SOCIO-ECONOMIC IMPACT ASSESSMENT OF MAIZE PRODUCTION TECHNOLOGY ON FARMERS' WELFARE IN SOUTHWEST, NIGERIA

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ABSTRACT

The study revealed that Internal Rate of Returns (IRR) of 62 % was estimated from investment made into maize technology, which are added values to the use of the technologies. It could therefore be concluded that maize technologies had contributed significantly to some dimensions of members' well-being and if technologies are adopted sustained with full use of recommended inputs, it can alleviate the problems of peasant farmers and will obviously boost food production, as well as meeting the goal of being self sufficient in food supply to the ever increasing population.

KEY WORDS: Socio-economic, impact, assessment, maize, and technology

DETAILED ABSTRACT

Coping with increased population is a major problem in developing countries of which Nigeria is one. Technologies are developed, disseminated and adopted at a cost. That is why it is imperative to investigate the general welfare and social well being of maize farmers as evidenced by their status relative to other farmers who do not adopt maize technologies. Both primary and secondary data were collected and analyzed using economic surplus approach.

The study revealed that Internal Rate of Returns (IRR) of 62 % was estimated from investment made into maize technology, which are added values to the use of the technologies. It could therefore be concluded that maize technologies had contributed significantly to some dimensions of members' well-being and if technologies are adopted sustained with full use of recommended inputs, it can alleviate the problems of peasant farmers and will obviously boost food production, as well as meeting the goal of being self sufficient in food supply to the ever increasing population. Therefore agricultural technologies developed and disseminated should meet farmers' socio- economic and environmental changing situations.

INTRODUCTION

Studies in maize production in different parts of the country (Nigeria) have shown an increasing importance of the crop amidst growing utilization by food processing industries and livestock feed mills. The crop has thus grown to be a local "cash crop" most especially in the Southwest part of Nigeria where at least 30 percent of the cropland has been put to maize production under various cropping system [3;7]. Growing maize in farms of 1 – 2 hectares can overcome hunger in the household and the aggregate effect could double food production in Africa [14].

However, if sown in a condition where this cannot be guaranteed, risk of yield losses may be higher than with local varieties. This study attempts to assess socio –economic impact of improved maize technology on farmers' welfare in Southwest , Nigeria.

Materials and Method

The study was carried out from three states namely Oyo, Osun and Ondo states out of 8 states in Southwest, Nigeria.

The economic impact assessment undertaken for analysis of sustained use of maze technology is an ex -post assessment, since the technologies are already with the farmers, at varying levels of adoption by the farmers over the years [15;8;7]. The method was originally used in the assessment of returns to maize in USA by [10]. It was also used by [11], by [2] and by [1] to estimate returns to investment for cassava research in Nigeria and also on the effect of technology change on farmers 'income in Oyo State, Nigeria.

Economic impact assessment is based on estimating the magnitude of cost reductions given the observed level of output and then making an adjustment for the change in quantity associated with the change in price.

ANALYTICAL TECHNIQUE

Economic impact assessment of research can be done through four approaches of

(i) indicator,
(ii) econometric,
(iii) programming and
(iv) economic surplus.

This study adopts economic surplus approach given its relative simplicity and lower demand for data. This impact assessment of maize research proposed in this study is an ex-post assessment since the technologies are already on the field, at varying levels of adoption by the farmers.

The data needed to calculate social gains fall into four broad categories namely:

(1) Market data on observed prices and quantities

(2) Agronomic evidence and costs of the technology being adopted

(3) Economic parameters on the market response to change (elasticities of supply and demand $\in$ and e)

(4) Research and extension costs incurred in obtaining the new technology.

The most fundamental data required for the impact assessment are the Price (P) and quantity (Q) of the soybeans that is affected by technology change. Data for price were obtained from CBN publication. Data on quantity of maize output over the years were sourced from the national statistics of CBN. For ex-post studies that use past prices, it is usually necessary to deflate them in order to remove the effects inflation by dividing the observed prices by consumer price index (CPI). The base period used is 1985 with CPI = 1.0. Therefore all observed prices were transferred into real prices at 1985 values.

Agronomic data on yield gains and adoption costs were procured from field trials and farm surveys. The field trials were conducted at IAR&T, Moor plantation and out stations. Information on adoption rates came from a combination of farm surveys and extension workers estimates.

