Short Communication

Indian Journal of Animal Sciences 69 (3) : 204-206, March 1999

Using Mishan's normalization procedure to analyze benefits and costs for catfish farms using recirculating ponds

WILLARD C LOSINGER[1] and RAJAN K SAMPATH[2]

Colorado State University, Fort Collins, Colorado 80523 USA

Received: 28 April 1998; Accepted: 11 August 1998

Key words : Aquaculture, Benefit-cost analysis, Catfish production, Mishan's normalization procedure (MNP)

A serious problem posed to the catfish industry in the United States is off-flavor of catfish (Lambregts *et al.* 1993), which occurs when certain compounds produced by algae in the ponds are absorbed by the catfish. The catfish cannot be marketed as long as the off-flavour persists. Carp can eat the algae and reduce the incidence of off-flavour in catfish. Realizing this, some producers place carp in their catfish ponds to combat the off-flavor problem.

Lambregts *et al.* (1993) studied recirculating systems, such that water was moved from ponds containing catfish to ponds containing carp (or similar fish species), and then back to the ponds containing the catfish. This was thought to reduce the incidence of off-flavor in catfish considerably.

For small (403 ha), medium (798 ha), and large (1588 ha) catfish farms with recirculating ponds in the upper Texas coast, Lambregts *et al.* (1993) reported internal rates of return of 0.150, 0.183, and 0.219, respectively, over a 10-year-period. However, they did not report a comparison between catfish farms with the recirculation system and catfish farms without the circulation system.

A number of limitations of the internal rate of return as a decision criterion have been noted. For one thing, a project destined to go on for 10 years may have multiple solutions for the internal rate of return. Moreover, the internal rate of return may yield results inconsistent with other decision criteria such as the Net Present Value criterion and the benefit/cost ratio (Sassone and Schaffer 1978). This is particularly so when the initial outlays involved in the investment alternatives are different.

Mishan's normalization procedure yields project rankings which are consistent, whether examining the normalized net terminal value, normalized net present value, or normalized internal rate of return (Mishan 1971).

Present address: [1]Ph. D. Student, [2]Professor, Department of Agricultural and Resource Economics.

The conditions for normalization are:

1. Equal or common outlay for all projects;
2. Reinvestment opportunities are specified and fully used; and
3. Common time period for investment.

The objective of this study was to apply Mishan's normalization procedure to data reported for cash flows for small, medium, and large catfish farms to determine whether the data suggest that a producer would really be better off with the recirculation system.

Table 1. Net cash flows and terminal values for small catfish farms (403 ha) on the upper Texas coast, 1991, for a 10-year planning horizon, using and not using a recirculation system

Year	With a recirculation system		Without a recirculation system	
	Cash flow	Terminal value	Cash flow	Terminal value
	$1 000			
1991	-764	-3,091	-764	-3 091
1992	-100	-352	-100	-352
1993	0	0	0	0
1994	87	352	77	205
1995	234	541	206	476
1996	139	280	122	245
1997	164	287	144	252
1998	101	154	89	135
1999	0	0	0	0
2000	154	177	136	156
2001	2 292	2 292	2 402	2 402
	640	428		

Source: Lambregts *et al.* (1993).

$33 000 not spent on pond pumps for the recirculation system in 1991 was assumed invested elsewhere at 15% interest and redeemed in 2001. Cash flows from the catfish farm are reduced 12% each year from 1993 to 2000 to reflect expected losses due to off-flavor for the catfish farms without the pond pumps. Net worth of the farm in 2001 is assumed to be the same for both farms.

Table 2. Net cash flows and terminal values for medium catfish farms (798 ha) on the upper Texas coast, 1991, for a 10-year planning horizon, using and not using a recirculation system

Year	With a recirculation system		Without a recirculation system	
	Cash flow	Terminal value	Cash flow	Terminal value
	$1 000			
1991	-1 433	-5 797	-1 433	-5 797
1992	-100	-352	-100	-352
1993	0	0	0	0
1994	274	729	241	641
1995	416	962	366	847
1996	343	690	301	605
1997	291	509	256	448
1998	500	760	440	669
1999	0	0	0	0
2000	395	454	345	397
2001	3 468	3 468	4 140	4 140
		1 423		1 598

Source: Lambregts *et al.* (1993).

$67 000 not spent on pond pumps for the recirculation system in 1991 was assumed invested elsewhere at 15% interest and redeemed in 2001. Cash flows from the catfish farm are reduced 12% each year from 1993 to 2000 to reflect expected losses due to off-flavour for the catfish farms without the pond pumps. Net worth of the farm in 2001 is assumed to be the same for both farms.

