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Generating Solar Energy in the Agricultural Lands in Bangladesh and Its Legal Implications

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Abstract : In the era of digitalization Bangladesh is going through many more ventures to be more self-dependent at its every segment. Adopting necessary arrangements to overcome existing flaws is the mission of this country. One of the concerned area is to ensure sustainable use of energy. To implement the Vision 2021 the Government is giving accent on generating energy through renewable sources to secure the interest of the present and future generations. As we require more electricity to produce more crops for increasing demand of this overgrowing population, we need to shift the energy dependency to some renewable sources like solar. Implementing the notion there found some sorts of encouragements from legal arenas in consort with some barriers which are unfavorable in certain cases. Though having environment regulating laws we lack many directions as to the manner of environment conservation with a clear instruction about energy consumption. This paper is firstly emphasizing the necessity to shift dependency of power generation through solar panels in agricultural fields and secondly, it tries to focus on the legal bars for smooth functioning of such establishments. This study intends to upraise people's interaction in solar power generation in their way of cultivation. In compliance with the goals of the United Nations, a reformed idea of energy consumption for agro farming could be executed through the shifting of energy mix by spreading more solar irrigation.

1. Introduction

The concept of solar power is getting more attention by the energy consumers now-a-days. Solar powering serves human life in a different way that is more exploiting. For the developing countries like Bangladesh it needs to be upgraded in environment and energy sector which is the significant one. Being an over densely populated country our demand of food is really so high. We have to import our daily food items from the neighbor countries to meet the demand. With a level of increasing population our demand of electricity is getting higher day by day. Agriculture is the main source of income in our country till now. It makes up to 12.68%[1] of the GDP, and over 47% of the labor force in Bangladesh is involved in agriculture[2]. The income of almost 90 percent of the population living in rural areas is dependent on agriculture.[3] Agriculture sector can be categorized as one of the major areas of power

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consumption which can moderately be maintained by solar generated energy. Also for the favorable location in Bangladesh we can create more power through this system. Solar panels can be set up over these lands and the vacant spaces to create energy for the cultivation of those lands. Additionally, the concerned person can supply the unused amount of power to others as well as to the national grid.

Bangladesh government has already taken steps to embolden solar system in power generation at agricultural fields with some grants also, here it needs to connect more people to recreate their existing power generation methods. We have already many land with a larger vacant areas of cultivation where we can easily point some solar panels with a least cost that could be permanent establishments for years. Proper utilization of agricultural lands which have enough scope to meet the demand of electricity by establishing solar panels on those lands. Analyzing the existing energy and land related laws we can sort out some bars which are responsible not to make solar system an easier one. By inserting Article 18A[4] through 15th Amendment[5] of the Bangladesh Constitution provision on conservation and development of environment has been placed in by our government[6], where preservation of non-renewable energy is a significant issue. The 7th Five Year Plan[7] sets forth the Sector Goal for the power and energy sector with a theme: "Ensure sustainability in production, consumption and use of power, energy and mineral resources."[8] It is the time to rethink about the shifting of dependency from the regular source of power generation to the renewable sources.

This research is mainly aiming to create some opportunities to meet the demand of electricity by the cultivators through using their own lands and thus to increase the energy dependency on solar systems rather than the non-renewable ones. For this purpose a study has been conducted between three areas near Dhaka City i.e. Savar, Keraniganj and Mymensingh where the respondent number was 60.

2. Fundamentals of Renewable Energy

It is a well-known concept that energy cannot be created nor be destroyed. It can only be converted from one form to another form.[9] In fact energy is something which cannot be defined by length or width rather it has to be consumed in its way. Generally energy can be classified in two categories: the one which is connected with the existence or position of a particular object that is potential energy (chemical energy, nuclear energy, elastic energy, gravitational energy) and the other which is connected with the motion of any particular object such as kinetic energy (thermal energy, mechanical energy, electrical energy and magnetic energy). There are more other forms of energy, such as- light, wave, heat, solar, hydroelectric, geothermal, biomass energy etc. All forms of energy cannot be restored to its previous position. Therefore, energy again can be classified into two categories as per its renewability: renewable and nonrenewable energy resources. The natural gas, oil, coal, nuclear are the forms of nonrenewable and solar, wind, water, biomass, geothermal are renewable. The non-renewable energy is hardly reversed to its useable form. We usually use energy in different ways from the environment. Thus energy is the term

