Cost Structure of Swine Farms under Rashtriya Krishi Vikas Yojana (RKVY) Project

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ABSTRACT

The cost struture and returns of surine sparms was studied during 2009-10, 2010-11 and 2011-12 at S V V U, Tirupati, under RKVY porject. It was found that the total costs of swine farms per unit decreased from Rs.36,070 to Rs.27,888 from first year to third year. The pattern of returns indicated that the net returns ranged from Rs.7442 to Rs.26741 per unit during the period of study. The returns per rupee of outlay have risen from 1.21 in first year to 1.96 in third year. The Net Present Worth (NPW) and Benefit-Cost ratio of the enterprise were Rs.2,15,247 and 1.27, respectively at 12% discount rate. Internal rate of return (IRR) stood at 99.36%.

Key words : BCR, IRR, NPW, RKVY, Swine farms.

The Government of India considered the need to rejuvenate agriculture and allied activities like Animal Husbandry. Accordingly the National development Council (NDC) resolved that Agricultural developmental strategies must be reoriented to meet the needs of farmers and called upon the central and state governments to evolve a strategy to reinforce agriculture. The NDC reaffirmed its commitment to achieve 4% annual growth in the agricultural sector during the 11th plan and resolved to introduce a new additional central assistance scheme namely Rashtriya Krishi Vikas Yojana (RKVY) to incentivize states to draw up plans for their agriculture sector more comprehensively, taking agro climatic conditions, natural resource issues and technology into account and integrating livestock, poultry and fisheries more fully. State Agriculture Department was designed as the Nodal Department. For fast-track implementation, states may notify or create an agency to implement the RKVY.

Accordingly, the Government of Andhra Pradesh has identified Sri Venkateswara Veterinary University (SVVU) as one of the agencies to implement the RKVY project. As a part of RKVY Programme a model pig unit has been established by the university at All India Co-ordinated Research Project (AICRP) on pigs at Tirupati to supply superior germplasm of Large White Yorkshire crossbred pigs to the pig farmers that aims in improvement of socio-economic status of downtrodden rural poor. The present study aims at studying costs and returns from the enterprise.

MATERIAL AND METHODS

The chief mandate of the Rashtriya Krishi Vikas Yojana (RKVY) project located at AICRP on Pigs, Tirupati is to supply superior germ plasm of Large White Yorkshire crossbred breeder pigs to the needy farmers of the state.

Desired number of weaner pigs as per the availability are distributed to the interested farmers on subsidized cost along with other inputs like concentrate feed, medicines and vaccines. The project takes sufficient care to crosscheck the facilities available with the beneficiaries like housing, water, feeding, availability of labour *etc*. In addition minimum training in feeding, breeding and other routine farm operations are imparted to the beneficiaries. They are properly advised about the importance of record keeping.

From among the 120 beneficiaries of the RKVY project who were supplied with the breeder pigs from the 2009-10 onwards, a total number of 30 beneficiaries were purposively selected as sample for the study. This number was based on the criterion that they should have completed a minimum period of 3 years in running the enterprise. The beneficiaries selected represented the districts of Chittoor, Nellore, Kadapa and Kurnool of Andhra Pradesh State.

Investment analysis

Capital investments made in livestock projects are divided into different time periods and returns are also spread over time. In order to assess the returns from investment, available alternatives

must be weighed for different lengths of time in respect of costs and returns *i.e.,* recognition of time value of money, profitability and economic viability of capital investment.

Net Present Worth (NPW)

This is simply the present worth of the cash flow stream. Sometimes, it is referred to as Net Present Value (NPV). The choice of discount rate to be used in the measurement of Net Present Worth (NPW) poses many problems. NPW is helpful in working out benefit- cost ratio of the project. The selection criterion of the project depends upon the positive value of the NPW when discounted at the opportunity cost of the capital. This could be satisfactorily done provided that there is a correct estimate of opportunity cost of capital. NPW is an absolute measure but not relative (Subba Reddy and Raghu Ram 2005).
NPW of the project is estimated using the following equation:

$$NPW = \frac{P1}{(1+i)^t_1} + \frac{P2}{(1+i)^t_2} + \ldots\ldots + \frac{Pn}{(1+i)^t_n}$$

Where,
P_1 = Net cash flow in the first year
i= Discount rate
t= Time period
c = Initial cost of the investment

Projects with positive NPW are given weightage in the selection compared to those with negative present values, while zero NPW makes the investor indifferent.

