

# **Regional Educational Programme for Capacity Development for Agricultural Innovation**

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## **Post Harvest Technology (Stored Grain Insect Management)**

**Innovation, Entrepreneurship and End users – A Practical model**

*“A grain saved is a grain produced....”*

*A seed saved is thousands produced....”*

The Indian subcontinent is situated in the tropical region of the world, where excess of rainfall and temperature prevails throughout the year. This leads to development of heavy moisture in the climate. The humidity present in the atmosphere has a great influence on storage of cereal crops. These post harvest losses have an impact at both the micro and macro levels of economy of our country by affecting the per capita food grain availability and thus threatens the food security of our Nation.

Grains are stored at farm, home and warehouse in our country. Nearly 60% the grains annually produced in the country is retained by the farmers for their own food, cattle feed, seed etc. Farmers store their grains generally in traditional storage structure. Recent estimates by All India Coordinated Scheme on Post Harvest Engineering & Technology (AICRP-PHET) shows that post harvest losses of food grains in the farmer’s holdings range from 12 to 16 percent in major food grains, out of which insect alone accounts for 2.0 to 4.0 percent. Besides the farms, around 72 million tonnes of food grains are stored in Food Corporation of India (FCI) and Central Warehousing Corporation (CWC). Estimation is currently on by AICRP-PHET scheme

with the support of FCI to find out the post harvest losses in warehouses. Available estimates revealed that in spite of all the measures of sanitation and control in perfect warehouses, there is a loss of 0.41 percent of food grain stock. It is estimated that nearly 5.0 million tonnes of food grains are being wasted per year by insects in storage by which around 380 million people can be fed for a month.

In the management strategy for these insects, phosphine formulation is the only option that too restricted use in warehouses only. Use of phosphine fumigation at farm level is very much limited.

Further insecticide resistance to phosphine fumigation has been reported from many parts of the country. With no alternatives to phosphine, there is urgent need for eco-friendly technologies for management of stored grain insects at farm, home and warehouses. As food grains cannot be treated with botanicals/ activated clays, there should be a way out to tackle the insect problems in storage. Precisely there is worldwide need for storage revolution which can happen only through innovations, usable eco-friendly technologies to manage insects at farm, home and warehouses.

## **Technologies developed by me:**

It is well proved that no granaries can be filled with grains without insects as the harvested produce contain egg (or) larvae (or) pupae in them because of field carryover infestation which cannot be avoided in developing countries like India. So what is required is simple technologies for timely detection of insects in the stored produce and thereby plan timely control measures.

Many devices have been developed for stored grain insect some of which are popularly used across the country in households / farms / warehouses.

### **LIST OF DEVICES DEVELOPED:**

1) TNAU insect probe trap; 2) TNAU Pitfall trap; 3) TNAU Two-in-one trap for pulse beetle; 4) Indicator Device; 5) Automatic insect removal bin; 6) UV – Light trap for warehouse; 7) Egg removal device (Indian Patent : **198434**); 8) Stack probe trap (Indian Patent Application Number :**284727** and 9) Stored grain insect pest management kit

All these devices can be used for both monitoring and mass trapping of stored grain insects. It is important to note that even a single live insect presence in food grain cannot be tolerated as they build up and cause enormous loss in storage due to their high reproductive rate.

## 1. TNAU INSECT PROBE TRAP

The use of trap is relatively a new method of detecting, trapping insects in stored grains. The basic components of a TNAU probe trap consists of three important parts: A main tube, insect trapping tube and a detachable cone at the bottom. Equispaced perforations of 2 mm diameter are made in the main tube.

**Concept:**Insects love “AIR” and move towards air. This behaviour of the insect is exploited in this technology.

**Method of working:**The insect trap has to be kept in the grain like rice, wheat etc., vertically with the white plastic cone downside as shown the figure. The top red cap must be with the level of the grain. Insects will move towards air in the main tube and enter through the hole. Once the insect enters the hole it falls down into the detachable white cone at the bottom. Then there is no way to escape and the insects are trapped forever. The white detachable cone can be unscrewed once in a week and the insects can be destroyed.

