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Cost of Augmenting Stream Flow Through Reduced Groundwater Pumping

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Market Report	Yr Ago	4 Wks Ago	8/20/99
Livestock and Products, Average Prices for Week Ending			
Slaughter Steers, Ch. 204, 1100-1300 lb Omaha, cwt.	$59.00	$64.20	$65.45
Feeder Steers, Med. Frame, 600-650 lb Dodge City, KS, cwt.	71.25	83.69	79.00
Feeder Steers, Med. Frame 600-650 lb, Nebraska Auction Wght. Avg.	*	84.64	*
Carcass Price, Ch. 1-3, 550-700 lb Cent. US, Equiv. Index Value, cwt.	75.72	99.30	102.76
Hogs, US 1-2, 220-230 lb Sioux Falls, SD, cwt.	35.95	*	36.00
Feeder Pigs, US 1-2, 40-45 lb Sioux Falls, SD, hd.	*	*	*
Vacuum Packed Pork Loins, Wholesale, 13-19 lb, 1/4" Trim, Cent. US, cwt.	105.50	105.35	105.94
Slaughter Lambs, Ch. & Pr., 115-125 lb Sioux Falls, SD, cwt.	81.00	79.60	85.38
Carcass Lambs, Ch. & Pr., 1-4, 55-65 lb FOB Midwest, cwt.	165.00	172.00	182.00
Crops, Cash Truck Prices for Date Shown			
Wheat, No. 1, H.W. Omaha, bu.	2.58	2.84	2.76
Corn, No. 2, Yellow Omaha, bu.	1.79	1.78	1.60
Soybeans, No. 1, Yellow Omaha, bu.	5.26	4.43	4.24
Grain Sorghum, No. 2, Yellow Kansas City, cwt.	3.25	3.23	3.06
Oats, No. 2, Heavy Sioux City, IA , bu.	*	1.27	1.11
Hay, First Day of Week Pile Prices			
Alfalfa, Sm. Square, RFV 150 or better Platte Valley, ton.	90.00	87.50	86.00
Alfalfa, Lg. Round, Good Northeast Nebraska, ton.	55.00	*	*
Prairie, Sm. Square, Good Northeast Nebraska, ton.	70.00	*	57.50

* No market.

There is currently considerable speculation and concern over the possibility of using reduced groundwater pumping to augment stream flow. This option has been raised as a possibility for helping Nebraska meet its compact obligations on the Republican River and as a means of providing part of the instream flow needs in the Big Bend reach of the Platte. The merits of this option depend on hydrology, value judgements regarding property rights and entitlements and on the economic cost of reduced pumping. This paper addresses only the question of economic cost.

The major economic cost of meeting policy goals through reduced pumping is the amount of farm income foregone. A recent study of the Frenchman Creek watershed suggests that this cost depends on how the policy is implemented, as well as on circumstances such as climate, irrigation system type, soils, pumping depth, crop prices and grain yields.

These economic costs were estimated for the Frenchman Creek area using a linear programing methodology. Irrigated agriculture in the region was defined in terms of two irrigation system types, sprinkler and gravity; three soils, sandy, silt loam and silt; and two water sources, surface water and groundwater pumped from a depth of 125 feet. These resources were used to produce four major irrigated crops; corn, soybeans, milo and wheat.The dryland crops considered were continuous corn, milo and wheat, a corn-soybean rotation and a fallow-wheat-corn rotation. The crop prices used were $2.49, $5.80, $2.28 and $3.42 for corn, soybeans, milo and wheat, respectively, which is the average of prices received

in Nebraska for 1990 to 1995. Grain yields at different water application levels were simulated using a crop growth model called EPIC, which was developed by the Agricultural Research Service, USDA.

The technical and economic feasibility of augmenting stream flow through reduced pumping depends substantially on the hydrology. The groundwater aquifer must be linked to the stream such that reduced pumping results in a timely increase in stream flow. For purposes of this analysis it was assumed that stream flow was reduced by one acre foot for each acre foot of groundwater that was consumed through evapotranspiration. Groundwater pumped but not consumed was assumed to have no net impact on stream flow. The results would be very different if each acre foot of consumed groundwater had less than a one acre foot impact on stream flow, or if some of the water which was pumped but not consumed was lost to the hydrologic system.

The results of the analysis suggest that it would cost between $40 and $150 per acre foot to augment stream flow by reducing groundwater pumping in the Frenchman Creek watershed, depending on how much reduction was desired and on what policy was used to produce the desired result. If stream flow was augmented by purchasing irrigation rights, i.e., retiring irrigated land, and if the purchasing agent succeeded in buying the least valuable irrigation rights in the region without paying more than they were worth to the farmer, the cost would be approximately $45 per acre foot of consumptive use. The average cost of irrigation rights was estimated to rise to over $100 per acre foot of consumptive use if it became necessary or desirable to acquire 25 percent or more of the stream linked groundwater irrigated land in the watershed.

If stream flow was augmented by regulating groundwater pumping, however, the economic costs would be much higher. It was estimated that even a small augmentation would cost more than $140 per acre foot of consumed water if it was achieved by restricting gross pumping in the watershed. This is because initially you would have to reduce gross pumping by over four acre feet in order to get a one acre foot change in consumptive use or stream flow. It is also because the regulatory approach forces all alluvial groundwater irrigators to cut back, whereas the purchase of irrigation rights would reallocate only the least valuable irrigation water to stream flow.

Although these results are for only one situation, they do suggest that reducing groundwater pumping to augment stream flow would be quite expensive and that water policy changes, such as the establishment of water markets, may be necessary if Nebraska is to meet stream flow needs at least cost and in a fair and equitable manner.

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