Benefit – Cost Ratio (B-C Ratio)

We compare the present worth of costs with present worth of benefits. Absolute value of the benefit-cost ratio will change based on the interest rate chosen. While ranking the projects depending upon the B-C ratio, the most common procedure of selecting projects is to choose the projects having B-C ratio of more than 1 when discounted at opportunity cost of capital.

Finally, the given project is opted for implementation among the available alternatives based on the highest B-C ratio. Following formula shows the estimation of B-C ratio (Subba Reddy and Raghu Ram 2005).

$$B – C \text{ ratio} = \frac{\sum_{t=1}^{n} \frac{Bt}{(1+r)^n}}{\sum_{t=1}^{n} \frac{Ct}{(1+r)^n}}$$

Where, Σ Bt= Sum of benefits
Σ Ct= Sum of the costs
r = Rate of interest
n = Number of years

Internal Rate of Return (IRR)

In the computation of internal rate of return, the time value of money is accounted. The method of working IRR provides the knowledge of actual rate of return from the different projects. Thus IRR is known as marginal efficiency of capital or yield on the investment. It is the discount rate at which the present values of the net cash flows are just equal to zero, *i.e.* NPW = zero. When NPW is set equal to zero, the equation is solved for 'i'. This is the internal rate of return. The IRR must be found out by trail and error method with some approximation.

In the working procedure, an arbitrary discount rate is assumed and its corresponding NPW is arrived at. The positive NPW value of the project indicates that IRR is still higher and the next assumed arbitrary IRR value must be comparatively higher than the initial level and this process is continued until NPW value becomes negative. Then by interpolation method the exact IRR is found out using the following formula. (Subba Reddy and Raghu Ram 2005).

$$\begin{bmatrix} internal \\ rate\ of \\ return \end{bmatrix} = \begin{bmatrix} Lower \\ discount \\ rate \end{bmatrix} + \begin{bmatrix} Difference \\ between\ the\ 2 \\ discount\ rates \end{bmatrix} \frac{preset\ worth\ of\ the\ cash\ flow\ at\ the\ lower\ discount\ rate}{absolute\ difference\ between\ the\ present\ worths\ of\ the\ cash\ flow\ at\ the\ 2\ discount\ rates}$$

RESULTS AND DISCUSSION

Cost structure on production of swine farms

Among all the total costs human labour was the highest cost factor of pig rearing, which stood highest at around 39 per cent reflecting the importance of labour component in the management of enterprise (Table 1). Hired labour was found to be relatively a major source in the total labour requirement. These findings was in agreement with the observations made by Nandakarni *et al.,* (1983).

Table 1. Cost structure on production of Swine farms.

Items	1st year			2nd year			3rd year		
	Rs. / farm	Rs. / unit*	%	Rs. / farm	Rs. / unit*	%	Rs. / farm	Rs. / unit*	%
Variable costs									
a) Family labour	35,870	5,636	15.63	42,335	5,007	15.60	42,801	4,281	15.35
b) Hired labour	55,000	8,643	23.96	66,796	7,900	24.62	67,527	6,753	24.21
Total human labour	90,869	14,279	39.59	1,09,131	12,908	40.23	1,10,328	11,033	39.56
Cost of garbage	32,600	5,123	14.20	43,148	5,103	15.90	46,810	4,681	16.78
Cost of conc. Mix	3,000	471	1.31	3,662	433	1.35	4,320	432	1.55
Veterinary expenditure	5,700	896	2.48	9,493	1,123	3.50	12,233	1,223	4.38
Electricity (water and refrigerator)	5,850	919	2.55	6,890	815	2.54	8,490	849	3.04
Auto (fuel) and tricycle maintenance	24,683	3,879	10.75	31,817	3,763	11.73	35,860	3,586	12.86
Slaughter expenditure	4,200	660	1.83	6,407	758	2.36	7,320	732	2.62
Wages to sales boy	2,883	453	1.26	3,233	382	1.92	3,617	362	1.30
Rent to sales counter	4,773	750	2.08	6,317	747	2.33	6,833	683	2.45
Interest on working capital	8,337	1,310	3.63	10,686	1,264	3.94	11,594	1,159	4.15
Total variable costs	1,82,895	28,740	79.68	2,30,784	27,296	85.07	2,47,405	24,740	88.71
Fixed costs									
Insurance charges @ 4%	267	42	0.12	333	39	0.12	230	23	0.08
Initial value of swine stock	25,067	3,939	10.92	19,417	2,297	7.16	12,667	1,267	4.54
Depreciation									
House / shed	13,778	2,165	6.00	13,778	1,630	5.08	12,718	1,272	4.56
Refrigerator	644	101	0.28	644	76	0.24	594	59	0.21
Auto / tricycle	2,090	328	0.91	2,090	248	0.77	1,900	190	0.68
Electric motor & pipes	383	60	0.17	383	45	0.14	345	34	0.12
Feed & water troughs	183	29	0.08	183	22	0.07	160	16	0.06
Total	42,412	6,664	18.48	36,828	4,357	13.57	28,614	2,861	10.26
Interest on fixed capital	4,241	666	1.85	3,682	435	1.36	2,861	286	1.03
Total fixed costs	46,653	7,330	20.32	40,510	4,792	14.93	31,475	3,147	11.28
Total costs (T.V.C+T.F.C)	2,29,548	36,070		2,71,294	32,088		2,78,880	27,888	

