



SEED COMMUNICATIONS

A Quarterly News Letter from
Society For Energy, Environment & Development

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FROM THE DESK OF EDITOR

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DST CORE SUPPORT SCHEME AWARDED

Mrs. R. Shyamala, General Secretary,
Society for Energy, Environment & Development (SEED)



The Department of Science & Technology (DST) had selected Society for Energy, Environment & Development (SEED) in Core Support Group and awarded Core support Scheme for 5 years (2009-2014) in the 1st Phase. Basing on the SEED innovative performance with commendation from the DST of 'very good' of the progress in Solar Dryer & Solar Food

Processing areas, the Second Phase

Scheme is again awarded for another five years (2015-2020).

The track record of the performance of 'SEED' is briefly reported during the above period in this issue of news letter.

R & D PROGRAMS DURING THE LAST FIVE YEARS (2009-2014)

- 5 Models designed & developed - Solar Dryers-SDM-50H, SDM-50HB, SDM-100, SDM-200 & SDM-500 for different climatic regions and capacities.
- 36 New Products developed through 6 novel processes: fruits (14), vegetables (4), spices (3) and non-timber forest produce (4), Osmo-solar dried fruit bars/slices (5) & Organic fruit bars/rolls (6) were developed, for the first time in the country, developed and commercialized through high ended supermarkets.

A) 5 MODELS SOLAR CABINET DRYERS DEVELOPED & COMMERCIALIZED

1. Solar Cabinet Dryer – SDM-50HC with special features of 50 kg capacity humid climate dryer with adsorbent silica & knock down condition dryer for easy transportation and assembly at site.
2. Solar Cabinet Dryer – SDM-HYBRID with special features of integrated solar thermal and photovoltaic technologies for cabinet air heating for colder region.

SEED SOLAR CABINET DRYER MODELS



3. Solar Cabinet Dryer – SDM-100 with high capacity drying
4. Solar Cabinet Dryer – SDM-200 with scaled up with pyramidal structure cabinet dryer.
5. Solar Cabinet Dryer – SDM-500 to suit business model for small scale industry

B) 6 DIFFERENT SOLAR FOOD PROCESSES DEVELOPED & COMMERCIALIZED WITH ZERO ENERGY COST

- Solar Dehydration process for the underutilized fruits and vegetables in different sub-tropical & tropical regions of the country like Fig, Sapota, Guava, Apple, Apricot, Plum, Cherry, Strawberry etc.
- Osmo-solar food processing of fruits like Mango, Guava, pineapple, and sapota for energy conservation.
- New process for formulation of enriched nutrient supplement diet containing sprouted ragi, soya flour, dehydrated vegetables and sugars to combat malnutrition such as protein, calcium, iron, vitamin-A & C for 6-16 years age students.
- Development of organic fruit bars and slices with no preservatives
- Development of special process of forest produce
- Development of chocolates enrobed dried fruits of Mango, Guava etc.

C) 36 NEW SOLAR FOOD PRODUCTS DEVELOPED IN SOLAR CABINET DRYERS WITH ZERO ENERGY COST

- Solar dehydrated Fruit Bars : Fig, Apples, Apricots, Plums, Cherrys and other regional fruits.

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- Solar dehydrated forest products : Andrographis paniculata (Nelavemu), Decalepis hamiltonii (Maredugaddalu), Sterculia urens (Gum Karaya), Asparagus racemosus (Satavari).
- smo-solar dehydrated fruit slices : Apple, Mango, Banana, Chikku & Guava.
- Nutritive supplementary Drink – a health drink consisting of Ragi Malt, Carrot, Tomato, Amla, Soya Flour, Skimmed milk, Cashew & other natural foods blended into powder as Nutritive Drink for school going children.
- Chocolates enrobed osmo-solar dehydrated fruits : Apple, Mango, Chikku, Guava & Banana.
- Organic fruit bars : Mango, Guava, Banana, Chikku, Pineapple, Dates.

D) 78 SOLAR CABINET DRYERS SUPPLIED IN 10 STATES

Seventy Eight Solar Cabinet Dryers supplied to entrepreneurs and others in Himachal Pradesh, Jammu & Kashmir, Rajasthan & Gujarat and installed at 9 Educational & Research Institutes, 17 NGO Centers, 8 Private enterprises & 4 Overseas enterprises.

E) 41 TRAINING PROGRAMMES CONDUCTED

Forty-One Training and Awareness programmes on Solar food processing technology benefiting about 6000 people at 'SEED' Rural Training Centre, Tholukatta Village, Moinabad, 'SEED' R & D Laboratory, Hyderabad, Kovel Foundation, Visakhapatnam, HESCO, Deharadun, CTRL, Rajhmundry, Krishi Vidyan Kendra, Kadapa, AIWC, Delhi, Chennai, in different states of India and from Australia, Mauritius and Saudi Arabia

F) 5 PRODUCTION CUM TRAINING CENTRES ESTABLISHED

Five Production-cum-training centers were established in five States through collaborative projects at Kovel Foundation, Vizag., HESCO, Dehradun., SEED-Rural Centre, Moinabad., Rural Communes, Pune & The Dale View, Trivandrum, for Technology Transfer.