Table 3. Net cash flows and terminal values for large catfish farms (1,588 ha) on the upper Texas coast, 1991, for a 10-year planning horizon, using and not using a recirculation system

Year	With a recirculation system		Without a recirculation system	
	Cash flow	Terminal value	Cash flow	Terminal value
	$1 000			
1991	-2 695	-10 903	-2 695	-10 903
1992	-100	-352	-100	-352
1993	31	95	27	83
1994	798	2 123	702	1 867
1995	951	2 200	837	1 936
1996	929	1 867	818	1 645
1997	776	1 357	683	1 195
1998	923	1 404	812	1 235
1999	0	0	0	0
2000	884	1 017	778	895
2001	6 680	6 680	8 000	8 000
		5 488		5 601

Source: Lambregts *et al.* (1993).

$100 000 not spent on pond pumps for the recirculation system in 1991 was assumed invested elsewhere at 15% interest and redeemed in 2001. Cash flows from the catfish farm are reduced 12% each year from 1993 to 2000 to reflect expected losses due to off-flavour for the catfish farm without the pond pumps. Net worth of the farm in 2001 is assumed to be the same for both farms.

Net cash flows projected by Lambregts *et al.* (1993) over a 10-year-period were used in this analysis. The base year was 1991. The owners/investors were assumed to receive dividends on 31 December of each year, and the farms were assumed to be managed by professional managers compensated by a fixed salary (Lambregts *et al.* 1993). The income received during the terminal year was computed from the internal rates of return and the cash flows given by Lambregts *et al.* (1993) for the first 9 years.

To compare net terminal values for catfish farms with and without the recirculation system, the only initial difference between the 2 systems was assumed to be the construction of pond pumps for the recirculation system. Lambregts *et al.* (1993) gave the costs of pond pumps in 1991 as $33,000, $67,000, and $100,000 for the small, medium, and large farms respectively. To give each system a common initial outlay, money not spent on pumps was assumed invested at a 15% rate of return, redeemed in 2001. Since Kinnucan *et al.* (1988) estimated that elimination of off-flavor would have short-run social welfare gains equivalent to 12% of catfish farm revenue, net cash flows were reduced 12% per year from 1993 through 2000 to approximate the cash flows for catfish farms without the recirculation system. The net worth of the farm at the end of the planning period was assumed to be the same whether the pond pumps were installed initially or not (i.e., the pumps were assumed to have no salvage value after 10 years).

The terminal value (in 2001) of income for each year was computed as where I_i represents the income received in year i. The 15% discount rate was suggested by Lambregts *et al.* (1993). The net terminal value was calculated by summing the individual terminal values across the 10-year–period.

The net terminal values with and without investing in pumps for the recirculation system were compared for the 3 farm sizes. Net terminal values were then computed using a 15% discount rate and compared.

Comparison of net terminal values between investing in a recirculation system versus not investing in a recirculation system revealed that investing in a recirculation system was superior to not investing in a recirculation system for a small catfish farm (Table 1). For a medium- and large-sized farm, it was better not to invest in the recirculation system (Tables 2 and 3).

Lambregts *et al.* (1993) stated that the investments necessary for farms using recirculating ponds were nearly double to those of equal sized farms with static ponds in Mississippi. In the comparisons presented here, the only difference in cost was assumed to be the cost of pumps. Even then, it seemed that the owner of a medium or large catfish farm was better off not buying the pumps for the recirculation system.

As Lambregts *et al.* (1993) stated, if the net worth of the farms were not included in the calculations of internal rate of

return, the internal rates of return would have been lower. In this study, the income in the terminal year (which included the net worth of the farms) accounted for a rather large portion of the profitability measures.

Given the fact that there is very little demand for carp and other filter-feeding fish (that would be raised in the treatment ponds), if a large number of catfish farmers started raising these kinds of fish (primarily for use in the treatment ponds), an excess supply of these kinds of fish would probably face catfish farmers very quickly. Perhaps fish-meal or petfood markets could be developed. Still, it doesn't seem that, in the short run at least, raising carp (or other species) will be as profitable as raising catfish. However, diversifying investments (raising both catfish and carp) may reduce risk somewhat (i.e., if all the catfish die from some new disease, the producer may at least be able to market the carp).

Someone contemplating entering the catfish business needs to take all information into account before beginning. The projected net cash flows are plausible guideposts at best--nothing can really be predicted with certainty. From the data, it appears that owners of medium and large catfish farms may in fact be better off not investing in pumps for a recirculation system.

REFERENCES

Kinnucan H, Sindelar S, Winehold D and Hatch U. 1988. Processor demand and price-markup functions for catfish: A disaggregated analysis with implications for the off-flavor problem. *Southern Journal of Agricultural Economics* **80** (4):81-91.

Lambregts J A D, Griffin W L, Lacewell R D, Davis J T and Clary G M. 1993. Estimated costs and returns for catfish farms with recirculating ponds along the upper Texas coast. *Journal of Agricultural and Applied Economics* **25** (2):1-12.

Mishan E J. 1971. *Cost-Benefit Analysis: An Introduction*. Praeger Publishers. New York.

Sassone P G and Schaffer W A. 1978. *Cost-Benefit Analysis: A Handbook*. Academic Press, New York.