    *   10 Sows + 1 boar

Table 2. Evaluation of certain productive and reproductive parameters.

	1st year	2nd year	3rd year	Average
Farrowing frequency per year	1.33	1.72	1.55	1.53
Average Litter size	6.50	7.20	6.90	6.86
No. of piglets born per sow in a year	8.64	12.38	10.69	10.57
Farrowing Rate	62.85	70.75	68.25	67.28
Sex Ratio(Male: Female)	47:53	51:49	49:51	49:51
Mortality (%)				
Sows	1.68	1.75	1.12	1.51
Boars	0.50	1.02	0.28	0.60
Piglets	14.10	15.18	15.05	14.77
Weaners	4.85	4.51	3.67	4.34
Total Mortality	21.13	22.46	20.12	21.23

Table 3. Returns from swine farming.

Items	1st Year			2nd Year			3rd Year		
	Rs./farm	Rs./unit	%	Rs./farm	Rs./unit	%	Rs./farm	Rs./unit	%
Appreciation on the value of the animals at the end of the year	9,300	1,461	3.36	4,150	491	0.89	5,085	508	0.93
Value of the sold animals	1,09,193	17,159	39.43	1,89,378	22,399	40.52	2,40,443	24,044	44.02
Slaughter	1,56,070	24,525	56.35	2,70,178	31,956	57.81	2,96,593	29,659	54.29
Manure	2,333	367	0.84	3,667	433	0.78	4,167	417	0.76
Gross Returns	2,76,897	43,512	100	4,67,373	55,281	100	5,46,288	54,629	100
Total costs	2,29,548	36,070		2,71,294	32,088		2,78,880	27,888	
Net Returns	47,349	7,442		1,96,079	23,193		2,67,408	26,741	
Returnsper Rupee of investment or outlay	1.21	1.21		1.72	1.72		1.96	1.96	

Table 4. Break up of returns of swine farming.

Items	1st Year			2nd Year			3rd Year		
	Rs./farm	Rs./unit	%	Rs./farm	Rs./unit	%	Rs./farm	Rs./unit	%
Sows	21,839	3,432	20.00	20,832	2,464	11.00	45,684	4,568	19.00
Boars	23,487	3,691	21.51	17,044	2,016	9.00	73,311	7,331	30.49
Piglets	27,298	4,290	25.00	47,363	5,602	25.01	60,110	6,011	25.00
Weaners	36,569	5,746	33.49	1,04,139	12,317	54.99	61,338	6,134	25.51
Total	1,09,193	17,159	100	1,89,378	22,399	100	2,40,443	24,044	100

Table 5. Estimation of Net Present Worth at 12% discount rate.

Years	Costs (Rs.)	Returns (Rs.)	Net Income (Rs.)	Discount Factor at 12%	NPW (Rs.)
1st Year	4,57,892	2,76,897	-1,80,995	0.8929	"1,61,610
2nd Year	2,50,201	4,673,73	2,17,172	0.7972	1,73,129
3rd year	2,60,072	5,46,288	2,86,216	0.7118	2,03,728
				NPW	2,15,247

Table 6. Estimation of Net Present Worth at 18% discount rate.

