

Solar Electrification: A Solution For Socio-Economic Development Of Rural Household: Empirical Evidence From District Sibi, Balochistan, Pakistan

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Abstract

Electricity is considered as the basic element for acceleration of social and economic development pace at urban as well as rural level. Due to high electricity demand at urban area the government of Pakistan is fail to fulfill the entire electricity demand of the urban areas because of that fact the rural areas have lack of access to seek electricity from the national grid.

The rural population of the Balochistan Province have resolved their electricity shortage problem by seeking electricity from renewable energy sources by using natural means. Majority people of urban as well as rural areas have solved their problem by self-installation of solar system.

In this regard present study is conducted in rural areas of district Sibi in Balochistan to investigate how much solar systems are successful in socio-economic development of household's livelihood. With the help of a cross sectional survey design; the primary data is collected from the 260 randomly selected household who have installed their own solar system for the last two years or more prior to the survey having no access to the national grid electricity at all. The data was collected through structured questionnaires by using a purposeful and convenient sampling techniques.

From the results of the study it is infer that most of the respondents are satisfy from the performance of the solar system except very few respondents belong to the poor population. The results indicate that installation of solar system has positively impacted business growth, income and assets level. It also enhanced their contacts with the local businessman which results in increasing number of their customers. Their children also benefiting from the solar system as they are now giving more time to their studies due to which their educational level is improving as compared to the past when they have not installed the solar system. This shows respondents are able in the establishment of sustainable business.

Key Words: Electrification, Solar System, Household, Socio-Economic Impacts, Rural Development.

1. INTRODUCTION

1.1 Background of the Study

From the last two decades a part from other problems shortage of electrification is felt as the major problem, it has crippled down the economic development of Pakistan. Due to extreme load shedding not only industrial sector has faced a great loss but also agriculture sector suffered negatively. It has

been observed from the past research studies that electricity is considered as the most important factor for socio-economic development. In-order to accelerate the development pace of urban and rural economy the government need to provide electricity both to the urban as well as rural areas of the whole country. Due to high urban electricity demand it is not possible for the government to fulfill the entire need of the urban areas. If government could not fulfill the urban

demand how it can provide it to the remote rural areas?

The economy of Pakistan is based mainly on agriculture and considered it as the backbone of the economy. Similarly, the livelihood of the rural population mainly depends upon agriculture in particular and microenterprises in general, it is because of shortage of electricity the agriculture sector is negatively affected so apart from other problems rural population is facing extreme poverty. For solving electricity problem the rural remote will need to resolve their problem by adopting renewable energy sources through natural means as an alternative to the conventional fossil fuel energy. The main importance of renewable energy is that it is sustainable, accessible, affordable, clean, environmental friendly and does not necessarily needed to be connected to the national grid.

Electricity is one of the main problem of Pakistan, as compare to other provinces the province of Balochistan has a severe power shortage. Quetta which is the capital city of the province facing from 4 to 8 hours of load shedding whereas other city of Balochistan is facing more than 12 hours. The rural area are facing acute power shortage where electricity available for only 1 hour in 48 hours means electricity is supply for only one hour after in two days. In this situation neither industrialization nor agriculture development is possible.

Balochistan is the largest in area but thinly populated province of Pakistan, covering 44% of the whole country's area whereas consist of only 5% of the total population of the country. The main strengths of this province lies in its huge but still untapped natural as well as mineral hydrocarbon deposit and 750 km undeveloped coastal belt. As per ADP Technical Report 2005 average household income is very low due to low level of industrial and agricultural activities which cause extremely low employment

opportunities. These key problems can be solved by providing better health services, educational institutions, improved agriculture system and development of industrial sector. The lack of access to electricity in the province is one of the major cause of poor rural economic development. The underdevelopment in the province has created unemployment, poverty and extreme level of discouragement among youths.

The total electricity demand of Balochistan province is about 1,650 Megawatt (MW), whereas the province is supplied only 650 MW electricity from the national grid it means there is still storage of 1000 MW electric supply. In province 80% population rely on agriculture income for bearing their livelihood expenses this is all due to river water deficiency problem the people are more inclined toward use of electric driven tube wells for irrigation. But due to long period of load shedding 47 hours in 48 hours has destroyed the agriculture production which has added in poverty level which is already at high level. The only solution for the province is to cover up electricity deficiency problem by seeking energy from alternative ways.

