

## **1. Introduction and Objectives:**

### **1.1 Introduction:**

The Building and Construction Improvement Programme (BACIP) was initiated in 1997 under the Aga Khan Foundation Pakistan (AKF-P) in partnership with the Canadian International Development Agency (CIDA) and subsequently supported by other donors. The objective of the programme was to promote measures that will enable the poor and isolated communities of the Hindukush, Karakoram and Himalayan mountain areas particularly in the Northern Areas (NAs) and Chitral region through analysis of people's problems related to housing and developing realistic and cost effective solutions. The project is evolving from an applied research project to extension and service delivery. BACIP activities and interventions include research and development of products that improve the domestic environment and structural stability of houses; field testing of products for acceptability and functionality; documentation of products and their manufacturing techniques, product promotion through awareness raising and information dissemination and entrepreneur training and training of contractors to carry out product installation. The programme has so far developed and tested 40 home improvement products. Most of the products relate directly to fuel & thermal efficiency (products that conserve fuel wood and forest) whereas 15 of these have been designed to help alleviate conditions of women.

BACIP, over the past seven years has been monitoring the performance of its products employing a number of tools/checklists, interviews of the consumers/stakeholders, interviews of entrepreneurs and the like. It has also been able to develop monitoring reports on some villages but it has not been able to maintain an M&E system. Thus a need was felt to conduct a case study to evaluate the impact of 2-3 core products of BACIP in selected villages, through an independent consultant and subsequently develop an M&E system for future monitoring of the BACIP activities.

### **1.2 Objectives of the Case Study:**

The specific objectives of the study are:

- Assess the impact of 2-3 core products on the livelihood of the local population in selected villages of Northern Areas;
- Develop an M&E system for future monitoring and assessment of BACIP products.

### **1.3 Terms of References (ToRs) of the Study:**

The consultant was required to do the following:

- Review BACIP documents;
- Develop tools for measuring the impacts/effects of the products' outcomes;
- Develop short reports on the two case studies clearly reflecting the quantified and monetised value of the outcomes contributing to poverty alleviation and increased disposable income of the product consumers and producers respectively;
- Develop monitoring systems, sample size and methodology for the surveys;
- Train BACIP staff in applying the survey questionnaires and using the monitoring system and framework for developing the reports;
- Analyze the garnered data leading to the development of the reports;
- The consultant will require to traveling to Northern Areas to visit at least two project villages in two different districts;

## **2. Methodology:**

During the course of the study the following steps were undertaken:

### **2.1 Literature Review:**

A detailed review of the project related documents as well as reports of the studies conducted so far by BACIP has been undertaken in order to develop an in-depth understanding of the project implementation dynamics. The list of documents reviewed is given at **annexure-I**.

### **2.2 Meeting with the Project Team:**

Detailed meetings with the project staff were held in the BACIP office. The purpose of these meetings was two fold. First to clarify those ambiguities that came to surface during the literature review and secondly to select 2-3 key BACIP products for assessing their impact in two different geographical zones of Northern Areas. The core BACIP products selected in consultation with the project team for assessment were:

- Roof Hatch Window (RHW);
- Water Warming Facility (WWF);
- Wall Insulation (W.I)

Moreover these meetings also aimed at getting the project's staff understanding about the study. The names of the staff members met during the course of the study are given at **annexure-II**.

### **2.3 Development and Sharing of Proforma/Questionnaire:**

Detailed proformas/questionnaires were developed for two different categories i.e one for the end users of the product and the second one for the entrepreneurs. These questionnaires were shared with the project staff for their input and were refined/amended accordingly. The questionnaires are given at **annexure-III**.

### **2.4 Meetings with the stakeholders:**

Meetings were held with the relevant stakeholders like the entrepreneurs, the end users of the products etc. for taking stock of their viewpoint about the BACIP products. The management of the Micro Finance Bank also met for getting information about the lending facilities.

### **2.5 Field Research:**

The field research was carried out through the following methodology:

- Selection of the target group;
- Structured interviews with the field staff in order to assess their perception about the project;
- Focused group discussion with the community elders;
- Structured interviews with randomly selected households;
- Structured interviews with randomly selected entrepreneurs of the products;

### **2.6 Data Analysis and Development of Study Report:**

Data collected from the field was analyzed for assessing the costs and benefits for ultimate evaluation of the products impacts and finally the study report.

### **3. Key Considerations:**

The readers of this study should keep some key considerations in mind while reading this study. These considerations are:

- The expected life span of all the products has been taken as eight (8) years and benefits have been extrapolated over the expected life span of the products;
- The prevailing discount rate of 12% has been taken for analysis purposes, as indicated by the Micro Finance Bank in the region;
- The fuel wood consumption under each category indicates fuel wood consumed specifically for that particular purpose and it has no concern with the fuel wood consumed under another category;
- The impact assessment has been carried out for two different categories of households i.e. one who purchases fuel wood from the market and the other who gets it for free;
- This impact assessment has been based on the use of fuel wood by an average family of the size of 6-7 persons in all the categories;
- For the WWF product the duration of the winter season has been taken as six months whereas for the other two products i.e. RHW and W.I the duration of the winter season has been taken as four months.

### **4. Impact Assessment of Core BACIP Products:**

As stated earlier in the preceding columns of this report, the instant impact assessment for all the three products has been carried out separately for two different categories of households/end users. This has been done because of the reason that impact for both the categories, as far as pay back period is concerned, is different. These categories are:

- Households who purchase fuel wood from the market; and
- Households who collect/get the fuel wood free of cost from the nearby forests.

#### **4.1 Roof Hatch Window:**

##### **4.1.1 Scenario-I: Households who purchases fuel wood for room heating:**

The end users have identified considerable avenues of savings as a result of installation of Roof Hatch Windows (RHWs), during the interview sessions with them. Most of the savings were either not quantified or not considered in most of the previous studies conducted/commissioned by BACIP. The details of these savings are given below:

##### **i. Fuel Wood Savings:**

The impact on savings on account of fuel wood consumption was two fold i.e. one due to reduced duration and second as a result of less consumption of fuel wood. The details are given below:

- According to 95% of the households at Chator Khand, surveyed by the consultant, the number of days of fuel wood consumption for room-heating purposes during the winter was reduced considerably with the installation of RHW. In other words the winter season was squeezed by one month as far as temperatures inside the room was concerned. According to these households the duration of fuel wood consumption, specifically for room heating, prior to installation of RHW was 120 days i.e. from November 1<sup>st</sup> to February 28<sup>th</sup> whereas with the installation of RHW the duration was reduced to 90 days i.e. from November 15<sup>th</sup> to February 15<sup>th</sup>;
- The same households were of the view that the fuel wood consumption was also reduced considerably because of maximum heat retention capacity of the rooms for longer duration of time

because of installation of Roof Hatch Windows. Prior to installation of the RHW an average household of 6-7 persons was using 18-22 kgs of fuel wood per day during the winter season whereas after the installation of RHW the consumption for the same size of family was dropped to 10-14 kgs per day. It can be concluded, by taking average of the two, that the fuel wood consumption as a result of installation of Roof Hatch Window was dropped from 20 kgs/day to 12 kgs/day. Thus the total savings during the entire winter on account of installation of RHW comes to 1320 Ks i.e about 55%.

The total impact of the two aspects for a single household of the size of 6-7 persons is calculated and presented below in tabular form:

**Table 4.1.1 Savings on account of Fuel Wood (RHW)**

S.No	Description	
1	Duration of use of fuel wood (Days) in winters prior to Installation of RHW (Nov. 1 <sup>st</sup> to Feb. 28 <sup>th</sup> )	120
2	Duration of use of fuel wood (Days) in winters after the Installation of RHW (Nov. 15 <sup>th</sup> to Feb. 15 <sup>th</sup> )	90
3	Fuel wood consumed per day by the household during winters before installation of RHW (Kgs)	20
4	Fuel wood consumed per day by the household during winters after installation of RHW (Kgs)	12
5	Total consumption of fuel wood by the household during the whole winter season before installation of RHW	2400
6	Total consumption of fuel wood by the household during the whole winter season after installation of RHW	1080
7	Total saving of fuel wood during the entire winter season (Kgs)	1320
8	Average cost of all types of fuel woods at Chator Khand (Rs/Kg)	3
9	Total savings in monetary terms as a result of installation of RHW	3960

## ii. Savings in health expenditure:

During the survey it was observed that there was considerable decrease in the health expenditures of the households, especially on children, during winters with the installation of BACIP products. According to 98% of households prior to installation of BACIP products their average monthly expenditure on health in winters was around Rs.250/- per month whereas after installation of the BACIP products it has dropped to Rs. 50/- per month. Survey and subsequent analysis revealed that 70% of the saving per month on account of health expenditure was due to RHW whereas the remaining 30% saving was due to WWF. This means that out of the Rs 200/- saved per month, Rs 140/- is due to RHW whereas the remaining saving of Rs 60/- is due to WWF. The impact was because of less smoky environment, no dust and comfortable level of room temperature due to which there is lesser number of cases of chest infection, pneumonia and asthmatic cases in the kids during the winter season as well as lesser cases of eye diseases for both kids and elders. The impact in the summers is negligible according to the households. The impact on an average family of 6-7 persons is illustrated below in tabular form:

**Table 4.1.2 Savings on Account of Health Expenditure (RHW)**

Ave. monthly Expndr. of a H/hold on health before installation of BACIP Products (Rs)	Ave. monthly Expndr. of a H/hold on health after installation of BACIP Products (Rs)	Total savings by an ave. H/hold per month due to RHW (70% of 200) (Rs)	Total savings by an ave. H/hold per winter season (Rs)
250/-	50/-	140/-	560/-

### iii. Energy Savings:

Due to availability of more day light in the room for 3-4 additional hours/day in the morning and evening as well as on cloudy/rainy days because of no covering of the roof hole with the installation of RHW there was less use of electricity, informed the end users. From the survey it was calculated that on average there was 10% savings in the electricity bills during the entire year. The impact on an average family of 6-7 persons is illustrated below in tabular form:

**Table 4.1.3 Savings on Account of Electricity (RHW)**

Ave. monthly Expndr. of an ave. H/hold on Electricity before installation of RHW (Rs)	Ave. monthly Expndr. of an ave. H/hold on Electricity after installation of RHW (Rs)	Total savings by an ave. H/hold per month (Rs)	Total savings by an ave. H/hold per year (Rs)
200/-	180/-	20/-	240/-