closely related to environment. By the over use of the non-renewable energy we are increasingly destabilizes our environment in a greater extent. In our ecosystem there is an existing energy mix which includes different sorts of energy based on our priority to consume them. We are now in an era which is aiming to shift to a new energy mix where renewable sources are present more than that is in now a days. With a clear vision to obtain the target of COP 21 and COP 22 the world is moving towards sustainable developments where a vast intension exists to conserve energy for the future generation as well as for the present one. We cannot shift to a newer usage promptly, rather we have to do it in an unceasing and stepped process. For such execution we need to put the flavor of renewable energy to every sector of our lifecycle.

3. Efficiency of Agricultural Lands as Solar Power Generator

Economy of Bangladesh is majorly depends on agriculture. Agricultural land in Bangladesh was reported at 70.63 % in 2015, according to the World Bank collection of development indicators. As it has a vast area of agricultural lands and they are continuously being used for cultivation of different species at different seasons, they have various looks and standings at altered times of the year. Our land is over populated to a greater extent. For this high volume of people we need more power to meet their demand. Where the electricity demand both in public and private sector is around 13000 MW, then the maximum served demand is only 9036 MW as on June 06, 2016 which is 69.51% of the demand. Only 55.26 percent of the households have access to electricity with 90.10 percent households in urban and 42.49 percent households in rural areas. Planning Commission of Bangladesh government has been making five year plan for the betterment of the country since 1973. Since then 5 five year plan and one two year plan has been implemented by the commission. The 7^{th} Five Year Plan which is planned for years 2016-2020 provides a broad outline underlying the Perspective Plan to promote sustainable development, focusing on globalization, ensuring supply of energy, and pursue sustainable development. This 7^{th} Five Year plan includes modernization of renewable energy through some efficient measures. And by 2030 it is targeted to shift the energy mix which is less depended on natural gas rather on coal and the renewable sources. Such renewable sources includes solar energy to a large extent. Solar energy can be used as power by using solar panels of different modules. As our have more lands which are being cultivated and which are of agricultural in types have more opportunities to be used as the power generator spaces.

From the early stages of this subcontinent as there were more vacant lands in comparison to the number of population, people were less interested to measure their own lands in particular. But with the grace of time, the population has increased and there urged a necessity to measure their own land to cultivate individually. Consequently the government took steps to conduct survey for villages and cities. Now a days we have our own land belonging to the record of rights. In this current spell of industrialization, still we cannot shift our dependency from agriculture to any

other economy source majorly. Till today it is our great concern for livelihood. And the costs related to agriculture are increasing by passing of time. Such costs are associated with diesel cost or electricity to activate pumps at irrigation, collecting and nurturing seeds, collecting crops from field, storing crops to store houses or in any other alternatives and then disposing of them by selling to market. Here one of the major costs is involved with triggering the pump machine either with diesel or with supplied electricity. As we get diesel as natural oil which is a non-renewable energy, it is in the way of completion day by day. Bangladesh has planned to produce 10% of total power generation by 2020 from renewable energy sources like wind, waste, and solar energy. The country plans to increase its renewable energy share to 17% by 2041 under its Intended Nationally Determined Contribution commitment to reduce greenhouse gas emissions by 5% until 2030.[10] As the total share of electricity is consumed mostly by daily users of residence and workplaces, factories and industries, also a major share is expended in agricultural sector; if there is really any possibility to generate power from solar for agricultural purposes we could be able to overcome some limitations. A better use of solar power can be made in some particular facets of agro i.e. water pumping to produce crops and livestock[11]; lighting the farms; heating and cooling; water for agricultural use; dying the seeds and crops when necessary; refrigerating the agricultural products; fencing electrical weirs around the field; lighting the houses adjacent to agro fields; storing power for later use when there is no available sunlight and so on.

One of the main reason for selecting agricultural land to produce solar power is that it needs a greater area to pointing solar panels and it is easier at agricultural fields rather than other sectors of power consumption. Here one of the interesting matter found during the survey is that about 84% of the trendy farmers give their prior consent to establish solar irrigation plant at their agricultural fields.

