Development in Solar Cooking Technology in the Last Decade: A Comprehensive Review

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Abstract. Food is one amongst the important factors responsible for the existence of life on the earth. With the introduction of civilization, cooked food came and cooking continued because of the benefits and satisfaction it renders to human beings. Hence the energy consumption for cooking food is ever growing. Since the conventional non-renewable sources used for cooking increases the cost of living by having direct or indirect impact on us and negative impact on environment that humans cannot afford, there is need to focus on solar cooking which can play a vital role in curbing this problem. In this literature, the development of solar cooker in the previous decade i.e., 2010-2020 has been studied and focused. The sub topics discussed revolve around the development of solar cooker. The sub topics include the history of solar cooking, worldwide status of solar cooker, principle of solar cooking, testing approaches for solar cooking has been illustrated.

1. Introduction

Energy has always been an inextricable part of human life. The existence of living organisms on the earth is possible due to the solar radiations reaching the earth and the ozone layer that makes the most favourable temperature required for the functioning of enzymes and led to the existence of life and other sources required for supporting the survival of life. Since the power of human metabolism is limited, with increased complexity and to perform activities which require power beyond the power of human metabolism inventions took place and energy flows. This led to the beginning of the energy era where harnessing of energy to perform activities started, it means that the dependency of human beings on energy sources also started [1]. The earliest energy era is also called as prehistoric era. During that period the only activity human beings performed was gathering food and to secure the food supply they relied on their muscular energy. About 250,000 years ago use of fire for cooking and warmth took place. Since then heat became the source for preparing food by a process called cooking which achieved a lot of significance. The burning of biomass like wood and dry leaves as a source of energy for cooking food prevailed since, additionally with the advancement of technology other two major sources of energy for cooking came into action that is coal and kerosene[2]. These sources are a major supplier of energy for cooking. According to the World Bank, around 3 billion people used coal, kerosene, and biomass for cooking in 2018. The use of these sources as cooking fuel is linked to a
greater incidence of respiratory diseases [50]. The World Bank report 2018 highlighted that approximately 4 million untimely or premature deaths are caused due to household air pollution from inefficacious cooking practices using conventional polluting cooking fuels. Yet, major source of cooking energy are obtained from these fuels in developing countries[51]. Presently biogas, liquefied petroleum gas(LPG), electricity, and natural gas are widely used for cooking whose contribution in pollution is minimal[52]. However, the availability, affordability and hence use of these cooking fuels in rural and poor households in developing countries is uncommon [51]. Also, the most commonly used fuel, LPG, produces 1.51 kg of Carbon dioxide per unit of its consumption. With the ever-increasing demand for cooked food due to increased population and to reduce the CO₂ emission there is a dire need to substitute the LPG with other cleaner sources for cooking available. Since solar energy is free, non exhaustive and abundantly available on the earth, it is considered as the propitious clean source for cooking[53]. Approximately 3850 thousand exajoule solar energy per year is received by the earth [54]. Also, most developing countries with dense populations receives mean daily solar intensity in the range of 5–7 kW h/m² and have more than 275 bright clear days in a year[55][56]. Also, solar cooking is considered the simplest and most efficient application for harnessing solar energy[57]. Hence solar energy has a great potential to meet the energy demand for cooking.

2. History of Solar Cooking

Tschirnhausen, a German Physicist was the first who experimented with the solar cooking[8]. He boiled water in the clay pot by focusing sun rays using a large lense[9]. The first solar cooker was fabricated as a solar collector and employed to cook fruit where it reached temperature up to 88°C by Swiss geologist and physicist Horace de Saussure in 1767[11][12]. In 1830, an insulated book solar cooker was used by Sir John Herschel to cook during his South Africa journey [12][14]. In 1869, Mouchot developed the first parabolic solar cooker which was later used by Napoleon III for French Colonial troops in Africa [13]. In 1876 in India, W. Adams developed the first panel solar cooker which could cook vegetables and meat. He cooked meals for 7 soldiers in only 2 hours using an octagonal solar oven with 8 reflecting mirrors[12][15]. Ducks were roasted using solar cooker at Xiao’s Duck Shop in Sichuan, China in 1894[16][17]. In 1945, Sri M.K. Ghosh designed the first commercial box type solar cooker[12][4]. In 1979, Dr. Metcalf and Marshall Longuin carried out water pasteurization using a solar box cooker [12]. Initially, due to its higher cost and low efficiency, it was not socially accepted and was not available in the market for sale. But with the rising cost of non-renewable conventional fuels in terms of monetary value as well as health and environmental cost, solar cooking is promoted by governments of many developing and developed countries. In India(1987), Mullick carried out the performance evaluation of box-type solar cookers and developed Figure of merit testing approach; which is one amongst the most efficient testing approach of solar cooker till today. In 2000, Dr. Paul Funk proposed an international standard in terms of cooking power (W) for testing solar cookers. Accepted also by ASAE[23].

