

Thematic studies for processing and preservation of food supplement, chilies and ginger by drying through solar energy

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1. Abstract

A thematic study was carried out in two selected villages- Todaijang and Nongba of Tamenglong District of Manipur and three selected villages- Neotan, Neirong and Jatinkaike of Changlang District in Arunachal Pradesh by AFPRO Guwahati to promote the use of Solar Dryers among rural population which in turn would contribute to beneficial changes in women's lives, in agricultural practices and in conservation of biomass. Two NGOs - Rongmei Baptist Association (RNBA), Imphal, Manipur and Seva Kendra, Khonsa, Arunachal Pradesh have been identified as the project implementing Partner [PIP]. Different SHG groups were identified to implement the project. Adequate orientation have been provided to the members with the help of expert professional Resource agency to provide necessary technology support, technical advise in the field of Solar Energy Resources. Different types of Solar Dryers-tunnel type and chimney type were installed in selected villages. Training were imparted on operation & maintenance of solar Driers to PIP staff, SHG members to handling, operate, repair, maintain & manage solar Driers. Exposure training also has been provided to the SHG members on preservation of gingers, tapioca along with packaging. Solar dryers for food products have been installed for the first time in these areas. SHG members used the dryers for drying various spices, fruits and vegetables such as turmeric, long melon, tapioca radish, banana, papaya, pineapple, maize, cooked rice, green leaf vegetables, cabbage, paddy and even meat apart from ginger and chilies. As King chilies production is very high in Manipur and there is a very high demand of it, women groups of Manipur utilized the dryer for drying king chilies. Previously the villagers used to dry the chilies above the firewood but gradually they have changed their tradition after installation of Solar Dryers and it saves time and energy. The solar dryer is appropriate to provide self employment for the family members especially women. The duration for drying differ from one item to another like 4-5 days for chilies 5-6 days for turmeric, 2-3 days for tapioca, 5-6 days or sometime 2-3 days for banana, 3-4 days for radish, 3-4 days for ginger, 3-4 days for bottle gourd, 2-3 days rice, 3-4 days meat etc depending on the weather condition.. The dried product under the Solar dryer can be kept for long duration without any deterioration. Using of the dryers also reduces the consumption of fire wood and reduces smoke pollution which directly effects the surrounding environment and also the persons involved during the process of drying. Introduction of this thematic study also results in strengthening of local institutions and awareness generation. The process has been developed for collection of minimal amount from the individual who are interested to dry their product which generate an income for the SHG. Hindrance like hail storm which damage the solar dryer's polythene and fans became a major problem. Networking with the marketing agency was also generated but the women groups were not able to meet the requirement of the marketing agency due to several reasons. The solar dryers installed at Changlang district of Arunachal Pradesh were not functioning well due to many reasons, hence to see the real impact, two tunnel types dryers has been shifted and installed at Mamziuram and Daisuang village of New Jalukie area of Nagaland under organization named RBA[Rongmei Baptist Association]. It has been found that solar dried product for example bananas and tapiocas are more sweeter than the raw one. Solar dryers are vey useable and it will help the community to have nutritious processed food.

2. Introduction

Innovation of Renewable Energy technique is very important to replace traditional energy sources as an alternative to commercial fuels such as fire wood, coal, oil and electricity. People have drying food for thousands of years by placing the food on mats in the sun. This simple method, however, allows the food to be contaminated by dust, airborne, molds and fungi, insects, rodents and other animals. Furthermore, open air drying is often not possible in humid climates. Dehydration or drying is a simple low cost way to preserve prevents fermentation or the growth of molds. Solar food dryers represent a major improvement upon this ancient method of dehydration foods. Although solar dryers involve an initial expense, they produce better looking, better test and more nutritious foods. Enhancing both their food value and their marketability. They also are faster, safer and more efficient than traditional sun drying techniques. Solar dryers use the energy of the sun to heat the air that flows over the food in the dryer. As air is heated, its relative humidity decreases and it is able to hold more moisture. Warm dry air flowing through the dryer carries away the moisture that evaporates from the surfaces of the food.