### iv. Saving from Plastic Sheet Covers:

It was observed during the survey that with open roof system the use of plastic sheet is inevitable. For covering the traditional roof hole in a room completely to avoid inflow of rainwater into the rooms, 2.25 sq. yds (1.5\*1.5) of plastic sheet is usually required. According to majority of the households the average life of plastic sheet during the summers (6-months duration) is 30 days whereas in winters (6-months duration) a plastic sheet can last even up to 60 days. The market price of an average quality plastic sheet in the Northern Areas Rs. 30/- per sq.yd. The savings realized due to plastic sheets is illustrated in the table below:

**Table 4.1.4 Savings on Account of Use of Plastic Sheet (RHW)**

Plastic Sheets used by a H/hold during summers (Nos)	Plastic Sheets used by a H/hold during winters (Nos)	Plastic Sheets used by a H/hold during the year (Nos)	Cost of a plastic sheet of size of 2.25 sq.yds (Rs)	Yearly Expndr of a H/hold on plastic sheets (Rs)	Total Savings from plastic sheets
6	3	9	67.5	608	608

### v. Savings in Clothes Washing:

Due to dust, smoke and inflows of rain water in the open roof system the frequency of washing clothes, carpets, bed sheets etc. was observed to be higher. According to the data collected the frequency of washing majority of these things was twice a week before the installation of RHW whereas with the installation of RHW the frequency has dropped to once a week in a family of the size of 6-7 persons. Consequently there was 50% decrease in the expenditure on account of use of detergents/washing powder in an average household. The savings on account of less clothes etc. washing activities in given below:

**Table 4.1.5 Savings on Account of clothes etc. Washing (RHW)**

Ave. monthly Expndr. of an ave. H/hold on Clothes etc. washing before installation of RHW (Rs)	Ave. monthly Expndr. of an ave. H/hold on Clothes etc. washing after installation of RHW (Rs)	Total savings by an ave. H/hold per month (Rs)	Total savings by an ave. H/hold per year (Rs)
60/-	30/-	30/-	360/-

### vi. Savings in Maintenance:

The saving on account of maintenance of the room was also observed to be of good size. With open roof system there was used to more dust and smoke in the room as well as inflow of rain water into the room due to which white wash of the room and minor repair of the wood work in the roof opening was required to be carried out after every three years by the owner. From the data collected it was revealed that after

the installation of RHW the above maintenance would be required only once in the entire life of the product. The savings on account of maintenance of the room with no labour charges (this will be provided by the owner) is given below:

**Table 4.1.6 Savings on Account of Maintenance (RHW)**

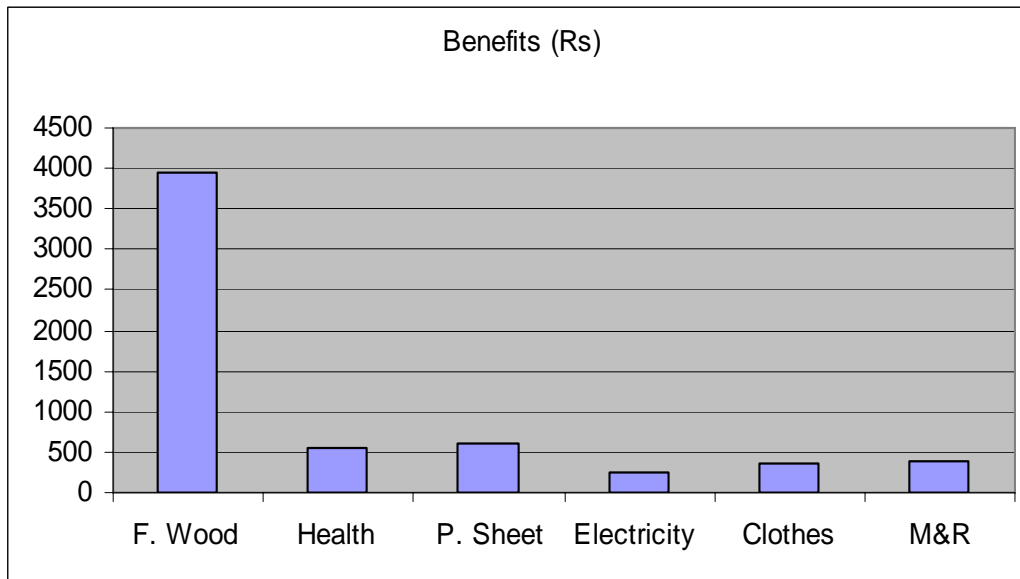
Ave. cost on maintenance of a H/hold before installation of RHW (Rs)	Ave. expndr. on maintenance of a H/hold without RHW-Thrice Rs)	Ave. expndr. on maintenance of an H/hold with RHW-Once (Rs)	Total savings by a H/hold (Rs)	Total savings by a H/hold per year (Rs)
1500/-	4500/-	1500/-	3000/-	375/-

#### 4.1.2 Cost-Benefit Analysis:

After taking into account the monetised value of all the above savings with expected life span of the product taken as eight years, the cost benefit analysis carried out at the prevailing discount rate of 12%, can be summarized as follows:

**Table 4.1.7 Cost-Benefit Analysis, Roof Hatch Window (RHW) – Fuel Wood Purchased**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	<b>2500</b>								
<b>Benefits</b>									
Fuel Wood Savings	0	3960	3960	3960	3960	3960	3960	3960	3960
Health Expenditure Saved	0	560	560	560	560	560	560	560	560
Saving in Plastic Sheet	0	608	608	608	608	608	608	608	608
Electricity Saved	0	240	240	240	240	240	240	240	240
Savings in Clothes etc. Washing	0	360	360	360	360	360	360	360	360
Saving in M&R	0	375	375	375	375	375	375	375	375
<b>Total Benefits</b>		<b>6103</b>	<b>6103</b>	<b>6103</b>	<b>6103</b>	<b>6103</b>	<b>6103</b>	<b>6103</b>	<b>6103</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flows	-2500	5449.1	4865.3	4344.0	3878.6	3463.0	3092.0	2760.7	2464.9
<b>Cumulated Cash Flows</b>	<b>-2500</b>	<b>2949.1</b>	<b>7814.4</b>	<b>12158.4</b>	<b>16036.9</b>	<b>19499.9</b>	<b>22591.9</b>	<b>25352.6</b>	<b>27817.5</b>



**Fig 4.1(a) Benefits Per Annum, Roof Hatch Window (RHW) – Fuel Wood Purchased**

#### **4.1.3 Key Results/Outcomes:**

The key results emerged from the cost benefit analysis of Roof Hatch Window (RHW), where the household/end user purchases fuel wood from the market of cost is given below:

- Net Present Value (Rs).....30318/-
- Benefit-Cost Ratio.....12.13
- Payback Period (Months).....5.5

#### **4.1.4 Scenario-II: Households who gets fuel wood for room heating free of cost:**

It was revealed during the survey that quite substantial number of households' get/arrange fuel wood for free from the nearby forest. Although the savings accrued by such families are less than those who purchases fuel wood from the market but still the pay back period for such families fall within a reasonable range. In the instant scenario some of the savings realized from different heads like health, electricity, clothes etc. washing, plastic sheets and maintenance remains the same as in those cases where the fuel wood is purchased by the end user of the product. However there were still some areas, which were needed to be quantified for the education of the community at large. The savings realized to such families through these heads are explained below:

##### **i. Saving in Non-loss of Daily Wage:**

This was one of the crucial factors, which required quantification for the sack of calculation of benefits of the product. Hence data in this regard was collected with utmost care. 90% of the households surveyed were of the view that before the installation of RHW they used to spare one whole day once in a fortnight for collection of fuel wood just for room heating purposes because of the reason that the forest was located at quite a long distance from the settlement. Whereas after the installation of RHW the frequency of collection of fuel wood has gone down to once in a month due to less consumption of fuel wood. As explained earlier with the installation of RHW the fuel wood consumption drops to 1080 kgs per winter season from 2400 kgs i.e. 55% reduction. The average daily wage of a labour in the Northern Areas of Pakistan is Rs. 100/- per day. In this way the total saving on account of loss of wage would be around

62.5%. The impact is higher because the winter season, as far as within the room is concerned, also shrinks from 4 months to 3 months with the installation of RHW. The saving to an average family of the size of 6-8 persons is explained in the table given below:

**Table 4.1.8 Savings on Account of Non-loss of Daily Wage (RHW)**

No. of days lost/winter season before installation of RHW	No. of days lost/winter season after installation of RHW	Average Daily Wage (Rs/day)	No. of days saved during the winter season	Total Saving in the winter season
8	3	100	5	500

#### **ii. Saving in transportation of Fuel Wood:**

The consumption of wood per average household (600 kgs per month) is too high and as such cannot be transported by the end users themselves on their backs whether the collection frequency is on fortnightly basis or monthly basis. On the other hand the collection of fuel wood on daily basis means no work for the sake of livelihood. Now there are two means of transportation of fuel wood i.e. through tractors or through mules/donkeys. The average rent of a tractor is Rs. 650/- per load (one load is approximately equal to 35 maunds i.e. 1400 kgs). Thus the average cost incurred by an average family per winter season on transportation of fuel wood of 2400 kgs through tractor amounts to Rs. 1115/-. On the contrary the average annual transportation cost per family on fuel wood transported through mules/donkeys comes to Rs. 150/- per month i.e. Rs. 600/- per winter season. If it is assumed that the households use both the modes equally, which was the case in 90% of the households, then the average transportation cost of an average family on fuel wood amounted to approximately Rs. 850/- per winter season. Since with the installation of RHW there is 55% reduction in the consumption of fuel wood for room heating, therefore the average saving on account of transportation by a household is estimated to be Rs. 468/- per winter season. The details are given in the table given below:

**Table 4.1.9 Savings on Account of Transportation of Fuel Wood (RHW)**

Average F.wood consumed by a h/hold per winter before installation of RHW – Kgs	Average F.wood consumed by a h/hold per winter after installation of RHW –Kgs	Ave. transportation cost of F.wood per winter before installation of RHW – Rs	Ave. transportation cost of fuel wood per winter after installation of RHW – Rs	Total Saving in the winter season – Rs
2400	1080	850	382	468