3. Worldwide Status of Solar Cooker

A major contribution in the global platform in creating awareness and educate people about solar cooking was formation of Solar Cooker International in California on January 6,1988. It won the Ashden Award in 2002 for its excellent work in Kenya and later in 2006, it was the winner of the World Renewable Energy Award. The United Nations Development Programme (UNDP) initiated the Mekhe Solar Cooker Project from 2004-2006 and later continued in 2015 which aimed at reducing indoor air pollution in rural areas of Africa. It contributed to the increase in the income of the women of Mekhe Village, cooking cost reduction by the use of the solar cooker. The project also leads to the reduction of 187390 kg in use of fuelwood and 47000 kg of CO₂ annually for three years of the project. In 2018, UNDP used renewable energy to achieve the Sustainable Development Goal in Africa, where it gave training 25000 people on solar cooker manufacturing and use of this technology in Chad. In 2019, with the support of UNDP, solar cooker ovens were provided across the Gaza strip, benefiting 9 families from North of Gaza, 5 from the Gaza Strip, 23 from the middle area, 6 from...
Khan Younis, and 4 from Rafat. In June 2020, with funding from the Global Environment Facility (GEF) and support of UNDP, Reducing Vulnerability from Climate Change (RVCC) Project, an innovative program by the Government of Lesotho has been initiated. This project is in the process to include solar cookers, fuel-efficient stoves, solar power packs, and cash transfer to curb the damage to the environment. Additionally, the World Bank has initiated the Energy Sector Management Assistance Programme (ESMAP) to promote the use of clean cooking by 2030.

4. Principle of Solar Cooking
The principle of harnessing solar energy to cook food with the help of a solar cooker has been known for over one hundred years yet the technologies used have changed only a little. Solar cookers first receive the solar radiation, then, either they reflect the solar radiations to the cooking utensil so that the reflected radiations together focus on cooking utensil to generate heat and then cooks food or they trap the solar radiation, retain the heat and the food is cooked by the generated due to the trapping of radiation[18]. It can be used for cooking, boiling, baking, and vital activities like pasteurizing and sterilization [12]. The major types of solar cookers are: Box, Parabolic, and Panel type solar cookers. All three types of solar cookers follow the same general working principle of solar cooking and their performance, efficiency, cost, and size varies depending on the geometrical and environmental parameters which we have discussed later in this literature.

4.1. Working of different types of solar cooker
• Box Type solar cooker: In the box type solar cooker the inner tray inside the body of the cooker is blackened as black color absorbs maximum heat. The box has one face made of glass through which the solar radiation to penetrate the box. The glass cover allows solar radiations of shorter wavelengths to enter. To minimize the heat loss there are two glass covers and a box is made airtight using a rubber strip. Insulating materials are used to store heat and resist heat loss and are put in the space between the body of the box and the black tray inside the box. In short, in the box type solar cooker; solar radiations get trapped causing heat generation in the cooking chamber which cooks food.
• Parabolic solar cooker: In the parabolic solar cooker reflection plays an important role. The body of this solar is made of multiple reflecting sheet material arranged in a manner forming a parabola. This whole setup is supported by a metal frame with castor wheels which allows it to stand and move to adjust the reflecting body to focus on the cooking pot with the passage of a day, the cooking pot is put on the central platform raised above the reflecting body. The reflecting body receives the solar radiation and reflects it to the bottom of the cooking pot which causes the heating effect to the pot and it(pot) transmits it to the food inside.
• Panel solar cooker: These types of solar cookers are a combination of box type and parabolic solar cooker.

