Flat-bed Dryers---a drying machine of rice seed to multi purposes

One of the challenging points along the process of paddy production is climatic change such as accidental and early rain fall especially in harvesting time. This challenging point becomes the main reason for loss of high crop due to lack of proper drying facilities. The certified seed, product of project, indeed needs to maintain its quality and prevent loss especially in post harvesting time. To overcome these situations, Flat-bed dryers will be installed in 5 locations among targeted seed producing locations according to geographical situation and accessibility of farmers.

Rice is most important food crop in Myanmar and also staple food for 60 million Myanmar people. It is grown over 8 million hectors annually all over the country and total rice production is over 30 million metric tons. Out of total swon area of 8.1 million hectors, summer rice contributes around 2 million ha for which the harvesting period for summer rice in some area which is between March to May in Lower Myanmar and June to August Upper Myanmar. In those harvest seasons, farmers are facing accidental and early rain fall leading to high crop loss due to lack of drying facilities. Those problems become serious and uncertain nowadays due to the changing agro-climatic condition. The only solution to those challenging problems is application of mechanical dryers just after harvesting crop. At harvest time rice grain contains a lot of moisture. At high grain moisture contents there is natural respiration in the grain that causes deterioration of the rice. High moisture promotes the development of insects and molds that are harmful to the grain. High moisture in grain also lowers the germination of rice. Therefore, drying of rice is critical to prevent insect infestation and quality deterioration of rice grain and seed.

There are numbers of drying tools for paddy drying in many countries according to the technology, design and investment. The most suitable dryer type for Myanmar is design by the Radanar Ayar that bring up as a Multi Purposed, Flat Bed, Paddy Dryer. It is most up-to-date and widely accepted paddy dryer, developed by local knowledge and technical recommended by the Department of Agricultural Research (DAR).

Normally, the Radanar Ayar’s Model on Multi-purposed, Flat-bed Dryers can be used to dry the seed, as storage facilities and in producing compost after off-farm seasons. During the off-farm seasons, compost can be produced by using Bio-Mass and raw materials which are locally available in project villages. Total capacity is 800 Baskets after 2 to 3 months with IM and EM; and two to three times can be produced annually. It is assumed that total 2400 Baskets of compost per unit per annum would be produced which will cover to 120~150 Acres. The project already selected the participating (5) villages that can be able to access by other neighbor villages for using this service.

1 IM=Ingredient Microorganism, EM= Effective Microorganism
The Selected villages were:
1) Magyi Chaung Village
2) Boe Yaung Village
3) Latar Chaung Village
4) Pyin Boe Gyi Village
5) Shwe Bo Su Village

Although there are many techniques and machines to enable as drying facilities, the project designed the multi-purposed flat-bed dryer for efficient drying of seeds and will able to use as compost-application out of seasons for seed drying.

**Advantages of using paddy dryers:**

There are number of advantages by using Flat bed Paddy Dryers:

- Overcome weather limitation like rainfall and rainy season harvesting especially in delta of over flood areas
- Prevent grain quality deterioration and losses that help farmers for food security and improve rural livelihood
- Drying efficiency can be compactable with highly sophisticated machines
- Affordable initial investment for the millers as well as farmers
- Rice husk, as heating source, available freely or at very cheap price
- Easy to maintain and no need to train operators with complicated technology
- Made up of locally available materials
- High head rice recovery as the grain is dried under controlled temperature
- No effect on germination as drying temperature is only between 40-43 degree Celsius
- Drying cost for one basket of paddy will be around 50 kyats for commercial dryers whereas the smaller capacity might be a little more costly.

**Technical Specifications:**

1. Type of the dryer  
   Flat Bed, Fixed Type, Batch Dryer
2. Drying Capacity  
   Various capacity can be constructed 6-tons per batch (Approximately to 300 Baskets of Paddy)
3. Heating System  
   Rice Hull Furnace (design will be varied according to the capacity of the dryer)
4. Fan Type: 30- Inches Myanmar Industry Improved flow fan in using large outlets

5. Energy source for running Fan: Diesel Engine (10 HP) is suitable.

6. Heating temperature: 40-43 degree celsius for grain and same in Seeds

7. Drying rate: Moisture reduction of 1-1.5% /Hr

8. Drying chamber type: Flat-bed with perforated floor a sided air duct with line system

9. Drying Bin Measurements (L, W, H)

Dryer measurement will be varied according to the capacity of the dryer: for example, 3 tons capacity size will be as follows:

- Length – 20 feet
- Width – 12 feet
- Height – 4.5 feet
- Plenum chamber height – 1.5 feet

### 1.1 DETAILS SPECIFICATION AND GENERAL ASSUMPTIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Dryers service life</td>
<td>5-years with long maintenance</td>
</tr>
<tr>
<td>Credit circle</td>
<td>5-years with long maintenance</td>
</tr>
<tr>
<td>Capacity per Batch</td>
<td>6 tons</td>
</tr>
<tr>
<td>Drying times</td>
<td>5- hours</td>
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<tr>
<td>Drying utilization;</td>
<td>60 days (batches)/year and Composting for off-farm seasons/year</td>
</tr>
<tr>
<td>Initial MC (wet basis):</td>
<td>26%</td>
</tr>
<tr>
<td>Final MC (wet basis):</td>
<td>12-14% (in general)</td>
</tr>
<tr>
<td>Weight after drying</td>
<td>5.5 tons</td>
</tr>
<tr>
<td>Price per rice hull per 5 running hours:</td>
<td>$ 10 cent ( $0.10 )</td>
</tr>
<tr>
<td>Price per kWh</td>
<td>$ 10 cent ( $0.10 )</td>
</tr>
<tr>
<td>Labour wage</td>
<td>$2 /day</td>
</tr>
<tr>
<td>Price difference between dry and wet paddy</td>
<td>$0.05/kg (dry season)/$ 0.03/kg (wet season)</td>
</tr>
<tr>
<td>Repair &amp; maintenance for machines:</td>
<td>10% of total investment/year</td>
</tr>
<tr>
<td>Salvage values:</td>
<td>8% of whole system cost</td>
</tr>
<tr>
<td>Labour requirement for loading and unloading</td>
<td>1 man day /1 batch</td>
</tr>
<tr>
<td>Labour requirement for drying</td>
<td>2 man day/10-batches</td>
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**Efficiency and Performance:**

According to the size of the dryer, initial Moisture Contents of the grain, surrounding weather condition and relative humidity (RH), the drying time can be varied.

But if the surrounding condition is relatively dry and initial MC of the grain is around 20%, the drying time will be around 5 hours. If environment is very moist, humid and rainy, the paddy could not be dried with ordinary farmers’ practice, the drying time will be much longer to dry the paddy. In that situation, the problem of germination will even be occurred without paddy dryers.

These Flat Bed Dryers can be operated around 3 to 4 batches for 24 hour operation if the labor is efficient in loading and unloading paddy. These dryers are very comparable with other sophisticated machines in capacity and quality output.

**Most Reliable Solution for the weather limitation:**

The grain quality of harvested crop is entirely dependent on the weather condition. That is why the production capacity and quality is limited in rainy season and the price on that period is higher than that of dry season harvested crops. Because of the advantages of using grain dryers, farmers can extend their production capacity and thereby their income will also be increased accordingly. Also the multi purposes efficiency for composting with Bio-mass which are locally available and that can easily drive to Organic Farming in near future.

1.2 Resulted of Composting in using Radanar Ayar’s Model – Multipurpose Flat bed dryers