Total Farmers	No. of Agreed	No. of Not Acknowledged	No. of Acknowledged
100%	84%	29%	71%

Table 1: Number of farmers giving consents to accept solar irrigation system.

We have already installed solar system in household and office uses. Over 3 million homes have been provided with small solar PV system of 8 to 20 watt so far.[12] Many more countries have started to enlarge their farming by solar panels. As the remote agricultural fields where it is not possible to fix a transmission point or the electricity cannot be supplied up to the necessary level there solar powering can be the accurate and only solution to grow more crops.

4. Status of Total Agricultural Lands in Bangladesh

As a densely populated area Bangladesh is utilizing almost total of its lands. It has an area of 147570 square kilometer including the agricultural land area of 91942 sq. Km which is 70.63% of the total land.[13] Total cultivable land in Bangladesh is 8505278.14 hectare whereas the total irrigated land is 7124895.41 hectare.[14]Average yearly loss of cropland was 4,474ha (0.19%) during the years 1976-2010.[15] Again,

Bangladesh is situated between 20"43' north and 26"38' north latitude, in a very suitable position in respect of the utilization of solar energy where greatest amount is available between two broad bands encircling the earth between 15" and 35" latitude north and south.[16] Facing the solar panels at east wet direction is more effective than facing it directing north south.

The borders, corners and the lands which do not require much height to be cultivated enough can be made the points to found up some solar panels which are suitable in nature for that particular land specifically. The solar panels can there be helpful to produce crops by their own generated electricity as well as the extra generated ones could be served to others, i.e nearby lands or national grid. This concept has been well accepted by many countries. Utilizing all the accessible lands it will be easier for Bangladesh to become a country self-sufficient with food necessity.

5. Inevitability of Solar Powered Agriculture in Bangladesh

Energy consumption is extremely connected with our environment and our right to safe environment has been guaranteed by our constitution and judicial activism. The symbiotic relationship between energy and environment can be further explained by the fact that use of non-renewable sources such as fossil fuels can emit carbon dioxide, which contributes to global warming.[17]

To a greater extent solar systems are more advantageous for us as it is the most reliable one. Solar energy is completely a free source of energy and it is found in abundance; it is non-polluting, ecologically acceptable and reduces emission of the Greenhouse effect on climate change by use of fossils fuels; it could be more affordable in future with decreasing costs and increasing efficiency; it is maintenance free and will last for years. Once, solar panels are installed, there are no recurring costs. It does not require any additional fuel, other than sunlight, to produce power. By relying on battery backup, solar energy can even provide electricity, even on cloudy days and at night. [18] Interestingly, Life- cycle assessments of Solar Power Irrigation System, accounting for emissions in a cradle-to-grave scenario, indicate a potential reduction in greenhouse gas emissions per unit of energy used for water pumping (CO2-eq/kWh) of 95 to 97 percent as compared with pumps operated with grid electricity (global average energy mix) and 97 to 98 percent as compared with diesel pumps.[19] Along with the irrigation solar system can make the water use more regulated and proper.

Production of electricity depends primarily on gas and fossil fuels. In FY-2017 gas based electricity generation accounted for about 66.46%, hydroelectric generation about 1.71% imported petroleum (21.96%), and of coal (1.76%) and 8.13% of power import. In our country, consumption of electricity was 45299 million kWh of energy in the year 2016 where only in agricultural use the consumption was 1637 kWh.[20] Renewable energy are targeted to achieve 199ktoe by the year 2041 whereas it was only 36ktoe at the year 2014.[21] For this Bangladesh Government is also trying to follow 'Private Sector Power Generation Policy of Bangladesh' for attracting private investment and ensure competitive price for power generation projects.[22]

Along with some private organizations the Government of Bangladesh has already taken many steps to accommodate the issue of planting solar panels at irrigation. It has started to think and initiate some shifting mechanisms to develop solar power system at irrigation. For single crops, irrigation for 70 to 120 days is necessary. For two cropping seasons per year, approximately 200 days are necessary. This means that there are times when energy is produced but not required for irrigation. It makes sense to distribute the generated electricity and feed it into the grid when the pumps are not used. Prerequisites for this strategy are sound institutional, where framework conditions such as technical standards for electrical and measuring equipment for connecting with the electricity grid are necessary.[23] Bangladesh Government has through its 7th five years plan fixed a target to make 10% share of renewable energy to the total electricity generation by the year 2020 being align with Sustainable Development Goals strategy of United Nations.[24] It is well observed here that to meet the future energy demand and combined motto solar powered agriculture is inevitable for our country.