In present situation of electricity crises, the government is unable to provide electricity as per demand so the people need to fulfill their demand from other available alternative sources. Among other alternative sources the solar electrification system is one of the cheapest and environmental friendly renewable source of energy from which the majority of the population can get benefit who have lack of electrification access from the national grid.

Balochistan's approximately 40% land area is exposed to direct solar radiation having energy potential of about 6 KWh/Square meter per day whereas having at average annual mean of sunshine duration from 8 to 8.5 hours as around daily and annual mean it can share about at average of about 19 to 20 hours per day. So by keeping in

view the above data the Balochistan is quite prosperous to get maximum benefit from the solar isolation.

Majority people both in urban as well as in rural areas have solved their electricity shortage problem through self-installation of solar system. The people have purchased their own solar systems and installed it in their shops, factory, and private hospitals. In remote rural areas where most of the land were barren due to lack of sufficient water the people have installed solar operated tube well for irrigation. By adoption of renewable energy they has not only made their life easy but also contributed in rural development.

The main focus of the study is to investigate how much the solar system is successful in the socio-economic development of household's livelihood in rural areas. A cross sectional survey design quantitative research study was conducted for investigation of socio/economic impacts of solar electrification on remote rural household of district Sibi, Balochistan, Pakistan.

2. LITERATURE REVIEW

2.1 Essentials of Rural Electrification

The availability of energy is considered as a basic requirement for economic development and for satisfying basic need of modern life. It is considered as one of the basic component required for acceleration of economic development, uplifting living standard and reduction of poverty. Lack of electricity is one of the major barrier to the economic development and delivery of public services for the most remote rural areas of the underdeveloped countries (wassie, Adaramola; 2021).

In case of lack of access to conventional electrification the only solution to the problem is seeking electrification through renewable energy. The solar and wind are considered as the most

suitable renewable energy sources for obtaining sustainable energy production. The access to sustainable energy is considered as an essential element for socio-economic development. In present era the technological development has made it possible to utilize both of these sources for obtaining sustainable energy which is now extensively utilized in different geographical location of the world. The main factors to be considered for obtaining electricity from renewable energy technologies are sustainability, affordability and adaptability (Shoaib, A; Ariaratnam, S. 2016).

The role of cheap, manageable and safe supply of energy play a vital role in socio-economic development of a country. As the supply of electrification from national grid is not easily obtainable from the government side due to vast gap between supply and demand. Thus for Pakistan like other under developing countries only a cheaper, manageable and safe supply of energy required for socio-economic development for its rural areas which can only be obtained from renewable energy sources.

2.2 Social and Economic Impacts of Solar System:

The benefits which are resulting from solar electrification rather than other sources will have a positive impact on social and economic life of the end user. Social and Economic development depends upon availability of proper supply of energy although the energy is not considered as basic human need. In Australian research study by Hick and Ison (2011) has used STEEP assessment framework for a case study analysis which focuses the impacts of renewable energy mainly on the four elements i.e. Social, Technical, Economic, Environmental and Political whereas the present study has taken into account the analysis of Economic and Social Impacts of Solar electrification on rural household development. The solar electrification has been consider as helpful in enterprise, agriculture and socio-economic development of its user.

2.3 Empirical Review

As per the Government of Balochistan's Renewable Feasibility report 2021, currently the Government of Pakistan is producing electricity 66% from thermal, 24% hydro, 6% renewable and 4% from nuclear. The production of electricity from thermal source is very expensive for the government of Pakistan as it depend up imports of fuel and petroleum for production of electricity which requires huge foreign exchange so cheaper alternate sources available are utilization of solar and wind energy

The electrification through solar system has potential to fulfill the energy demand of the rural population of Balochistan. The solar energy plays a vital role in increasing energy diversity, long term energy security and ecological safety. It has been reported by several research studies that the solar electrification is the only feasible cost-effective solution left with remote rural population for seeking off-grid electrification in the underdeveloped countries.

