

BBEST 3MAN NHYEHYEE HO NSEM TIAWA

Ghana BBEST Nhyehyee Tiawa A Eto So 1

BSF Mfididwuma: Atenaee Ho Anoyie
Ma Mmoayen Kumaa, Nnwene Ne
Nnɔbaee Adwumayefoɔ A Wɔwɔ Ghana



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NNYINASOO

Ewiasse nyinaa, kwadwuma ma yen aduane beye tɔn 23.7 da biara (FAO, 2017), nanso wei de ɔhaw kɛsɛ ba nneema a atwa yen ho ahyia so. Asoɛɛɛ no nsa wɔ wiase yi mu soro mframagya a ɛkye ɔhyew (greenhouse gas) a ɛkɔ wiem no mu 21%, a wei de nhye to nneema a atwa yen ho ahyia no so (Duque-Acevedo et al., 2020). Nokorɛ no ne sɛ, yetwa nnɔbaɛ bi te sɛ ɛmo, nnuaba ne nnuane a ɛbɔ firi nhini mu ɔha mu nkyekyemu 30–40%, nanso ɛmu 60–70% na ɛsɛɛ. Ɛnso ho ara, wɔsusu sɛ mfudɛɛ a wɔtwa no mu beye 40% (2.5 billion tons) na ɛyera anaa sɛ ɛsɛɛ (WWF, 2021). Nnipa dodoo a wɔwɔ nkuro akɛsɛɛ mu no nso ka botaaɛ titire nti a nnuane sɛ wɔ fipam ahodoɔ mu no ho. Kurom nnipa beye ɔpepe 20 a yenyaa no afe 2023 mu no, afe biara Ghana ma yen fipam mu mfudɛɛ a asɛ tɔn ɔpepe 3 (3 million tons), ne ɛmu beye 54–67% a ɛye dɛɛ wɔamfa abɛɛfo aduro anka. Afe biara, Nkran nko ara ma yen tɔn ɔpepe baako. Wɔgyae mfudɛɛ a ɛsɛɛ yi mu fa dodoo no ara ma no porɔ anaa wɔhye anaa sɛ wɔkɔhwie gu, a ɛde ɔhaw ba yen atenaɛ so na afei ɛde ewiem nsakyerɛɛ ne apomuden mu nsunsuanso bɔne ahodoɔ ba. Nnipa redɔso na ama aduane ho hia rekɔ soro no, yehia mprenpren nsoano a ɛbeboa ama yeatumi asɔ mfudɛɛ sɛɛ a ɛfiri kuayɔ, kuro kɛsɛɛ mu ne nnuane nhyehyɛɛ ahodoɔ mu ba no ano.

Black Soldier Fly (BSF) mfididwumakuo no ma akwan pa a ɛdi mu a ɛbeboa asi mfudɛɛ sɛɛ yi ano. Black Soldier Fly (*Hermetia illucens*) (Fig. 1A) ma yen lava a proteen ahye wɔn ma (Fig. 1B) na wɔayɛ ɔyɛ-asase-yie (fertilizer) (Fig. 1C). Saa ntummoa yi nni nsunsuanso bɔne biara wɔ nnipa so te sɛdɛɛ nwansena tɛɛ no a wɔtumi kye nyarewa no.

Yɛde BSF mfididwumakuo hye Ghana kuadwuma ne mfudɛɛ sɛɛ anosie nhyehyɛɛ mu a, ɔman no betumi ate nsunsuanso bɔne a ɛba wɔ kuayɛ so no, nkanka ne ewiem nsakyerɛɛ ne yen atenaɛ sɛɛ so, na aboa ama aduane ho bammɔ akɔ soro, na wɔnam yen ara yen man yi mu anammɔntuo a ɛye afebɔ so asɔ akuafoɔ nkumaa asene.

