

# Economic Viability of Introducing Renewable Energy in Poultry Industry of Bangladesh

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**Abstract** In present scenario, rapid increase of fuel cost and utility price in Bangladesh, is providing hindrance for the growth of poultry industry. Energy demand is very sensitive for the operation of poultry industry. However, a vast availability of roof top makes poultry industry a lucrative candidate for solar photovoltaic adoption. This research identifies various aspects of solar photovoltaic adoption in poultry industry considering economic and technical viability through this feasibility study. In this paper, it is evident that poultry industry can meet not only their local need of energy but also export electricity to grid by solar photovoltaic adoption. In present condition total energy consumption cannot be met by utility, diesel is often employed in load shedding time. Our technical study suggests that implementation of solar photovoltaic will cut down the cost of electricity generation by curtailing diesel consumption. As poultry industry requires a large space to operate, on-grid PV system can cater not only the internal load but also earn significant revenue by exporting electricity in the basis of net metering guideline. Electricity generation can be a significant source of income for the industry. Financial viability of solar adoption in poultry industry largely depend on the price of Feed in Tariff (FIT). The aim of this paper is to achieve the optimal feed in tariff in different conditions such as incentives, grants and interest rate. Proper incentives and reduction of bank interest can make the renewable energy electricity generation adoption in poultry industry competitive with traditional power generation.

**Keywords**— Feed in Tariff , Off-grid, On-grid, Photovoltaic(PV), Renewable Energy.

## 1 INTRODUCTION

Stimulated interest in renewable energy occurs due to the escalation of fuel price and climate change[1].

Bangladesh is one of the most densely populated country with more than 160 million population. Moreover, Bangladesh is experiencing rapid GDP growth in recent years. Stable rapid growth and urbanization are the root causes of increasing demand in electricity.

Bangladesh set a goal to attain the demand of universal electricity access within 2021. Mandate of energy policy of Bangladesh is that 10 percent of electricity should come from renewable sources. In terms of capacity 2000 MW electricity should be harnessed from renewable sources [2].

Renewable energy sources are sustainable and clean and can reproduce without depletion in the course of time. They can support the effect of continuous reduction of fossil fuels and tackle the impact that fossil fuels have on the environment. Although the greenhouse gas emission is not a primary concern for a low economy country like Bangladesh, incorporation of renewable energy is obvious because of rapidly reducing natural resources. Bangladesh has few renewable energy potentials among which solar and biomass are the most promising sources[3].

Established policies and guidelines are necessary to achieve sustainable growth from a desired sector. In order to flourish renewable energy adoption draft net metering guideline is published. Net metering is a useful method to integrate and promote renewable energy investments. Net energy metering (NEM) refers to a policy mechanism that allows prosumers to connect their renewable energy systems to the distribution grid. The mechanism allows for the export of energy (e.g. electricity) generated from distributed renewable energy sources in exchange of credits in the form of energy or money. This method of sharing energy is often termed as 'energy banking'[4]

Bangladesh poultry industry is experiencing a meteoric rise in different sectors of the industry as follows: total number of farms, net profit against production volume and entry of big farms. Based on the nature of different farms, the farms are categorized as follows:

Table 1 : Companies and their type of integration [5]

Integration	Companies
Feed mill +PS+ Hatchery	Aman Food groups
Feed mill + PS + Hatchery+ Commercial Stock	Afil Agro Ltd, AG Agro
Feed mill + PS+ Hatchery + Contract growing + Further processing	BRAC poultry
Feed mill + GPS + PS+ Hatchery + Contract growing + Further processing	Aftab bohumukhi Farms Ltd
Feed mill + GPS + PS+ Hatchery + Further processing	Paragon poultry
Feed mill + GPS + PS+ Hatchery + Commercial Stock + Further processing	CP Bangladesh Co Ltd, Kazi Farms

GPS = Grandparent stocks, PS = Parent Stocks

## 2 Literature Review

Solar energy is the most abundant and promising renewable energy resource with higher potential to gain energy than any other sources. It can be used in two ways known as thermal route and photovoltaic route. In thermal route the heat from solar energy is used for various purposes like heating, water purification, power generation, etc. On the other hand, in photovoltaic route the light in solar energy is converted into elec-

tricity, which can be used in lighting, pumping and power supply in rural areas where grid electricity is not reachable. China generated 200% more electricity in 2014 compared to the previous year because of newly added solar PV in their grid[6]. However, because of geographic position, Bangladesh has a great potential of utilizing solar irradiation. Bangladesh receives an average of 4–6.5 kWh/m<sup>2</sup> of solar radiation daily[6].

### 3. Case study:

In order to research on feasibility of adopting solar photovoltaic, we have visited three poultry farms in three different locations of Bangladesh. The farms are as follows- Kazi parent stock farms in Nalkura Panchagarh, Kazi farms Nilphamary project and Paragon poultry Sreepur projects and these farms are denoted as Farm1, Farm2 and Farm3 respectively. The key important facts and figures are summarized below.

Table 2: Potential electricity generation from the three farms after catering their own load

Farm Category	Connected Load (KW)	Roof space (square Meter)	Potential Plant Size (KW)	Potential plant export electricity generation (MWh)
Farm1	460	5660	450	533
Farm2	475	5250	450	527
Farm3	465	4900	450	526

From the Table 2, it is quite evident that these three farms have sufficient roof space for developing electricity through solar photovoltaic adoption. In the visit it is clearly visible that some energy savings mechanism can be implemented. These additional arrangements may produce higher export electricity.