6. The Consigned Authorities for Solar Irrigation

Infrastructure Development Company Limited (IDCOL), Rural Electrification Board (REB), Local Government Engineering Department (LGED), Bangladesh Power Development Board (BPDB), NGOs and Private Organizations implementing solar energy program are the concerned development authorities involved with solar irrigation. [25]Infrastructure Development Company Limited (IDCOL) has been launching its project of accommodating grants from government to establish more solar irrigation pumps for agricultural purpose. It is aiming to reach to the remote places of the country where the supply of electricity is not possible in total. The interesting matter is that it is going to meet the demand in case of smaller lands also where the others are initiating only in large scale planting as it needs comparatively more space. IDCOL has now set a target of installing 50,000 solar irrigation pumps by 2025[26]. With the support of the World Bank, KfW, GPOBA, JICA, USAID, ADB and BCCRF for this initiative IDCOL has approved 1,473 solar irrigation pumps up to July 2019 of which 1,270 are already in operation with a cumulative capacity of about 28.78 MWp. The remaining pumps are expected to come into operation shortly.[27] It is granting loan amounting 10,000 BDT for a single irrigation pump and 50,000 BDT for solar mini/micro grid projects.[28] The Asian Development Bank, the World Bank is helping Bangladesh through a finance agreement that will provide $55 million in funding for the growth of renewable energy. This agreement includes supporting the creation of 1,000 solar irrigation pumps along with 30 solar mini-grids that will also greatly improve the agriculture industry by reducing carbon emissions from using diesel-fueled irrigation pumps.[29] Some other concerning private companies in relation to the power planting includes- Rahimafrooz Solar, Energypac, Cygni, Exelon Bangladesh Limited, Omera Solar, solaren Foundation, Sodev Consult International Limited, Seer Group, Roots Venture Limited, Shepra Power Engineering Limited, Easy Electronics and so on.

7. Legal Parameters

To ensure a meaningful life Bangladesh has so many laws to protect the environmental safety. As the energy issue is vastly connected with some other aspects i.e. land and property related laws; we can sort out the assisting factors which can make us able to generate more energy as well as the existing lacunas of these laws. Here, to resolve the legal bars firstly we have to identify the demands and problems faced by the mass people at placing solar panels to their agricultural fields. As well Bangladesh is trying to comply with international treaties at its best. We can have a glance to these relevant laws to pin the legal status of our solar system installation progress.

7.1 National Laws

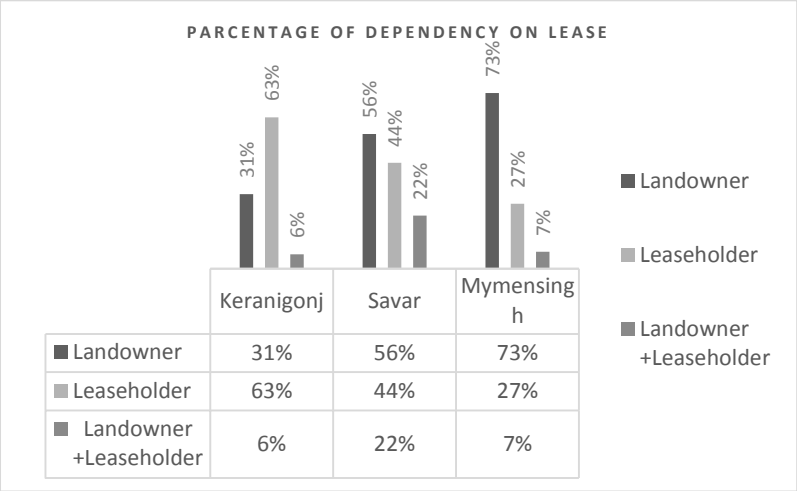
Though we have some laws to regulate the energy sector but there is no compiled form of it. The Constitution of the People's Republic of Bangladesh has been amended through its 15th amendment inserted Article 18A to upgrade the environment to make human life an easier one, whereas High Court Division interprets the term right to life as a meaningful life[30].