**Salient Features:**No chemicals; No side effects and No maintenance cost.

**Efficiency:**TNAU Insect traps are excellent insect detection devices in food grains and more effective in the detection of stored grain insects namely *Rhizopertha dominica* (F.), *Sitophilus cryzae* (L.) and *Tribolium castaneum* (Herbst) in stored food grains both **in terms of detection** as well as

**number of insects caught** than the standard normal sampling method (by spear sampling). The detection ratio (trap : normal sample) is higher in trap than of normal sampling method by factors ranging from 2 : 1 to 31 : 1. The insects catch is also higher in the probe trap than the normal sampling method by factors ranging from 20 : 1 to 121 : 1.

They are also good mass trapping devices when used at 2 – 3 numbers / 25 kg bin (28 cm dia and 39 cm length). They should be placed at top 6 inches of the grain, where the insect activity is seen during early period of storage. They can remove > 80% of the insects within 10 – 20 days.

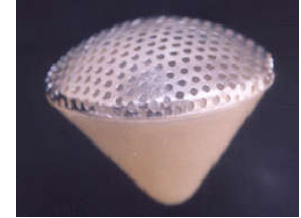


## 2. TNAU PIT FALL TRAP

Pitfall traps are used for capturing insects active on grain surface and in other layers of grain. (Monitoring and mass trapping tool).

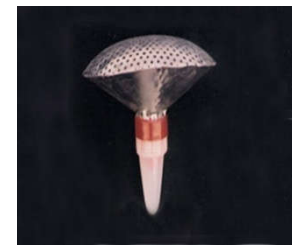
### Standard Model

- Standard model of pitfall trap has 2 parts, perforated lid (2 mm (or) 3 mm) and a cone shaped bottom portion.
- Application of special coating with sticky material on the inner side of cone to hold trapped insects is necessary
- This procedure is tedious.



### TNAU Model

- TNAU model has perforated lid, cone shaped bottom which tapers into a funnel shaped trapping tube.
- Hence sticky coating is dispensed with
- Commercial model is in plastic, simple and economical
- Easy to handle.



## 3. TNAU TWO-IN-ONE MODEL TRAP



The probe trap containing the components namely the perforated tube, pitfall mechanism, a collection tube and the cone shaped pitfall trap with a perforated lid and the bottom tapering cone were combined as a single unit. Combination of probe and pitfall increase the trapping efficiency of insects. Best suited for pulse beetles as they are seen only on grain surface wandering here and there. It does not require tedious procedures like coating the inner surface of pitfall cone with sticky materials before trapping to hold pulse beetles. Beetles are captured alive in this trap, which may facilitate release of pheromone and there by attract more insects.

## 4. INDICATOR DEVICE

It consists of a cone shaped perforated cup (3mm perforation) with a lid at the top. The cup is fixed at the bottom with a container and circular dish, which are to be smeared with sticky material like vaseline.



Farmers, before storing their pulses, should take 200 g of pulses to be stored and put them in the cup. When the field carried over beetles start emerging, due to their wandering behaviour, they enter the perforations and get slipped off and fall into the trapping portions. As they stick on to the sticky materials, farmers can easily locate the beetles and can take out the bulk-stored pulses for sun drying. The device with 2mm perforations can be used for cereals.

This will help in eliminating the initial population, which acts as the major source for further build up. Thus, timely detection will help the farmers to preserve their valuable pulses during storage. The device is being popularised.

## 5. TNAU AUTOMATIC INSECT REMOVAL BIN

TNAU insect removal bin can remove insect automatically. The structure has 4 major parts namely outer container, inner perforated container, collection vessel and the lid. The model exploits wandering behaviour of stored product insects as well as the movement of these insects towards well aerated regions. The grains are held in the specially designed inner perforated container. The space



between inner and outer



container provides good aeration for the insects. Insects, while wandering, enter the perforation to reach the aerated part and while doing so, get slipped off and fall into the collection vessel through a pitfall mechanism provided in the collection vessel. In order to quickly collect the insects, as and when they emerge from grains, perforated (2 mm) rods are fixed in the inner container.