Paul and Uhomoibhi (2014) have expressed in their research studies at Africa that utilization of energy generated from the solar plants have enhanced possibility for sustainable economic development in African countries which are helpful in economic growth, productive capability, education and agriculture. In a research study conducted at Bajaur area of Pakistan it was revealed that after installation of solar system it has created a positive impact on livelihood of household as children of the household were studying more apart from that their consumption on food stuff against their consumption level on kerosene oil was reduced as before solar electrification. It was experienced that their access to communication was increased and have a positive not significant impact on their income level. In addition to the above it has been found that entrepreneur sale and income level increased as they were able to spend more time in their enterprise after installation of solar system (Rehman et all. 2017). Nearly similar findings were observed in a research study conducted by Buragohain (2012) in six states of India that the household who electrified their houses and

enterprises by installation of solar systems have found improvement in their children education, standard of living, generation of their income but also experienced declined in crime rate due to installation of solar streets light in their villages.

Education play a key role in development of society, the solar electricity provides favorable environment in which children are able to gives plenty of their time to education and study more attentively which will be helpful in promotion of their standard of education (Paul, D. I; Uhomoibhi, J; 2014). During survey it has been observed that in those homes where there is no electrification facility the female spend most of their time in home, they are bound to spend most of their time by feeding children and taking care of their animals. But in those home where electricity facility is available the female can spend most of their time in seeking education and they are more helpful in economic development of rural area. All those who have well earning they can give more attention toward their health so their health condition is better than those who could not afford health facilities.

It has been reported in the Nigerian study by Adisa (2020) that rural women's participation in solar powered irrigation has been helpful in women empowerment and their knowledge have been given value which is more helpful in their decision making in everyday life. The solar irrigation has improved their income level and quality of life by enabling them by sending their children to school in more comfortable way now they are able for installing solar system for their home through their own generated funds.

The World Bank joint report (2008) reported that rural electrification has positive impact on the quality of life, education, health, productivity, extended hours for micro business and enhanced security in area. It has also increased the use of television due to which time for entertainment and information were extended. In another World Bank report (2001) experienced that rural electrification has improved access to communication, education, economic

opportunities of the people. It has also been observed that it has improved health services and securities in the area. The rural electrification in Bangladesh has positive impacts on household income, daily consumption and level of children education (Khankder, Barnes and Hussain; 2012).

3. METHODOLOGY

3.1 Methodology of the Study:

A cross sectional survey design is conducted to investigate socio/economic impacts of the solar electrification on remote rural household at district Sibi, Balochistan. The study is based on both primary as well as secondary data, the Primary data for the study is collected through an extensive household survey method by using questionnaire whereas the secondary data is collected from the previous report regarding rural development, district profile and government policy regarding installation of solar system.

3.2 Sampling Technique:

A purposeful and convenient sampling techniques is applied for collection of field data from the selected household. The purposeful sampling is used in two stages, in first stage villages and in second the respondents of the study are selected for interview and collection of data. The respondents selected for the research study are those living in remote areas of district Sibi who have installed their own solar system and having no access to the national grid electricity for all the time.

3.3 Sampling Size:

To seek quantitative information from the targeted respondents who are utilizing solar system both at home as well as for their business, an empirical survey is conducted in selected

villages i.e. Luni, Khajjak, Bagh Nari, Talli, Gulo Shair, Dhadar and Lahri. As all solar system users have installed and finance their system on self-finance so there is no exact information about total users in district Sibi. Due to lack of information regarding total population of the solar system users so 260 rural households have been targeted for interview and collection of primary data.

3.4 Data Collection process:

The primary data was collected through a structured interview. The questionnaire was developed in English by using selected and obtained variables from the reviewed literature. A group of students having a research background are trained for interviewing the respondents, they visited remote selected villages for data collection as per sample size and filled in the questionnaire by asking the relevant questions regarding their demographic profile, impacts of solar system on their entrepreneur and household. The study predicted the enterprise performance in term of sale, income, number of customers, level of stocks and investment whereas household wellbeing by level of household income, assets, living standard, health status and level of their children education since after installation of solar system. The Statistical Package for Social Scientists (SPSS) 16 version is used for data editing, cleaning and analysis.