Years	Costs (Rs.)	Returns(Rs.)	Net Income (Rs.)	Discount Factor at 18%	NPW (Rs.)
1st Year	4,57,892	2,76,897	-1,80,995	0.8474	-1,53,375
2nd Year	2,50,201	4,67,373	2,17,172	0.7182	1,55,973
3rd year	2,60,072	5,46,288	2,86,216	0.6086	1,74,191
				NPW	1,76,789

Table 7. Estimation of Net Present Worth at 24% discount rate.

Years	Costs (Rs.)	Returns (Rs.)	Net Income (Rs.)	Discount Factor at 24%	NPW (Rs.)
1st Year	4,57,892	2,76,897	-1,80,995	0.8064	-1,45,954
2nd Year	2,50,201	4,67,373	2,17,172	0.6504	1,41,249
3rd year	2,60,072	5,46,288	2,86,216	0.5245	1,50,120
				NPW	1,45,415

Table 8. Estimation of Benefit-Cost Ratio at 12% discount rate

Years	Costs (Rs.)	Returns (Rs.)	Discount Factor at 12%	Present worth of costs (Rs.)	Present worth of returns (Rs.)
1st Year	4,57,892	2,76,897	0.8929	4,08,852	2,47,241
2nd Year	2,50,201	4,67,373	0.7972	1,99,460	3,72,590
3rd year	2,60,072	5,46,288	0.7118	1,85,119	3,88,848
Total	-	-	-	7,93,431	10,08,679

Benefit-cost Ratio = Present worth of returns / Present worth of costs = 1.27

Cost of garbage was yet another major cost factor recording 14 per cent of the total cost. Under intensive system of rearing, feeding of garbage was a major component procured from student's hostels, hotels and restaurants. Maintenance of autos and tricycle was other item of expenditure which accounted for 11 per cent. Depending upon the size of establishment, the rearers either maintained auto or tricycles for procuring and transporting the garbage.

Other items of expenditure among the variable costs were slaughter charges, electricity charges, wages to sales boy, rent paid to sales counter *etc*. This trend suggested that with increase in the herd size, per unit variable costs tended to decrease.

Among the fixed costs, initial value of swine stock was the major item accounting for 10 per cent. Depreciation on buildings, machinery and equipment was the other component of fixed cost. Insurance charges were mostly confined to the bank borrowers who have to necessarily insure their flock while non borrowers did not insure their animals. Total costs per unit were Rs.36070,

Table 9. Estimation of Benefit-Cost Ratio at 18% discount rate.

Years	Costs (Rs.)	Returns (Rs.)	Discount Factor at 18%	Present worth of costs (Rs.)	Present worth of returns (Rs.)
1st Year	4,57,892	2,76,897	0.8474	3,88,018	2,34,642
2nd Year	2,50,201	4,67,373	0.7182	1,79,694	3,35,667
3rd year	2,60,072	5,46,288	0.6086	1,58,279	3,32,471
Total	-	-	-	7,25,992	9,02,780

Benefit-cost Ratio = Present worth of returns / Present worth of costs = 1.24

Table 10. Estimation of Benefit-Cost Ratio at 24 % discount rate.

Years	Costs (Rs.)	Returns (Rs.)	Discount Factor at 24%	Present worth of costs (Rs.)	Present worth of returns (Rs.)
1st Year	457892	276897	0.8064	369244	223290
2nd Year	250201	467373	0.6504	162731	303979
3rd year	260072	546288	0.5245	136408	286528
Total	-	-	-	668383	813797

Benefit-cost Ratio = Present worth of returns / Present worth of costs = 1.21

Table 11. Estimation of Internal Rate of Return.

Years	Costs (Rs.)	Gross Income (Rs.)	Net Income (Rs.)	Discount Factor at 95%	Net present worth (Rs.)	Discount Factor at 100%	Net present worth (Rs.)
1st Year	4,57,892	2,76,897	-1,80,995	0.5128	-92,814	0.5	-90,497
2nd Year	2,50,201	4,67,373	2,17,172	0.263	57,116	0.25	54,293
3rd year	2,60,072	5,46,288	2,86,216	0.1349	38,610	0.125	35,777
					2912		-427

IRR=95+5[2912/2912+427]   IRR=95+5[2912/3339] = 99.36%

Rs.32088 and 27888 in the first, second and third years, respectively.

Evaluation of certain productive and reproductive parameters

The farrowing frequency varied from 1.33 to 1.72 during the three years under the study with an average of 1.53, which is a normal feature of pig farming (Table 2).