The container will be useful for storing rice, wheat, broken pulses, coriander etc. The insects such as rice weevil, lesser grain borer, red flour beetle, saw toothed beetle, which are commonly found attacking stored grains can be removed automatically by storing grains in this container. Within a very short period of 10 days a majority of the insects (more than 90

per cent) can be removed from the grains. The containers are available in 2 kg, 5 kg, 25 kg, 100 kg and 500 kg capacities.

**Efficiency:**Grains (paddy and sorghum) stored in Automatic insect removal bin (100 kg and 500 kg) recorded only 1 – 4% damage by insects compared to 33 to 65% damage in ordinary bin after 10 months of storage. The population of insects (*R. dominica*, *S. oryzae*) ranged from 0 – 2 / kg in grain stored in 100 kg Automatic insect removal bin compared to 5 – 191 / kg in ordinary bin after 10 months of storage.

## 6. UV – LIGHT TRAP FOR GRAIN STORAGE GODOWNS

The UV light trap mainly consists of an ultra-violet source (4 W germicidal lamp). The lamp produces ultra-violet rays of peak emission around 250 nano meter. The UV light trap can be placed in food grain storage godowns at 1.5 m above ground level, preferably in places around warehouse corners, as it has been observed that the insect tends to move towards these places during the evening hours.



The trap can be operated during the night hours. The light trap attracts stored product insects of paddy like lesser grain borer, *Rhyzopertha dominica*, red flour beetle, *Tribolium castaneum* and cigarette beetle *Lasioderma serricorne* in large numbers. Psocids which are of great nuisance in godowns are also attracted in large numbers. Normally 2 numbers of UV light trap per 60 x 20 m (L x B) godown with 5 m height is suggested.

The trap is ideal for use in godowns meant for long term storage of grains, whenever infested stocks arrive in godowns and during post fumigation periods to trap the resistant strains and left over insects to prevent build up of the pest populations. In godowns of frequent transactions the trap can be used for monitoring.

**Efficiency:**It has been found that two traps kept at the corners of the warehouse (60m x 20m x 5m) can catch around 200 insects/day even from a godown where normal sampling did not show any insect presence, thus indicating its effectiveness as a monitoring and mass trapping device. It has been recorded around 3000 *Rhyzopertha dominica* on a single day from single trap kept in a paddy godown.

## 7. A DEVICE TO REMOVE INSECT EGGS FROM STORED PULSE SEEDS (Indian Patent No. 198434)

Pulses are more difficult to store than cereals as these suffer a great damage during storage by pulse beetle *Callosobruchus sp.* The main source of infestation by pulse beetle is its carry over damage from field to stores which is well known. The present invention is a prototype of a gadget which can successfully crush the eggs of pulse beetle, *Callosobruchus chinensis* and *Callosobruchus maculatus* which attack stored pulses. The gadget has outer container and an inner perforated container with a rotating rod having fixed with plastic brushes on all sides. Due to the splashing action of the brush in rotating rod, the eggs get crushed and thus the damage is prevented. The treatment does not affect the germination of seeds.



### Advantages of the invention

1. The device is useful in removing the eggs without affecting the germination
2. Once the eggs are removed there will not be further build up of population during storage of seeds.
3. Removing the eggs laid by the beetles will have a significant impact in arresting the population build up in storage.
4. Farmers generally fear to store pulse seeds because of the pulse beetle damage during storage. The device of the present invention can remove this fear from the farmers mind and thus motivate them “to have their own seeds”.
5. The device is also useful for rice, broken pulses, sorghum and maize to remove adults as well as crush free living larvae, pupa and eggs laid externally.
6. The patent has been recently commercialized.

## **8. TNAU- STACK PROBE TRAP for monitoring stored product insects in warehouse. (Indian Patent No.284727)**

The invention relates to a device for detecting stored grain insects in bagstacks which comprises a main hollow tube having a diameter in the range of 1.8 to 2.0 cm with equispaced perforation in the range of 1.8 to 2 mm on its upper portion with a bend at one end which ends in a transparent collection unit to collect the insects falling down from the bend, the other end of main tube being closed.