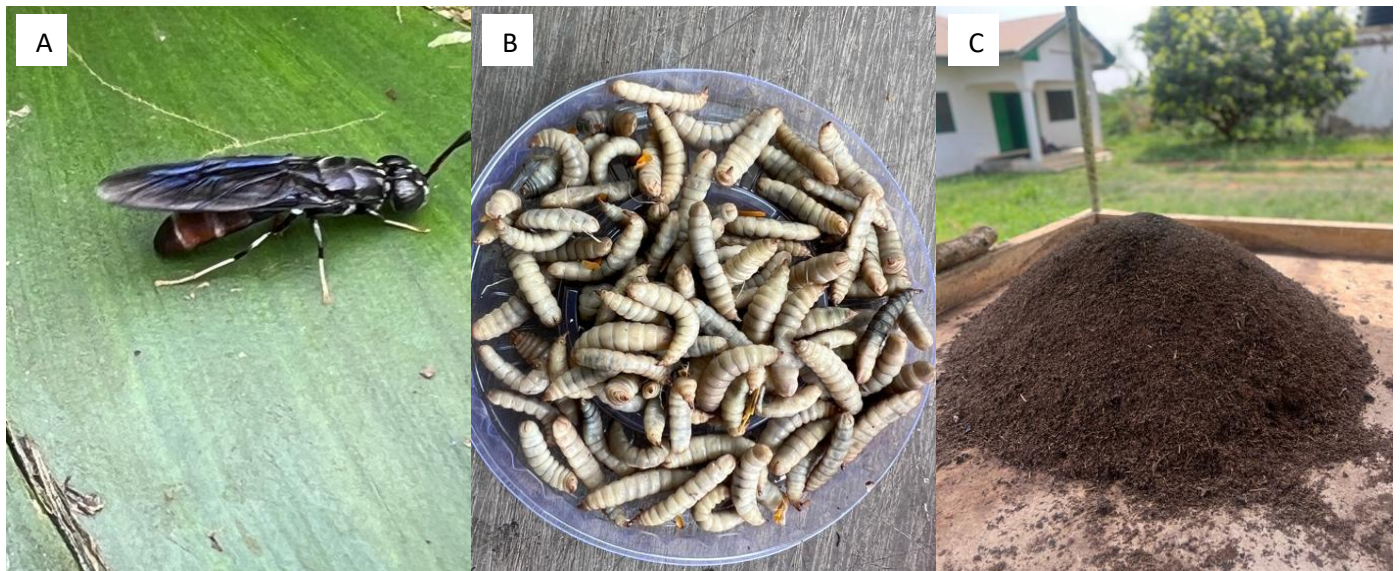


Figure 1: Black Soldier Fly (A), Harvested Black Soldier Larvae (B) ne Organic fertilizer (C). Source: BBEST Project/BNARI

ANOYIE A ƐWɔ HO NANSO ƐNNI MU

Mmoayen nkumaa, nnwene, ne mfudɛɛ akuafoɔ hyia ɔhaw a ano ye den pii ɛsiane kuadwuma akadɛɛ a yeagyɛ atom a ɛsua na ne bɔɔ nso ye den bi te sɛ aduane a yɛde nnwene na ayɛ, aduane a wɔde soy adua ayɛ, ne ɔyɛ-asase-yie ahodoɔ a ɛmfiri abɔdɛɛ mu (Makkar et al., 2014). Ɛnye sikasem mu haw nko ara na saa akadɛɛ ahodoɔ yi de to akuafoɔ so, mmom ɛnye anammɔn pa na ɛmmaa yen atenaɛ nso. Saa nsem ahodoɔ yi ma yehunu mprenpren yi mu hia a ɛhia sɛ yepe akwan ahodoɔ a ne bɔɔ nye den na ɛye afebɔ a ɛbeboa ama yeanya pii afiri kuadwuma mu, na ate nsunsuanso bɔne a ɛba yen atenaɛ sɔɔ so, na asan aboa aduane nhyehyɛɛ ho anammɔntuo ahodoɔ a adwene wɔ mu no.

Bio, akwan ahodoɔ a yeagyɛ tom a yɛde mfudɛɛ a ɛsɛɛ ne nnuane nhyehyɛɛ ahodoɔ no fa so a ɛbi ne sɛ yerehye wɔ petee mu ne kwan a yɛfa so ma no porɔ a ɛde soro mframagya a ɛkye ɔhyew (greenhouse gases) a ano ye den kɔ ewiem. Mfudɛɛ a asɛɛ a wɔhye no petee mu no de greenhouse gases (GHGs) kɔ wiem a ɛde ewiem nsakyerɛɛ ba. Woyi GHGs to nkyen a, petee mu hyɛɛ no de nneema bɔne bi a ɛnya nsunsuanso bɔne wɔ yen atenaɛ bi te sɛ nsuo ne nneema a ɛye den a adi afra wɔ weim (particulate matter), kaabɔn tuntum, nnubɔne ne nnadɛɛ a ɛmu ye duru kɔ wiem, a wɔtumi kɔtena asase, yen nsuo ahodoɔ ne nnɔbaɛ ahodoɔ ani a ɛwura yen nnuane ahodoɔ no mu a ɛbetumi de ɔhaw kɛsɛɛ pa ara aba mmoawa nketenkete a yemfa yen ani nhunu wɔn, nnua, mmoa, ne nnipa so. Nnuane porɔ (Composting) yi hia beaɛ a ɛsɛ sɛdɛɛ ɛbeyɛ na ɛbete nnuanennuro a ɛbekɔ kwa so, ɛhia sika a yɛde bepe akadɛɛ ahodoɔ ne adwumayefoo, ɛna sɛ yeanyɛ ho adwuma yie a, ɛbetumi de nka aba.

ANOYIE A EFIRI BBEST PROJECT HO

Black Soldier Fly (BSF) mfididwumakuo (Fig. 2) ye anoyie a egyina nneema a nkwa wɔ mu na ɛkɔ ntwaaho so sɔ mfudee sɛɛ ho haw a ɛreboaboa ano wɔ kuadwuma ne nnuane nhyehyɛɛ ahodoɔ mu no ano. Kuadwuma ne nnuane nhyehyɛɛ ahodoɔ no ma yen mfudee a asɛɛ bebreɛ a ɛbi ne nnɔbaɛ ase, mmoa agyana ne nnuane a asɛɛ ne nnuane ase a yenya firi nnuane ho dwumadie ahodoɔ mu. Aforɔ nso ne tete akwan ahodoɔ a yefa so brɛ mfudee sɛɛ ase (s.e., sɛ wɛrɛkɔhwie agu, petee mu hyee, ne kwan a wɔma no porɔ a ɛnye kwan pa) a ɛde soro mframagya a ɛkye ɔhyew (methane CO₂), nka ne mmoawa a wɔsɛ nnɔbaɛ ho haw ahodoɔ ne nsuo ne nsase sɛɛ ba (Makkar *et al.*, 2014).

