

A close-up photograph of a person's hands, likely a woman, holding two distinct piles of grain. The left hand holds a pile of clean, bright yellowish-brown grains. The right hand holds a pile of similar grains but heavily contaminated with dark, fuzzy mold. The person is wearing a purple patterned garment and several colorful bangles (red, green, and gold) on their wrists. The background is dark and out of focus.

**Storage technologies appropriate for  
decentralised village level food security**

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## **Problem**

A Womens' Group in Mizapur (Andhra Pradesh) needed communal storage for sorghum that can keep the stock in good condition for at least eight months.

## **Group's solution**

To have a concrete bin and initial management support from IGSM-RI and CEC. A 13-tonne capacity concrete bin was constructed ready for the 2000 kharif sorghum harvest.



**Reinforced-concrete grain bin at Mizapur  
(13-tonne capacity)**

# Main features of bin

- Construction costs - US\$720
- Annual management costs US\$220 (includes IGSM-RI and CEC costs)
- Womens' Group happy with size and location
- Not happy with
  - lack of partition
  - heavy concrete lid
  - moisture seepage through outlet pipe

# Initial management strategy

- Grain sun dried for up to 15 days and then placed in gunny bags. Then bags emptied into silo.
- Periodic inspection for pests by farmers, IGSM-RI & CEC (monthly)
- Fumigation with phosphine if pest found (supervised by IGSM-RI)

# What happened to grain quality

A gradual decline of kharif sorghum harvested October 2000

<b>Month</b>	<b>% moisture content</b>	<b>% discoloured grain</b>	<b>% damaged grain</b>	<b>% weeviled grain</b>
January	10.1	4.0	0.4	1.1
February	9.0	3.8	0.6	1.3
April	9.0	5.1	0.6	1.2
June	9.1	5.2	0.7	1.7
July	9.3	4.8	0.9	2.3
September	9.4	5.0	0.8	3.1
November	9.4	5.1	0.9	4.2
December	9.5	5.1	0.9	5.4

# Moving forward

## Improvements to the bin

- Replaced lid with one of fibre glass construction,
- Sealed outlet port, but
- Unable to insert partition

and .....



# ... devising a sustainable grain management strategy

## Objectives

- To prevent insect infestation without recourse to fumigation or admixture of synthetic insecticide.
- To introduce a procedure that farmers can implement without assistance of IGSM-RI or CEC
- Put 10 tonnes of kharif sorghum into the bin in Nov/Dec 2002 and retain good quality until about June 2003.