### **Advantages of the invention**

- i) The device is useful in detecting stored grain insects in bag stacks of the food grain warehouses without any damage to sacks.
- ii) The device does not require any bait materials to trap insects.
- iii) The device is useful in studying the distribution pattern of stored product insects in various layers of bag stacks.
- iv) The device will be useful to validate the effect of fumigation by using it immediately after fumigation, in different layers of the fumigated stacks.

## **9. TNAU Kit- TNAU STORED GRAIN INSECT PEST MANAGEMENT KIT**

Food grains are stored for varying periods to ensure proper and balanced public distribution throughout the year. Among the biotic and abiotic factors which affect grains / seeds in storage, insect plays a major role in the deterioration of grains / seeds causing both qualitative and quantitative losses.



Often the presence of insects in store houses are felt only when they are hovering and flying around, by which time enormous loss and population build up of insects might have occurred.



Hence, timely detection of the stored grain insects will help to prevent heavy losses. TNAU is one of the pioneering institutes in India in the development of detection devices for stored grain insects. These devices exploit the wandering behaviour of the insects and help in timely detection of insects in stored produce leading to timely control. These include TNAU probe trap, TNAU pit fall trap, two in one model trap, indicator device, Automatic insect removal bin, UV-light trap technology, TNAU insect egg removal device and TNAU stack probe trap for warehouse. These devices have been widely used in many places and have received State and National recognitions.

Hence, I developed a “KIT” named as **TNAU-Stored Grain Insect Pest Management Kit** containing prototypes of all the devices along with a CD-Rom about the devices and how to use them. This kit will be of great use in popularization of the technologies across the country. The kit will be an ideal “hands – on training” tool for Education, Extension centers (KVK, Plant clinic, save grain centers) and also for private ware housing. This TNAU kit is the first of its kind in the world.

# Method of Popularization

## Step:1 Commercialisation of Technology - Entrepreneurship

### PROMOTION OF AGRO-BASED INDUSTRIES FOR RURAL TECHNOLOGIES

#### COMMERCIALIZATION - Agro-based industries

*Technology becomes viable*

***ONLY IF IT IS COMMERCIALIZED***

*Unless a product is commercialized there will not be  
any desirable effects on the technology transfer*

**My innovations led to the birth and the growth of four Entrepreneurs  
in India.**

#### (1) KSNM MARKETING (2002)

SF No.29/1B, Ona Palayam,

Siruvani Water Line Road,

Dheenam Palayam Post,

Coimbatore,

Tamil Nadu - 641 109, India

Web : [www.ksnmmarketing.com](http://www.ksnmmarketing.com)

Email : [ksnmmarketing@hotmail.com](mailto:ksnmmarketing@hotmail.com)



#### (2) MELWIN ENGINEERING (2011)

18/2, Gandhi Street,

Bharathi Nagar, Podanur (PO),

Coimbatore – 641 023.

Tamil Nadu, India.

Email : [anitathomascs10@gmail.com](mailto:anitathomascs10@gmail.com)

**(3) M/s. KHUSBOO ENTERPRISES (2014)**

AZIZ Complex, Panbazar,

Guwahati

Assam. India (2014)

Email: ravi\_agarwal8@yahoo.com



**(4) M/s. BHUVI CARE (P) LTD. (2014)**

Sipcot Industrial Growth Centre,

Gangaikondan,

Tirunelveli – 627 352.

Tamil Nadu, India.