Adoption rate (t) defined as the ratio of area on improved variety to total area on the crop in the area, was found and it served as an input in economic impact assessment determination. Information on adoption costs, which include value of labour, capital inputs provided by the respondents' households as well as purchased inputs such as fertilizers, seeds and chemicals required to obtain the yield increased associated with the new technology were procured from the surveyed households.

THEORETICAL FRAME WORK

An important step in economic impact assessment of technology development and promotion is the measurement of total social gain. In this study, this is done using economic surplus approach. The rational, is the technology adoption results in a rightward shift of supply curve from S to S^1. On the condition that a constant demand curve (DD) prevails, this results in a new equilibrium with lower price P^1 and an increased quantity demanded, Q^1 for the commodity (Figure 1)

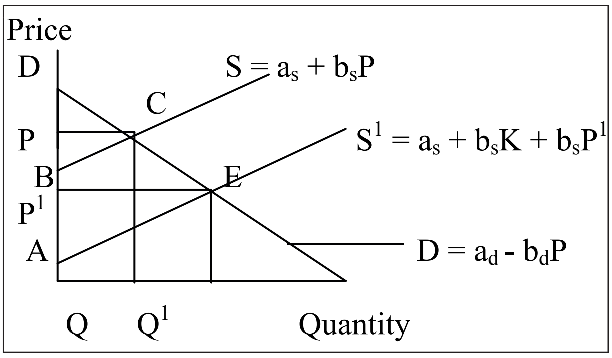

Figure 1: An ex-post economic impact assessment

Without the technology, the surplus represented by area ABCE would not have arisen. Economic qualification of the area measures the social gain arising from the technology adoption. Economic impact assessment is based on estimating the magnitude of cost reductions given the observed level of output and then making an adjustment for the change is quantity associated with the change in price.

The area representing the social gains (SG) as estimated by [2] is given by

$SG = kPQ - \frac{1}{2}kP\triangle Q$.

For an ex-post appraisal, where Q is the observed quantity produced of the commodity

$\triangle Q$ is the change in quantity caused by the technology and k is the vertical shift in supply.

Deduction of research and extension costs from social gains in a year would produce the net social gain for the year. Armed with suitable computer programme of spread sheet like Excel or Lotus 1-2-3, the Internal Rate of Return (IRR) on investments in the technology can be estimated from the flow of net social gains over years.

From the equation of Social Gain (SG), the P and Q is observable through a census of agriculture, from statistics estimates published by Central Bank of Nigeria (CBN) and Federal Office of Statistics (FOS). The unknown varieties, which must be estimated, are k and ΔQ. In order to calculate k and ΔQ we need first to estimate J, I and K parameters (J parameter can be defined as the total increase in production caused by adopting the new technology; I parameter may be defined as the increase in per-unit input costs required to obtain the given production increase (J) while K is the net reduction in production cost induced by the new technology which is the vertical shift in the supply curve) which are not directly observable but can be estimated in terms of research results of yield increases (dY), adoption cost (dC), adoption rates (t), total hectarage planted to the crop (A), total production (Q) and the overall average yield (Y = Q/A).

According to [2] the J-parameter is the total increase in production that would be caused by adopting the new technology, in the absence of any change costs or price and it is given as

$J = \Delta Y * t * A$.

Computing J-parameter in proportional terms, as the increase in quantity produced as a share of total quantity, we have

$j = J/Q$

This transformation permits us to estimate the supply shift parameter (j) in terms of the yield gains, adoption rates and the overall average yield level (Y) i.e.

$j = (\triangle Y * t)/Y$.

It is important to note that this is valid only if Y is defined as the overall average yield

$Y = Q/A$

The I-parameter is the increase in per unit input cost required to obtain the production increase J. It is therefore given as:

$I = \triangle C * t/Y$

Expressing I in proportional terms as a share of the product price P, the proportional cost increase parameter (c) is

$c = I/P = (\triangle C * t)/Y*P$

The K-parameter is the net reduction in production costs induced by the technology and can be obtained from combining the effects of increased productivity (J) and adoption costs (I). It corresponds to a vertical shift in the supply curve. Given J and I, it can be computed using the slope of the supply curve (b_s) as

$K = (J * b_s) - I$

The slopes of supply curves (b_s) are associated with units of measurement; therefore preference is for the use of supply elasticity ($\in$), which is independent of units of measurement.