4. Finding and Analysis

4.1 Demographic Characteristics

Total 260 responded are approached for interview out of which 235 responder's interview forms are found correct in all respect for analysis so the response rate of the valid interviewed form are 90%

Table 4.1 Gender of the Respondents

Gender	Frequency	Percentage
Male	221	94.0 %
Female	14	06.0 %
Total	235	100.0 %

Source survey data

The table indicates out of 235 majority 94% are the male whereas minor 06% are the female respondents. The main reason for low rate of female respondents are the cultural bearers which exist in the surveyed area due to which it was very difficult for the male to approach the female

respondents. It is the main limitation of the study as all members of the survey team involved in the collection of data are male as the females are not ready to become team member as their parents not allowed them to visit remote areas for data collection.

Table 4.2 Family Size

Number of Members	Frequency	Percentage
1 member	03	01.3 %
2 to 5 members	54	23.0 %
More than 05 members	178	75.7 %
Total	235	100.0 %

Source survey data

From the table it can be observe that majority 75.7% respondent's family has five family members whereas very small 1.3% respondent's family consists of only one members. The main reason of the majority respondents having large family members are due to the joint family system

in the surveyed areas where most of the rural families like to live jointly in this way they can share their family resources and reduces their consumption cost. All family members both male and female earn and spend their earned income jointly for running their family affairs.

Table 4.3 Purpose for which Solar System Installed

Number of Members	Frequency	Percentage
Household	80	34.0 %
Business	63	26.8 %
Farming	33	14.0 %
Other	59	24.7
Total	235	100.0 %

Source survey data

Table provide information about purpose for which household use solar system. The data indicate that out of the total surveyed respondents 34.0% are using solar electrification for household 26.8% for business 14.0% farming and 24.7% for other purposes, so majority of the respondents are using solar electrification for household & business and very least for farming purpose. The main reason of less utilization of solar electrification for

agriculture farming is due to it cost as for irrigation purpose a heavy plants of solar system is required which are very costly only farmer having large piece of land can install such solar system and can bear its installation cost whereas small farmer having a small piece of land can't bear its installation cost without any financial assistance from other source of financing like government/NGO funding.

4.4 Impact on Energy Expenses

Reduced Energy Expenses?	Frequency	Percentage
Yes	216	91.9 %
No	19	8.1 %

Total	235	100.0 %
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Source survey data

Table indicates the impact of solar system on household energy expenses, in response to the question the majority 91.9% are of the opinion that their energy expenses decreased since installation of solar system whereas only 8.1% felt negatively.

As solar energy is not only sustainable but it is also a low cost as compare to other energy sources so they prefer solar system as compare to other alternative sources.

Table 4.5 Reason of Preference of Solar System

Reason of Preference	Frequency	Percentage
It is very low cost system	196	83.4 %
It is a permanent Source of Supply	36	15.3 %
It can be share with other without any official permission.	03	1.3 %
Total	235	100.0 %

Source survey data

The above table presents reasons regarding preference of solar system as compare to other energy sources the results indicate strong evidence of the respondents 83.4% have felt solar system is very low cost of energy supply which can be afford by common household as compared to the other sources of energy whereas 15.3% have a feeling

that as it is a permanent source of supply as compare to other source of energy so they prefer it, only 1.3% have expressed that it can be share with other without seeking official permission like in case of government provided electrification from the main grid.

4.6 (a) Impact on Business Timing

Business Timing Increased?	Frequency	Percentage
Yes.	156	66.4 %
Not	60	25.5 %
Don't Know.	19	8.1 %
Total	235	100.0 %

Source survey data

In response to the question regarding continuation of business during the night timing in late hour, the results indicate that the majority 66.4% user of solar system have replied, now they can continue

to operate their business in late hour in night timing since the installation of solar system whereas 25.5% have negatively replied and 8.1% said they don't know about it.

Table 4.6 (b) Reasons to Continue Business in Late Hour in Night.

Reasons to Continue Business in Late Hours in Night.	Frequency	Percentage
Due to Security Reasons.	157	66.8 %
To Increase Sale.	17	7.2 %
To Increase Customers.	06	2.6 %
To Increase Income Level.	55	23.4 %
Total	235	100.0 %

Source survey data

Field survey data shown the reasons for operating business in late hours in night timing, the above table indicates 66.8% of the user have felt they now feel secure that is why they can continue to operate their business, 23.4% said they continue their

business to increase their income level whereas 9.8% have replied to increase their sale and customers they prefer to continue to operate their business in late hours.