5. Testing Approaches
The selection of best solar cooker is done by evaluation of solar cooker based on 1. Quantitative Criteria 2. Qualitative Criteria[6]. The evaluation of the performance of solar cooker comes under quantitative criteria. The qualitative criteria follow the quantitative criteria because if the performance of the solar cooker does not satisfy the consumers’ requirements the technology will either be replaced or disenchanted. The acceptance or rejection of technology by consumers is based on performance, costs and dynamic human behavior and are called qualitative criteria of selection of solar cooker[7]. In this literature, a quantitative criterion is focused as it is a base for the further manufacturing and supply of solar cooker in the market.

5.1. Quantitative Criteria
5.1.1. Average Heating Power of solar cooker

It is expressed as[4]: \[ Q_{\text{heat}} = \frac{m_w \times c_p \times \Delta T_{\text{a}} - \Delta t}{\Delta t} \] (1)

Where: \( m_w \): mass of water as load, \( c_p \): specific heating capacity at a constant pressure, \( T_{\text{a}} \): ambient temperature, \( \Delta t \): Cooking time

*To avoid the uncertainty of the boiling point, heating power is measured from ambient temperature up to 95°

5.1.2. Figure of merit

A) First Figure of Merit (\( F_1 \)): To identify the highest/maximum temperature that can be reached by a solar cooker \( F_1 \) test is conducted; where the load in the solar cooker is absent.

Expression[4][5]: \[ F_1 = \frac{T_p - T_A}{H_S} \] (2)

Where: \( T_p \): maximum temperature reached by a solar cooker, \( T_A \): Ambient temperature, \( H_S \) or \( I_S \): Solar radiation on a horizontal surface or say, Direct Solar Irradiance.

It is also calculated using the ratio of the Optical Efficiency to the Heat Loss factor of the solar cooker [48].

B) Second Figure of Merit (\( F_2 \)): This test is done in the presence of load in the solar cooker.

Expression[4][5]: \[ F_2 = \frac{m_w \times c_w \times \ln \left( \frac{1-F_1}{1-F_1} \right) \times \frac{T_w1 - T_w2}{H_{\text{ev}}} \ln \frac{1-F_1}{1-F_1} \times \frac{T_w1 - T_w2}{H_{\text{ev}}} }{A(t_2-t_1)} \] (3)

where: \( m_w \): mass of water as load, \( c_w \): specific heating capacity of load, \( A \):aperture area of the cooker, \( t_1 \):time when cooking started, \( t_2 \):time when cooking stopped, \( T_A \):ambient temperature, \( T_{w1} \):initial water temperature, \( T_{w2} \):final water temperature, \( H_{\text{ev}} \):Average horizontal solar radiation or average DNI

*The higher value of factor of merit \( F_1 \) and \( F_2 \) is desirable for better cooker. Based on the first figure of merit, there are two divisions of solar cooker; first is solar cooker with \( F_1 \) greater than 0.12 and second is class B solar cooker which has \( F_1 \) smaller than 0.12.

5.1.3. Cooking Power

It is the rate of useful energy available during the heating period.

Expression[10]: \[ P = \frac{m_w \times c_w \times (T_{w2} - T_{w1})}{t} \] (4)

where: P: cooking power, \( t \): cooking time

5.1.4. Standardized Cooking Power

Expression[10]: \[ P_s = \frac{P \times S_i}{I_s} \] (5)

where: \( S_i \): Standard Insolation, \( I_s \): Interval Average Solar Insolation

5.1.5. Optical Efficiency

From the calculation of \( F_1 \), the subsection above, optical efficiency can be defined as the product of the first figure of merit and the heat loss factor of a solar cooker [48].

Expression[22]: \[ Q_{\text{oe}} = \frac{Q_{\text{heat}}}{I \times A} \] (6)

where: \( Q_{\text{heat}} \): heating power of the solar cooker, \( I \): solar radiation, \( A \): area of collector surface.

5.1.6. Evaporation Power

It is determined during the evaporation of water at the boiling point. The heat capacity of the cooker has less influence on the performance because the system works at a constant temperature.

Expression[21]: \[ Q_{\text{ev}} = m_{\text{ev}} \times H_{fg} \] (7)

where: \( m_{\text{ev}} \): measured rate of evaporated mass of water, \( H_{fg} \): latent heat of evaporation.
5.1.7. Efficiency
It is the ratio of the power output by the power input. Here the power input is a product of solar radiation and the area of the collector surface.
Expression\[21\]:
\[ Q_{\text{eff}} = \frac{Q_{\text{output}}}{I \times A} \] (8)
where: \( Q_{\text{output}} \): Power Output, \( I \): Solar radiation, \( A \): area of the collector surface.