3. Background

Thematic studies for increase Agricultural Practices of food supplements, chillies and ginger and processing and preservation by drying through Solar Energy has been conducted under EED [Evangelischer Entwicklungsdienst (EED) Church Development Services, Germany] NE package VIII. The project, AFPRO-EED North east Package-VIII with the title 'Community Natural Based Resource & Livelihood Development' was the fifth package operating in the NE India, which was commenced in July, 2002 and concluded in September 2006. In the project area/villages supply of rural electricity is extremely uncertain and with excess cutting of firewood as a fuel for domestic use, forest cover being diminished. Solar Driers would be most efficiently utilized by these growers [Ginger and chilli cultivators]. The solar dryer is appropriate to provide self employment for the family members especially women. Processing and preservation of cash crops close to their source will ensure fresher products and an even better quality product. There are no Co-operatives or Government outlets within the area as such the Marketing the Agri Products is entirely dependent on outsiders. Even the fresh fruits like bananas, oranges and pineapples and other fresh vegetables produce in a bulk and sold through middlemen who visit the villages and offer their rates. The farmers are unable to sell their agricultural produce at competitive price.

The focus was on Solar Driers and or continuous Tray Driers i.e. Solar Drying Techniques for preserving food supplements (chilies and ginger) by drying. There are possibilities of drying fish, mushroom and fruits like banana and pineapples which are available in the project villages in abundance, emphasis being on chilies and ginger. Local women groups can earn money by producing (cultivating) chilies and ginger on large scale.

This program on chilies and ginger product development has been undertaken with the following aim

- Ginger and Chillies of the special variety is not preserved and processed on a commercial scale and their cultivation is limited as a perishable item for domestic consumption and for sale in local markets. However, if dried, preserved and packed both the food supplements have a wide range of marketing both for local and export markets.
- To re-establish the image of chilies and ginger as a valuable resource among traditional users and local consumers.

- The produce to be brought to the processing centre of Seva Kendra and RNBA for processing and preservation by drying and packing at the hands of the women workers-thus creating an employment opportunity for rural women.
- To assist village rural women to establish small enterprises a based on the local resources and manageable technology development

4. Project

The project is thematic studies for processing and preservation of food supplement, chillies and ginger by drying through solar energy

4.1 Objective

- To create awareness on Solar Energy issues and the capacity for energy planning, conservation and management at village level
- To generate awareness and promote Solar drying Technology and increase the use of this technology in different project villages of the two states.
- To motivate women, in particular, to be involved in the process and allowed to directly benefit from it.
- To impart training and demonstration
- To create skilled manpower
- To create employment at micro level that exists within the villages
- To build the capacity for managing and maintaining this system locally
- To create awareness on appropriate Solar Energy resources to meet the requirement of the cultivators
- To contribute to the rural poor through sustainable energy
- Generate employment and encourage social integration

4.2. Methodology

Preliminary survey was conducted on both the states in particular villages for implantation of the project. The two NGOs identified, Rongmei Baptist association[RNBA}-Imphal, Manipur and Seva Kendra, Khonsa, Arunachal Pradesh were selected as Project Implementing Partner[PIP]. Project Implementation Partners have been a long association with AFPRO since EED package programme started to implement in North East India [1996]. PIP were package partners of AFPRO since 12 years. On the basis of their performance PIPs has been selected for this project. Location selected were two villages namely Todaijang and Nongba of Tomenglong District of Manipur and three villages namely Neotan, Neirong and Jatinkaike of Changlang District in Arunachal Pradesh as project village. PIPs have mobilized the rural community [women SHGs and farmers] before starting the project and identified a group of personnels from the community preferably women self help group with proper consultation with Village development Committees [VDC]. The members of the group belong to particular village. The program has been designed particularly to empower women self help groups with solar assisted dryers and to create ownership as primary stakeholders. Thus women self help groups were identified as target group to implement the project. There are three SHGs namely-Banthampang consisting 27 members, Kapi SHG consisting 30 members and Diamchanglong with 22 members in Tamenglong district of manipur and six Selp Help Groups(SHG) were selected in Changlang district of Arunachal Pradesh and they are- Sunshine, Milijuli, Shann, Menchan, Ajungban and Namphai