We have a large number of laws which are intending to regulate the environmental issues. But there is no specific Act, rather having certain policies regarding the energy consumption or preservation i.e. the Renewable Energy Policy of Bangladesh, 2008; the National Energy Policy 1996 (updated in 2008). Again as we are heading towards a renewable energy phase, Sustainable and Renewable Energy Development Authority (SREDA) has been established to monitor and control the energy matters by the Sustainable and Renewable Energy Development Authority Act, 2013. The Bangladesh Energy Regulatory Commission Act, 2003 (Amended in 2010) and the Electricity Act, 1910 (Amended in 2012) are in force till date but they are not exhaustive in their nature as they are not able to ensure the probability of energy use in each sector.

The Environment Conservation Act 1995 provides rules for obtaining environment clearance certificate to ensure sustainability and declares economic critical areas. But the indication to keep the energy efficient for future generation is not yet given clearly.

The Transfer of Property Act, 1882 prescribes five ways to transfer an immovable property- sale, mortgage, lease, gift and will. By these kinds of transfer ownership passes absolutely excluding by mortgage and lease. When someone transfers his immovable property by lease[31] it is transferred to the later on some condition and with only one year validity. In our country a large portion of people are doing agriculture by granting lease of other's property. From the produced crops of such leased lands, the cultivators have to share a major portion with the landowner. That's why both the parties get less percentage of outcomes derived from the land. Neither the land owner nor the leased one is being interested to establish solar plants with their expense. If any promotion could be done to by any respective authority to

assure to lessen their burden then it probably be easier for them to make a better arrangement for installing solar system.



	Keranigonj	Savar	Mymensingh
Landowner	31%	56%	73%
Leaseholder	63%	44%	27%
Landowner +Leaseholder	6%	22%	7%

Chart 1: Percentage of Dependency on Lease.

This table shows a picture of lease dependency of people residing near Dhaka city.as this study has been conducted based on three areas- Savar, Keranigonj and Mymensingh; this table shows the percentage of people fully and partially dependent on lease. Analyzing the situation we can revise our plans to execute the solar system installation in a greater extent.

Our major income tax regulation is the Income Tax Ordinance of 1984 which is revised in each fiscal year determining the tax rate and its collection procedure along with some prescribed penalties.[32] It is matter of pleasure that to promote agricultural income[33]our tax law has some relinquishment for the persons whose income is solely dependent on agriculture. For example, for this fiscal year 2019-2020 where a person having any other source of income is allowed to be exempted from tax up to 2,50,000 taka out of his total taxable income; the tax rebate is allowed to an extent of additional 2,00,000 taka[34] from the total taxable income of a person who earns only by agriculture. Though this ordinance is trying to encourage cultivators there is no surprising provision for those who is aiming to modernize his land with solar powering.

7.2 Compliance with the International Treaties and Standards

Our world is going through a new facet of climate change. To make this world better every country is structuring its legal notions to upgrade the troubled environment. Bangladesh is moving in the same path with a view to make the world sustainable. The United Nations' motto to build a better environment it arranges Conference of Parties on a regular basis of which Bangladesh is a party. She is thus aiming to unveil the miseries faced by its citizens as well as it wants to build some standard regulations. As a middle income country developed from the developing

countries,[35]Bangladesh's sustainable development activities are focusing on the United Nations Millennium Development Goals (MDGs) which is made aiming to develop the middle income countries. On 20 December, 2015 the world unanimously adopted the post-2015 international development agenda through Sustainable Development Goals (SDGs) for the period of 2015-2030 which has a major aim to update energy affordable, reliable, sustainable and modern (which includes renewable energy) for all[36]; make a greater Percentage of renewable energy in energy mix globally; multiply the energy efficiency improvement globally through renewable energy, energy efficiency and advanced & cleaner fossil-fuel technology, and promote investment in energy technology through expanding modern and sustainable energy services. Being a member party of the United Nations, Bangladesh has ratified the Paris Agreement of 2015 which is aiming to upgrade the standard of world's environment. As a means of progress it craves for some basic changes in accordance with the international standards fixed by the Paris Agreement and COP 25.

