

Millipede Damage after First Rains

Insights from Senegal

Noah Elhardt works with Beersheba Project in Senegal. In August, 2017, he mentioned in a Facebook post that farmers were transplanting millet seedlings into their mulched field (Figure 9) as a strategy to combat millipede attacks, which he said often decimate young seedlings in fields that were seeded later than the very first rains. ECHO contacted Noah for more information, since we have heard from other farmers that also deal with millipede damage.

"A neighboring farmer tried some FFF techniques a couple of years ago, after seeing them work on the farm. He seeded a week or two after the first rains, and lost his entire crop to millipedes. He hasn't tried FFF since.

"This year, our communal class plots at the project are flourishing: beans, sorghum, millet and corn alike. All of these were planted the day of the first rain. Many of our interns (who have their own FFF plots) were running a little behind, and didn't get their seed into the ground until a week or more later, at which point they had nearly 100% loss on millet and sorghum and medium losses on beans, mostly to millipedes. Those interns that sowed millet early and heavy were able to get a good stand. From what we've observed, the millipedes come out in mass about a week into the rainy season. If you have seed in the ground before the rain (as local farmers here do with millet) or if you are ready to seed with the first good rain, I think you can get ahead of them. Otherwise, they can be pretty devastating. Several farmers/interns have commented on a link between mulch and millipedes, but I'm not yet able to define what that link is. It is certainly possible to have success with lots of mulch (we would have lost our entire corn crop this year without it!), but I think timing of seeding and/or mulching might be critical if millipedes are a problem.



Figure 9. Transplanting into a mulched field. *Source: Noah Elhardt*



Figure 10. Direct seeded millet (top) and transplanted millet (bottom). *Source: Noah Elhardt*

"We asked Benoit, the former intern with the longest experience with FFF, if he has any problems with millipedes. He said yes, he does. How does he combat them? He kills every millipede he sees with his hoe. I guess he spends a lot of time in his field."

Noah gave an update in late September. "To review, we lost some of our millet and most of our sorghum fields that were planted more than a week after the first rains this year to millipede predation during the seedling stage. This has been a problem here in the past, both on

and off our farm. Because these were FFF plots, our interns didn't want to waste the compost-filled, mulched Zai holes. As we were thinning other, successful millet and sorghum fields (those that had been seeded with the first rain), many interns opted to take the plants that were thinned (ripped out of the ground), top them (remove the upper shoot portion), and transplant them into their failed FFF plots.

"11 days into the rainy season, we underwent a 3-week dry spell. Otherwise, this has been an average rainy season in length (3 months) and rainfall (~500 mm). We transplanted on days 32 to 35 (first rain after dry spell). We probably would have transplanted sooner had rains allowed.

"Despite undergoing significant transplant shock (again, these were plants ripped out of a field, not gently transplanted from a nursery), both the millet and sorghum plots produced a harvest. Because of heavy bird predation on most of our plots, I won't have meaningful data on comparative grain production. However, as you can see from the photos in Figure 10, the transplanted plots are significantly shorter than, and physiologically behind, the direct seeded plots, but are still producing a reasonable harvest. I would wager that the transplant shock could be reduced by starting seedlings in a nursery, and that transplanting them earlier in the rainy

season (if the nursery is seeded before the onset of rains) would allow for a longer growing season and would offset the impact of transplant shock. This would also allow one to get a few weeks ahead of the weeds!”

Insights from Uganda

Millipedes have also been an issue in Uganda. Bill Stough gathered and shared some information with Bob Hargrave:

“The millipedes come out (rather plague like) and eat the planted seeds, in the ground before they germinate. They particularly devastate beans (almost totally), but also the maize and cassava. With cassava they eat the areas which should be the budding place, so nothing shoots. They seem to come predominantly in one geographical area, the immediate community. Adjacent areas are not affected. I couldn't ascertain whether the soils differed in the neighboring villages. They come after the long dry season (it is in a bi-modal region), almost immediately following the initial rains. Thereafter through the year they are not a problem. In the short-rain season they are not a problem.

“This has happened as long as people can remember. They simply plant and lose a substantial percentage of their crops, and that's the way it is. Coming off the dry season and moving into the hungry time, they have little choice but to just take their chances. They seemed to think that the millipedes liked to live under the mulch blanket. I couldn't get a sense if they thought the mulch blanket increased the problem. But for sure they burrowed into the ground and targeted the seeds. Virtually every Farming God's Way plot lost their beans completely in an initial implementation. Interestingly, one man had a bumper crop of beans from his three rows, and no problems with his maize. He had planted before the rains, and almost immediately after he planted there was a very large rain. He had good germination and good harvest, and no loss to the millipedes. (He had actually failed to follow instructions to wait to plant until after knowing the rains had come for certain; we don't recommend dry planting due to the risk related to the unpredictability of the rain actually coming, and the possibility of losing the seed.)

“There seems to be something out of balance going on.

“Questions and thoughts offered: What is their primary food source - is there something of an answer in the fact that the millipedes are there at the start then gone? Has their real food source arrived? Could a delayed planting by 10 days or longer be the answer? Another mechanism to validate is SCALE - is this mulch blanket acting as the only available cover in the FGW fields, the only true climatic climax ecosystem available? So is the scale too small to be an indicator of pest activity?

“Neem, one of the best natural pesticides available, has been suggested as a solution. Other organic pesticides are great repellants which should work on millipedes. There is a good one [*Producing Food Without Pesticides* (<https://www.echocommunity.org/resources/d5b9abeb-9697-474e-b743-18802642715f>)] by Lowell Fuglie.

“But I'm really feeling there is something off in the ecosystem—one factor being that it was an issue during traditional methods prior to the introduction of mulching.”

Research related insights

Tim Motis found a thesis by Ernst Ebregt on millipedes and sweet potato weevils in Uganda (<http://edepot.wur.nl/41168> (<http://edepot.wur.nl/41168>)).

Tim commented, "I can see where it would be hard to design a research effort around an event that only occurs such a short time during the year. If you do try any of the trapping or baiting interventions in Ebregt's thesis, I would be very curious to hear how they work."

Quoted below are some potential measures that appear towards the end (page 150-151) of Ebregt's thesis:

"Handpicking of millipedes

"During early morning hours and cloudy/rainy days in the beginning of the first rainy season (for example in north-eastern Uganda in March/April), millipedes can be seen moving around in abundant numbers. By then they can be easily collected by means of handpicking.

"Trapping millipedes

"Millipedes are generally active during the night. During daytime, they hide themselves in refuges. Preliminary research has been done, catching millipedes with baited pitfall traps, and with the help of piles of heaped grass/sweet potato vines or roof tiles.

"Baited pitfall traps

"In a preliminary experiment by the author, baited traps were planted in a sweet potato field. 'Extracts' of groundnut, sweet potato, cassava, and maize as well as molasses were used as baits. However, the baits and their constitution should be improved and other promising suitable baits should be tried out as well... Follow-up field experiments with baited pitfall traps in sweet potato, groundnut, maize and cassava fields should be done.

"Grass heaps as 'traps'

"In another preliminary experiment, it appeared that piled grass in heaps, originating from a cleared sweet potato field, functioned as biological 'traps'. The advantage was that local, low-cost material could be used. Heaped piles of sweet potato vines also did well. Field experiments should be designed and carried out.

"Roof tiles as 'traps'

"In another preliminary field experiment, roof tiles appeared to be hiding places for millipedes during daytime. However, during hot sunny days, millipedes dug themselves in the soil and were difficult to retrieve. A disadvantage was that roof tiles were rare in the village. The efficiency of roof tiles or other possible devices, which function as a 'traps', should be tried out in the field.

"Use of botanicals to control millipedes

"... In preliminary research in north-eastern Uganda, extracts of the neem tree (*Azadirachta indica*), goat weed (*Ageratum conyzoides*), African marigold (*Tagetes* spp.), tobacco (*Nicotiana tabacum*) and chilies (*Capsicum* spp.) were used. So were ash and goat droppings soaked in urine. These showed poor results due to logistic problems and dry weather conditions. Laboratory and field trials to determine the repellent and insecticidal effects of extracts of local plants on sweet potato weevils and millipedes are crucial. Such trials can be used to assess the relevance of control options, which fit in an integrated crop production and pest management approach in sweet potato, groundnut, maize and cassava."