G) 24 MICRO ENTERPRISES IN SOLAR FOOD PROCESSING STARTED

Twenty Four Microenterprises are established in 10 States in the country.

H) 35 TEST MARKET OUTLETS FOR 20 SOLAR PRODUCTS COMMERCIALIZED

Thirty Five outlets were started in more than 120 high ended outlets in Telangana, Andhra Pradesh and Karnataka for sale of 20 products in super markets for quality feed back from the test market as business model.



I) 21 STUDENTS CONDUCTED ACADEMIC RESEARCH PROGRAMMES FROM 10 UNIVERSITIES

Entered into MOU with 4 Uni., such as Gitam University, Visakhapatnam, JNTUH Univ. Hyderabad, K. L. University, Vijayawada, Loyala Academy, Secunderabad for collaborative Research programs and for Ph.D. programmes.

21- Students of M.Sc. & B.Tech. in Food Science, Bio-Tech & Mechanical Engineering did their dissertation/internship programmes from 10 universities such as NIT, Chennai, Gitam, K.L. Univ., JNTU-H, & Osmania, Andhra Univ. Dr. YSR Horticultural University etc.

J) 211 SOLAR DRYERS IMPACT ON CLIMATE PROTECTION—REDUCTION OF CO₂

Dryer Capacity	No. Dryers	Total fruit bars (MT)	Total Fruit (MT)	Replaced CO ₂ (MT)	Power (Elec) Saving (KWh)	Power saving (MW)
8	50	8	26.64	54.37	44,800	45
50	159	159	529.47	1080.69	890,400	890
100	1	2	6.66	13.59	11,200	11
200	1	4	13.32	27.19	22,400	22
Total	211	173	576.09	1175.85	9,68,800	969

The above table gives the supply of 211 solar cabinet dryers of 4 variety models in India and also to other countries such as Saudi Arabia, Malaysia, Mauritius, Australia & East Africa. The outcome of processing 576 MTs fruits into 173 M.Ts. fruit bars with entirely use of Solar Energy. Each MT of fruit with the use of Solar Energy reduces carbon emission at 36,288 kg / Ton of fruits processed. The process of fruit bar generates 1175.85 MTs carbon dioxide emission with conventional electricity in 211 dryers. This is equivalent to saving of 9,68,800 Kwh or equivalent to 969 MWs.

K) AWARDS & REWARDS

Winner of the NABARD Rural Innovations award -2012 for solar food processing & dryer.

'DSIR' recognized SEED Lab as Scientific and Industrial Research Organization (SIRO) in 2012.

L) PUBLICATIONS

Monograph on "Innovative Solar Food Processing Technology"
Review article on "Solar Energy in food processing – a critical appraisal"
26 Technical papers presented/published in Journals, National & State Level Workshops, Seminars & Training Manuals.

'SEED' – Communications – a quarterly news letter from 'SEED', Publication started in 2014.

VIP COMMENTS

"The work carried out by SEED is highly impressive and has applications in rural areas where solar energy is abundant. This organization activities had to be promoted by public institutions. I wish all success and will be happy to associate with SEED. "

Venkatarama Gudem, W.G. Dist, A.P.

Dr. B.M.C. Reddy, Vice Chancellor, Dr. YSR Horticultural University,

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SUSTAINABLE LIVELIHOOD FOR WOMEN THROUGH SOLAR FOOD PROCESSING

Pilot Project on Income Generation through Solar Dryers in
Andhra, Delhi, Kerala & Tamil Nadu

By Mrs. Lalitta Balakrishnan & colleagues, AIWC



Introduction

All India Women's Conference (AIWC) is one of the oldest and pioneering Women's not for profit organization. AIWC was established in 1927 in India by an Irish Lady, Margaret Cousins, for the education & emancipation of women, along

with eminent Indian women like Sarojini Naidu, Rajkumari Amrit Kaur, and others. It has more than 150,000 members and 500-plus branches across the country working for the empowerment of women. Amongst many projects AIWC has undertaken one of the important programs is implementing application of renewable energy technologies with the objective of making them a tool of women's self-reliance, through various low-carbon technologies for over four decades.

India is the only country which has a separate Ministry of New and Renewable Energy (MNRE), Government at the centre for promotion of renewable-energy technology. AIWC has collaborated with the Ministry for the successful implementation of the projects, being identified as one of the Nodal Agencies.

Drying of Fruits and Vegetables

Drying of fruits and vegetables is a well-known practice in India. Sun drying is widely practiced. But, hardly 2% of the country's horticultural produce, i.e., fruits and vegetables, are processed. Countries like Thailand, Philippines, USA, process more than 70% of their produce.