Email : [bcpl2002@gmail.com](mailto:bcpl2002@gmail.com)

***WERE ASSIGNED THE RIGHT BY TNAU TO MANUFACTURE AND  
MARKET THE TNAU INSECT TRAP TECHNOLOGY***

**Step: 2 Through publications**

A. Research Articles	:	108
B. Popular Articles	:	120
C. Technical Bulletin / Booklets published	:	
a) English	:	16
b) Tamil (Local language)	:	8
D. Books written	:	6
E. Patent obtained	:	

1. A Device to Remove Insect Eggs from Stored Pulse Seeds (Indian Patent No. 198434)
2. Trap for monitoring stored product insects in warehouse. (Indian Patent No. 284727)

**Step: 3 Through websites**


- a. [www.mohantrap.com](http://www.mohantrap.com)
- b. [http://agritech.tnau.ac.in/crop protection/insect traps](http://agritech.tnau.ac.in/crop%20protection/insect%20traps)

**Step: 4 Through demonstrations, exhibition and case studies**

Several demonstrations and exhibitions have been conducted (> 500) with case studies.

# Transfer of Technology (End Users)

## Technology – 1: TNAU Probe Trap



**Tamil Nadu Agricultural University**

**TNAU INSECT TRAP for STORED GRAIN INSECT MANAGEMENT**

Large Scale trapping of Red flourbeetle, *Tribolium* sp. and trapping of groundnut bruchids from stored groundnut pods in a lab test. *National Research Centre for Groundnut (ICAR) - Junagadh, Gujarat* (Around 1000 *Tribolium* and 300 *Caryedon* adults were removed within a month )


A 2-4% saving of rice within a month from rice weevil damage. *Avinashilingam Institute for Home Science (Deemed University), Coimbatore, Tamil Nadu*

The trap kindered the scientific temper of school childrens from Dharmapuri and Trichy in Tamil Nadu leading to winning of *National / International award by the school children*

Around 90 per cent removal of weevils from rice stored in drums within a week. *Scott Christian College, Nagercoil, Tamil Nadu.*

Uses the Probe Trap for detecting Cigarette beetle in Herbal Tea Exported to Germany *M/s Saraf Trading Corporation, Cochin, Kerala.*

Uses the Probe traps for detecting insects in stored Siddha Products. *M/s SKM Siddha, Erode, Tamil Nadu.*



**TNAU INSECT PROBE TRAP**

Cost of Trap : Rs.75/- only

Traps used by **CARE India** under ICDS programme to mitigate the grain losses at village level in Hoshangabad and Harda districts of **Madhya Pradesh**

2 - 6 per cent saving in wheat from weevils within 3 months under small scale bag storage. *Gondar University, Ethiopia, Africa*

Around 30 rice weevils (*Sitophilus* sp.) removed within a day from stored rice. Around 20 red flour beetles (*Tribolium* sp.) removed within 1/2 hour from Rava ..... *Pest Control India.*

Removed 100 - 200 flat grain beetles from bins stored with rice (100 - 500 kg) within 3 days in Gorakpur, Uttar Pradesh. *Tata Chemicals Ltd., Kolkatta and RIN, Chennai*

2-3 kg rice saving in 3 months. (Households) in tribal regions of *Adilabad District, Andhra Pradesh - Basix (Microfinance Organisation in Andhra Pradesh)* Reduced drudgery for women in cleaning Jowar.

- ❖ Around 3 lakh people in india uses TNAU insect trap
- ❖ Introduction of TNAU Trap in Africa, Ethiopia, Rwanda, Nigeria, Turkey, Egypt, Thailand and France.

### Tamil Nadu

### Kerala



Telangana



Uttar Pradesh



Madhya Pradesh



### *Technologies cross border ...*

These trap technology have been introduced recently in Ethiopia, Rwanda, Nigeria, Turkey, Egypt, Thailand and France.



### **Technology – 2: TNAU Automatic Insect Removal Bin:**

- ❖ Around 5000 farmers in the North-eastern zone of India use the insect removal bin for paddy seed storage.

- ❖ First time a technology has gone to North- Eastern zone of our country which is the current priority area for agricultural development in the country.
- ❖ A factory in North-Eastern Zone of India, manufacturing and marketing the TNAU-BIN.



### **Technology – 3: TNAU UV- Light Trap:**

- ❖ Food Corporation of India has adopted TNAU -UV light trap technology.
- ❖ Recently, the Tamil Nadu Govt. announced the adoption of TNAU UV- Light traps. 162 no's of light traps to be installed in 54 godowns of Tamil Nadu State Warehousing Corporation (TNSWC).