Training and adequate orientation which was very much essential for PIPs has been achieved with the help of expert Resource Agency/person. It was proposed that the

Technical services in the field of Solar Energy resources would be provided through a professional with experience in the field of Alternate Energy Resources. Accordingly, Solar Alternatives, St. Mary's Church Compound, Phulwari Sharif, Patna-801501(Bihar) has been selected as a resource agency and Consultant identified was Rev. Fr. M. Mathews sj, Director Incharge of Solar Alternatives. Consultant provided necessary technical support, technical advice, training and orientation inputs in the field of Solar Energy. Training were imparted on operation & maintenance of solar Driers to PIP staff, SHG members to handling, operate, repair, maintain & manage solar Driers. Exposure training also has been provided to the SHG members on preservation of gingers, tapioca along with packaging.

4.2.1. Pre Program Implementation:-

Solar Alternatives, Patna has been identified as an implementation agency for installation of the dryers in the project areas. The consultant, Rev. Fr. M. Mathews sj, Director Incharge of Solar Alternatives visited the project site Imphal during 15-16th June, 2005. RNBA, Imphal organized one workshop on 'Solar and solar assisted drying and processing programme on 17th June, 2005 for the partners and community at Imphal during his visit. The team visited the project site of Seva Kendra, Khonsa on 19-20th June, 2005 and finalized the matter after receiving the basic information's on climate, household and available agricultural products.

4.2.2. Visit to Solar Alternatives Patna for Practical Demonstration of Solar Dryers proposed to be installed in project areas of RNBA & Seva Kendra:-

Before signing the agreement with the Consultant, The AFPRO Guwahati coordinator and chief functionary of the PIPs visited the M/S Solar Alternatives during 29th August – 01st September, 2005. After having observed the Solar Dryer system in the Solar Alternatives, Patna, based on technical design of the German model [Solar tuneel dryer developed at the Institute for Agricultural Engineering in the Tropics and subtropics of Hohenheim University, consists basically of a plastic foil-covered flat plate solar air heater, a drying tunnel and small axial flow fans. Some modifications have been suggested to suit the climatic conditions of the North East Region. The main changes which have been suggested in the model were the reduction in size and extra precaution for the protection of the plastic sheets [Transparent UV stabilized PE plastic foil, 0.2mm in thickness, with a transmissivity of 92% for visible radiation]

Memorandum of Understanding (MoU) has been signed between the PIP and ATF-G on 24th September, 2005 and 26th September, 2005.

Two different types of solar dryers were selected with little modification to suit the climatic condition of the region. They are Tunnel type(10 metres length/1.5m width) and Chimney type (5 trays measuring 30" by 10") solar dryers. About 50 kg material and 5kg material can be dried in tunnel and chimney type dryers at a time respectively. Two solar dryers each of Tunnel type and Chimney type have been installed at Manipur and Arunachal Pradesh during 5-8th November, 2005 and 14-18th December, 2005 by Solar Alternative, Patna- Bihar respectively. PIP supplied scale and weighing machine to the SHG to measure the quantity of raw and finished products.



Solar Dryers (Tunnel and chimney type)

The main role of the PIPs were-

- Provision of adequate space for installation of solar Energy Appliances-Solar Dryers.
- Provision of all possible assistance during installation of the dryers.
- Mobilization of rural community (Women SHGs and farmers)

- Identify a personal from the SHG to be trained in operation, repairs and maintenance of Solar Dryers.
- Marketing of finished product.