Table 4.7 Impact on House Burn Cases.

House Burn Cases?	Frequency	Percentage
Yes.	179	76.2 %
Not	29	12.3 %
Don't Know.	27	11.5 %
Total	235	100.0 %

Source survey data

Table provide information regarding house burn cases in surveyed area it has been inferred that the majority 76.2% of the respondents have replied positively that their house burn cases due to utilization of solar system as compare to other

sources of energy has been decreased whereas 12.3% reply in negative and about nearly same percentage answer was neutral about incidence of house burn cases.

4.3 Impact on Business

Table 4.8 Impact on level of Income

Respondent Response	Frequency	Percent
Negatively	03	01.3%
No Effect	37	15.7%
Somewhat Positively	137	58.3%
Very Positively	58	24.7%
Total	235	100.0%

Source survey data

When respondents are asked about the impact of solar electrification on level of income of their business vast majority 83.0% of the respondents have positively replied and said their income generated from business is increased the main reason behind this is solar electrification due to

which they can operate their business in late hour in night. Only 1.3% respondents have reported that their business income is declined rather than increase whereas 15.7% respondent neutrally replied.

Table 4.9 Impact on level of Stock of Goods

Respondent Response	Frequency	Percent
Negatively	02	0.9%
No Effect	37	24.3%
Somewhat Positively	137	50.6%
Very Positively	57	24.2%
Total	235	100.0%

Source survey data

From the field data shown in table it can be infer that majority 74.8% respondents have felt positive impact on the level of the stock of goods since installation of solar system as their number of customer and sale have been increased, 24.3%

respondents reply they didn't felt any effect on the stock whereas very few 0.9% respondents are of the opinion their level of stock of stock of goods is negatively affected.

Table 4.10 Impact on Financial Position

Respondent Response	Frequency	Percent
Negatively	01	0.4%
No Effect	25	10.6%
Somewhat Positively	127	54.1%
Very Positively	82	34.9%
Total	235	100.0%

Source survey data

From the data it can be observed that most of the respondent 89.0% felt positive impact on financial position of their business which has been enhanced since they have obtained electricity from solar

system whereas 0.4% have negatively replied and 10.6% replied they have not felt any effect on their financial position which is remain same as before installation of solar system.

Table 4.11 Impact on number of Contacts with Local Business People

Respondent Response	Frequency	Percent
Negatively	03	01.3%
No Effect	81	34.5%
Somewhat Positively	97	41.2%
Very Positively	54	23.0%
Total	235	100.0%

Source survey data

From the data collected from surveyed area indicated in table it can be infer that vast majority 64.2% respondents are agree that after seeking electricity from solar system their number of contacts with local business people are increased as now they are more in contact with them regarding

their supply of goods, collection of cash, payment of cash whereas 34.5% reply they have not felt any effect either increase or decrease in number of contacts with local business people, very low percentage 1.3% have a feeling that these number are negatively affected rather than positive.

Table 4.12 Impact on Investment in Business

Respondent Response	Frequency	Percent
Negatively	05	02.2%
No Effect	50	21.2%
Somewhat Positively	109	46.4%
Very Positively	71	30.2%
Total	235	100.0%

Source survey data

Table indicates information about investment in business a high majority 76.6% of respondent have express their view that investment in their business has increased as now their business expenses especially energy expenses have decreased which

positively affected their level of saving from business, 21.2% reply that it has not affect their investment whereas very minor percentage (2.2%) respondents replied it has negatively affected their investment.

4.4 Impact on Household

Table 4.13 Impact on Overall Household Income.

Respondent Response	Frequency	Percent
Decreased Greatly	00	00.0%
Decreased	08	03.4%
Stayed About the Same	100	42.6%
Increased	89	37.9%
Increased Greatly	36	15.2%
Don't Know	02	00.9%
Total	235	100.0%

Source survey data

The table indicates information about impact of solar system on overall household income, from the data it can be inferred that majority 53.2% respondents have an opinion that their household income is increase since the installation of solar

system and utilization of electricity generated from it, about 42.6% have a feeling that their household income level is not effected and remain same as it was before installation of solar system whereas very few 3.4% respondents have felt their household income decreased rather increasing.