### **Recommendations by FCI:**

- ❖ The UV light traps were found to be effective in reducing the insect population inside the sheds.
- ❖ It prevents/ reduces cross infestation of from one godown to another godown.
- ❖ The traps can be kept only in the gang ways and not in the alleyways due to paucity of space in alleyways.
- ❖ It could be an effective tool in disinfestation operations by way of reduction of insect population prior to the fumigation to ensure 100% kill for heavily infested stocks.
- ❖ It is also effective for the godowns situated near residential areas by preventing the flying insects in the late hours.

### **Firms/Exporters who use the trap**

1. M/s Madaus Pharmaceuticals PVT. Ltd. Goa, India
2. M/s Saraf Trading Corporation PVT. LTD, Cochin, India
3. M/s SKM Siddha and Ayurvedic, Tamil Nadu, India.
4. M/s Cadburys India Ltd., Dharapuram, Tamil Nadu, India.
5. M/s Jayanthi India Spices Ltd, Coimbatore, India.
6. M/s Mahyco Maharashtra Hybrid Seeds Co. Limited, India
7. M/s Ulavan Producers company, Erode, Tamil Nadu.
8. FCI.

### **Significance:**

- ❖ Practical studies on UV Light trap was first carried out by me in India in 1990's as part of my Ph.D thesis.

Mohan, S. M. Gopalan, P.C. Sundara Babu and U.V. Sreenarayan. 1994. Practical studies on the use of light trap and bait trap for management of *Rhyzopertha dominica* in rice warehouse.

**International Journal of Pest Management 40(2): 148-152.**

- ❖ My Ph.D. thesis has won the Jawaharlal Nehru Award in the year 1993.
- ❖ My continuous TOT efforts along with patience and perseverance led to large scale testing of UV- light trap technology by FCI, which resulted in adoption of the technology. Around 400 units have been sold out in last three months paving way for UV light trap technology becoming an essential and integral part of stored grain insect management in FCI which store around 72 million tonnes of food grains. Thus I have sown the seeds for a stored grain revolution in our country which is the need of the hour.

### **Technology – 4: TNAU Stack probe Trap:**

**(Indian Patent Application No.284727)**

- ❖ TNAU Stack Probe Trap is being commercially used by M/s Ulavan Producers Company, Erode for turmeric storage pest management.
- ❖ Around 500 units have been sold out so far.



### Other Firms/Exporters who use the trap

1. M/s Gubba Cold Storage Ltd. Hyderabad, India.
2. M/s Jayanthi India Spices Ltd, Coimbatore, India.



### Technology – 5:TNAU insect egg remover machine commercialized

(Indian patent no: 198434):

No of units sold:

1. Machine operated- 3 (Mainly rice traders/merchants buy this machine)
2. Hand operated – 2 (Self help groups)



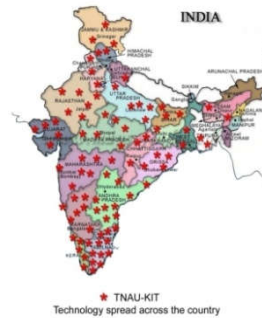
Cleaning efficacy: 200 kg/ hr  
Approximate unit cost- Rs: 1, 75,000/-



Cleaning efficacy: 50 kg/ hr  
Approximate unit cost- Rs: 40,000/-

## Technology – 6: TNAU Kit:

- ❖ Around 300 agricultural colleges / KVK's/ farmers training centers across the country are using the TNAU Kit for teaching and training.
- ❖ Around 400 schools enrolling 12,000 students in Tamil Nadu are using TNAU Kit for teaching school children.



## IMPACT CREATED ON AGRICULTURAL EDUCATION

### a. Impact on School Education:

My traps kindered the scientific temper of school children in Tamil Nadu (This was possible only by extensive popularisation activity done by me)

Besides being useful to the farmers, households and warehouse managers, my TNAU Insect trap technologies paved way for kindering the scientific temper of school children.