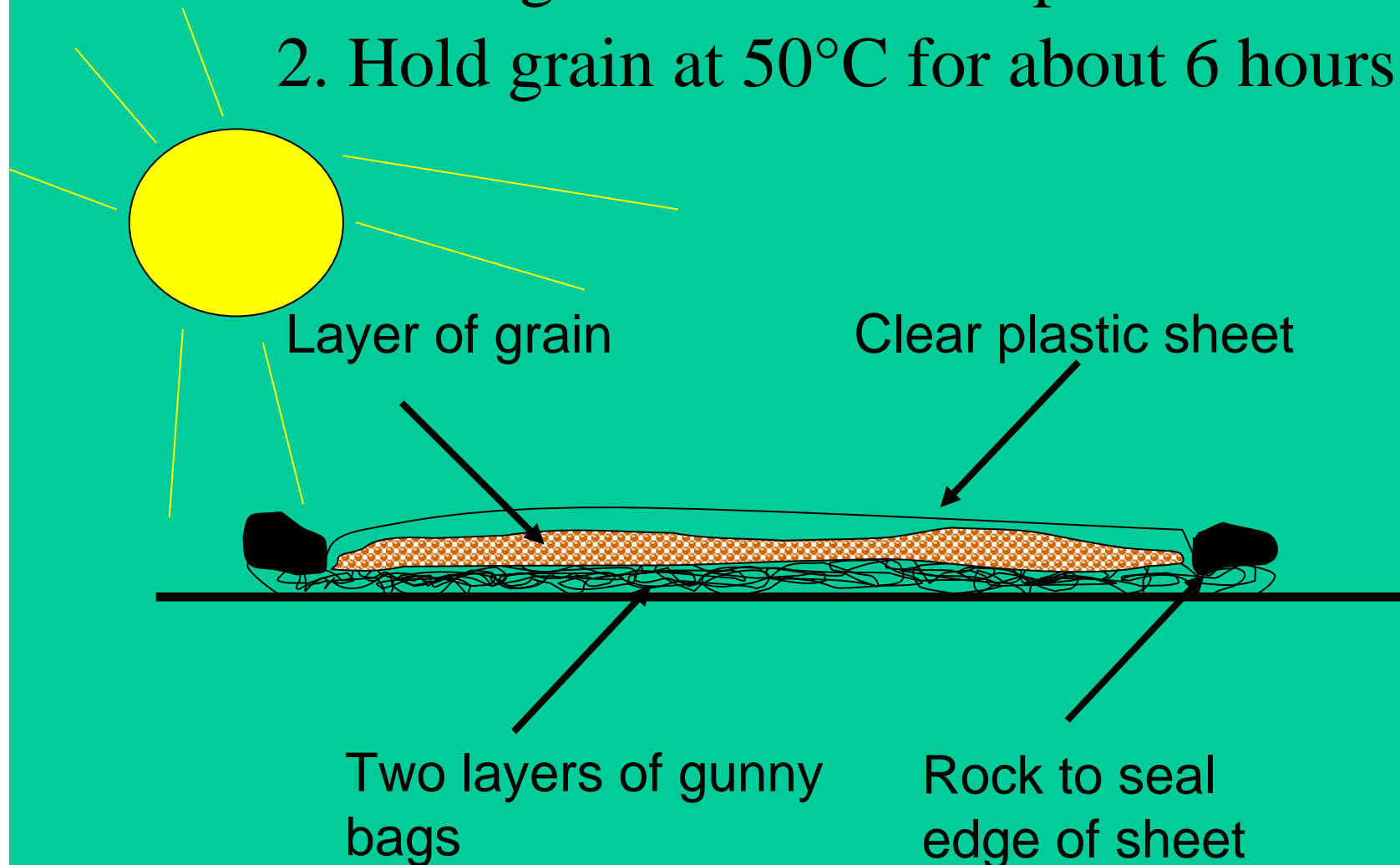


**Suggested procedure**

**Grain solarization**

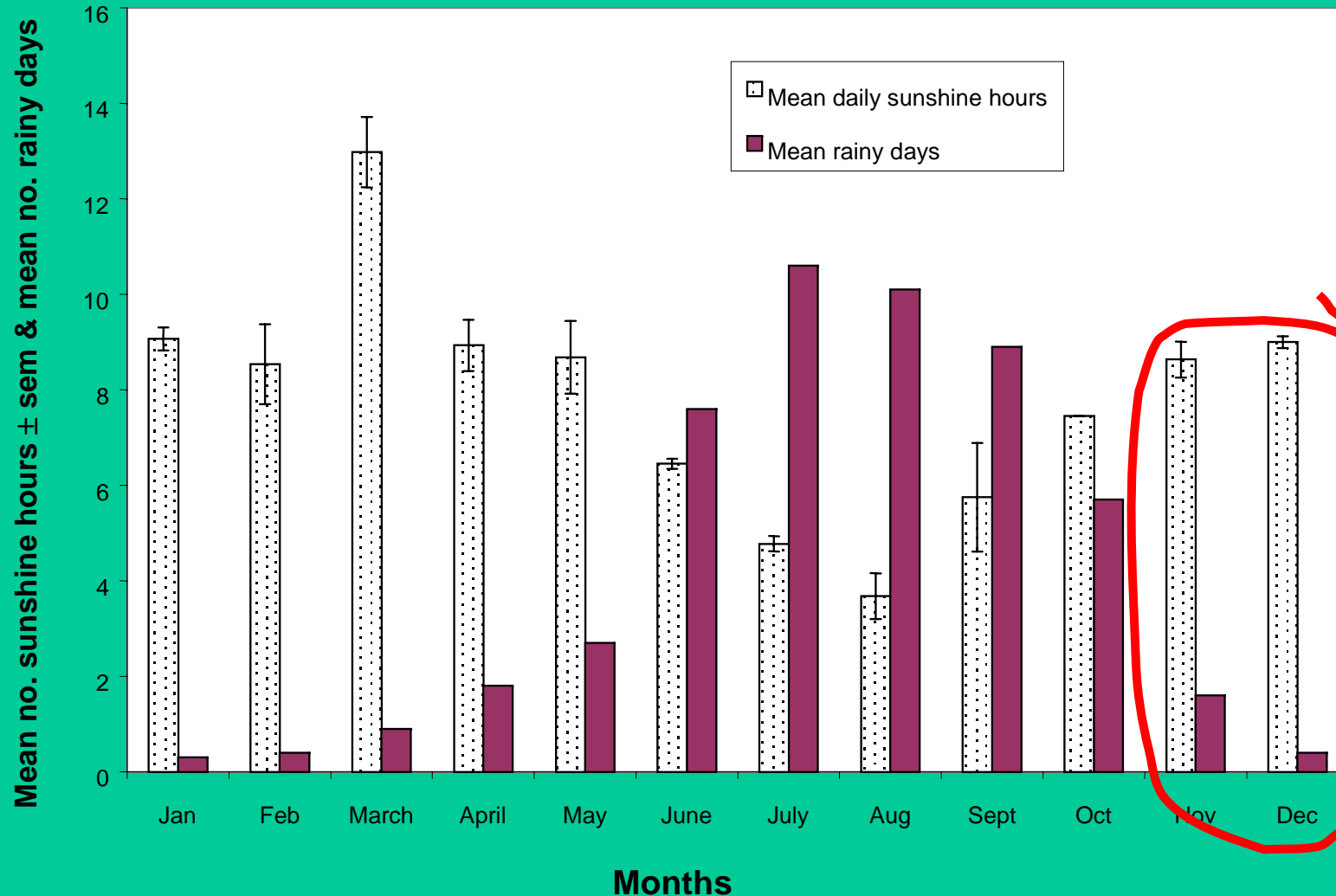
# How to solarize grain

1. Place grain in an envelope in the sun.
2. Hold grain at 50°C for about 6 hours.



# Would there be enough sunshine for solarization ?

Hyderabad airport during 1999 and 2000



# Preliminary tests of solarization at IGSM-RI

Model solarizer tested

Clear polythene (folded under edge of black polythene)

Grain layer

Black polythene

Two layers of jute sacks for insulation



# Questions to be answered

## Test 1

1. How important is grain depth?
2. How important are the black layer and insulating layer?
  - Grain - 11.8% mc and infested with *Sitophilus oryzae* and *Rhyzopertha dominica*
  - Depth of grain layer 1 cm, 1.5 cm, 2 cm or 3 cm
  - To be solarized 10 am to 4 pm
  - After solarization, samples incubated at 27°C for one month to check for any living insects

# What happened

<b>Equipment</b>	<b>Grain depth</b>	<b>Insect infestation after one month</b>