Table 4.14 Impact on Household Assets.

Respondent Response	Frequency	Percent
Decreased Greatly	00	00.0%
Decreased	04	01.7%
Stayed About the Same	78	33.2%
Increased	125	53.2%
Increased Greatly	27	11.5%
Don't Know	01	00.4%
Total	235	100.0%

Source survey data

The table shows that a vast majority 64.7% respondents have replied that their house assets i.e. television, furniture, electronic appliances are increased since the installation of solar system whereas 33.2% have a feeling that their household assets are remain same as it was whereas very minor 1.7% respondents have felt their household assets have been decreased.

It shows the solar electrification have positive impact on the user house hold assets as their consumption expenses on utilization of solar system has been reduced as compare to seeking energy from other sources so they utilize the saving amount on the purchase of assets.

Table 4.15 Impact on Family's Standard of living.

Respondent Response	Frequency	Percent
Decreased Greatly	0	00.0%
Decreased	0	00.0%
Stayed About the Same	63	26.8%
Increased	124	52.8%
Increased Greatly	42	17.9%
Don't Know	06	02.5%
Total	235	100.0%

Source survey data

From field data given in table it can be easily judged that high majority 70.7% respondents are of the opinion that their standard of living is improved since installation of solar system, 26.8% respondent reply that they have not felt any change in their standard of living because it is remain same as it was before installation of solar system whereas 2.5% have replied they don't know about it.

The main reasons behind enhancement of standard of living of user is that they have bought television due which they become connected with the other world and learn from them whereas some have utilized their saving on their health care due to which they are known living more comfortable life as compare to the past.

Table 4.16 Impact on Children's Working Timing of Education.

Respondent Response	Frequency	Percent
Decreased Greatly	04	01.7%
Decreased	01	00.4%
Stayed About the Same	59	25.1%
Increased	148	63.0%
Increased Greatly	22	09.4%
Don't Know	01	00.4%
Total	235	100.0%

Source survey data

About 72.4% respondents have replied since installation of solar system and getting electricity from that source of energy they have experienced that their children are giving more time to their education as they are now study up to late timing in the evening also complete their homework well in time, pay attention to their study during

examination 25.1% respondents have experience their working habit has not changed they are working as usual as they were working before whereas 2.1% have felt their children watching television more instead of giving their time to education minor percentage 0.4% have said they don't know about any impact.

Table 4.17 Impact on Children's Level of Education.

Respondent Response	Frequency	Percent
Decreased Greatly	0	00.0%

Decreased	4	01.7%
Stayed About the Same	50	21.3%
Increased	158	67.2%
Increased Greatly	18	07.7%
Don't Know	05	02.1%
Total	235	100.0%

Source survey data

It is infer from the field data that 74.9% parents have a feeling that their children's level of education have been improved since installation of solar system 21.3% parents have replied their children's educational level is not effected whereas 1.7% parents say their children educational level has been declined since after installation of solar system.

This shows that installation of solar system and seeking electricity from it have made a positive impact on educational level of their children as their children are giving more time to education due lightening in the evening as well as in hot summer they have a fan facility which can reduce temperature level and make environment more conducive for seeking education.

Table 4.18 Impact on Family Level of Health.

Respondent Response	Frequency	Percent
Decreased Greatly	2	00.8%
Decreased	1	00.4%
Stayed About the Same	81	34.5%
Increased	132	56.2%
Increased Greatly	11	04.7%
Don't Know	08	03.4%
Total	235	100.0%

Source survey data

The table indicates that the level of health of the vast majority 60.9% respondents have a feeling that their health position is now much more better than before 34.5% replied that they have not feel any change 1.2% have complained their health have been declined since installation of solar system whereas 3.4% have replied they don't felt any change in their health level.

When the respondents were asked why they felt positive impact on their health they say as their eyes site and chest related problems which were caused because of utilization of energy from other sources like kerosene oil or burning of wood have been reduced as solar system is much friendly to the health as compare to the other sources of energy.

5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion.

The importance of energy can't be ignore as it is now counted as basic need of life and without it achievement of social and economic development objectives are impossible especially both in agricultural as well as industrial sector.

