What is in lawn worry? 
Full blown form (PAW) Spodoptera frugiperda (Lepidoptera:Noctuidae) is a destructive pest native to America, recently invaded India and presently causing economic damage in maize. The incidence of this pest was first observed in Stanagarai, Karnataka on 15th May 2016. PAW was later reported in Tamil Nadu, Andhra Pradesh, Telangana, Mahasarakam, Mahakali, Udha. Sihver, West Bengal, Gujarat, Chhattisgarh and Kerala at mild to moderate levels in farmers’ fields.

Which crops are in danger? 
Maize is primarily a pest of maize. If maize is not available it will go for sugarcane! If both are not available it will attack other crops belonging to the family of graminaceae, such as oatgrass, rye, wheat, raddish, grasses etc. It may attack cotton and vegetables as well, which is not reported yet.

How to recognize PAW has arrived in your field? 
Adult moth is a strong flyer, can fly over 100 Km in search of host plants. Phenomenous bugs specific to PAW will attract male moths. Male moth has two characteristic markings, mts: a round oval spot towards the centre and a white patch at the spiral max of forking (Figure 1A). Foraging of females in bull with horn markings (Figure 1B).

What PAW moths do after reaching its favourite crops? 
A female moth lays over 1000 eggs in single or multiple clusters, covered with hairs (Figure 2A a). Incubation period varies from 4.56 to 5.79 to 6.59 days. New born larva in groups disperse from the blossoming site and reach to find on epidermal layers of lower surface of young leaves. Larvae undergo 6 stages called internal molts with no tail, covering head, black scales all over the body and undergo pupation. Pupa is reddish brown in colour (Figure 2A c) and takes 7.37±0.62 to 8.05 to 9.52 days to emerge as adult moth (Figure 2A d). Adult moth can mature from 6.7±0.58 to 8.7±0.21 days. The total life cycle takes 30.75±1 to 34.90±0.86 days (Figure 2A e) as observed from August to January under natural growing conditions in KAMDAHM Winter Nursery Centre, Hyderabad.

Figure 2.1 A live PAW larva under a microscope. B: FESEM image of (1000 X) PAW larvae. C: PAW female laying eggs in maize leaf. D: PAW larva (6 X) and head (1000 X) showing nauplius eye and mouth parts. E: PAW adult male (6 X) showing small antennae and wings.

How to ascertain the larvae feeding your crop is PAW? 
Larvae of many species of lepsyptera belong to the group Myididae and Spodoptera lack the same for a larva and cause similar symptoms in maize. PAW larvae appear in groups of green, alight from grass with four black spots in each abdominal segment (Figure 2 F) and has three cream yellow line running down its back (Figure 3 A, B, C). It is easily identified from any other pest larvae (Figure 3 B 1 & 2). In grass gatherer (Figure 3B 1 & 2), the green larvae (4.5±0.5 to 7.5±0.6 days) mature and then undergo pupation. Pupa is reddish brown in colour (Figure 2A c) and takes 7.37±0.62 to 8.05 to 9.52 days to emerge as adult moth (Figure 2A d). Adult moth can mature from 6.7±0.58 to 8.7±0.21 days. The total life cycle takes 30.75±1 to 34.90±0.86 days (Figure 2A e) as observed from August to January under natural growing conditions in KAMDAHM Winter Nursery Centre, Hyderabad.

Figure 3.1 A live PAW larva under a microscope. B: FESEM image of (1000 X) PAW larvae. C: PAW female laying eggs in maize leaf. D: PAW larva (6 X) and head (1000 X) showing nauplius eye and mouth parts.
What measures to be taken at this stage?

Particulars sprays fail to control 1st and 2nd instar larvae. Only effective measures at this stage is host plant burning. Mix 18 kg rice husk and 2 kg jiggery in 2.5 litres of water and keep the mixture for 24 hours. Spray mixture at 10Kg/L of 50% BP, and roll and soil of 5-10 cm distance just at half an hour before application in the field. And some sand while rolling if the soil is too wet. The habit should be applied into the wheel of the plant in the evening. The above measure is sufficient to control one acre.

4) Damage toot and corn ear: In reproductive stage of the maize crop, toot and corn ear are the vulnerable parts. Toot damage is most common (Fig 7A), which would not lead to economic damage, but become corn ears will ripen. (Fig 7D) directly affect the yield. Sweet corns are more prone to FAW damage, which makes the ears unmarketable (Fig 7C).

What is the management strategy to be adopted if FAW has established in an area?

Crop management practices with systematic plant protection is one of the major criteria to manage FAW population below economic threshold levels.

An integrated post management (IPM) approach is to be followed as described below.

1. Select sunny day with high ambient temperature. Choose cultivars with tight ear cover, especially for sweet corns.

2. Deep ploughing before every crop season to open up the soil to expose FAW pupae to sun and predation. If ploughing is practiced, apply nematodes (e.g., 500 kg/ha) to maintain soil intact and free of biological interference.

3. Plan for maximizing plant diversity by intercropping of maize with allelopathic plants of different region. E.g. Maize + pigeon pea/pawpaw green gram. Plant Naper grass in the border zone as it acts as FAW trap crop.

4. Plan the sowing time at community level to follow synchrony/planting.

5. Treat seeds with Cyst Sudanese 128% + Thiram + Thiram 19.5% (6 ml per kg seed) and report to offer protection up to 20 weeks after germination (Note: that this formulation is not registered in India and also has not been evaluated in ICAR/FPS programmes).

6. If pegging worm is uncontrolled in just tattar baby and sweet corn cultivation, apply the spray with 5% NSE or acaricides (150 ppm) of Steg at weekly interval or Release Steinagromyces or Tellescena novae at $5,000 per acre at weekly intervals, striking a white reaction on the maize stem.

7. Inspect FAW pheromone traps (5 traps on or before germination of the corn to monitor pest arrival and population buildup. Use 15 traps for mass mapping of male to keep population buildup under control.

8. Fruits plantique (6-10 days) soon as sowing is completed.

9. Follow weekly scouting and adopt symptomatic based control measures on action thresholds (Table 1).

10. While scouting, hand pick and destroy egg masses and maize larvae by hooking or immersing in kerosene water.

### Table 1: Identification threshold for the crop growth stages and spray schedule

<table>
<thead>
<tr>
<th>No.</th>
<th>Crop stages</th>
<th>Biological threshold</th>
<th>Toxicological threshold</th>
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<tr>
<td>1</td>
<td>Sowing stage</td>
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<td>0.25% sweet corn</td>
</tr>
<tr>
<td>2</td>
<td>Planting stage</td>
<td>0.1% sweet corn</td>
<td>0.5% sweet corn</td>
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<tr>
<td>3</td>
<td>5-10% infestation</td>
<td>0.25% sweet corn</td>
<td>0.5% sweet corn</td>
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<td>4</td>
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<td>11</td>
<td>5-10% infestation</td>
<td>0.25% sweet corn</td>
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</table>

**Fig. 4** Sampling technique to estimate FAW infestation threshold in maize field.

**Fig. 7** Damaged (A) and unaffected (B) sweet corn leaflets by FAW larvae.