Average litter size of 6.86 under field conditions was a normal observation in the enterprise. Number of piglets per sow in a year varied from 8.64 to 10.67 with an average of 10.57 which is also a normal feature as well. Farrowing rate observed among the sample farmers was 62.85 in the first year, 72.75 in the second year and 68.25 in the third year, with an average value of 67.28 reflecting reasonably good breeding management.

The ratio of male to female was almost similar in all the 3 years. Total mortality was recorded around 20 per cent and piglets accounted for greater percentage of mortality. Comparatively higher mortality in piglets is not uncommon under field conditions of pig rearing.

Returns from swine farming

Reveals that sale of pork was the main source of income accounting for more than 50 per cent, while the income generated from sale of animals was the other source. The disposed animals were either meant for consumption or as breeding stock (Table 3).

Appreciation of the unsold animals at the end of the year was a minor source of income to the extent of 0.89 to 3.66 per cent. Pig manure was also other source, but, it was lesser in terms of income. The income per farm and per unit was found to increase with the time. Increase in returns per farm was evidently due to the increase in flock size through additions by way of births. Returns per rupee of investment or outlay were found to increase with the time as it was 1.21 during 1st year, 1.72 in 2nd year and 1.96 in the 3rd year. These results were in line with the findings of Selvakumar *et al.,* (1993).

Break up of returns of swine farming

Returns from the sale of animals was 2nd highest major source of income in swine farming (Table 4). When this income was split up, it was found that sale of sows and piglets together accounted for greater part of the income standing at 45 to 47 per cent. Next source of income was weaners, more specifically male weaners normally meant for either breeding or fattening. Finally, the sale of boars was yet another source occupying nearly 25 per cent of the income. Boars of good breeding characters were retained by the buyers and rest were used for slaughter.

The income from such sales was up to the extent of 21.51 per cent, 9.00 per cent and 30.49 per cent in the corresponding years. These observations were in agreement with Selvakumar *et al.,* (1987).

Investment analysis
Net present worth (NPW)

Reveals that NPW of the project at 12 % discount rate worked out to Rs.2,15,247, while the NPW at 18% and 24% was Rs.1,76,789 and Rs.1,45,415, respectively. The positive NPW value even at higher discount rates indicated that the enterprise is a profitable venture (Table 5, 6 and 7).

Benefit-Cost Ratio

The benefit cost ratio was 1.27 at 12% discount rate. Benefit-cost ratios were also estimated at 18 per cent and 24 per cent discount factors and it was found to be 1.24 and 1.21 respectively which indicated the economic viability of the project (Table 8, 9 and 10). Similar findings

of B-C ratio were reported by Selvakumar *et al.,* (1989), Ezeibe (2010), Oguniyi and Omoteso (2011).

The study on the costs and returns aspects of swine farm in the selected area has revealed that the total costs per unit tended to decrease with passage of time, while the net returns indicated a positive trend with the passage of time. The NPW was positive, B-C ratio was more than 1 and IRR was 99.36% showing the economic viability of the project. The sensitivity analysis which was applied varying with the discount factor from 18 per cent to 24 per cent have also amply demonstrated that this project is viable even at higher rates of discount thereby demonstrating the risk absorbing capacity.

LITERATURE CITED

Ezeibe A B C 2010 Profitability analysis of pig production under intensive management system in Nsukka local government area of Enugu state, Nigeria. *International Journal of Economic Development research and Investment,* Vol. 1Nos. 2 and 3.

Nandakarni U G, Somayazulu L B S, Jain T B, Gupta H C and Agarwal S C 1983 Cost of maintenance of pigs. *Indian Journal of Animal Sciences,* 53(8): 858-864.

Ogunniyi L T and Omoteso O A 2011 Economics analysis of swine production in Nigeria: A case study of Ibadan zone of Oyo state. *Journal of Human Ecology,* 35(2): 137-142

Selvakumar K N 1987 Economics of Large White Yorkshire production - A micro analysis in Coimbatore district. Published M.Sc thesis. TNAU.

Selvakumar K N, Prabaharan R. and Sundaresan R 1989 An investment analysis of swine production. *Financing agriculture,* 21:1, 13-15.ref.

Selvakumar K N, Prabaharan R and Sundaresan R 1993 Economics of Large White Yorkshire swine production in Coimbatore district of Tamilnadu state. *Indian Veterinary Journal,* 1993. 70:10, 942-944. ref.

Subba Reddy S and Raghu Ram P 2005 Agricultural Finance and Management. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.