Although, the Sustainable and Renewable Energy Development Authority Act, 2013 and the Environment Conservation Act, 1995 has been up to dated; there lacks a mandatory guideline to build a good collaboration between different stakeholders.

7.3 Recent Undertakings by Government

The Paris Agreement is said to be the turning point of the world's stakeholders to move faster for reduce effects of climate change. It has come with some rigorously significant visions where emission reduction of Carbon Dioxide throughout the world and to make a better sustainable world were declared with great emphasis. It has made bound every member country of United Nations to submit their Intended Nationally Determined Contributors (INDCs) which is the key indications of their next 10 years improvements plans regarding sustainability.[37] The foundation of this INDC is Bangladesh's existing strategies and plans, in particular the Bangladesh Climate Change Strategy and Action Plan(BCCSAP), the Renewable Energy Policy 2008, the Energy Efficiency and Conservation Master Plan(E&CC Master Plan), the forthcoming National Adaptation Plan, the National Sustainable Development Strategy, the Perspective Plan (Vision 2021) and the Sixth (and forthcoming seventh) Five Year Plan, the National Disaster Management Plan and the Disaster Management Act, 2012.[38]INDCs were reported by the Bangladesh Government and it has secured its power to make any revision where necessary. Bangladesh in its mitigation action plan has selected the programs to ensure less emission of Carbon Dioxide. These programs includes- Improved energy efficiency in production and consumption of energy; Renewable energy development; Lower emissions from agricultural land with an objective to ensure energy secure and low-carbon development of the economy; maximizing the use of renewable energy sources to lower greenhouse gas emission and ensuring energy security; raise productivity of agricultural land and lower emissions of methane.[39]

Bangladesh already has a number of activities and targets that are driving action to meet targets of the Paris Agreement of those there is an indication to power the agro

with renewables; i.e.: a target to reduce energy intensity (per GDP) by 20% by 2030 compared to 2013; an Energy Management Program, an Energy Efficiency labelling program to promote sales of high efficiency products in the market; the Solar Homes Program, providing off-grid electricity access to rural areas; a target to deliver 5% of energy from renewable sources by 2015, and 10% by 2020 (according to 2008 Renewable Energy Policy). [40]

Such plans are the outcomes of the moving wheel of our country as it looks forward to make the power sector more ample and dependent on solar system.

8. Importance and Findings of the Study

While focusing on the summary findings of this research we can have a glance at our survey report in short. As our survey has done in between three zones near Dhaka city, findings from these areas we can make us acknowledged about the solar awareness of these localities. We have conducted our survey amongst the regular farmers who are having farming experience of a spell of 4 to 50 years. The people of great Mymensingh are 30% more dependent on agriculture rather than Savar or Keranigonj areas. Amongst them most people are doing agriculture by way of taking lease. The farmers are having 2 to 15 of their family members engaged with farming.

Needs of power: Farmers are dependent mostly on diesel or electricity and sometimes on shallow machine for irrigation purpose. A less number of people use the tube well water for irrigation which is hard-hitting and time consuming also. Here the below chart can give an idea about the dependency of power for irrigation:

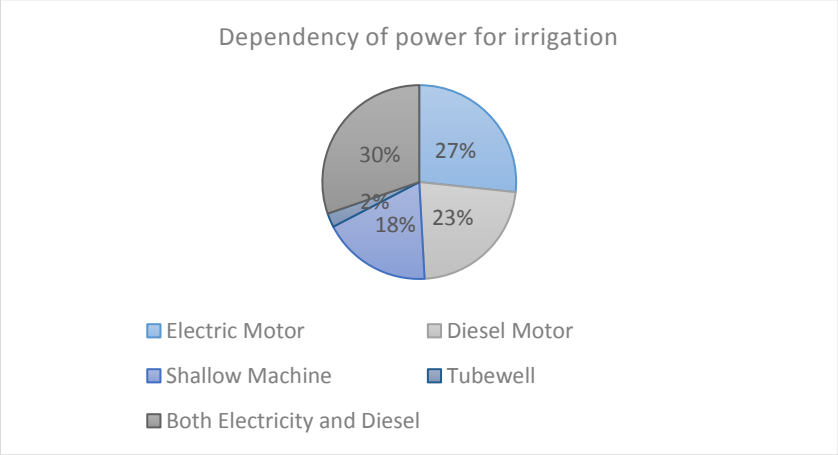


Chart 2: Dependency of power for irrigation

This chart provides a very clear picture of farmers' dependency of power for irrigation. Here, through this research it has been found that farmers majorly depend on electric motor which is 27% out of total dependency. The percentage of their dependency on diesel machine is 23%, on shallow machine 18%, on tube well it is 2% and the percentage of dependency on both electricity and diesel is 30%.

So it can easily be found that people using power for irrigation can make a shift to solar power by the assistance of our stakeholders.

Costs: It has found that farmers of these areas have to bear costs with an extent of 3000-25000 BDT in each year and the major portion they have to expend for irrigation purpose only. It is to be noted that if we can establish solar panels there it could be treated as investment at once for a longer period. Installing solar system may cost 1.5-2.5 lac taka for an acre.[41]The providers of solar panels give warranties for a longer period for their tools. So it is obvious that once one installs solar system his later costs will automatically be reduced to almost zero for irrigation. Here we can have the idea of costing of cultivation of different landowners living near Dhaka city in short:

Cultivating Areas (Decimal)	Total cultivation cost (BDT)
110	20000-25000
78	8000-9000
250	40000
100	16000
42	6000
52	8000-10000

Table 2: Cultivation cost of lands

As we have got the fact that most of the people near Dhaka City who are earning through agriculture have acknowledged with the solar system. But because of non-availability of the solar irrigation pumps, they cannot become the ultimate beneficiaries of this system.

We can apply some methods to assess the actual benefit. Our government has introduced an equation to assess the annual benefit for a particular area. For each Energy Efficiency and Conservation program, annual benefits shall surpass annual costs; i.e. annual benefits –annual costs > 0.[42]

Legal backdrops: Bangladesh lacks a compiled form of energy law for a better national use. Though having some relevant laws regarding solar powering it is almost unclear for a person to understand that from where he should start for installing solar panels to his agro area. From the early stage of promoting solar powering it is now in need to create a proper guideline from the part of the government. Through incorporating in relevant laws government can make easier the process of solar powering to agro fields so as to meet the energy demand in this moderate way.

9. Limitations and Requisites

Though having so many reasons to be make our agriculture dependent on solar power it has certain limitations which are dispiriting also. To execute the plan properly there sorted some requisites to be considered:

Requirement of sunlight: It cannot produce electricity during the night or in hazy days. Land area required compared to traditional power plant is much more.[43]

Requirement of space to locate: solar systems need more space to be located to generate power. In our country where population is comparatively higher rather than total amount of land, it feels sometimes harder to select places where solar panels can be pointed permanently.

Requirement of suitable lands: to point solar panels the selective lands should have certain physiognomies; i.e. the land should not be more covered with trees or any other shades nor the land should be flooded with water or letting it being wet during a larger time of the year.

Requirement of government assistance: Establishing solar system is to some extent expensive and need to overcome certain stages. From soil testing to generating electricity a person has to face many more difficulties to ensure solar powering. But once it has been established it need not to maintain on a daily base or to expense further as it is of permanent nature. Here if the Government spreads its assistance – towards the interested farmers/persons it will be more accessible, but up to that period they has to face different sorts of hazards.

Requirements of detailed policies or regulations: Bangladesh is literally lacking any prescriptive policy to regulate the overall solar energy sector. It needs more concentration to overcome the hindrances at fixing solar system at agricultural field as well as in other modes of power consumption. Here is great lacunae existed to be modified in a shorter term to intensely care on such venture.

Requirement of knowledge for proper functioning: Farmers and individuals are less known about the use solar irrigation, necessity to use it, or how it could be fixed to their agricultural lands, who are the authorized agents, or what are the consequences actually they have to expect. Such sorts of information are in need to be served countrywide generally. Until then the proper functioning cannot be possible.