From the research it is clear that the solar system has made positive impacts on the business and day to day life of the users as it has been experienced in the study area; the respondents can open their shops up-to late hours in night due to lightning facility as they feel more secure as compare to the past when were lack of lightning facility moreover the incidence of burn cases are reduce as compare to other sources of energy which they obtained

from kerosene oil or coal etc. The Solar system has also a positive impact on work place environment as now more customer are inclined to come to their shops for purchase of goods.

The entrepreneur found solar system has positive impact on business performance, growth and number of customer since its installation. As number of customers are increasing which positively affected sale of the business as well as enhanced income level of the entrepreneur. The level of stock as well as financial performance of the enterprise has been improved which leads to the enhancement of financial position of the business. The respondents are now spending more time in their business activities which caused increases their contact with the local business community. The business of the respondents are growing as their contacts with local business community have been increased all these factors have improved the work place environment which has resulted to make more investment in their business. Similar results were found in Bajaur area of Pakistan and study conducted in six states of India that solar system installed by the entrepreneur has positively affected their business performance (Rehman et al. 2017) & (Buragohain ; 2012)

It is clear from the study results that electricity obtained from solar was helpful in enhancement of household's income level which cause in increasing their level of assets. The household income level increased as income level of the businesses operated by them have been improved due to solar system which is helpful in enhancement of income level of the household. Due to higher level of income the households are now better in position to spend more on household expenditure which leads to improvement in living standard of the households. The finding of the study supported by previous researches reported by the World Bank (2008) and the Khankder, Barnes and Hussain; (2012).

The respondents are also agree that their kids are now spending more time on their education instead on other non-educational activities. Their children now work more devotedly and working up-to late

hours in the evening time. It is also disclose by the respondents that their children are working in summer season as they now use fan to reduce room temperature and make conducive environment for studying this also helpful in increasing level of education in study area. The same results were found in Bangladeshi study (Khankder, Barnes and Hussain; 2012).

The respondents are not only paying attention to their children education but also they are now becoming more health cautious by keeping their home more clean but also visit public as well as private clinics when they become ill which has created a positive impact on their health. It is also infer from the field data that solar system is now more helpful in improvement of user health as their home environment is feasible for health as they are now not utilizing kerosene oil or other source of energy due to which their home environment is less polluted which cause positive impacts on their level of health. Almost same results were inferred by the Paul & Uhomobhi (2014).

5.2 Conclusion

It is very much clear from the research study that solar electrification has both social as well as economic impacts on livelihood of the rural household of district Sibi. It has been inferred that most of the respondent are satisfy from the performance of the solar system but very minor respondents belong to poor community were not in favor of solar which are purchased and installed in study area. The capital cost of solar system is very high only those having financial resources they can bear the financial cost of the solar system whereas the poor people can't bear its burden without financial assistance from government or non-government organization.

The result of the present study shows that installation of solar system has positively affected business growth, income level, and assets and enhanced contact with local business people and number of customers. This shows respondents are able in the establishment of sustainable business.

The solar system has also created positive impact on livelihood of rural people. The respondents benefited by increasing their level of income,

household assets and they can bear day to day household expenditure. Their standard of living also improve their health status as compare to the status when they were getting benefit from other sources of energy prior to installation of solar system. Their children are benefiting from solar system as they are giving more time to their studies due to which their schools results are improving as compare to the past when they have not install the solar system.

5.3 Recommendation

All the above results show that solar system have both social as well economic impacts on livelihood of the rural population of District Sibi. If government want sustainable development in Balochistan they need to promote local solar industry by providing tax relief. The poor community needs to be provide financial assistance from government as well as from non-government organization also the government should provide solar panel at subsidies rates to the poor community. The local people require training regarding solar system utilization also about repairing the default if aroused during the operation of solar system. So technical institution need to introduce solar system technology education also training opportunities to the local people about repair and maintenance of solar system.

5.4 Limitation of the Study

In this research study the access to female were very difficult as data collection team were consist of male members due to which it was not possible for them to interview female solar system user. The access to very limited number of female user were possible for more reliable information more extensive data is required.

The present study was confine to only rural area of district Sibi whereas there are many user in urban area who are getting benefit from the solar system so separate research study need to be conducted to see the impact of solar system on livelihood of urban population

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