A. Seventh standard student of Chinmaya Vidyalaya, Trichy, Tamil Nadu Mr. M. Abhilash has WON 2 Gold Medals in the INTEL - IRIS completion and a WIPO Award for young inventor by making TNAU traps using waste materials (Bisleri bottles).

B. Students of the Senthil Matriculation School in Dharmapuri, recently Won a Medal at 10<sup>th</sup> National Children's Science Congress - 2002 by developing their own model of insect trap from the inspiration they got on seeing my probe trap model.

C. URC Palaniammal Matric Higher Secondary School, Sengodampalayam, Erode has won a prize and Rs. 1000/- cash award for the model "Protection of



Food Grains" in exhibition cum competition "Genesis 2003" organised by P.K.R. Arts College for Women, Gobichettipalayam.

D. Mr. R.Vignesh of Padma Sheshadri Balamandir Higher Secondary School, Chennai has won the best project award for making TNAU traps in plastic waste materials during SCHOOL ANNUAL MEET 2009.

Impressed upon by the creative activity by the school students of Tamil Nadu, based on the technologies developed by me, I was appointed as the **Chairman of the Committee to revamp and revitalise the Agricultural School Education in Tamil Nadu.** I feel this is the greatest achievement in my life as School Education is very important in shaping the future of the student community. The new 11<sup>th</sup> Standard Agricultural Practice-I Book which is currently read by approximately 12 thousand school students enrolled in around 400 schools in Tamil Nadu has a chapter on Importance of **Post Harvest Technology** in which the TNAU probe trap is highlighted.



As "**Chairman**" I made significant reforms in Agricultural education in Tamil Nadu Schools. The old curriculum structure which was in practice in Tamil Nadu around last 20 years was revamped and a common text book, Agricultural Practices I and Agricultural Practices II (for 11<sup>th</sup> and 12<sup>th</sup> standard schools) was introduced in the year 2010-11, 2011-12 respectively. First time in curriculum **Practical Guide** was introduced for 11 and 12<sup>th</sup> standards in Tamil Nadu.



**b. Impact on PG Education:**

**TNAU stored grain insect pest management kit:**



TNAU is one of the pioneering institutes in India in the development of detection devices for stored grain insects. These devices exploit the wandering behaviour of the

insects and help in timely detection of insects in stored produce leading to timely control. These include TNAU probe trap, TNAU pit fall trap, two in one model trap, indicator device, Automatic insect removal bin, UV-light trap technology, TNAU egg removal device and TNAU trap for warehouse. These devices have been widely used in many places and have received State and National recognitions. Hence, I developed a “KIT” named as **TNAU-Stored Grain Insect Pest Management Kit** containing prototypes of all the devices along with a CD-Rom about the devices and how to use them. This kit will be of great use in popularization of the technologies across the country. The kit will be an ideal “hands – on training” tool for Education, Extension centers (KVK, Plant clinic, save grain centers) and also for private ware housing. This TNAU kit is the first of its kind in the world. **Around 300 Agricultural Colleges / KVK’s in India uses this kit for teaching in UG/PG programme and training scientists, farmers and other end users.**

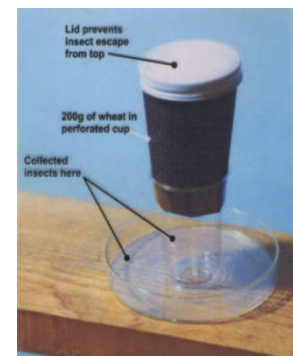
#### **NEW TECHNIQUE DEVELOPED FOR POST GRADUATE TEACHING**

A simple and rapid technique named **cup bioassay** to determine if natural products are repellent or attractive to stored product insects was developed during my training in Cereal Research Center in Canada. This has been **included in post-graduate curriculum.**

Mohan, S. and Paul Fields 2002. A simple technique to assess compounds that are repellent (or) attractive to stored product insects.

**Journal of Stored Product Research. 38: 23-31.**

This technique developed by me has been quoted by more people (**cited 20 times**) across the world.



**For further details Visit [www.mohantrap.com](http://www.mohantrap.com)**