### 4. Net Metering and Feed in Tariff Guideline

Exporting electricity to the grid is very much dependent on the net metering guideline. Bangladesh has produced a comprehensive guideline for prosumers in this case the poultry industry to produce electricity through renewable energy sources. But the tariff of the net metering guidelines is not well explained. It suggests that the electricity price will be adjusted with the current bills of months and subsequent months. So, a clear indication of feed in tariff is expected from the authority.

### 5. Result and Discussions

In Table-3, the relation of Electricity Export Rate with the overall financial indicators are explained. In the earlier feed in tariff conditions, government try to address electricity export cost of different Photovoltaic (PV) installation upto 18 cents whereas in the latest feed in tariff conditions the rate is fixed to 10.5 cents. If the rate is 10.5 cent, it is equivalent to 9 BDT. Moreover, in Net metering, government try to address the issue by adjusting with the current billing.

Table-3 comparison analysis of solar energy adoption in different Feed in Tariffs

Electricity Export Rate (BDT)	IRR	BCR	Payback	NPV
8	3.1	.38	12.4	-17,198,1258
9	5.2	.59	11.3	-11,394,324
10	7.2	.80	10.4	-5,590,521
11	9.1	1.01	9.6	213,282
12	10.9	1.22	8.9	6,017,086
13	12.6	1.42	8.4	11,820,889
14	14.3	1.63	7.9	17,624,692
15	16	1.84	7.4	23,248,495

If we analyze the different parameters related with electricity export rate, the satisfactory results obtained at over BDT 11. But according to present net metering scenarios, the electricity export rate will be at 8 to 9 BDT. Then the project is not feasible. To interest the poultry industry to adopt the photovoltaic to a certain extent, the price needs to be higher than the existing conditions and rate should be close upto 14 BDT. Otherwise the project will not be feasible. But for net metering guideline, the price will be BDT 8. In the Table 4, different financial schemes are also considered.

In table 4, we figure out some optimal conditions to have a decent IRR 15% for electricity export rate at 8. Excellent results can be achieved with the Tax and interest rate reductions. Even the escalation of fuel rate and electricity will create more opportunities for solar photovoltaic adoption in poultry industry in Bangladesh.

Table-4: Optimal financial conditions for different scheme to make the project feasible at Electricity Export Rate at 8 BDT

Variable	Value	BCR	NPV	IRR
Grant	45%	1.48	23,248,495	15%
Tax	7%	1.46	22,456,784	15%
GHG Credit	20 usd	1.39	23,546,567	15%
Interest rate	7%	1.31	24,660,785	15%
Fuel Escalation Rate	10%	1.41	27,624,692	15%
Electricity Escalation	5%	1.45	25,624,560	15%

From the Table -04 we can have a look at the different schemes which are applicable to different financial conditions. In order to have sufficient growth, government can take initiatives to have certain renewable energy adoption. Government are giving grant in different sectors like agriculture, education and Information technology technology. Normally, 10 to 15 percent grant is warded. That is why 45 percent grant is too high. That is why grant will have very few impacts in solar photovoltaic adoption.

Tax reduction is another important parameter to have sufficient impact. At Tax rate at 7, the project is feasible for most of

the cases. Reducing the corporate tax will have certain benefits. This scheme is easily implementable.

GHG credit is one of the key parameters to encourage renewable energy adoption. In order to have excellent performance, GHG credit up to 20 USD will have serious impact. But getting GHG credit is very difficult and requires a lot of legal and technical procedures. But due to different conditions, GHG at 20 USD will have excellent conditions.

Interest rate is one of the key aspects. In this research, the equity to debt ratio is 30 to 70 and loan period is 10 years. So, after the analysis, we have found out that 7% interest rate will have better results.

The fuel escalation and electricity escalation rate are more efficient parameters for renewable energy adoption. The cost relates to fuel, in our study diesel, is continuously increasing to a certain acceleration. Lack of reserve and ever-increasing energy demand is increasing the fuel price. Renewable energy adoption will reduce the cost of fuel price and mitigate the escalation price.

Another important consideration is electricity escalation price. Due to dependency on fossil fuel, the electricity generation price will increase day by day. In order to achieve stability, the renewable energy will be important to the effect of electricity escalation rate.

Net metering guideline and Feed in Tariff guidelines are the two cornerstones for rapid development of renewable energy production. In order to have sufficient development, this policy need more explanation. Different industry will have different energy potential and adoption feasibility. That is why the guidelines need more clarity on tariffs. The proper feed in tariff should be higher than 12 cents.

## 6. Conclusion and future works:

Poultry industry of Bangladesh is experiencing a rapid growth and disruptions. According to ever increasing cost of capital, electricity generation can be a great line of business for the industry. Other than adopting photovoltaic, there is a large potential for biogas and solar thermal also. Most of the loads in poultry industry are the heating load. These heating loads are inefficient. They normally use electrical to mechanical conversions. Solar thermal has a wide range of scope in poultry industry. Another important aspect for poultry industry will be adoption of biogas. Some firms sell the poultry waste to produce compost. These poultry waste can have a meaningful contribution in biogas generation which can easily reduce the grid electricity for energy consumption. Our result suggests that different schemes from government and funding agency will have significant encouragement for poultry industry adoption of renewable energy.

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