Requirement of attentions: The policies adopted nationally and internationally are rare publicized. As a consequence the people related with agriculture are less aware about the existing factors of climate change, limitations of energy, more emission of carbon dioxide, revealing of renewable energy sources and about creating opportunity to contribute at power generation through solar irrigation or solar powering.

10. Recommendations

1. Specific laws to regulate energy sector: Though having many energy related policies and regulations, Bangladesh is lacking with specific law regulating the whole energy sector. An enhanced law is needed to regulate the energy sector which will be sufficient with the provisions of accompanying administrative factors, compensation/punishment tools, non-compliance mechanisms, quality assurance team etc.
2. Creation of One Stop Service: Investors and developers of the solar plants need to acquire permission from 30 different stops of the governmental organs. It is really harassing and if there can be establish a One Stop Service where the investors and developers can approach directly and easily with their concern. It will help discouraging people from taking steps forward for solar powering.

3. Awareness building: In our research we have found that around 77% of farmers are knowing that solar panels have less capacity to produce electricity. As to their opinion, solar system may be enough for lighting or heating but not be enough for irrigation pump. Such views are only derived from their innocence about the actual efficiency of solar panels. Their thinking is limited to the concept of less captivity of renewable sources can only be revised by adopting awareness policies. People can be more awakened by the persuasive approach of the government and the promotional policies adopted by the private companies. By banners, seminars and by the slants by local authorities to let them known about the existing plan of solar irrigation pump could be more effective to make them consented. The international examples here could be exposed to make them assure about their contribution to energy sector.
4. Making greater access to solar system: Still the farmers are less acknowledged with solar irrigation system available. Government and non-government organizations, privation companies concerned with solar equipment have to rethink of reaching farmers advertising them about solar irrigation. There need more publicizing programs to make them more concerned along with some promotions.
5. Accessibility with cheap price of solar panels: Solar panels are expensive rather than regular electricity providers. But the advantage is once it is fixed well it has almost no maintenance cost later. In a maximum up to 20 years it has not to be refurbished. The International Renewable Energy Agency (IRENA) is projecting a 59 percent cost reduction for electricity generated by solar PV by 2025 compared to 2015 prices.[44] Following the step the concerned groups of investors or grantors can revise their calculations to support the agendas.
6. Removing legal barriers: Hassles faced by the farmers at incorporating solar system should be reduced or removed in a sense. Being a little bit expensive in many times farmers could be discouraged to accept the system, here the legal barriers could be more discouraging. Sequent steps be taken to make this sector an ultimate disturbance free.
7. Collaboration of private companies: In our country many investors are interested in solar powering. But as the granting are less available they cannot fully approach to the remote farmers. So to fulfill the agendas of Bangladesh government they can collaborate with a purpose to serve. Private companies may co-operate with stakeholders both financially and good advices.
8. Disposal of panel wastes properly: Production of PV panels requires some toxins and rare minerals; mining and production of these tends to produce environmentally harmful waste; panels need to be correctly disposed of to avoid environmental harm. Such rules should be developed to ensure the full benefit of solar irrigation which will be really worthy for our environment.

11. Conclusion

With the advancement of the world which is running towards sustainable development, one of the main aim is to ensure the shifting of our energy dependency to renewable ones i.e. solar power. Having been incorporated to various sides of our daily life, solar system is going to be a mandatory part at our power generation sector. Here is a need to swing our way of using electricity source on solar system at agricultural fields so as to ensure an un-interrupted electricity supply with lesser cost. As the solar irrigation pumps are still not available to farmers, there is a growing need to advertise some programs to make them more encouraged. For instance, the government is already started making arrangements for thus and openhanded financial grants for the interested persons who are trying to cope up with this strategy, we can now in an easy turning stage to ensure this shifting. A great collaboration between government agencies, non-governmental Organizations (NGOs), private organizations and different stakeholders should be maintained in a broader extent to ensure more solar usages in agricultural fields. By continuing this way we can contribute more to our energy sector for the even reaching of our energy demand. Again we could be able to produce more crops by such un-interrupted and less expensive energy consumption. Stepping with the solar schemes it would be a better way for Bangladesh to meet the international standard of developments for making a better livable world.

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