BSF lava di mfudee a asɛɛ no na wɔadane no de kɔ nneema a ɛho hia mu. Black Soldier Fly lava yi betumi ayam mfudee a asɛɛ yi dodoɔ no ara wɔ bere tiawa bi mu. BSF lava yi betumi adi mfudee a asɛɛ yi ama ne dodoɔ so ate beye 70%. Nhyehyɛɛ no dane mfudee a asɛɛ a ɛho nhia no ma no beye nnua ne mmoa ho adeɛ (biomass) ne mfudee ase a ɛho hia. Wɔde nnua ne mmoa ho adeɛ (biomass) a lava a proteen ahye wɔn ma no ama yɛanya no ma sɛ mmoa aduane (nnwene, ntakrammoa, ne mprako). Saa ara nso na mfudee ase no (BSF Frass) nso ye ɔye-asase-yie a ɛfiri abɔdeɛ (biofertilizer) mu, a nnuanennuro aye mu ma ne mmoawammoawa nketewa a wɔboa nnɔbaɛ (microbes). Yebetumi de BSF lava yi anya lava sraɛɛ/anwa (larval fat/oil) a wɔde di dwuma wɔ mmoa aduane anaa mfididwuma dwumadie ahodoɔ mu.



Figure 2: Black Soldier Fly mfididwumakuo a ɛrekyere circular bioeconomy. Source: BNARI

Black Soldier Fly mfididwumakuo dane mfudee a asɛɛ a ɛfiri deɛ wɔakɔhwie agu mu, de te ne nsunsuanso bone wɔ atenaɛ so ne soro mframagya a ɛkye ɔhyew a ɛkɔ wiem no so. Nimdeɛ yi te nka bone so, mmoawammoawa a wɔsɛ nnɔbaɛ, ne mmoawa a wɔtumi de nyarewa siane (disease vectors) wɔ kuadwuma mmeaɛ ahodoɔ mu. Sikasem mu nnepa a yɛbenya afiri nimdeɛ yi mu bi ne mfudee a ɛsɛɛ a yekoto gu ho ka a ɛso bete ama mfuo ahodoɔ no ne nnuane ho adwumayefoɔ, beaɛ foforo a yebetumi anya sika afiri a ɛɛfiri lava, anwa ne ɔye-asase-yie a yɛtɔn so ne te a ɛte nnuane ahodoɔ a ne boɔ ye den a ɛfiri aduane a yede nnwene na aye ne aduane a wɔde soy adua aye a yede yen ho ato soɔ no so. Nimdeɛ yi nam fraase (frass) a wɔde di dwuma so boa ma asase mu ahooɔden kɔ nkan, a wei ma yenya nnɔbaɛ pii, ɛma kuadwuma nhyehyɛɛ a ɛkɔ ntwaaho kɔ so a ɛde nnuanennuro ne nnua ne mmoa ho adeɛ a ɛboa nnɔbaɛ san hye asase no mu bio. Black Soldier Fly mfididwumayekuo boa nnipa ma wɔnya nneema pa wɔ wɔn atenaɛ. Weinom bi ne nnwuma ahodoɔ a ɛbo yen atenaɛ ho ban wɔ nnɔbaɛ a asɛɛ anoboaboa mu, mmoawammoawa kuaye mu, ne mfudee mu dwadie. Wɔnam ayɛmma ne nnwene nnuane a ne boɔ nye den so boa nnuane ho bammɔ.

TɔFABɔ

Soldier Fly mfididwumakuo ma yen Ghana mfudee sɛɛ, mmoa aduane a ne boɔ ye den, ne asase mu nufusuo a ɛso rete no ho anoyie a ɛye afeɔɔ. ɛboa sikasem a egyina abɔdeɛ ahodoɔ a nkwa wɔ mu (bioeconomy) a ɛkɔ ntwaaho so, na ɛma asetena tu mpɔn ma ne titire, mmabunu ne mmaa. Saa nimdeɛ yi ma yenya Ghana mfudee sɛɛ ho dwumadie ne atenaɛ apomuden ho haw ahodoɔ ho anoyie a ani da ho na eye afeɔɔ, nkanka ne kuro keɛɛ mu mmeaɛ bi te sɛ Nkran a mfudee sɛɛ ate atese pa ara no.

Ne nyinaa nka mfua no, deɛ ɛma ne nnyentom sɛ wɔde bɛdi dwuma no tɔ sini no yɛ ɔman nhyehyɛɛ a ɛnni hɔ, ahobammɔ nhyehyɛɛ ahodoɔ, ne anisoadehunