

8/25/2021

Dr. B.C Roy Engineering College, Durgapur Mail - PRISM project, "A Fuzzy Based Solar Egg-Incubator: A Low cost New Technology"

BCREC  
mail



4/1

Dr. Dola Sinha <dola.sinha@bcrec.ac.in>

## PRISM project, "A Fuzzy Based Solar Egg-Incubator: A Low cost New Technology"

1 message

Ramanuj Banerjee <ramanuj.b@nic.in>  
To: dola.sinha@bcrec.ac.in  
Cc: sanjaykain16 <sanjaykain16@hotmail.com>

Tue, Aug 24, 2021 at 5:36 PM

Please send all document through TOCIC pl.

Dear Madam,

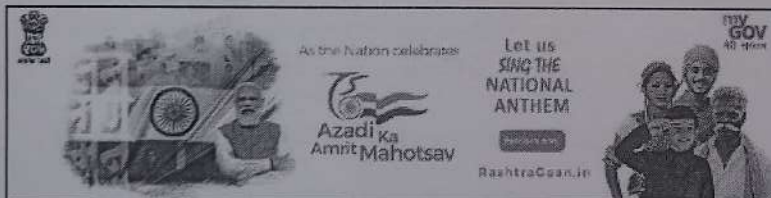
We are glad to inform you that PRISM screening committee has recommended your proposal, " **A Fuzzy Based Solar Egg-Incubator: A Low cost New Technology** ". Please see the enclosed letter for details process.

You are requested to submit signed terms & conditions in Rs. 50 stamp paper (format enclosed) and ECS blank form (enclosed) duly filled and endorsed by the bank manager pl.

CC: CSIR-CGCRI, Kolkata please help innovator to make the process done successfully

regards,

Dr. Ramanuj Banerjee  
Scientist-'F' & Member Secretary, PRISM  
Government of India  
Department of Scientific & Industrial Research  
Ministry of Science and Technology  
Technology Bhawan, New Mehrauli Road, New Delhi-110016  
Phone: 011-26590426,26534665



### 3 attachments

ECS\_Blank.pdf  
166K

Terms and conditions.doc  
47K

Letter.doc  
33K

### 3. Brief description of the idea highlighting innovative element.

Title: Fuzzy Based Solar Egg-Incubator: A low cost new Technology

The poultry sector of India experienced more rapid significant improvement than that of any other animal sector. It also has undergone a paradigm shift towards automation during the last decades. This basic operation of a poultry farm centres on the successful development of fertilized eggs to healthy chicks. It involves the control of the surrounding extrinsic environmental factors. A mother hen can perform this function naturally. But somehow the efficiency is low. An incubator which is the central unit of the hatchery basically sets the perfect environment and condition for an egg to hatch by regulating the factors like temperature, humidity, proper air ventilation and turning the eggs after certain intervals and finally contributes to increase the efficiency.

The existing egg incubators are high cost due to cost of raw materials required for manufacturing the egg incubator. Another constraint of the machine is increasing cost of power and energy required for the operation of hatching.

On the other hand solar power becomes one of the main non-conventional sources of energy contributing a lot to the rural and remote live hood in our country.

This project basically aims to build a cost effective solar incubator consisting of automatic controller to maintain the perfect ambience for hatching.

The proposed work concentrates on the following objectives:

- Automatic smooth control of the temperature and sufficient air circulation inside the incubator
- Automatic smooth control of humidity inside the incubator
- Automatic regular rotation of the eggs
- Go green with solar power i.e., easy on the wallet and the environment.

**Innovation:** There are some main contributions of the work:

1. Use of low cost air cooling techniques over the techniques of air conditions where khas-khas, cooling fan and water pump are used. The speed of fan and pump will be increased with increment of temperature after a certain range of temperature. The amount of efficiency sacrificed may be justified if we consider the cost minimization.
2. An idea of humidity control can be achieved by using silica gel, which will be kept in a closed chamber and the doors of the chamber will be opened and closed by electromagnet for dehumidification of inside air.
3. The fuzzy based central control unit is the main innovation of the project. A detailed programming in a single Arduino is quite capable of controlling temperature and humidity altogether by switching ON and OFF several devices as per requirement.
4. To run the whole system solar power will be used which is cost effective, eco friendly. And for backup batteries will be there, which can also be charged from solar panel. So it is only one time investment and there is no running cost



## Fuzzy Based Solar Egg-Incubator: A low cost new Technology

Innovator: Dr. Dola Sinha

Farm mechanisation is absolutely necessary for the growth of Indian economy which is only 18% now. An automatic egg-incubator is a part of agriculture mechanisation which provides an artificial environment to support the foetus to grow inside without the presence of the mother. It regulates the suitable temperature and humidity and automatic turning of eggs with certain intervals.