5.1.8. Uniformity Factor
It is used to estimate the flux uniformity of the cavity receiver surface.
Expression\[46\]:
\[ UF = \frac{\text{Maximum Flux} - \text{Average Flux}}{\text{Maximum Flux}} \] (9)
Where, maximum flux is determined by considering the highest fluxed areas inside the cavity of the receiver surface and average flux is calculated based on incoming energy divided by surface area of the cavity.

5.1.9. Reflectance
The ratio of reflected irradiance to the incident irradiance is called Reflectance\[22\].

5.1.10. Exergy Factor
It is the ratio of the total exergy to the total energy. It can be a useful parameter for calculating the thermal performance of a solar cooker as it considers both the initial temperature of the storage tank and the ambient temperature conditions of the solar cooker\[33\].

5.1.11. Parameter Index
A new performance indicator for the box type solar cooker ‘Parameter Index’ has been defined by Kammen and Lankford. Unlike other cooker testing procedures, this index emphasizes the dynamic cooking capability of the cooker\[48\].

6. Performance of Solar Cooker over the Last Decade

| S.n. | Reference | Region | Year | Highlights | Performance |
|------|-----------|--------|------|------------|-------------|
| 1.   | Naveen et.al [25] | India | 2011 | Box type solar cooker (BSC) and Shortened/truncated pyramid type box solar cooker(TPBSC) | Energy Efficiency(%) Exergy Efficiency(%) | BSC 26.21 2.85 TPBSC 26.52 2.78 |
| 2.   | Harmim et.al [26] | Sahara | 2012 | Box Type solar cooker employing an optogeometrical parabolic concentrator | | • \( F_1 = 0.1681 \) \( F_2 = 0.35 \) • Energy Efficiency= 20.94% |
| 3.   | Mahavar et.al [27] | Rajasthan | 2012 | Single family cooker with hybrid insulation and polymetric glaze | | \( F_1 = 0.116 \) \( F_2 = 0.466 \) |
| 4.   | M. Mussard Trondheim | | | Solar cooking using heat | First solar cooker used was SK14 solar cooker without heat storage and hence no |
charging could be done and cooking is done by direct heat. Another solar cooker with heat storage took hours to get charged to meet the required operating temperature which was very high.

- Boiling time with solar cooker with heat storage= 38 minutes
- Boiling time with solar cooker without heat storage = 27 minutes

| 5. | S. Skouri et.al [29] | Tunis, Tunisia | 2013 | Solar parabolic concentrator SPC using four absorber plate/receiver | Receiver used | Thermal Efficiency(%) |
|----|----------------------|----------------|------|---------------------------------------------------------------|----------------|-----------------------|
|    |                      |                |      | Thin plate                                                   |                | 53                    |
|    |                      |                |      | Disk                                                         |                | 70                    |
|    |                      |                |      | Water caloriemeter                                           |                | 71                    |
|    |                      |                |      | Solar heat exchanger                                         |                | 72                    |

| 6. | S.Z. Farooqui et.al [30][31] | Karachi, Pakistan | 2013 | Solar cooker with vacuum tube | Average Thermal Power Transfer per sq. Meter= 208 W |
|    |                               |                  |      |                                                                             | Overall thermal power transfer efficiency= 30% |
|    |                               |                  |      |                                                                             | Exergy Efficiency= 4.6% |

| 7. | S.Z. Farooqui et.al[32] | Karachi, Pakistan | 2013 | Box type solar cooker with gravity based tracking system | Optimization of solar cooker for 6 hours of cooking per day without manual tracking. To track the sun more accurately system need to set for 3 hours at a time |
|    |                               |                  |      |                                                              |                                                                 |
|    |                               |                  |      |                                                              | F₁= 0.1258        F₂= 0.369 |

| 8. | A. Mawire et.al [33] | Mmabatho, South Africa | 2014 | Solar cooker with thermal oil | Thermal Oil Charging Power(W) Energy Storage Charging Efficiency |
|    |                     |                     |      | Sunflower Oil                                                   | 1015             0.78               |
|    |                     |                     |      | Shell Thermia C                                               | 864              0.80               |
|    |                     |                     |      | Shell Thermia B                                               | 838              0.79               |