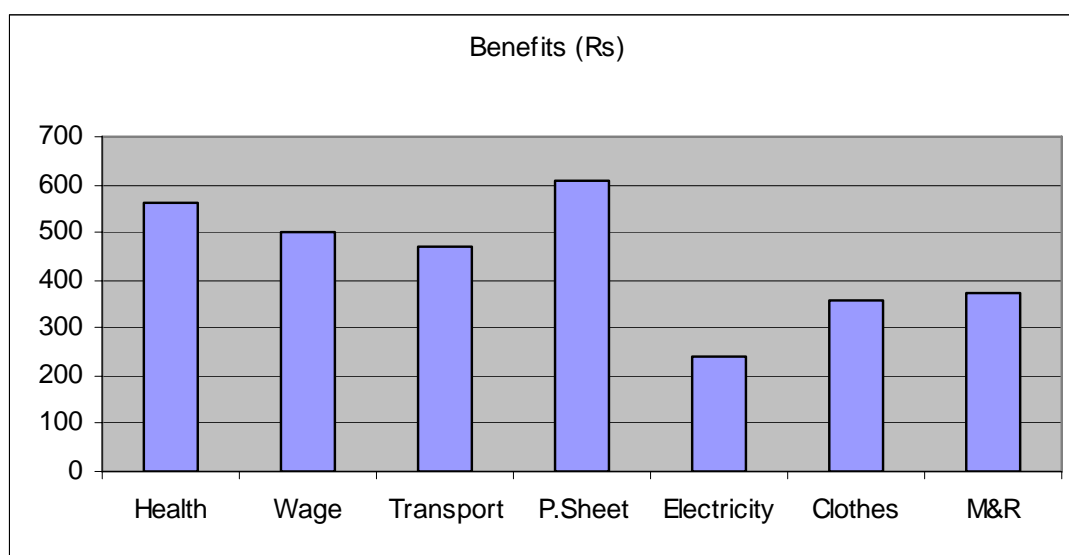
#### **4.1.5 Cost-Benefit Analysis:**

As stated earlier the benefits accrued on account of health, electricity, Clothes etc. washing, plastic sheets and maintenance would remain the same as those of the families who purchases fuel wood from the market. Thus after taking into account the monetised value of all the above savings with expected life span of the product taken as eight years, the cost benefit analysis carried out at the prevailing discount rate of 12%, can be summarized as follows:



**Table 4.1.10 Cost-Benefit Analysis, Roof Hatch Window (RHW) – Fuel Wood (Free of Cost)**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	<b>2500</b>								
<b>Benefits</b>									
Health Expenditure Saved	0	560	560	560	560	560	560	560	560
Saving in loss of Wage	0	500	500	500	500	500	500	500	500
Saving in transportation of F.wood	0	468	468	468	468	468	468	468	468
Saving in Plastic Sheet	0	608	608	608	608	608	608	608	608
Electricity Saved	0	240	240	240	240	240	240	240	240
Savings in Clothes etc. Washing	0	360	360	360	360	360	360	360	360
M&R	0	375	375	375	375	375	375	375	375
<b>Total Benefits</b>		<b>3111</b>	<b>3111</b>	<b>3111</b>	<b>3111</b>	<b>3111</b>	<b>3111</b>	<b>3111</b>	<b>3111</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flow	-2500	2777.7	2480.1	2214.3	1977.1	1765.3	1576.1	1407.3	1256.5
<b>Commulated Cash Flow</b>	<b>-2500</b>	<b>277.7</b>	<b>2757.7</b>	<b>4972.1</b>	<b>6949.2</b>	<b>8714.5</b>	<b>10290.6</b>	<b>11697.8</b>	<b>12954.3</b>



**Fig 4.1(b) Benefits Per Annum, Roof Hatch Window (RHW) – Fuel Wood (Free of Cost)**

#### 4.1.6 Key Results/Outcomes:

The key results emerged from the cost benefit analysis of Roof Watch Window (RHW), where the household/end user arrange fuel wood free of cost is given below:

- Net Present Value (Rs).....15454/-
- Benefit-Cost Ratio.....6.18
- Payback Period (Months).....10.8

#### 4.1.7 A Comparison of the Two Scenarios:

The comparison of the two scenarios is illustrated in the bar diagrams given below. It is very much evident from the figures that monetary benefits to the households who purchase fuel wood from the market is far higher than those who gets it for free. However, the pay back period for the free of cost fuel wood users still fall within a reasonable range i.e. less than a year which according to any standards/yardstick is an affordable time for a low income family.

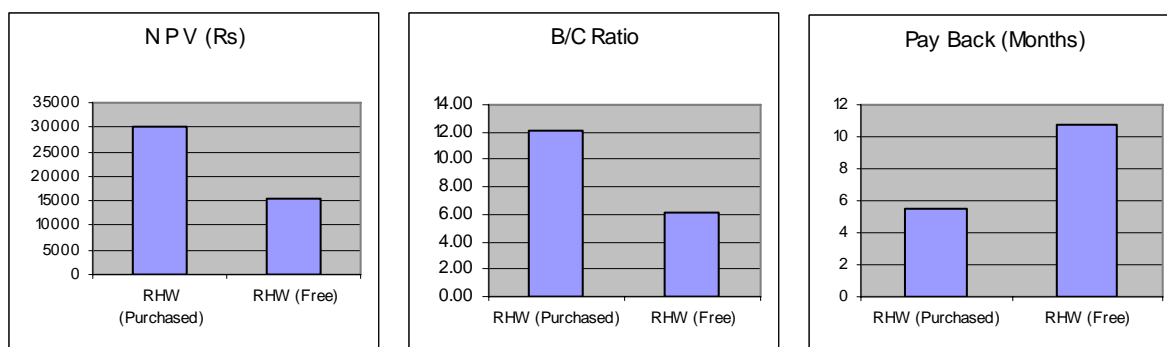


Fig 4.1(c) Cost-Benefit Analysis, Roof Hatch Window (RHW) – a Comparison of the two Scenarios

## 4.2 Water Warming Facility (WWF):

### 4.2.1 Scenario-I: Households who purchases fuel wood for water warming:

As far as the Water Warming Facility (WWF) was concerned, the beneficiaries have identified three main areas of savings i.e fuel wood, health and water heating pot (utensil) during the interview sessions with them. The details of these savings calculated on the basis of information provided by the individual households are given below:

#### i. Fuel Wood Savings:

Almost the entire households questioned during the survey were of the view that with the acquisition of Water Warming Facility (WWF) there was 100% savings observed on account of expenditure on fuel wood purchased specifically for water warming. People at Chator Khand start using warm water for various purposes from October, 1<sup>st</sup> that goes up to the end of March. According to the community the level of consumption of fuel wood, specifically for water warming, increases with the increase in the intensity of winter season. The use of fuel wood for water warming during the entire winter season and the savings thereof are explained below in two separate tables with average per kg cost of fuel wood taken as Rs. 3/-.

**Table 4.2.1 Fuel Wood Consumption Pattern in Winter (WWF)**

Ave. use of F.Wood in October @8 kg/day	Ave. use of F.Wood in November @12 kg/day	Ave. use of F.Wood in December @16 kg/day	Ave. use of F.Wood in January @16 kg/day	Ave. use of F.Wood in February @12 kg/day	Ave. use of F.Wood in March @8 kg/day	Total Consumption in entire winter (kgs)
240	360	480	480	360	240	2160

**Table 4.2.2 Savings on Account of Fuel Wood (WWF)**

Consumption of F.Wood/winter prior to WWF	Cost of F.Wood Rs/Kg	Cost of F.Wood for entire winter - Rs	Consumption of F.Wood/winter after to WWF	Total Savings in winter - Rs
2160	3	6480	0	6480

**ii. Savings in health expenditure:**

During the survey it was observed that there was some decrease in the expenditure on health, especially on the women, during winters with the acquisition of WWF. According to 98% of households prior to the WWF the women used to get sick in extreme weather due to frequent in out for warm water arrangements for the entire family. As stated earlier, according to 98% of households prior to installation of BACIP products their average monthly expenditure on health in winters was around Rs.250/- per month whereas after installation of the BACIP products it has dropped to Rs. 50/- per month. Survey and subsequent analysis revealed that 70% of the saving per month on account of health expenditure was due to RHW whereas the remaining 30% saving was due to WWF. This means that out of the Rs 200/- saved per month, Rs 140/- is due to RHW whereas the remaining saving of Rs 60/- is due to WWF. The impact is illustrated below in tabular form:

**Table 4.2.3 Savings on Account of Health Expenditure (WWF)**

Ave. monthly Expndr. of an ave. H/hold on health before BACIP Products (Rs)	Ave. monthly Expndr. of an ave. H/hold on health after BACIP Products (Rs)	Total savings by an ave. H/hold per month due to WWF (30% of 200) (Rs)	Total savings by an ave. H/hold per winter season (Rs)
250/-	50	60/-	360/-

**iii. Saving in Water Heating Utensil:**

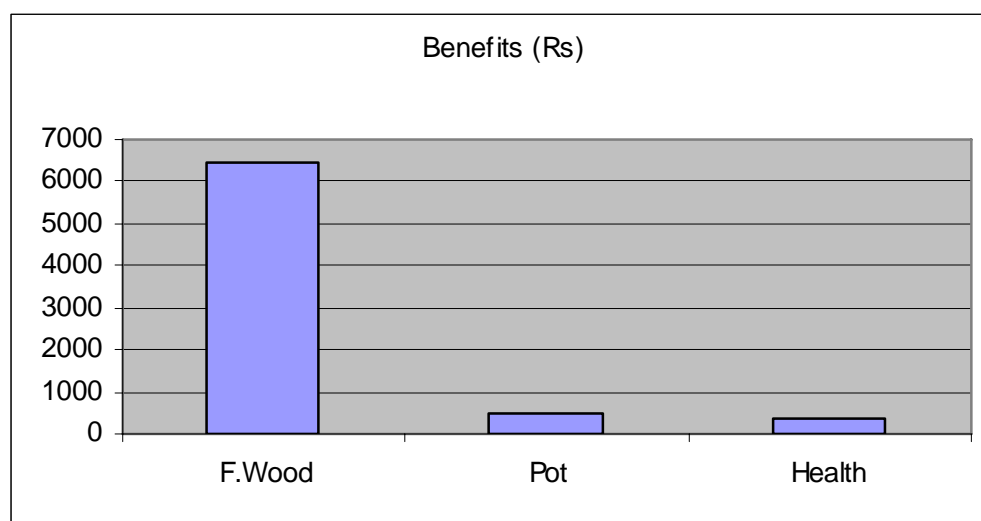
This was a very unique type of saving that was identified by some 75% of the households during the survey whereas the rest of 25% were not aware of this saving although they have benefited from it. In fact this factor has been overlooked by almost all the evaluations that has been carried out up till now. The households visited communicated that previously a very big utensil was used to be required for water heating purposes, as small daily utensils were of little use because of big quantity of warm water requirement of the families round the clock. These utensils were used to be very costly. The costs of these utensils varied from a very costly one amounting to Rs. 1200/- to a low quality one costing just Rs. 400/-. In the instant study an average cost of Rs. 500/- has been taken for evaluation purposes. Since the average life of these utensils is also 8-10 years therefore the cost effect has also been taken only once in the initial year for the analysis purposes. Thus the total saving from this head is Rs.500/- for the entire period of evaluation.

**4.2.2 Cost-Benefit Analysis:**

After taking into account the monetised value of all the above savings with expected life span of the product taken as eight years, the cost benefit analysis carried out at the prevailing discount rate of 12%, can be summarized as follows:

**Table 4.2.4 Cost-Benefit Analysis, Water Warming Facility (WWF) – Fuel Wood Purchased**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	2400								
<b>Benefits</b>									
Fuel Wood Savings	0	6480	6480	6480	6480	6480	6480	6480	6480
Saving on Water heating Pot	0	500	0	0	0	0	0	0	0
Health Expenditure Saved	0	360	360	360	360	360	360	360	360
<b>Total Benefits</b>		<b>7340</b>	<b>6840</b>	<b>6840</b>	<b>6840</b>	<b>6840</b>	<b>6840</b>	<b>6840</b>	<b>6840</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flow	-2400	6553.6	5452.8	4868.6	4346.9	3881.2	3465.4	3094.1	2762.6
Commulated Cash Flow	-2400	4153.6	9606.4	14475.0	18821.9	22703.1	26168.5	29262.5	32025.1



**Fig 4.2(a) Benefits per Annum, Water Warming Facility (WWF) – Fuel Wood (Purchased)**

#### **4.2.3 Key Results/Outcomes:**

The key results emerged from the cost benefit analysis of Water Warming Facility (WWF), where the household/end user purchases fuel wood from the market is given below:

- Net Present Value (Rs).....34425/-
- Benefit-Cost Ratio.....14.34
- Payback Period (Months).....4.4

#### 4.2.4 Scenario-II: Households who gets fuel wood for water heating free of cost:

Like for the room heating, for the water heating purposes also, quite a substantial number of households' used to get/arrange fuel wood for free from the nearby forest. Although the savings accrued by such families are less than those who purchases fuel wood from the market but still the pay back period for such families fall within a reasonable range. In the instant scenario some of the savings realized from different heads like health, water-heating utensil remains the same as in those cases where the fuel wood is purchased by the end user of the product. However there were still some areas, which needed to be quantified for assessing the impact of the product as well as for the awareness of the community at large. The savings realized to such families through these heads are explained below:

##### i. Saving due to Non-loss of Daily Wage:

As discussed earlier this was one of the crucial factors, which required quantification for the sack of calculation of benefits of the product. Hence data in this regard was collected with utmost care. Like in the case of RHW here also some 95% of the households surveyed were of the view that before the acquisition of WWF they used to spare one whole day once in a fortnight for collection of fuel wood just for water heating purposes because of the reason that the forest was located at quite a long distance from the settlement. Whereas after acquiring of WWF the frequency of collection of fuel wood specifically for water heating purposes has gone down to zero due to nil consumption of fuel wood for this activity. As explained earlier with the installation of WWF the fuel wood consumption dropped from 2160 kgs per season to zero, which means 100% saving. The average daily wage of a labour in the Northern Areas of Pakistan is Rs. 100/- per day. In this way the total saving on account of loss of wage would be 100%. The impact is higher because unlike the room heating activity the water heating activity starts a month earlier and ends a month later. The saving to an average family is explained in the table given below:

**Table 4.2.5 Savings on Account of Non-loss of Daily Wage (WWF)**

No. of days lost/winter season before installation of WWF – 2/Month	No. of days lost/winter season after installation of WWF	Average Daily Wage (Rs/day)	No. of days saved during the winter season	Total Saving in the winter season
12	0	100	12	1200

##### ii. Saving in transportation of Fuel Wood:

As explained under scenario-I of WWF, average fuel wood consumption, specifically for water heating purposes, was 2160 kgs per winter season stretching up to six months i.e 360 kgs per month, which is too high and as such cannot be transported by the end users themselves on their backs whether the collection frequency is on fortnightly basis or monthly basis. The collection of fuel wood on daily basis means no work for the sake of livelihood. Now there are two means of transportation of fuel wood i.e. through tractors or through mules/donkeys. The average rent of a tractor is Rs. 650/- per load (one load is approximately equal to 35 maunds i.e 1400 kgs). Thus the average cost incurred by an average family per winter season on transportation of fuel wood of 2160 kgs through tractor amounts to Rs. 1002/-. On the contrary the average annual transportation cost on fuel wood transported through mules/donkeys comes to Rs. 100/- to 150/- per month. If we take the average cost of Rs. 125/- per month, then the total cost per winter season would come to Rs. 650/- per winter season. If it is assumed that the households use both the modes equally, which was the case in 90% of the households, then the average transportation cost of an average family on fuel wood amounted to approximately Rs. 825/- per winter season. Since with the installation of WWF there is 100% reduction in the consumption of fuel wood for water heating, therefore the saving on account of transportation by a household is Rs. 825/- per winter season. The details are given in the table given below:

**Table 4.2.6 Savings on Account of Transportation of Fuel Wood (WWF)**

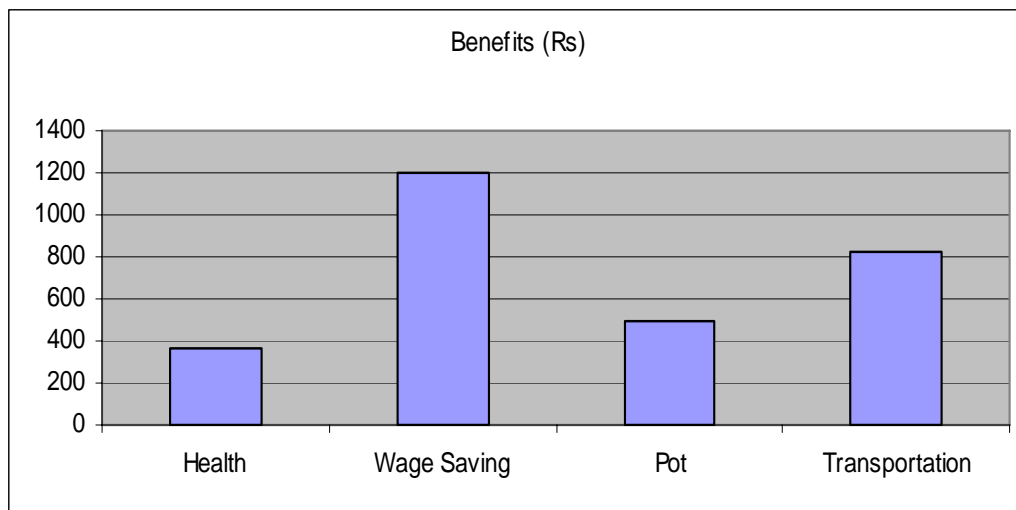
Average F.wood consumed by a h/hold per winter before installation of WWF – Kgs	Average F.wood consumed by a h/hold per winter after installation of WWF– Kgs	Ave. transportation cost of F.wood per winter before installation of WWF – Rs	Ave. transportation cost of fuel wood per winter after installation of WWF – Rs	Total Saving in the winter season – Rs
2160	0	825	0	825

#### 4.2.5 Cost-Benefit Analysis:

As stated earlier the benefits accrued on account of health and water-heating utensil would remain the same as those of the families who purchases fuel wood. Thus after taking into account the monetised value of all the above savings with expected life span of the product taken as eight years, the cost benefit analysis carried out at the prevailing discount rate of 12%, can be summarized as follows:

**Table 4.2.7 Cost-Benefit Analysis, Water Warming Facility (WWF) – Fuel Wood (Free of Cost)**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	<b>2400</b>								
<b>Benefits</b>									
Health Expenditure Saved	0	360	360	360	360	360	360	360	360
Saving in loss of Wage	0	1200	1200	1200	1200	1200	1200	1200	1200
Saving on Water heating Pot	0	500	0	0	0	0	0	0	0
Saving in transportation of F.Wood	0	825	825	825	825	825	825	825	825
<b>Total Benefits</b>		<b>2885</b>	<b>2385</b>	<b>2385</b>	<b>2385</b>	<b>2385</b>	<b>2385</b>	<b>2385</b>	<b>2385</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flow	-2400	2575.9	1901.3	1697.6	1515.7	1353.3	1208.3	1078.9	963.3
<b>Commulated Cash Flow</b>	<b>-2400</b>	<b>175.9</b>	<b>2077.2</b>	<b>3774.8</b>	<b>5290.5</b>	<b>6643.8</b>	<b>7852.1</b>	<b>8931.0</b>	<b>9894.2</b>



**Fig 4.2(b) Benefits per Annum, Water Warming Facility (WWF)–Fuel Wood (Free of Cost)**

#### 4.2.6 Key Results/Outcomes:

The key results emerged from the cost benefit analysis of Water Warming Facility (WWF), where the household/end user gets fuel wood free of cost is given below:

- Net Present Value (Rs).....12294/-
- Benefit-Cost Ratio.....5.12
- Payback Period (Months).....11.2

#### 4.2.7 A Comparison of the Two Scenarios:

The comparison of the two scenarios for WWF is given in the bar diagrams below. It is very much evident from the figures that monetary benefits to the households who purchase fuel wood from the market is far higher than those who gets it for free. However, like the RHW, the pay back period for the free of cost fuel wood users still falls within a reasonable range i.e. less than a year, which according to any standards/yardstick is an affordable time for a low income family.