The main role of Consultant/ Consulting Agency

- Users Training on operation & maintenance of solar Driers to PIP staff
- Train personals to handling, operate, repair, maintain & manage solar Driers
- Orientation training to for the following personal
- PIP field staff
- Members of Self Help Groups
- Farmers group

Strategy has been prepared by PIP in consultation with the community for the commercial value of the dried product. Exposure training also has been arranged for the SHG members at Imphal and Assam Agricultural University, Jorhat for food processing, preservation and marketing.

4.2.3.Solar Dryers at Manipur

Solar dryer for food products have been installed for the first time in these areas. The finance of the solar dryers met from EED package’s thematic study part. The transportation cost of the solar dryers from the nearest railway station to the village and the local labour charge were the main financial contributions from the villagers. They need not had to pay any rent for the dryers.The dryers were installed in nearby places. The villagers are aware properly about the dryers and their utilization. They dried various spices, fruits and vegetables such as turmeric, long melon, tapioca radish, banana, papaya, pineapple, maize, cooked rice, green leaf vegetables, cabbage, paddy and even meat apart from ginger and chillies. Chimney type dryer has been installed in one of the residence the group members which is run by the women society. According to villagers the dried banana is much sweeter than raw one.



Chimney type dryer

According to villagers number of days require to dry are-

- Turmeric : 5-6 days
- Tapioca : 2-3 days
- Banana : 5-6 days
- King chillies: 5-6 days
- Radies: 3-4 days



- Ginger: 3-4 days
- bottle gourd: 3-4 days
- Rice: 2-3 days
- Meat: 3-4 days

As King chillies production is very high in Manipur and there is a very high demand of it, women groups of Manipur utilized the dryer for drying king chillies. Previously the

villagers used to dry the chilies above the firewood but gradually they have changed their tradition after installation of Solar Dryers and it saves time and energy. In a tribal community food stuffs are dried and seasoned by using firewood which is not always good for health. According to the members women and children wasted most of their time in collection of firewood from the hills of far away but after getting the dryers they slowly reduce the extra collection of firewood which was required early for drying the same food stuff to store for the off season. The solar dryer is appropriate to provide self employment for the family members especially women. One person has been given responsibility to take care of the dryers and he was doing well.

4.2.4. Solar Dryers in Miao, Arunachal Pradesh

Initially after installation of the dryers in the villages different types of fruits and vegetables were dried like tapioca, radies, chilies, banana, pineapple, papaya, turmeric, ginger, tomato, bottle gourd, meat etc.

But after 3 months the solar dryers became non-functional due to damage caused by a hail storm. It was repaired again. Chimney type dryers were used to dry only household produce for own consumption. As the concept was very new and SHGs were also very new to use the dryer so some hindrance aroused and they had to be motivated very frequently. The SHGs are not able to dry agricultural produce on a larger scale due to less production level which was not at commercial level. They require a huge production for marketing the same, The income generated from the dryers was such that the beneficiaries were not able to generate money from the dryers but they were capacitated enough about the technique. During monitoring PIP co-ordinator expressed that it will be better to shift the dryers to a nearby place where they would be at least used for commercial purposes. According to him it is of no use in spending money maintaining them if there is no return out of it. The SHGs were too dependent on PIP for its maintenance and repair.

Some of the records maintained by two SHG members as cited below [Record of one season]

Location : Neoton

Sl no	Dried goods	Quantity dried
1	Ginger	83 kg
2	Maiz	41 kg
3	Turmeric	12 kg
4	Cooked rice	17 kg
5	Chilli	22 kg
6	Tapioka	45 kg

Location : Neirong

Sl no	Dried items	Quantity dried
1	Vegetables:green leaf,cabbage	46 kg
2	Fruits	32 kg
3	Meat	8 kg
4	Paddy	90 kg