Full solariser	1.0 cm	None
	1.5 cm	None
	2.0 cm	Moderate infestation
	3.0 cm	Heavy infestation
No black sheet	1.0 cm	None
	1.5 cm	None
	2.0 cm	Moderate infestation
	3.0 cm	Heavy infestation
No jute bags	1.0 cm	Moderate infestation
	1.5 cm	Moderate infestation
	2.0 cm	Moderate infestation
	3.0 cm	Heavy infestation

## Conclusions

- grain depth should not exceed 1.5 cm
- black sheeting is unnecessary
- jute sacking is an essential insulation layer

# Questions to be answered

## Test 2

1. How important is the degree of sealing?
2. Does solarization affect grain germination?

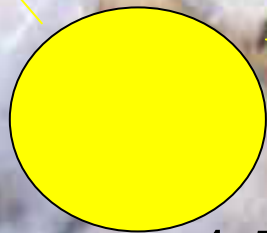
<b>Sealing</b>	<b>Grain depth (cm)</b>	<b>Insect survival</b>	<b>Grain germination</b>
Fully sealed envelope- top and black layer	1.5	None	None
	2.0	Moderate	None
Partially sealed envelope - top folded under jute sacks	1.5	None	None
	2.0	Moderate	None
Untreated grain	-	-	88%

## Conclusions

- Envelope can be fully or partially sealed
- Grain for seed should not be solarized

