health. In the RCA analysis, the use of chemicals can be tracked only by their cost as used in the enterprise budgets. In some regions of the country on specific crops, chemicals are used more heavily than elsewhere. It is obvious that under the high stress scenario, chemical use will be widespread and intensive. The other scenarios, however, indicate that with much lower demands and greater productivity, chemical use may not be of such broad concern. The opportunity may exist to substitute surplus cropland for chemicals in the production process, should offsite problems of chemical use become unmanageable.

Animal Waste: Manure by-products of livestock production, too, can pose offsite side effects which can be serious in some areas of the country. Waste problems are directly correlated with livestock concentrations, which today are occuring in the southeast and southwest parts of the United States. Differences in resource conditions such as those posed in the low and high stress scenarios can have the effect of changing spatial concentration of livestock production. The analysis indicates that under the high stress scenario, beef production would tend to move west, with pork and dairy production remaining relatively unchanged. The very high need for cropland in this scenario precludes the production of forage in the east, particularly the southeast. Cow/calf operations move further west with the potential for exacerbating animal waste problems.

Conclusions

The low and high stress scenarios were developed to put reasonable bounds around the intermediate case projections. The low stress scenario was a look at a future of very high productivity improvements combined with lower levels of exports. This scenario indicates that excess agricultural capacity would increase 66 million acres over the intermediate scenario.

The high stress scenario, essentially a "worst case" future, was developed to test resource limits. Very high exports combined with lower levels of technology projections along with other restrictions on resource quality and quantity served to test the limits of the agricultural resource system. The parameter levels used in the high stress scenario were picked to be as limiting as could be reasonably expected to occur in the event worst case conditions develop.

That worst case levels would occur for all parameters at the same time is extremely unlikely. For example, in the environment of very high commodity prices implied by the high exports used in this scenario, incentive for innovation and adoption of technology would in reality increase rather than remain at the low levels assumed. The opposite is true for the high technology levels assumed in the low stress scenario; low prices would tend to reduce innovation and adoption.

However, despite the usual economists' caveats, it can be concluded that resources are adequate to provide for food and fiber needs even under the most stressful conditions that can reasonably be postulated. On the other hand, low stress conditions can only exacerbate the excess capacity conditions--commodity surpluses, low prices and income, farm financial stress--experienced at the present time.

Table 1. Brief outline of data set and models used by ARIMS

Item	Use in ARIMS
Major Data Sets:	
CARD/SCS Crop Budgets	Costs of Production - Crops
ERS Livestock Budgets	Costs of Production - Livestock
Forest Service's RPA data base	Cost of production - Forage
National Resource Inventory	Current Land Base Characteristics
SRS County Yields	1979 - 1981 Base Yields
Second National Water Assessment	Water availability estimates
Major Models Employed:	
National Interregional Agricultural Projection System (NIRAP)	Base Case export levels, All case domestic demands, Agricultural to Non-agricultural land conversion estimates.
Erosion Productivity Impact Simulator (EPIS)	Impact of sheet and rill and wind erosion on yields and production costs.
Resources for the Future's Water Quality Model	Constraints on erosion levels required to meet water quality standards
ERS's Budget Generators	Costs of production for crops, livestock and irrigation

Table 2. Projected annual rates of change for exports and technology.

	LOW STRESS		INTERMEDIATE CASE		HIGH STRESS	
	1980-2000	1980-2030	1980-2000	1980-2030	1980-2000	1980-2030
	percent per year		percent per year		percent per year	
EXPORTS						
WHEAT	-0.19	1.00	0.82	1.25	2.72	2.62
SOYBEANS	2.15	2.23	2.91	2.39	4.90	3.87
CORN	0.57	1.40	1.62	1.65	3.78	3.18
TECHNOLOGY						
WHEAT	3.16	1.93	2.28	1.45	1.25	0.85
SOYBEANS	4.48	2.17	2.65	1.66	1.47	0.98
CORN	2.65	1.93	1.89	1.45	1.02	0.85

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