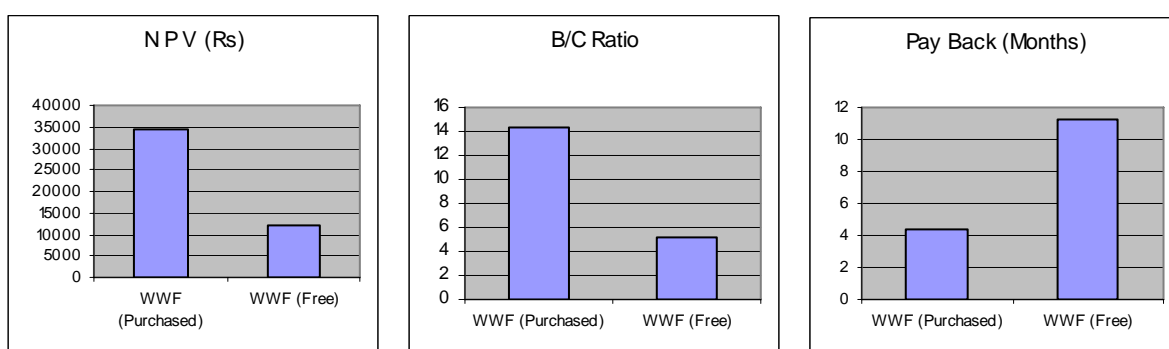


Fig 4.2(c) Cost-Benefit Analysis, Water Warming Facility (WWF) – a Comparison of the two scenarios

### 4.3 Wall Insulation (W.I):

#### 4.3.1 Scenario-I: Households who purchases fuel wood for room heating:

Wall Insulation (W.I) is a very effective technique for retention of heat inside the room but due to the traditional practice of leaving a void in the roof the, impact of the W.I is reduced drastically. This was the outcome of the survey conducted for the W.I technique. The details of these savings are given below:

##### i. Fuel Wood Savings:

Like the RHW, the impact on savings on account of fuel wood consumption was also two fold i.e. one due to reduced duration and second as a result of less consumption of fuel wood. The details are given below:

- As explained under the RHW analysis the number of days of fuel wood consumption for room-heating purposes during the winter also reduces with the W.I but to lesser extent than RHW due to the hole in the roof. Here the winter season squeezes by just 20 days as far as room temperatures are concerned. According to 90% of the households survey for gauging the impact of W.I, the duration of fuel wood consumption, specifically for room heating, prior to installation of W.I was 120 days i.e. from November 1<sup>st</sup> to February 28<sup>th</sup> whereas with the W.I facility the duration was reduced to 105 days i.e. one week on either side of the winter season;
- The same households were of the view that the fuel wood consumption also reduces to little extent due to the void in the roof. Prior to the W.I facility an average household of 6-7 persons was using around 20 kgs of fuel wood per day during the winter season whereas after the W.I facility the consumption for the same size of family was dropped to just around 16 kgs per day. It can be concluded that the fuel wood consumption as a result of W.I technique drops from 20 kgs/day to 16 kgs/day i.e. by just 20%.

The total impact of the two aspects for single household of the size of 6-7 persons is calculated and presented below in tabular form:

**Table 4.3.1 Savings on account of Fuel Wood (W.I)**

S.No	Description	
1	Duration of use of fuel wood (Days) in winters prior to Wall Insulation (Nov. 1 <sup>st</sup> to Feb. 28 <sup>th</sup> )	120
2	Duration of use of fuel wood (Days) in winters after the Wall Insulation	105
3	Fuel wood consumed per day by the household during winters before Wall Insulation (Kgs)	20
4	Fuel wood consumed per day by the household during winters after Wall Insulation (Kgs)	16
5	Total consumption of fuel wood by the household during the whole winter season before Wall Insulation	2400
6	Total consumption of fuel wood by the household during the whole winter season after Wall Insulation	1680
7	Total saving of fuel wood during the entire winter season (Kgs)	720
8	Average cost of all types of fuel woods at Chator Khand (Rs/Kg)	3
9	Total savings in monetary terms as a result of Wall Insulation (Rs)	2160

## ii. Savings in health expenditure:

During the survey it was observed that impact on the health expenditure was also lesser than that of RHW because of various reasons. Prior to Wall Insulation the average seasonal expenditure on health was Rs 1000/-, which was reduced by just 40%. The survey for assessing the impact of W.I was conducted only in those houses where there was just the W.I facility installed. Again the lesser reduction in health expenditure was due to the void in the roof. The impact in the summers was negligible according to the households. The impact on an average family of 6-7 persons is illustrated below in tabular form:

**Table 4.3.2 Savings on Account of Health Expenditure (W.I)**

Ave. monthly Expndr. of a H/hold on health before installation of W.I (Rs)	Ave. monthly Expndr. of a H/hold on health after installation of W.I (Rs)	Total savings by an ave. H/hold per month (Rs)	Total savings by an ave. H/hold per winter season (Rs)
250/-	150/-	100/-	400/-

## iii. Energy Savings:

Since we are evaluating the impact of the W.I technique alone under the assumption that there will be a void in the roof of the room and as such there is no electricity saving as far as winters are concerned. However a new dimension of electricity saving came into the knowledge of the consultant through the people interviewed and that was saving in the electricity head in summers due to wall insulation. According to majority of the households prior to wall insulation the use of the ceiling fans were used to be started by mid April and extended up to Mid October. With the wall insulation the summers have been squeezed by two months (one month on either side of the season) as far use of fan was concerned. From the survey it was calculated that on average there was 40% savings in the electricity bills of during those two months of the summers. The impact on an average family of 6-7 persons is illustrated below in tabular form:



**Table 4.3.3 Savings on Account of Electricity (W.I)**

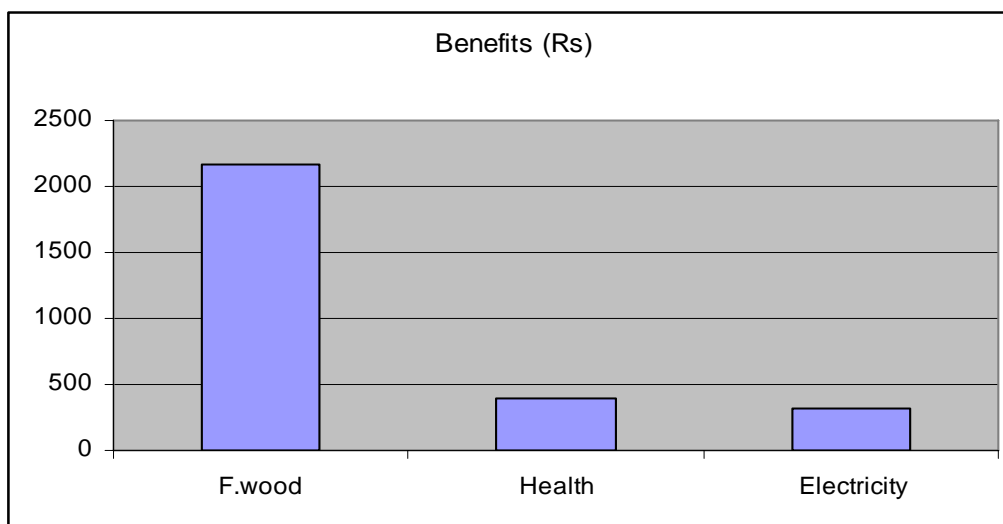
Ave. monthly Expndr. of a H/hold on Electricity in summers before W.I (Rs)	Ave. monthly Expndr. of a H/hold on Electricity in summers after W.I (Rs)	Total savings by an ave. H/hold per month (Rs)	Total savings by an ave. H/hold in two months (Rs)
400/-	240/-	160/-	320/-

#### 4.3.2 Cost-Benefit Analysis:

Thus after taking into account the monetised value of all the above savings with expected life span of the product taken as eight years, the cost benefit analysis carried out at the prevailing discount rate of 12%, can be summarized as follows:

**Table 4.3.4 Cost-Benefit Analysis, Wall Insulation (W.I) – Fuel Wood Purchased**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	<b>6000</b>								
<b>Benefits</b>									
Fuel Wood Savings	0	2160	2160	2160	2160	2160	2160	2160	2160
Health Expenditure Saved	0	400	400	400	400	400	400	400	400
Electricity Saved in Summers	0	320	320	320	320	320	320	320	320
<b>Total Benefits</b>	<b>0</b>	<b>2880</b>	<b>2880</b>	<b>2880</b>	<b>2880</b>	<b>2880</b>	<b>2880</b>	<b>2880</b>	<b>2880</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flow	-6000	2571.4	2295.9	2049.9	1830.3	1634.2	1459.1	1302.8	1163.2
<b>Commulated Cash Flow</b>	<b>-6000</b>	<b>-3428.6</b>	<b>-1132.7</b>	<b>917.3</b>	<b>2747.6</b>	<b>4381.8</b>	<b>5840.9</b>	<b>7143.6</b>	<b>8306.8</b>



**Fig 4.3(a) Benefits per Annum, Wall Insulation (W.I) – Fuel Wood Purchased**

#### 4.3.3 Key Results/Outcomes:

The key results emerged from the cost benefit analysis of Wall Insulation (W.I), where the household/end user purchases fuel wood from the market is given below:

- Net Present Value (Rs).....14307/-
- Benefit-Cost Ratio.....2.38
- Payback Period (Months).....30.6

#### 4.3.4 Scenario-II: Households who get fuel wood for room heating free of cost:

In the second scenario, where the households get fuel wood for free, the situation becomes further gloomy. It was revealed during the survey that quite sizeable number of households' get/arrange fuel wood for free from the nearby forest. The savings accrued by such families are far lesser than those who purchases fuel wood from the market and the pay back period is spread over a longer period of time. In the instant scenario some of the savings realized from reduction in health expenditure and electricity charges remains the same as in those cases where the fuel wood is purchased by the end user of the product. However there were still some areas, which were needed to be quantified for the education of the community at large. The savings realized to such families through these heads are explained below:

##### i. Saving in Non-loss of Daily Wage:

As explained earlier with the wall insulation the fuel wood consumption drops to 1680 kgs per winter season from 2400 kgs i.e. 30% saving. The average daily wage of a labour in the Northern Areas of Pakistan is Rs. 100/- per day. In this way the total saving on account of loss of wage would be around Rs. 250/- per entire winter season. The saving to an average family of the size of 6-8 persons is explained in the table given below:

Table 4.3.5 Savings on Account of Non-loss of Daily Wage (W.I)

No. of days lost/winter season before installation of W.I	No. of days lost/winter season after installation of W.I	Average Daily Wage (Rs/day)	No. of days saved during the winter season	Total Saving in the winter season
8	5.5	100	2.5	250

##### iii. Saving in transportation of Fuel Wood:

As explained in the preceding paragraphs, the average cost incurred by an average family per winter season on transportation of fuel wood of 2400 kgs through tractor amounts to Rs. 1115/-. On the contrary the average annual transportation cost per on fuel wood transported through mules/donkeys comes to Rs. 150/- per month i.e. Rs. 600/- per winter season. If it is assumed that the households use both the modes equally, which was the case in 90% of the households, then the average transportation cost of an average family on fuel wood amounted to approximately Rs. 850/- per winter season. Since with wall insulation there is 30% reduction in the consumption of fuel wood for room heating, therefore the average saving on account of transportation by a household is estimated to be Rs. 250/- per winter season. The details are given in the table given below:

Table 4.3.6 Savings on Account of Transportation of Fuel Wood (W.I)

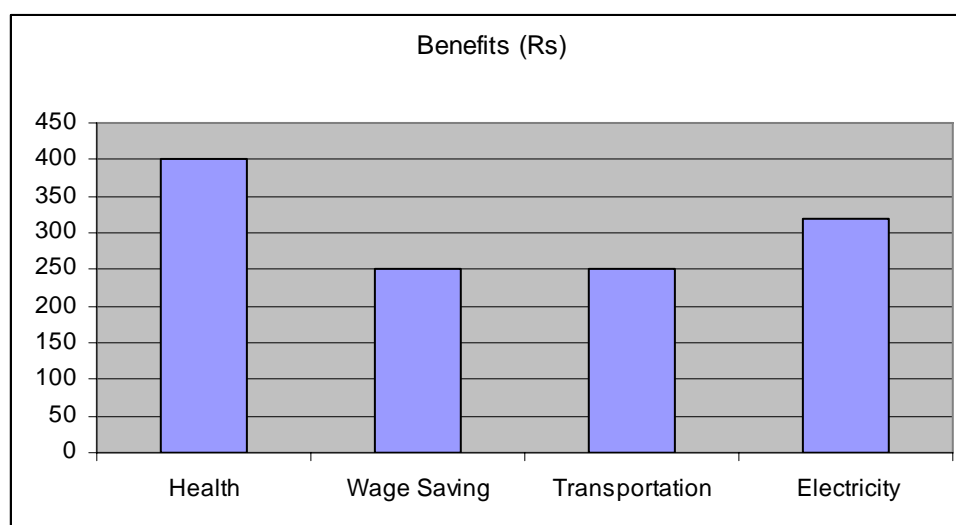
Average F.wood consumed by a h/hold per winter before installation of W.I - Kgs	Average F.wood consumed by a h/hold per winter after installation of W.I - Kgs	Ave. transportation cost of F.wood per winter before installation of W.I - Rs	Ave. transportation cost of fuel wood per winter after installation of W.I- Rs	Total Saving in the winter season - Rs
2400	1680	850	600	250

#### 4.3.5 Cost-Benefit Analysis:

As stated earlier the benefits accrued on account of health, electricity, Clothes etc. washing, plastic sheet and maintenance would remain the same as those of the families who purchases fuel wood for free. Thus after taking into account the monetised value of all the above savings with expected life span of the product taken as eight years, the cost benefit analysis carried out at the prevailing discount rate of 12%, can be summarized as follows:

**Table 4.3.7 Cost-Benefit Analysis, Wall Insulation (W.I) – Fuel Wood (Free of Cost)**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	<b>6000</b>								
<b>Benefits</b>									
Health Expenditure Saved	0	400	400	400	400	400	400	400	400
Saving in loss of Wage	0	250	250	250	250	250	250	250	250
Saving in transportation of F.Wood	0	250	250	250	250	250	250	250	250
Electricity Saved in Summers	0	320	320	320	320	320	320	320	320
<b>Total Benefits</b>	<b>0</b>	<b>1220</b>	<b>1220</b>	<b>1220</b>	<b>1220</b>	<b>1220</b>	<b>1220</b>	<b>1220</b>	<b>1220</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flow	-6000	1089.3	972.6	868.4	775.3	692.3	618.1	551.9	492.7
<b>Commulated Cash Flow</b>	<b>-6000</b>	<b>-4910.7</b>	<b>-3938.1</b>	<b>-3069.8</b>	<b>-2294.4</b>	<b>-1602.2</b>	<b>-984.1</b>	<b>-432.2</b>	<b>60.5</b>



**Fig 4.3(b) Benefits per Annum, Wall Insulation (W.I) – Fuel Wood (Free of Cost)**

#### 4.3.6 Key Results/Outcomes:

The key results emerged from the cost benefit analysis of Wall Insulation (W.I), where the household/end user arrange fuel wood for free is given below:

- Net Present Value (Rs).....6061/-
- Benefit-Cost Ratio.....1.01
- Payback Period (Months).....94.5

#### 4.3.7 A Comparison of the Two Scenarios:

The comparison of the two scenarios for W.I is given in the bar diagrams below. Although the product is of less benefit to both the categories of households but still it is evident from the figures that monetary benefits to the households who purchase fuel wood from the market are far higher than those who get it for free. Moreover the payback period for the free of cost fuel wood users is so high i.e. eight years and as such does not qualify for recommendation/adoption on any internationally recommended standards/yardstick for a low income family.

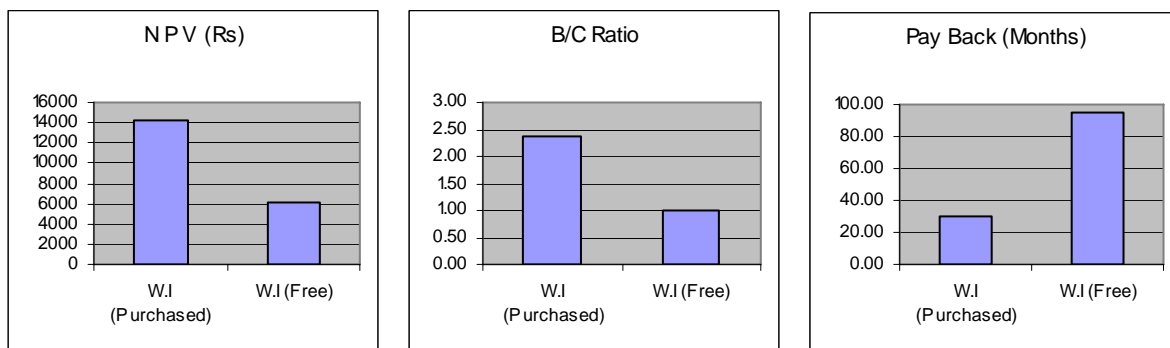


Fig 4.3(c) Cost-Benefit Analysis, Wall Insulation (W.I) – A Comparison of the two scenarios

#### 4.4 Roof Hatch Window (RHW) and Wall Insulation (W.I) Combined:

The above analysis of wall insulation clearly depicts that it will be highly unfeasible because of the longer pay back period especially in the case of households who gets fuel wood for free from the forest. The situation leads us to explore another option so that the product becomes feasible for the community. No doubt the wall insulation is a highly effective technique as far as heat retention inside the room is concerned but it becomes least effective when the room is not air tight as indicated in the above cost benefit analysis of the product. If the BACIP wants to make the technique effective and has its impact on the ground then wall insulation shall be taken in combination with some other product. In the instant case study wall insulation has been evaluated in combination with RHW.

##### 4.4.1 Scenario-I: Households who purchase fuel wood for room heating:

When the two products were taken in combination, it has a multiplying impact especially on the wall insulation. Although the price load increases in this option but it becomes negligible in view of enormous decrease in the pay back period as well as increase in the NPV. Moreover if a household can afford the costly facility of wall insulation then it can also afford the cost of RHW. For the users of RHW it is not mandatory to opt for the combined option. 7-8 households were specifically surveyed in the Chator Khand area that have both the facilities installed in the same room. The sole purpose was to evaluate the impact of BACIP products when used in combination. The methodology adopted for calculating the savings was the same as used for the individual products. The details of these savings are given below:

#### i. Fuel Wood Savings:

The impact on savings on account of fuel wood consumption furthers in this option. This was mainly because of the reason that there was further drop in the use of fuel wood when both the products were installed simultaneously. The households were of the view that the fuel wood consumption reduced considerably because of extraordinary level of heat retention capacity of the rooms for longer duration of time. Prior to installation of these products an average household of 6-7 persons was using around 20 kgs of fuel wood per day during the winter season whereas after installation of these products consumption for the same size of family was dropped to around 8 kgs per day. It can be concluded that the fuel wood consumption, as a result of installation both the products simultaneously, dropped from 20 kgs/day to 8 kgs/day i.e. by 60%.

The total impact of the two aspects for single household of the size of 6-7 persons is calculated and presented below in tabular form:

**Table 4.4.1 Savings on account of Fuel Wood (RHW + W.I)**

S.No	Description	
1	Duration of use of fuel wood (Days) in winters prior to Installation of RHW (Nov. 1 <sup>st</sup> to Feb. 28 <sup>th</sup> )	120
2	Duration of use of fuel wood (Days) in winters after the Installation of RHW (Nov. 15 <sup>th</sup> to Feb. 15 <sup>th</sup> )	90
3	Fuel wood consumed per day by the household during winters before installation of RHW (Kgs)	20
4	Fuel wood consumed per day by the household during winters after installation of RHW (Kgs)	8
5	Total consumption of fuel wood by the household during the whole winter season before installation of RHW + WI	2400
6	Total consumption of fuel wood by the household during the whole winter season after installation of RHW + WI	720
7	Total saving of fuel wood during the entire winter season (Kgs)	1680
8	Average cost of all types of fuel woods at Chator Khand (Rs/Kg)	3
9	Total savings in monetary terms as a result of installation of RHW + W.I (Rs)	5040

#### ii. Savings in health expenditure:

It was observed that the impact on the saving on account of health expenditure was the same as that of the RHW alone. The impact on an average family of 6-7 persons is illustrated below in tabular form:

**Table 4.4.2 Savings on Account of Health Expenditure (RHW + W.I)**

Ave. monthly Expndr. of an ave. H/hold on health before installation of BACIP Products (Rs)	Ave. monthly Expndr. of an ave. H/hold on health after installation of BACIP Products (Rs)	Total savings by an ave. H/hold per month due to RHW+W.I (70% of 200) (Rs)	Total savings by an ave. H/hold per winter season (Rs)
250/-	50/-	140/-	560/-

#### iii. Energy Savings:

Here the impact was almost doubled due to savings in electricity in both the seasons. As elaborated earlier in the study that both the products have different dimensions as far as saving in electricity was concerned. Explanation of these savings has already been discussed in detail in the preceding paragraphs. The combine impact on an average family of 6-7 persons is illustrated below in tabular form:

**Table 4.4.3 Savings on Account of Electricity (RHW + W.I)**

Savings in Electricity charges with installation of RHW (Rs)	Savings in Electricity charges with installation of W.I (Rs)	Total savings by an ave. H/hold per year (Rs)
240/-	320/-	560/-

**iv. Saving from Plastic Sheets:**

The saving on account of plastic sheets covering has also been elaborated in enough detail under the RHW and as such there is no need to repeat that. The savings realized due to plastic sheets is illustrated in the table below:

**Table 4.4.4 Savings on Account of Use of Plastic Sheet (RHW + W.I)**

Plastic Sheets used by a H/H during summers Nos)	Plastic Sheets used by a H/H during winters (Nos)	Plastic Sheets used by a H/H during the year (Nos)	Cost of a plastic sheet of size of 2.25 sq.yds (Rs)	Yearly Expndr of a H/H on plastic sheets (Rs)	Total Savings from plastic sheets
6	3	9	67.5	608	608

**v. Savings in Clothes Washing:**

The savings under this head also remains the same because of the same conditions. The savings on account of less clothes etc. washing activities in given below:

**Table 4.4.5 Savings on Account of clothes etc. Washing (RHW + W.I)**

Ave. monthly Expndr. of a H/hold on Clothes etc. washing before installation of RHW+W.I (Rs)	Ave. monthly Expndr. of a H/hold on Clothes etc. washing after installation of RHW+W.I (Rs)	Total savings by an ave. H/hold per month (Rs)	Total savings by an ave. H/hold per year (Rs)
60/-	30/-	30/-	360/-

**vi. Savings in Maintenance:**

The saving on account of maintenance of the room was also observed to be of good size. With open roof system there was used to be more dust and smoke in the room as well as inflow of rain water into the room due to which white wash of the room and miner repair of the wood work in the roof opening was required to be carried out after every three years by the owner. From the data collected it was revealed that after the installation of RHW and W.I the above maintenance would be required only once in the entire life of the product. The savings on account of maintenance of the room with no labour charges (this will be provided by the owner) in given below:

**Table 2.4.6 Savings on Account of Maintenance (RHW + W.I)**

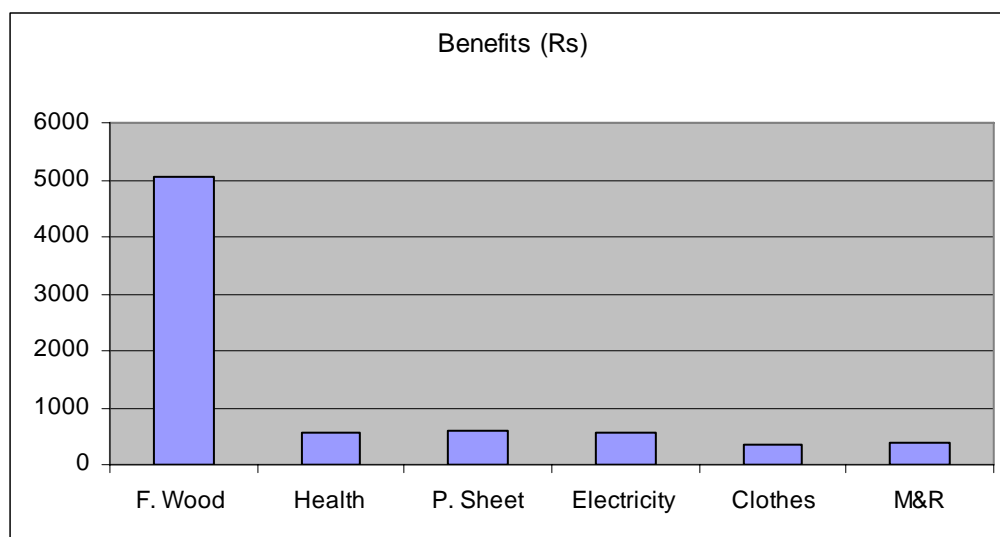
Ave. cost on maintenance of H/hold before installation of RHW+W.I (Rs)	Ave. expndr. on maintenance of H/hold without RHW+W.I-Thrice Rs)	Ave. expndr. on maintenance of a H/hold with RHW+W.I Once (Rs)	Total savings by a H/hold (Rs)	Total savings by a H/hold per year (Rs)
1500/-	4500/-	1500/-	3000/-	375/-

**4.4.2 Cost-Benefit Analysis:**

Thus after taking into account the monetised value of all the above savings with expected life span of both the products taken as eight years, the cost benefit analysis carried out at the prevailing discount rate of 12%, can be summarized as follows:

**Table 4.4.7 Cost-Benefit Analysis, RHW + W.I – Fuel Wood Purchased**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	<b>8500</b>								
<b>Benefits</b>									
Fuel Wood Savings	0	5040	5040	5040	5040	5040	5040	5040	5040
Health Expenditure Saved	0	560	560	560	560	560	560	560	560
Savings in Plastic Sheet	0	608	608	608	608	608	608	608	608
Electricity Saved (Winter+Summer)	0	560	560	560	560	560	560	560	560
Savings in Clothes etc. Washing	0	360	360	360	360	360	360	360	360
M&R	0	375	375	375	375	375	375	375	375
<b>Total Benefits</b>	<b>0</b>	<b>7503</b>	<b>7503</b>	<b>7503</b>	<b>7503</b>	<b>7503</b>	<b>7503</b>	<b>7503</b>	<b>7503</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flow	-8500	6699.1	5981.3	5340.5	4768.3	4257.4	3801.3	3394.0	3030.3
<b>Commulated Cash Flow</b>	<b>-8500</b>	<b>-1800.9</b>	<b>4180.5</b>	<b>9520.9</b>	<b>14289.2</b>	<b>18546.6</b>	<b>22347.9</b>	<b>25741.9</b>	<b>28772.2</b>



**Fig 4.4(a) Cost-Benefit Analysis, RHW + W.I Combined – Fuel Wood Purchased**

#### 4.4.3 Key Results/Outcomes:

The key results emerged from the cost benefit analysis of Wall Insulation (W.I) in combination with Roof Hatch Window (RHW), where the household/end user purchase fuel wood from the market is given below:

- Net Present Value (Rs).....37272/-
- Benefit-Cost Ratio.....4.38
- Payback Period (Months).....15.6

#### 4.4.4 Scenario-II: Households who gets fuel wood for room heating free of cost:

Like the RHW the savings realized from different heads of health, electricity, clothes etc. washing, plastic sheets and maintenance remained the same as in those cases where the household purchased the fuel wood. In this case the saving from fuel wood was replaced by saving in non-loss of daily wage and transportation cost. The savings realized to such families through these heads are explained below:

##### i. Saving in Non-loss of Daily Wage:

As indicated earlier, with the installation of both the facilities the fuel wood consumption dropped to 720 kgs per winter season from 2400 kgs i.e. 70% reduction. The average daily wage of a labour in the Northern Areas of Pakistan is Rs. 100/- per day. In this way the total saving on account of loss of wage would be around 75%. The impact is higher because the winter season, as far as within the room is concerned, also shrinks from 4 months to 3 months with the installation of both the facilities. The saving to an average family of the size of 6-7 persons is explained in the table given below:

Table 4.4.8 Savings on Account of Loss of Daily Wage (RHW + W.I)

No. of days lost/winter season before installation of RHW+W.I	No. of days lost/winter season after installation of RHW+W.I	Average Daily Wage (Rs/day)	No. of days saved during the winter season	Total Saving in the winter season
8	2	100	6	600

##### ii. Saving in transportation of Fuel Wood:

Likewise the transportation cost on fuel wood also dropped by 70% with the installation of both the facilities. Calculations made on the same pattern as that for RHW revealed that the average saving on account of transportation by a household is estimated to be Rs. 595/- per winter season. The details are given in the table given below:

Table 4.4.9 Savings on Account of Transportation of Fuel Wood (RHW + W.I)

Average F.wood consumed by a h/hold per winter before installation of RHW+W.I - Kgs	Average F.wood consumed by a h/hold per winter after installation of RHW+W.I -Kgs	Ave transportation cost of F.wood per winter before installation of RHW+W.I - Rs	Ave. transportation cost of fuel wood per winter after installation of RHW+W.I - Rs	Total Saving in the winter season - Rs
2400	720	850	255	595

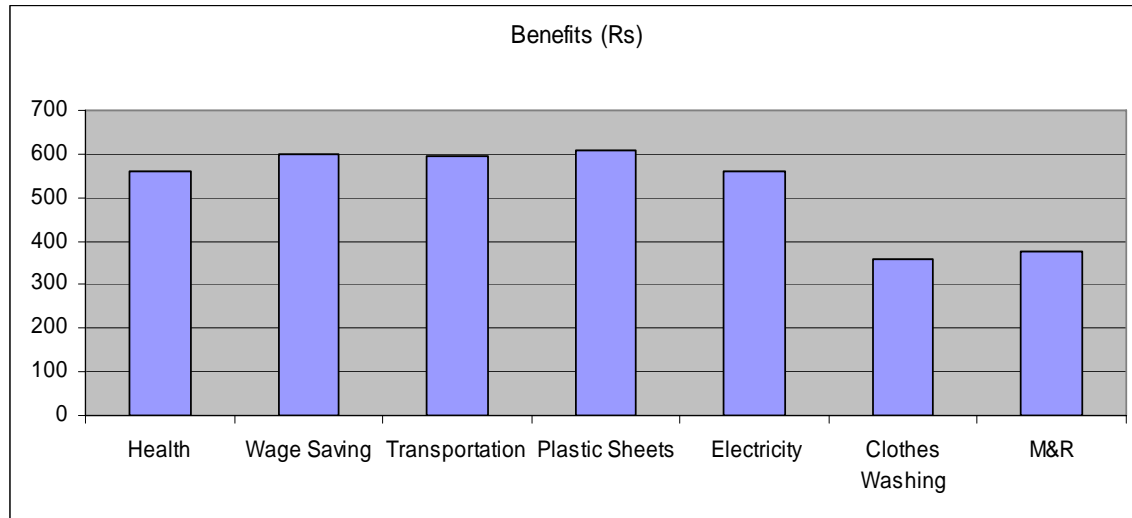


#### 4.4.5 Cost-Benefit Analysis:

As stated earlier the benefits accrued on account of health, electricity, Clothes etc. washing, plastic sheets and maintenance would remain the same as those of the families who [purchase](#) fuel wood for free. Thus after taking into account the monetised value of all the above savings with expected life span of both the products taken as eight years, the cost benefit analysis carried out at the prevailing discount factor (D.F) of 12%, can be summarized as follows:

**Table 4.4.10 Cost-Benefit Analysis, RHW & W.I Combined – Fuel Wood (Free of Cost)**

	0	1	2	3	4	5	6	7	8
<b>Total Costs</b>	<b>8500</b>								
<b>Benefits</b>									
Health Expenditure Saved	0	560	560	560	560	560	560	560	560
Saving in loss of Wage	0	600	600	600	600	600	600	600	600
Saving in transportation	0	595	595	595	595	595	595	595	595
Saving in Plastic Sheets	0	608	608	608	608	608	608	608	608
Electricity Saved (Winter+Summer)	0	560	560	560	560	560	560	560	560
Savings in Clothes etc. Washing	0	360	360	360	360	360	360	360	360
M&R	0	250	250	250	250	250	250	250	250
<b>Total Benefits</b>	<b>0</b>	<b>3533</b>	<b>3533</b>	<b>3533</b>	<b>3533</b>	<b>3533</b>	<b>3533</b>	<b>3533</b>	<b>3533</b>
Discount Factor (12%)		0.8929	0.7972	0.7118	0.6355	0.5674	0.5066	0.4523	0.4039
Discounted Cash Flow	-8500	3154.5	2816.5	2514.7	2245.3	2004.7	1789.9	1598.1	1426.9
<b>Commulated Cash Flow</b>	<b>-8500</b>	<b>-5345.5</b>	<b>-2529.1</b>	<b>-14.3</b>	<b>2231.0</b>	<b>4235.7</b>	<b>6025.6</b>	<b>7623.8</b>	<b>9050.7</b>



**Fig 4.4(b) Benefits Per Annum, RHW & W.I Combined – Fuel Wood (Free of Cost)**

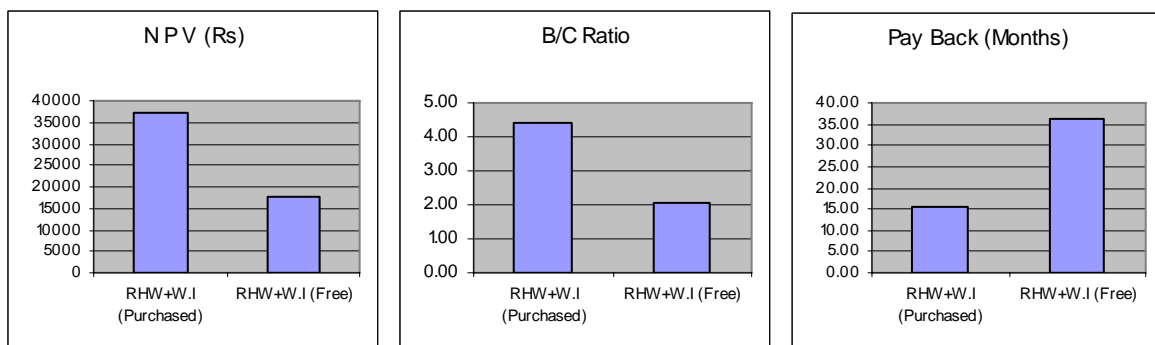
#### 4.4.6 **Key Results/Outcomes:**

The key results emerged from the cost benefit analysis of Wall Insulation (W.I) in combination with Roof Hatch Window (RHW), where the household/end user arrange fuel wood free of cost is given below:

- Net Present Value (Rs).....17551/-
- Benefit-Cost Ratio.....2.06
- Payback Period (Months).....36.08

#### 4.4.7 **A Comparison of the Two Scenarios:**

The comparison of the two scenarios for both the products used in combination is given in the bar diagrams below. The benefits have increased substantially as far as W.I is concerned. It is also evident from the analysis that the difference in pay back period between the two categories also reduced considerably with the use of the products in combination especially for the free of cost fuel wood users which has come down to around three years from eight years.



**Fig 4.4(c) Cost-Benefit Analysis, RHW & W.I Combined – a comparison of both scenarios**

## **5. Impact on Entrepreneurship:**

Another dimension of the BACIP products was its impact on the entrepreneurship at large in the area. A separate proforma/questionnaire was specifically designed for collection information from the entrepreneurs for gauging the impact of the BACIP products from the perspective of the entrepreneurship. The questionnaire/proforma is given at **annexure-IV**. At least a dozen entrepreneurs were interviewed in the Gilgit and Chator Khand area for this purpose. The following key impacts of the program were noted during the course of the study as far as entrepreneurship was concerned:

### **5.1 Increased Disposable Income:**

It was very much evident from the survey that with the introduction of BACIP products by the program there was enormous increase in the income of the already existing entrepreneurs of the area. The increase in the income of these entrepreneurs was ranging from Rs. 10000/- P/M to Rs. 15000/- P/M depending upon the business turnover. Replication of the products was beyond imagination of the project. However the documentation part of this aspect was very weak. These entrepreneurs identified the following non-quantifiable benefits during the interview sessions:

- Improved living standard;
- More investment in the education of children through admission in better schools;
- Enhanced status in the society;
- Reduced tension in the family life at home;
- Increased Calories in-take;
- Those wishes are fulfilled which were dreams for them; etc

### **5.2 New Entrepreneurs:**

The credit of introduction of new entrepreneurs in the market also goes solely to the BACIP. These new entrepreneurs have been trained by the BACIP through specialized and tailor made residential training programmes. These new entrepreneurs, although not that much established as yet, have very bright future ahead of them especially keeping in view the demand of the BACIP products. One possible avenue for the flourishing of the business of these new entrepreneurs is the extension in the credit facility to a larger population for the purchase of the BACIP products by the Micro Finance Banks.

### **5.3 Employment Generation:**

One of the key impacts, which will have a very lasting impact on the economy of the area in the very near future, is the availability of more employment opportunities in the area. During the survey it transpired that on average an established entrepreneur maintain skilled/unskilled manpower of 3-5 persons. Thus by virtue of BACIP products more people are now earning livelihood for their families. The situation will further improve with the establishment of the newly introduced entrepreneurs as well as with the increase in the use of the BACIP products in the area. This dimension of the programme will help a great deal in eradicating poverty in the area.

### **5.4 Multiplying Impact through Trainings:**

BACIP also organize trainings for the new entrepreneurs in which the old entrepreneurs are used as resource persons. Thus the programme is multiplying the impact of the products through this tailor made training programmes. These training programmes help the new entrants in the field of manufacturing in learning the key techniques of the art as well as in refining their skills in the new adopted field for the sake of livelihood.

## 6. Conclusions/Recommendations:

Following are the key conclusions/recommendations of the study:

- i. From the cost benefit analysis of the BACIP products it is quite evident that these products are contributing greatly towards poverty alleviation in the region as well as ensuring increased disposable income to the product consumers through savings in many areas and to the producers through increase in business turnover. This in turn is playing the role of a catalyst in generating economic activity in the region. In order to sustain the current level of interest of the communities in the core BACIP products and to increase it further through multiplying impact it is recommended that the program should develop a robust and implementable awareness and promotional strategy;
- ii. One of the major impacts of these core BACIP products was the utilization of the saved/increased income by the communities on the education of their children and on the quality of food. Majority of the households informed that they have switched over their children from Urdu Medium to English Medium Schools, which means that the saving is being invested by the beneficiaries in their future generation. Secondly their calories intake has improved with saved/increased income which means the percentage of under-nourished children would start declining in the area in the near future;
- iii. Evaluating the impact of the products just from the economic and financial perspective will not be fair, rather it would be injustice with the program as far as its social impacts on the families are concerned. The following are some of the social benefits which although have no financial impacts on the families but have great psychological impact on these families:
  - The products have a great impact as far as gender perspective is concerned. Besides the benefit of reduction in health expenditure, accrued specifically to women, there is another dimension to it and that is there is more time available to women for sleeping, relaxation and social interaction, which provide great psychological relief to them. Resultantly there are less tension in the day to day affairs of the families and women can spare more time towards their children and in some cases to economic activities;
  - The children can utilize more time in their studies and as such get better educated instead of wasting time in collection of fuel wood;
  - Because of the comfortable environment inside the room for longer duration of time and availability of extra light the children can study for longer duration of time anywhere in the room. It was revealed by majority of the families that prior to installation of the BACIP products the children were unable to study in the rooms sitting at a distance from the stove;
  - Social status of the families was also positively affected because of the neat and clean walls, rooms, carpets and bed sheets etc.;
  - There was a positive impact on the health of the communities using BACIP products.
- iv. BACIP products also have a positive impact on the environment of the area. As ascertained from the cost benefit analysis of the products, there is great reduction in the use of fuel wood in these areas after introduction of BACIP products. More installation of BACIP products would mean lesser and lesser use of fuel wood that in turn will reduce deforestation and resultantly there will be less soil erosion, minimum loss to the biodiversity and less damage to the ecosystem at large. BACIP should make environmental sensitization a key component of its awareness campaign for the education of the communities especially the children;
- v. The wall insulation is a very effective technique for retention of heat inside the room in extreme weathers but is of little use in the presence of that traditional void in the roof. As indicated in the analysis, for the families who get fuel wood for free, the pay back period is so long i.e. eight years and is therefore avoided by these families. It is recommended that the wall insulation facility should be encouraged in combination with Roof Hatch Window. Due to this very reason the pay back period falls by three times i.e. less than three years. The BACIP field staff should sensitize the communities through a well planned awareness programme about this aspect;

- vi. It came into lime light during the field survey that the beneficiaries of the BACIP products were not the poorest of the poor. Instead the major beneficiaries were well off people and to some extent the middle class families. BACIP should explore avenues that how the poor families can benefit from the products;
- vii. Majority of the poor people wants to have the BACIP products installed in their houses but the can't afford the loan at 12% interest rate. BACIP can enhance the impact of its products and bring down further the cost of the products by extending lending facilities itself to the communities at less than 12% interest rate. If BACIP charge just 5% interest rate on the loan extended to the communities, which in reality will be just management fee, there would be enormous increase in the sale of the product because of either the short payback period or paying capacity of the households due to easy installments. This will also enable the poorest of the poor to install these products. Establishment of a revolving fund could be one option that can be explored;
- viii. The replication has not been documented properly and therefore the impact of the program cannot be properly assessed. During the meetings with the entrepreneurs it was revealed that the replication of the core BACIP products was beyond imagination. A proper system of documentation regarding replication of these products needs to be devised so that the actual impact of the program can be assessed;
- ix. The quality of the products in certain areas, although very nominal, was reported to be low. It is suggested that BACIP should intervene in this area immediately otherwise low quality products will be poured into the market by profiteers and the trust of the community on the these products will vanish which will be a great set back to the objectives of the program;
- x. Mr Arif Hasan in his "End of Project Evaluation" conducted in 2001 has very rightly pointed out the contractors should be made BACIP partners. The instant study also support that idea as it will ensure more rapid replication of the products and more properly as well as quality installation;

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