# Solarization in Mirzapur December 2002

**20 quintals in 3 days by 5 people**



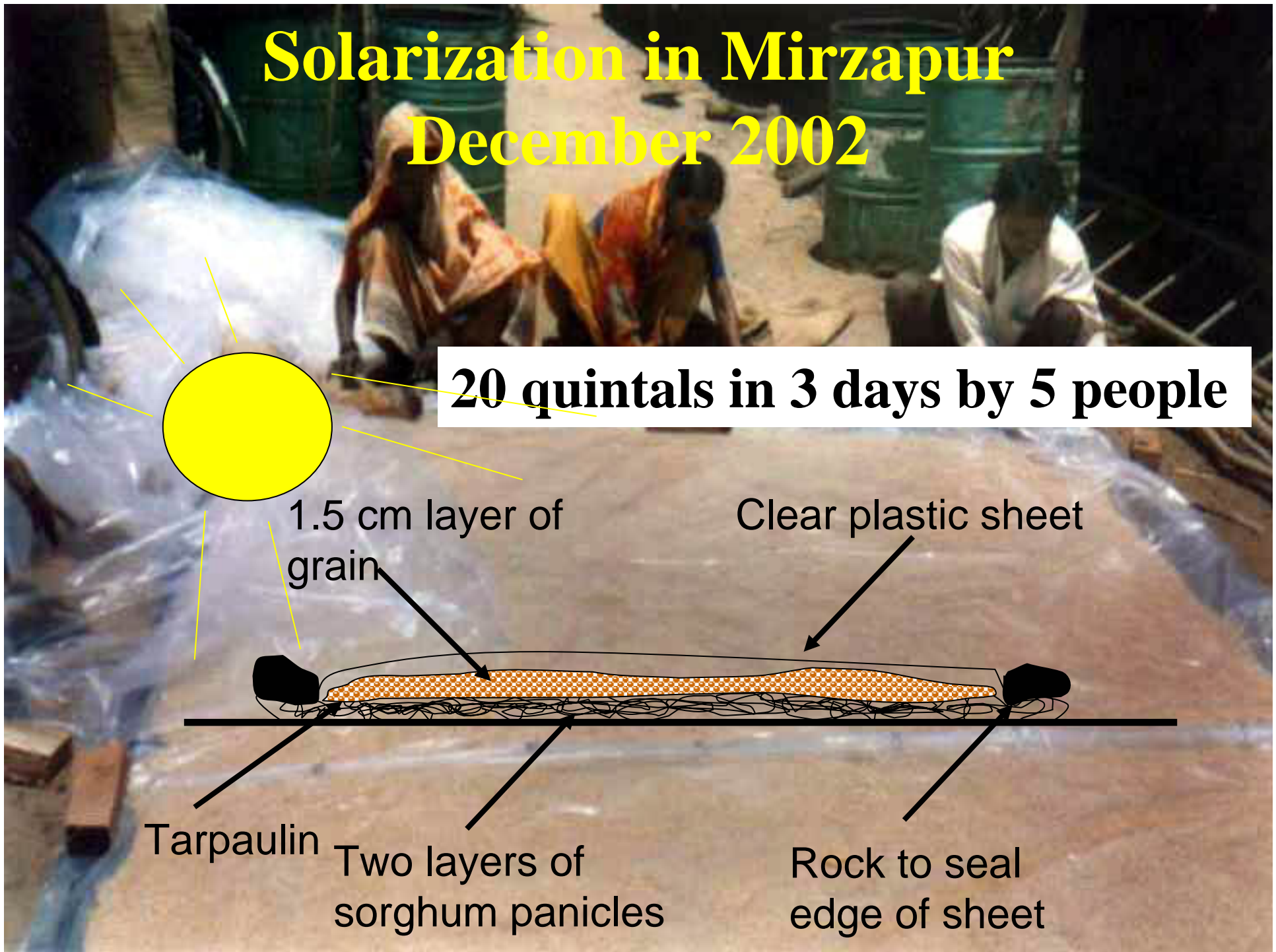
1.5 cm layer of grain

Clear plastic sheet

Tarpaulin

Two layers of sorghum panicles

Rock to seal edge of sheet





# Solarization in Mirzapur contd

- Grain at 12% moisture content
- Maximum recorded temperature 52° C
- Immediately after treatment, grain placed in polypropylene bags
- Stored in Panhayat offices until all solarization completed, then placed in bin
- Bin painted with gas-tight paint and inlet and outlet ports sealed

# What happened at Mizapur ?

- Silo emptied March 2003 - drought led to shortened storage period. Some for sale, some to be donated to drought victims.