In the existing technology,

- The automated egg incubators are based on *conventional or PID based controller*. PID controller is readily available but its gains are to be tuned to get better results. Slight change in system parameters need to vary the gains. It makes the controller less adaptive. [Drawback 1]
- In the market, single stage and double or multi-stage incubators are available. Multi-stage incubators are complex in structure and its operation. Incubation environment is disturbed during each loading/unloading activity. Here manual interventions interrupt the incubation process and consume higher electricity. Thus it is not economical. [Drawback 2]
- In the existing incubators, incubation tray rotates but eggs do not rotate through their axes. Thus it creates deformities in the embryo or requires rotation of egg by hand. [Drawback 3]
- Existing incubators are run by electricity. For uninterrupted power supply there is a strong need of Inverter and battery, which will added extra cost of the system. So it has higher running cost also. [Drawback 4]
- Sometime diesel generators are used to supply the power, which creates environment pollution and directly it affects the health of chicks. [Drawback 5]

Based on the above drawbacks of the existing egg incubators in the market, we would like to fabricate a single stage, fuzzy logic based low cost solar powered automatic egg incubator, which provides flexible and smooth control of temperature and humidity, and automatic rotation of eggs in its own axes. Thus the objectives of this project are:

- **Automatic flexible control of the temperature and sufficient air circulation inside the incubator**
- **Automatic smooth control of humidity inside the incubator**
- **Automatic regular rotation of the eggs in its axis**
- **Go green with solar power i.e., easy on the wallet and the environment.**

Fuzzy logic controller in its design itself is adaptive and simple in structure. Computational complexity is also very low and making it suitable for hardware implementation. It can be handled by unskilled operators also. In the egg-incubator, there are number of atmospheric conditions that may arise depending on the variation of temperature and humidity. The Fuzzy logic controller can take care of each possible condition by set the rules manually without using individual controller for controlling each parameter. So this can be economical as well as simple in process. Stepper motor based egg rotation technology is used here, which is also connected with Arduino based micro controller, which provide house for the fuzzy logic controller. So, one central controller can control all the parameters.

Here, the incubator is based on single stage. For the cases of Hatchability, 1st grade chicks, 7-day mortality and Livability, the single-stage system is more than multi-stage system by 2.59 %, 2.80 %, 2.69 % and 0.175 % respectively. It causes an increase in Average chick weight, Average chicken weight and Avg. daily gain by 1.59%, 1.21 g, 0.59 kg and 0.8 g/day respectively when compared to multi-stage system.

Solar power and battery based system provides uninterrupted power supply with environment friendly clean technology and less running cost. Also it reduces 50% of the production cost. It will be one time investment and beneficial for long term. The clean technology can also be useful for organic farming and produce healthy chicks.

**Work done so far:**

- Fuzzy based adaptive central controller is designed for flexible control of the all parameters.
- Simulation study of the proposed scheme is done which shows satisfactory results.
- Automatic rotation of egg in its axis inside the incubation tray is made satisfactorily
- Automatic individual control of Fan and pump
- Incubator box with humidity control through magnetic door.

**Opportunity of this project:**

- This will contribute more and more towards Indian GDP;
- Fuel cost incurred in farm automation contributes to about 50% of the production cost according to Bhartiya Kisan Sangh; on rising fuel costs of 2020. As the machine will be automatic without any fuel cost so it will reduce the production cost by 50%.
- Solve unemployment to a huge extent by providing opportunities for employment in the manufacturing unit.
- Timely and precise hatching improves the health of chicks.
- It will encourage poultry farming in remote areas having scarcity of electricity.

**Market:**

In Indian scenario, the consumption of poultry meat during 2013-2020 approximately 3955000 metric ton and the global poultry meat market accelerate at a CAGR rate of 3% in 2020-2024. Thus there is a huge demand of poultry market. It is expected that the demand of automatic solar energy based efficient egg incubator is/will be high. In Covid -19 scenario, consumption of poultry products are also enhanced. Due to non availability of solar energy and fuzzy based flexible central controller for egg incubator, it is expected that it will create huge demand in the market and market share will rise more than 1%.

File No. DSIR/PRISM/207/2021  
Government of India  
Ministry of Science & Technology  
Department of Scientific & Industrial Research

Technology Bhavan  
New Mehrauli Road  
New Delhi-110 016

Dated: 21.09.2021

To

The Pay & Accounts Officer,  
Department of Scientific & Industrial Research,  
New Delhi.

**Subject: "A Fuzzy Based Solar Egg-Incubator: A Low Cost New Technology" – financial support under Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM) of DSIR.**

Sir,

I am directed to convey the approval & sanction of the President of India for the above project entitled "A Fuzzy Based Solar Egg-Incubator: A Low Cost New Technology" submitted by Dr. Dola Sinha, West Bengal under Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM) scheme of Department of Scientific & Industrial Research (DSIR) for PRISM support of ₹2.00 Lakhs/- (Rs. Two Lakhs Only), out of the total project cost of Rs. 2.30 lakhs/- (Rupees Two Lakh Thirty Thousand only) for a duration of 18 months and ₹0.20 lakhs (Rupees Twenty Thousand only) to TOCIC at CTAE, Udaipur for providing necessary assistance in execution of the project. The support of ₹2.00 Lakhs/- (Rs. Two lakhs Only) for project work under PRISM Grants-in-Aid is to be utilized as under. The balance expenditure will be borne by the innovator.

Sl. No.	Items	Proposed total expenditure	Amount (in lakhs) PRISM support recommended
1.	R&D/Design Engineering / Consultancy charges	-	-
2.	Rental charges for laboratory / workshop facilities	-	-
3.	Essential equipment that cannot be taken on rent	-	-
4.	Raw material / spares/consumables cost	0.85	0.70
5.	Fabrication / synthesis charges	0.90	0.90
6.	Manpower (based on actual & not exceeding 20% of the total project cost)	-	-
7.	Testing and trials	-	-
8.	Travel (based on actual & not exceeding 5% of the total project cost)	0.10	0.10
9.	Patent Filing (Actual fee paid to patent office)	0.20	0.20
10.	Other Expenditure	0.25	0.10
<b>Total Cost :</b>		<b>2.30</b>	<b>2.00</b>

2. I am also directed to convey the sanction of the President of India for the release of first instalment of ₹1.60 lakhs (Rupees One Lakh Sixty Thousand only) to the innovator, Dr. Dola Sinha, West Bengal for the project work and ₹16,000/- (Rupees Sixteen Thousand only) to TOCIC at CTAE, Udaipur under Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM) programme of DSIR.

3. The amount of ₹1.76 lakhs (Rupees One Lakh Seventy six Thousand only) will be drawn by the Drawing and Disbursing Officer, Department of Scientific & Industrial Research (DSIR), New Delhi and will be disbursed through RTGS/NEFT to the following as per details given below:

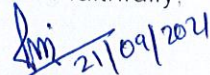
contd. . on pp. 2/-



Name of the Beneficiary with Full Address	Dr. Dola Sinha, B-1/2B, NIT Campus, Durgapur, West Bengal – 713 209	College of Technology and Engineering, Udaipur – 313 001 Kind Attn: Dean
Beneficiaries Bank with Full Address	HDFC Bank Ltd. A 102 and 103, City Centre, Bengal Shristi Complex, Durgapur, West Bengal-713 216	Punjab National Bank Sant Teresa Asram, Udaipur (Rajasthan)
IFSC of the Bank	HDFC0000234	PUNB0472100
Beneficiaries Account Number	02341050014225	4721000400000772
Amount	₹1.60 lakhs (Rs. One Lakh Sixty Thousands only)	₹16,000/- (Rs. Sixteen Thousand only)

4. This DSIR support is subject to the terms & conditions as accepted by Dr. Dola Sinha, West Bengal. The next instalment of DSIR support would be considered for release based on the progress of the project and receipt of Statement of Expenditure (SE) and Utilisation Certificate (UC) from Dr. Dola Sinha, West Bengal and TOCIC at CTAE, Udaipur.
5. It is certified that the provision of GFR 212(1) relating to Utilization Certificate (UCs) does not arise for this release as this is the 1<sup>st</sup> instalment towards the activity.
6. As per Rule 211(1) of GFRs, the accounts of the Grantee shall be open to inspection by the sanctioning authority/audit whenever the Grantee is called upon to do so.
7. As per provision contained in GFR Rule 230 (8) all interests/other earnings accrued against Grants-in aid shall be mandatorily remitted to the Ministry of Science & Technology, Govt. of India.
8. The expenditure involved will be debited against Demand No. 90 of DSIR plan (2021-22), 3425 Major Head, 60-Others (Sub-Major Head), 60.200 (Assistance to other Scientific bodies), 59-PRISM (Promoting Innovations in Individuals, Start-ups and MSMEs), 59.01.31 (Grants-in-Aid), where funds are available for the purpose.
9. This sanction has been issued under the powers delegated to this department and with the concurrence of IFD vide their diary no. E1597/DS(F)/DSIR/2021 dated 06.09.2021.
10. Sanction has been entered at Sl. No. 26 in the register of the grants (2021-22) maintained by the division.

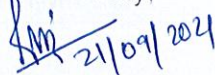
Yours faithfully,

  
(Dr. Ramanuj Banerjee)  
Scientist-F

Copy to:

1. Cash Section, DSIR – 3 copies
2. Dr. Dola Sinha, B-1/2B, NIT Campus, Durgapur, West Bengal – 713 209
3. Dean, College of Technology and Engineering, Maharana Pratap University of Technology & Engineering, University Campus, Udaipur – 313 001, Rajasthan
4. Prof. Sanjay Jain, Co-ordinator, TePP Outreach cum Cluster Innovation Centre (TOCIC), Department of Farm Machinery and Power Engineering, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur – 313 001
5. IFD, DSIR
6. Director of Audit (CW&M-II), ACGR Building, IP Estate, New Delhi-110 001
7. Dr. P.K.Dutta, Scientist-F & Head PRISM, DSIR
8. Sanction Folder
9. Project File.

Yours faithfully,

  
(Dr. Ramanuj Banerjee)  
Scientist-F