$K = J/(\in Q/P) - I$

$K = [JP/\in Q] - I$

Using proportional terms i.e. the net-reduction in production cost as a proportion of the production price,

$k = K/P = [JP/\in QP] - I/P$

$= (j/\in) - c$

The change in quantity actually caused by technology ($\triangle Q$) depends on the shift in supply and the responsiveness of supply and demand. The equilibrium situation without technology would be that price and quantity, which satisfy both, demand and supply:

$Q_d = Q_s$

$a_{d\,+}\, b_d P = a_s + b_s P$

$P = (a_s - a_d) / (b_d - b_s)$

With technology , the equilibrium must be on a new supply curve, that is shifted in the direction of a price increase:

$Q_d = Q_s$

$a_d + b_d P^1 = a_s + b_s K + b_s P^1$

$P^1 = (a_s - a_d + b_s K)/ (b_d - b_s)$

The resulting change in price is:

$\triangle P = -b_s K/(b_d - b_s) = b_s K/(b_s+b_s)$

And hence the change in quantity is

$\triangle Q = b_d \triangle P$

$= b_d b_s K/(b_d+b_s)$

To substitute elasticities for slopes, assume elasticity of demand is e, then

$e = \%\triangle Q/\%\triangle P$

$= (\triangle Q/Q) / (\triangle P/P)$

$= (\triangle Q/\triangle P)\ (P/Q)$

$= b_d\ (P/Q)$

$\therefore\ b_d = e/(P/Q) = eQ/P$

Thus $\triangle Q = (eQ/P) \times (\in Q/P)\ K/[eQ/P) + [\in Q/P]$

$\triangle Q = e\in K\ (Q^2/P^2) / [(e + \in) \times (Q/P)]$

In proportional terms, this simplifies to:

$\triangle Q = Qe\in k/ (e+\in)$

The social gain earlier given as

$SG = kPQ \pm ½kP\triangle Q$

therefore becomes

$SG = kPQ \pm ½kP\ Qe\in k / (e+\in)$

$SG = kPQ \pm ½k^2PQe\in/(e+\in)$

Since k,P,Q,e, and $\in$ can be estimated or observed, the social gain from the technology adoption can be calculated . Deduction of research and extensive costs from social gain over the years will produce the flow of net social gain which should be expressed in constant value, and the internal rate of return can be estimated from the cash flow.

The social gains (SG) as estimated by [5] is given by

$SG = k \bullet P \bullet Q - 0.5 \bullet k \bullet p \bullet q.$

Deduction of research and extension costs from social gains in a year would produce the net social gain for the year. Armed with suitable computer programme of spread sheet like Excel or Lotus 1-2-3, the Internal Rate of Return (IRR) on investments in the technology can be estimated from the flow of net social gains over years.

RESULTS

From the study, an average yield of 1,850 kg/ha was estimated from the use of improved maize technological package. This gave a difference of 889 kg/ha in 1980 through 1990 and it increased to 1,076 kg/ha in 1991, 1,548 kg/ha in 1992 and dropped to 920 kg/ha in 2002 at a reduction of 41 percent from the expected yield. The price of maize varied from ₦2,500 / ton in 1980 to ₦ 35, 000/ha in 2002. (Table 1) (Please see the conversion rate below the table and at 1985 factor price)

A total area of 8,920 hectares was put to the cultivation of improved maize varieties in 1980 in the study area; it however increased to 85,000 hectares in 2002. An adoption rate of 9 percent was recorded in 1980 using [5] standard.

Adoption Rate (t) is calculated as proportion of the total hectare put to maize production improved and local varieties. It dropped to one percent in 1981 and later increased to 21 percent in 1982 and thereafter it increased to 90 percent in 2002.

The proportional increase in production of 0.86 was obtained in 1980 and 0.89 in 2002 (Table 2). An adoption cost or ₦316/ha was observed in 1980 that increased to ₦ 17, 858/ha in 2002. The real adoption cost calculated at 1985 constant gave a value of ₦770.7 in 1980 and ₦ 452.63 in 2002. A nominal price of ₦ 0.30 per kg was estimated for 1980 market price for (1 kg) of maize grain while the current price for 2002 was ₦62/kg (Table 3).

The proportional production cost increase due to the maize technology was calculated to be 0.10 in 1980 and 0.28 in 2002. (Table 3).

Estimated supply elasticity (∈) of 0.2 and 0.4 for demand elasticity were assumed at a constant level for the period. The K values (supply shift caused by the improved technology) of 0.043 and 0.447 in 1980 and 2002 respectively were calculated (Table 4). The social gains accrued from the adoption of maize technologies gave a value of ₦ 2.087million in 1980, which increased to ₦4588.118 million in 2002. When this was valued at 1985 constant price factor using 1985 consumer price index, ₦5.09 million was the real social gains in 1980 million in 2002 (Table 5).

A stream of net social gains was obtained after deduction of Research and Extension cost. The flow gave a net present value of (₦3, 102.93) at 20% interest rate. An Internal Rate of Returns (IRR) of 62 percent was obtained for the period under study (Table 6). The IRR of 62 percent is regarded as high according to [9] a value above 50 percent is very high which is an indication that there is under investment. Therefore it is recommended that the stakeholders should invest more into maize technology development, dissemination as well as its sustainability to ensure increased production and improved farmers well-being .

DISCUSSION

Internal rates of returns of 62 percent, was obtained for maize, technologies being the cost of money invested into development and dissemination of the technologies when these technologies are sustained. The benefits diffused over the whole population. The implication is that technologies are expected to improve the level of living of farmers that practiced and sustained them. The same was experienced in the study area, farmers that had adopted the whole package showed a significant difference. Increased output is a function of income and better living in the areas of better nutrition, better information accessibility and high socio- economic status.

It was also noted that k value of –1.75246 was recorded in 1984 in Table 4, similar negative values were experienced in Table 6 as net real social gains, The reasons might not be unconnected with economic depression and devaluation of naira during the period. This caused agricultural production to be stagnant. Inputs were above the reach of resource poor farmers, yet some resources were already allotted into development of the technology.

Improvements in technology, driven by application of scientific research to practical problems are at the heart of economic growth and development. However, the economic value of public investment in research may not be obvious. It is particularly difficult to observe the impact of agricultural research, because the benefits are diff-used over many years and to millions of dispersed producers and consumers.

Funds and resources allocated to agricultural research and development (R&D) are not available for use in other-productive activities. Agricultural R&D therefore has a real cost to the society because of forgone alternatives. The economic aspect of the project evaluation requires a determination of the likelihood that the project contributes significantly to the development of the total economy and that its contribution is great enough to justify the resources devoted. Economic studies are needed to measure those benefits, in order to compare them with costs of research and extension. This is with a view to come up with project cash flow on which investment appraisal method can be used to determine whether investment earns a rate of return which exceeds the interest rate or cost of borrowed funds.

Since the IRR estimated for maize technology is well above prevailing interest rate during the period, it is an indication that investment put to maize technology is a paying venture.

The recommendations include:

• Technologies should be developed and disseminated bearing the socio-economic status of users in mind that is poor resources farmers and should be cost effective for proper adaptation and the technology should be flexible. Sustainability of technology should be the focus of research and extension.

• Input delivery system of the Agricultural Development Programme (ADPs) should be farmers driven other than their present focus of being profit generation.

• There is thus need to educate young Nigerians to take to agriculture and especially to growing of maize since it has been proven in this study to be a remunerative crop enterprise for those who adopted and sustained the use of the recommended practices.

Table 1: Agronomic data on production of maize, Average yield, output and consumer price index between 1980 and 2002.

YEARS	A AREA (HA)	Q OUTPUT (TON)	Y AVERAGE Yield(kg/ha)	AV YIELD IMP.TECH yield(kg/ha)	Dy	NOM PRICE N/TON	N/KG	CPI 1985=1
1980	95600	91919	961.49582	1850	888.50	2500	2.5	0.41
1981	982200	94419	961.30116	1850	1753.87	3000	3.0	0.502
1982	130600	125572	961.50077	1850	888.5092	3000	3.0	0.546
1983	148800	143071	961.49866	1850	888.5013	3000	3.0	0.673
1984	11200	106919	954.63393	1850	7696.34	3000	3.0	0.962
1985	211600	203453	961.49811	1850	888.5019	3000	3.0	1
1986	211700	203646	961.9556	1850	888.0444	7000	7.0	1.1
1987	211760	203550	961.22969	1850	888.7703	7000	7.0	1.95
1988	211740	203607	961.58969	1850	888.4103	10000	10.0	2.98
1989	211740	203588	961.49995	1850	888.5	14000	14.0	3.08
1990	211740	203558	961.35827	1850	888.6417	3000	3.0	3.459
1991	263000	203558	773.98479	1850	1076.015	4000	4.0	5.068
1992	676000	203558	301.1213	1850	1548.879	6000	6.0	8.002
1993	693200	252875	364.79371	1850	1485.206	5500	5.5	11.746
1994	925400	649972	702.36871	1850	1147.631	13000	13.0	20.177
1995	898600	666512	741.72268	1850	1108.277	15500	15.5	26.465
1996	912000	880772	965.75877	1850	884.2412	20000	20.0	28.556
1997	905300	864004	954.38418	1850	895.6158	25000	25.0	30.565
1998	908660	876888	965.03423	1850	884.9658	30000	30.0	32.465
1999	908865	870446	957.7286	1850	892.2714	35000	35.0	34.225
2000	928530	873677	940.9249	1850	909.0751	35,000	35.0	36.177
2001	935300	873678	934.11526	1850	915.8847	35,000	35.0	37.175
2002	940000	873698	929.46596	1850	920.534	35,000	35.0	39.455

Note: An average estimate of ₦120 = 1USD in 2002 as exchange rate
Sources: CBN, Several Issues, F.O.S, Several Issues Field survey data, 2002

Table 2: Hectares maize improved varieties Adoption Rate and proportioning production increase 1980 to 2002.

YEARS	MAIZE VARIETIES (HA)	ADOPTION IMP TECH (t)	PROPORTIONAL PROD SHIFT j=(Dy•t)/Y
1980	8929	0.09339958	0.0863092
1981	10008	0.01018937	0.1859025
1982	27508	0.21062787	0.194636
1983	36006	0.24197581	0.2236049
1984	48691	4.34741071	0.5049192
1985	48691	0.2301087	0.212639
1986	55056	0.26006613	0.2400841
1987	63522	0.29997167	0.2773592
1988	71991	0.33999717	0.3141225
1989	78343	0.36999622	0.341905
1990	88930	0.41999622	0.388228
1991	126240	0.48	0.6673094
1992	392080	0.58	2.983348
1993	485240	0.7	2.8499516
1994	768082	0.83	1.3561737
1995	799754	0.89	1.3298324
1996	793440	0.87	0.7965652
1997	778558	0.86	0.8070436
1998	826880	0.90999934	0.8344971
1999	837800	0.92180907	0.8588068
2000	845600	0.91068678	0.8798605
2001	848800	0.9075163	0.8898049
2002	850000	0.90425532	0.8955657

4Source Computed from collected data , 2002

Table 3: Maize Technology Production, Adoption cost and proportions adoption cost 1980 – 2002

YEARS	PROD COST N/HA	ADP COST N/HA	REAL ADP COST	NOM PRICE N/KG	Real price	C
1980	691	316	770.73171	0.3	0.731707	0.1023207
1981	756	506	1007.96813	0.3	0.59761	0.1787793
1982	1081	556	1018.31502	0.3	0.549451	0.4059941
1983	1081	848.585	1260.89896	0.3	0.445765	0.7118645
1984	1181	927.085	963.705821	0.7	0.727651	0.6031361
1985	1814	1423.99	1423.99	0.7	0.7	0.4868481
1986	2814	2208.99	2008.17273	0.7	0.636364	0.8531482
1987	2570	2017.45	1034.58974	1.0	0.512821	0.6295871
1988	2578	2023.73	679.104027	1.4	0.469799	0.5111049
1989	3060	2402.1	779.902597	3.0	0.974026	0.3081186
1990	3360	2637.6	762.532524	3.0	0.867303	0.3841031
1991	3530	2771.05	546.773875	4.0	0.789266	0.4296286
1992	5045	3960.325	494.916896	6.0	0.749813	1.2713528
1993	6095	4784.575	407.33654	6.0	0.510812	1.530181
1994	6095	4784.575	237.130148	12.0	0.594737	0.4711672
1995	10735	8426.975	318.419611	13.0	0.491215	0.7778159
1996	14225	11166.63	391.043038	30.0	1.050567	0.3353137
1997	17250	13541.25	443.031245	50.0	1.635858	0.2440417
1998	18750	14718.75	453.372863	50.0	1.54012	0.2775871
1999	19225	15091.63	440.953251	50.0	1.46092	0.2905123
2000	20250	15896.25	439.402106	60.0	1.658512	0.2564233
2001	21250	16681.25	448.72226	60.0	1.613988	0.2701042
2002	22750	17858.75	452.635914	62.0	1.57141	0.2802315

Source Computed from collected data, 2002

Table 4: Supply, demand elasticity and supply shift due to technology 1980 to 2002.

YEARS	Supply elasticity (E)	Demand elasticity (e)	k
1980	2	0.4	0.043155
1981	2	0.4	0.092951
1982	2	0.4	0.097318
1983	2	0.4	0.111802
1984	2	0.4	-1.75246
1985	2	0.4	0.10632
1986	2	0.4	0.120042
1987	2	0.4	0.13868
1988	2	0.4	0.157061
1989	2	0.4	0.170953
1990	2	0.4	0.194114
1991	2	0.4	0.333655
1992	2	0.4	1.491674
1993	2	0.4	1.424976
1994	2	0.4	0.678087
1995	2	0.4	0.664916
1996	2	0.4	0.398283
1997	2	0.4	0.403522
1998	2	0.4	0.417249
1999	2	0.4	0.429403
2000	2	0.4	0.43993
2001	2	0.4	0.444902
2002	2	0.4	0.447783

Source Computed from collected data, 2002

Table 5: Supply shift due and social gains from Maize Technology 1980 to 2002.

YEARS	k	Dq	0.5kpdQ	Kpq	SG=KPQ-.5KPDQ	REAL SG
1980	0.043155	132.22	2.0875912	4.17518248	2.087591	5.091686
1981	0.092951	292.55	8.1252407	16.2504814	8.125241	16.185738
1982	0.097318	407.35	10.890723	21.7814457	10.89072	19.946379
1983	0.111802	533.19	13.28646	26.572919	13.28646	19.742139
1984	-1.75246	-6245.71	3982.196	7964.39208	3982.196	4139.4969
1985	0.10632	721.03	26.830996	53.6619927	26.831	26.830996
1986	0.120042	814.87	31.124107	62.2482143	31.12411	28.294643
1987	0.13868	940.94	33.458806	66.9176121	33.45881	17.158362
1988	0.157061	1065.96	39.327055	78.6541093	39.32705	13.196998
1989	0.170953	1160.13	96.587834	193.175668	96.58783	31.359686
1990	0.194114	1317.12	110.87184	221.743687	110.8718	32.053149
1991	0.333655	2263.94	298.09505	596.190094	298.095	58.81907
1992	1.491674	10121.41	5660.2743	11320.5486	5660.274	707.35745
1993	1.424976	12011.36	4371.5038	8743.00768	4371.504	372.16958
1994	0.678087	14691.25	2962.3659	5924.73183	2962.366	146.81895
1995	0.664916	14772.49	2412.4703	4824.94057	2412.47	91.157011
1996	0.398283	11693.21	2446.3514	4892.70282	2446.351	85.66856
1997	0.403522	11621.48	3835.695	7671.38994	3835.695	125.49305
1998	0.417249	12196.01	3918.6561	7837.31223	3918.656	120.70402
1999	0.429403	12459.08	3907.9422	7815.88444	3907.942	114.18385
2000	0.43993	12811.9	4673.9711	9347.94228	4673.971	129.19731
2001	0.444902	12956.72	4651.8963	9303.79254	4651.896	125.13507
2002	0.447783	13040.90	4588.1184	9176.23682	4588.118	116.28738

Source Computed from collected data, 2002

Table 6: Research and Extension Costs and Net Social gains from maize technology between 1980 and 2002

YEARS	RESEARCH MILLION N	EXTENSION COST	TOTAL	REALTC	NRSG	
1980	0.855912	0	1	2.07591	3.004095	
1981	4.078871	0	4	8.12524	8.060498	
1982	5.946335	0	6	10.8907	9.055656	
1983	8.941787	0	9	13.2865	6.455679	
1984	3830.873	0	3,831	3982.196	157.3009	NPV=
1985	26.831	0	27	26.831	0	(N3, 102.93)
1986	34	0	34	30.12411	-2.82946	
1987	65	0	65	32.45881	-16.3004	
1988	117	0	117	37.32705	-26.1301	
1989	207	90	297	96.58783	-65.2281	
1990	314	70	384	110.8718	-78.8187	
1991	1,311	200	1,511	298.095	-239.276	
1992	40,294	5000	45,294	5660.274	-4952.92	
1993	48,976	2372	51,348	4371.504	-3999.33	
1994	57,772	2000	59,772	2962.366	-2815.55	
1995	62,346	1500	63,846	2412.47	-2321.31	
1996	68,158	1700	69,858	2446.351	-2360.68	
1997	115,238	2000	117,238	3835.695	-3710.2	
1998	125,219	2000	127,219	3918.656	-3797.95	
1999	132,841	908	133,749	3907.942	-3793.76	
2000	167,090	2000	169,090	4673.971	-4544.77	
2001	170,934	2000	172,934	4751.896	-4526.76	
2002	179,436	1588	181,024	4488.118	-4471.83	IRR=62%

Source Computed from collected data, 2002

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