Solar Drying Technology

Solar dryer technology can be utilized in small-scale food processing industries for producing hygienic, high-quality food products. It will also promote renewable energy sources as income-generating units, apart from saving the world from the ill effects of climate change. Thus, with a vision to enhance incomes of women from economically poor strata in rural India, to promote a renewable energy source, and to produce a quality

value-added food product, AIWC came out with the project "Income generation for poor women through solar dryers in Andhra Pradesh, Kerala, Tamil Nadu and Delhi". The one-year-long pilot project was conducted successfully in four places: Delhi, Trivandrum, Chennai and Hyderabad. After a lot of consultations, a SDM-50 type solar dryer was selected, and the pilot project was implemented with the installation of four solar dryers at Chennai, Hyderabad, Trivandrum and Delhi.

The project was implemented through AIWC Head quarters, New Delhi, Women's Indian Association, Chennai, Priyadarshini Mahila Samajam, Trivandrum and AI.

Usually a minimum of 4 solar dryers will be chosen for one economic unit, but in our case, we tried out the project in four different regions with funding from Asian Development Bank Small grants programme, in 1984-85. Although there are many cheaper models, we had selected the SDM-50 solar dryer, developed by the NGO "Society for Energy, Environment & Development" (SEED) from Hyderabad after 10 years of intensive research under the leadership of Prof. Ramakrishnan Rao, who is still helping us with the project whenever needed.

In Puducherry, where the project of solar drying is being launched as a follow-up, there are many "Self Help Groups" (SHG), who are supplying mid-day balanced meals (Poushtik Ahaar) under the ICDS Program. Further, all the solar-dried projects, including "Aam Papad" (mango bars), are being marketed by the Renewable Energy Agency of Puducherry. Hence, with mitigation of global warming, we believe that this project will prove to be successful in Puducherry and can contribute locally and globally to post-2015 Millennium Development goals.

(Abridged version Reproduced from Article in Combining Energy Access and Climate Protection, published by International Network for Sustainable Energy, INFORSE, December, 2014.)

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The one-year long pilot project was carried out in two phases:

1. Training and installation of dryers in four locations. More than one hundred women have received intensive training in all the aspects of solar drying, and another two hundred women, including members of SHGs, have been given full orientation and short training.
2. To carry out production on experimental basis.

Experiments were done with different products in different locations based on available resources and demands along with the validation of technology. Mango bars, Ginger powder, Margosa powder and Fenugreek powder for diabetic patients and desiccated coconut powder were few of the products. Details of each product were systematically filled in a cost analysis. One of the key outputs of the project is a matrix that gives details of profitability, and marketability of various solar dried products across seasons.

Product Preparation and Marketing

The products were identified on the basis of season, fruits and vegetables available in the local market and market survey.

The branch in Tamil Nadu experimented with tomato powder, curry leaf powder, kasuri methi and bitter gourd powder. Delhi pilot dried tomato slices, kasuri methi, mango bars, kadi masala powder, tomato powder, amla powder and ginger powder. The members at Delhi dried basil, pudina and drumstick leaves apart from mango bars. Simple dry kadi leaves having medicinal values were also produced. The kadi leaves dissolved in water provide cure for BP problem in human beings. Kerala branch performed very well and experimented with curd green chilies, curd bitter gourd, black pepper, rice wafers and tapioca wafers. With their own efforts they have purchased one more dryer for their branch.

The details of each product were recorded systematically in a cost analysis report prepared specially for the project.

Solar drying is continued in four states and recently AIWC has conducted a Solar Training

Programme in collaboration with SEED at AIWC's headquarters.

It is estimated that one ton of fruit processing eliminates about 3,240 kg of CO₂ emission. Currently there are about 161 solar dryers operational in India that produce about 165 tons of fruit bars. This results in reduction by 500 Mt of CO₂. Use of solar energy will reduce the requirement of electricity to up to 1,188,000 kWh in a year, which corresponds to 119 lakhs (190,000 USD) of power-saving at the rate Rs. 10/kWh (0.16 USD / kWh). At current prices, about 44 lakhs (69,576 USD) have been invested for setting up of dryers.

Conclusion

It is concluded that the pilot may be replicated in A- and B-grade cities of India and other Asian countries, as market is available for hygienic products. Self-Help Groups (SHGs) and individual women should be encouraged to take up the enterprise after proper training. The greatest positive factor of the enterprise is that it doesn't involve full-time engagement and thus could be taken up by daily laborers, housewives, or other women engaged with some other active source, for SHGs or individuals. Apart from this, it saves an enormous amount of rural produce from perishing.

Finally, it is concluded that the solar dryer use is suitable for wealth creation among poor women and plays a great role in reducing global warming. This could be easily replicated in all countries growing large amount of fruits and vegetables along with medicinal plants and with fish, which could be turned into value-added and hygienic products by solar drying.

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