| 9. | V.P. Sethi et.al[34] | Ludhiana, India | 2014 | Optimally inclined box type solar cooker with parallelepiped cooking vessel design | Figure of merit for inclined cooker 0.16 0.54 |
|    |                     |                  |      | For Parallelepipied solar cooker |
|    |                     |                  |      | • Standard cooking power was 40% more and |
|    |                     |                  |      | • cooking time was 37% less |
|    |                     |                  |      | as compared to conventional cylindrical vessel solar cooker placed horizontally |

| 10. | S.B. Joshi et.al[35] | Gujarat, India | 2015 | Hybrid Box type Solar Cooker | Energy Efficiency= 38% |
11. S.Z. Farooqui et.al [36] Krachi, Pakistan 2015 Box type Solar Cooker with power free tracking system
Length of booster mirror was twice the width of solar cooker inclined at an optimal angle for the day with tracking system and can gather 3kWh of solar energy during 6 hours which can be extend for more hours without the loss of efficiency of cooking.

12. H. Zamani et.al [37] Iran 2015 Parabolic solar cooker with three adjustable mirrors, which can be placed on the parabolic path according to the sun’s position
In the presence of adjustable mirrors
- Overall increase in energy efficiency= +35.5%
- Increase in effective energy efficiency= +32.07%
as compared to non adjustable mirrors in concerned design of solar cooker.

13. S. Mahanvar et.al [38] Jaipur, India 2017 Box Solar Cooker with Electric Power Back up
The major problem in solar cooking is incapability of cooking in low availability of sunlight and in night.

| Condition          | Cooking time |
|--------------------|--------------|
| Outdoor cooking    | 1 hr 30 mins – 2hrs 30 mins |
| Scattered cloudy day | 1 hr 40 mins |
| Indoor cooking     | 1 hr 25 mins |

| Dish               | Energy efficiency(%) of solar cooker used | Cooking Time(minutes) |
|--------------------|------------------------------------------|-----------------------|
| Sweet Potato       | 18.9                                     | 46                    |
| Pork               | 22.6                                     | 34                    |
| Yarn               | 11.2                                     | 61                    |
| Radish             | 12.2                                     | 64                    |

14. Yunsheng Zhao et.al [39] Beijing, China 2018 Novel portable solar cooker using a curved Fresnel loss concentrator

| Absorber type          | Energy Efficiency( %) | Exergy Efficiency(%) |
|------------------------|-----------------------|----------------------|
| Ordinary               | 27.7 – 17.0           | 17.9 – 11.5          |
| Triangular porosity    | 30.4 – 18.7           | 19.9 – 12.8          |
| Semi circular porosity | 33.2 – 20.4           | 21.7 – 14.0          |
| Trapezoidal porosity   | 34.6 – 21.2           | 22.6 – 14.6          |

15. E. Cuce et.al [40] Turkey 2018 Thermal performance of a cylindrical solar cooker via novel micro/nano porous absorbers

16. A. Saxena et.al [41] India 2018 Hybrid Solar cooker with air duct
Product cooked
Thermal Efficiency of solar cooker with air duct(%)
| No. | Authors | Country | Year | Type of Solar Cooker | Solution/Improvement |
|-----|---------|---------|------|----------------------|----------------------|
| 17. | M. Singh et al. [42] | Ludhiana, India | 2018 | Multi Self Inclined Solar Cooker and Conventional Horizontally placed Solar Cooker | For Multi self Inclined solar cooker: $F_1 = 0.13$, $F_2 = 0.45$; Standard Boiling Time: 194 mins; Cooking Power: 145 W; Which is better than HPSC |
| 18. | Gianluca Coccia et al. [43] | Italy | 2018 | High temperature solar box cooker with a solar salt as phase change material in thermal storage unit | The load cooling time extended by average 86.55% in presence of solar salt as phase change material in the thermal storage unit |
| 19. | Mandeep et al. [24] | Ludhiana, India | 2018 | Twin chamber community solar cooker | $F_1 = 0.13$, $F_2 = 0.42$ |
| 20. | H.A. Zafar et al. [48] | Taxila, Pakistan | 2018 | Solar cooker with L shaped absorber plate, double glazed, one internal and two external reflectors | $F_1 = 0.12$, $F_2 = 0.262$; Parameter Index: 2.90%; Energy Efficiency: 20% |
| 21. | A. Keith et al. [44] | Australia | 2019 | Collapsible parabolic solar cooker incorporating phase change material | |
| 22. | Hosseinza deh M et al. [45] | Iran | 2019 | Portable Evacuated Tube Solar Cooker | Method: Analytic (75.89) Taguchi (76.30) Solar cooker Efficiency (%): Useful thermal power (Watt): 208.32 196.22 |
| 23. | H. Wang et al. [46] | China | 2019 | Solar Cooker with a fixed focus Fresnel lens solar concentrator | Shape of bottom Reflective cone: Spherical (72.23%) Cylindrical (68.37%) Conical (76.40%) |
| 24. | A. Ukey et al. [49] | Nagpur, India | 2019 | Octagonal Box type solar cooker with multiple reflector | $F_1 = 0.3027$, $F_2 = 0.607$; Energy Efficiency: 38.36% |
| 25. | Gianluca Coccia | Italy | 2020 | Portable Solar Box Cooker | In the absence of solar energy, erythritol stabilised the temperature |
et.al [47] coupled with an Erythritol as Phase change material thermal energy storage inside the cooking chamber and hence extended the duration of cooking. • Extension of average load cooling time in range 125-100°C by 351.16% in presence of erythritol as PCM TES as compared to no TES unit.

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**Figure 1.** TPB Solar cooker[25].

**Figure 2.** Box Type solar cooker with optogeometrical Concentrator[26].

**Figure 3.** Cylindrical Solar Cooker[40].

**Figure 4.** Vacuum tube based solar cooker[30].

**Figure 5.** Novel portable solar cooker using a curved Fresnel loss concentrator[39].

**Figure 6.** Hybrid Solar cooker with air duct[41].

**Figure 7.** Twin Chamber community solar cooker[24].

**Figure 8.** Evacuated Tube Solar Cooker[45].

**Figure 9.** Solar cooker with L shape absorber plate[48].
7. Conclusion
In the study done, quantitative criteria, that is, performance of the solar cooker in the past decade 2011-2020 has been reviewed. To emphasize on the solar cooker the history of solar cookers designed and invented, the status of solar cooking across the world, the principles based on which solar cookers work and what are the testing approaches to identify whether the designed solar cooker is technically feasible for use or not. The results of the tests conducted show that since 2013, B Type solar cooker existed but with improved technology today mostly A Type solar cookers are designed. The findings of the literature reviewed for the performance of the solar cookers are as followed:

- 8 booster mirrors maximizes the solar radiation received by the solar cooker, erythritol used as a phase change material of thermal storage unit in this solar cooker is efficient for thermal storage; additionally it is organic, cheap and non toxic.
  In another literature, solar salt has been used as phase change material which has extended the cooling time of the load in the range of 65.12% to 107.98%. Hence these can be used in solar cooking setup as a phase change material.
- In the octagonal box type solar cooker, multiple reflectors inside the box; focus all the rays received; to the cooking chamber. Also the duration of staying at the highest temperature attained is more in the octagonal box solar cooker as compared to the simple box cooker.
- The optical efficiency of the system can be improved by bottom reflective cone of different shapes not the flux uniformity of the receiver.
- The inner reflectors of the L shaped solar cookers increase the thermal performance of the solar cooker by very small percentage.
- In the Twin Chamber Community cooker, as the latitude increases the contribution of the booster mirror in enhancing solar radiation also increases. Additionally, insulated wall separating the two cooking chambers reduces the heat loss significantly.
- The presence of Thermal storage increases the utilization of solar cookers by extending and stabilizing cooking even in the absence of solar radiation.
- Daily solar insolation collection is higher due to the north-facing booster mirror of ISCCD design, daily solar insolation collection.
- The unique feature of the hybrid solar cooker with air duct is its robust design and fast thermal response of cooking.
- Microporous absorber provides better thermal performance figures compared to the conventional absorber.
- The study of solar box type cooker with electric backup shows that electric backup provides a continuous supply of energy for cooking in absence of solar radiations.

Analysing the thermal performance of solar cookers above, it can be concluded that there is a large scope of adaptability and acceptance of solar cooker in the society. Also, according to the World Energy Outlook 2020; due to pandemic in 2020, the progress in providing clean cooking fuels like LPG has declined drastically and there is still 2.6 billion people lacked clean cooking fuel, solar cooking can be an efficient solution to tackle this problem.

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