5	Maiz	38 kg
6	Spices: Chilli, ginger, Turmeric	19 kg

Status of chimney type dryers at Neotan and Jatinkakai

Sl	Dried items	Neotan (quantity)	Jatikakai (quantity)
1	Chilli	2 kg	5 kg
2	Haldi	4 kg	9 kg
3	Maiz	21 kg	33 kg
4	Rice	8 kg	-
5	Fruits and vegetables	15 kg	4 kg
6	Nuts	-	1 kg
7	Tapioca	-	6 kg

4.3. Result & Observations

The duration for drying differ from one item to another like 4-5 days for chillies 5-6 days for turmeric, 2-3 days for tapioca, 5-6 days or sometime 2-3 days for banana, 3-4 days for radish, 3-4 days for ginger, 3-4 days for bottle gourd, 2-3 days rice, 3-4 days meat etc depending on the weather condition.. The dried product under the Solar dryer can be kept for long duration without any deterioration. Using of the dryers also reduces the consumption of fire wood and reduces smoke pollution which directly effects the surrounding environment and also the persons involved during the process of drying. Introduction of this thematic study also results in strengthening of local institutions and awareness generation. The process has been developed for collection of minimal amount of money(Rs.0.5 from group member and Rs.1 per kg material dried from other villagers) from the individual who are interested to dry their product which generate an income for the SHG. Hindrance like hail storm which damage the solar dryer's plastic and fans became a major problem. Networking with the marketing agency was also generated but the women groups were not able to meet the requirement of the marketing agency due to several reasons verbal communication as the SHG members only can communicate through local language. Another reason was Produced were not so high to meet the demand of the marketing agency. In this point also they require training to know the process like at a lot what amount they should collect for drying and management of time.

The solar dryers installed at Changlang district of Arunachal Pradesh were not functioning well due to many reasons, hence to see the real impact, two tunnel types dryers has been shifted and installed at Mamziuram and Daisuang village of New Jalukie area of Nagaland under organization named RBA [Rongmei Baptist Association] during February, 2008. RBA was interested to install the dryer as there is a heavy market demand for organic product produced by the villagers. The wastage of fruit items like mangoes, jackfruit, pineapples, gooseberries, bamboo shoots, naga (raja) chilly, green leaves and beans are high due to heavy production and lack of storage technique. So if solar energy can be utilized for drying these item then villagers will have nutritious food even for longer time. SHGs are happy to get these new technology of drying as their excess food item usually thrown as wastage.

The project at Manipur is running well and they have a great demand on dried tapioca and king chillies.

During monitoring it was observed that villagers were aware about the dryers and their utilization.

- The members of SHGs used dryers for domestic purposes
- Hail-stones have done damaged to the drier
- Nominal amount has been charged by the groups from individual who use the dryer.
- People are keen to engage in income generation project with immediate gains.
- SHGs are not able to reach a consensus on business activities.
- People used the dryer for preserving household/perishable goods
- It is easy to maintain this type of dryers
- Organization of the SHG and strengthen them is a major task.
- Frequent and constant monitoring cum encouraging of SHG is very important

5. Conclusion

It has been found that solar dried product for example bananas and tapiocas are sweeter than the raw one. Solar dryers are vey useable and it will help the community to have nutritious processed food. All the SHGs should come together and formulate the overall strategies covering maintenance of the dryers, optimum utilization of the dryers, packaging of the dried product, marketing of the finished product. Efforts were made from PIP sides for strengthening the SHG members. As regards the marketing is concerned all the PIPs were introduced to M/s. Agribusiness and requested to become the member of this marketing network. Regarding different shapes of the vegetables and fruits while cutting for the purpose of drying also has been demonstrated according to the consumer's choice at market. Fruits like banana should be cut as round shaped so that it has a look for marketing. Monitoring is utmost important for success of the project. Initially many hindrance may come but with proper strategy, awareness, maintenance and frequent monitoring, the project will be a successful venture. As a pilot study this project generated awareness and learnings about use of solar energy among all who has associated with it.



Tapioca under tunnel dryer



Drying of turmeric & tapioca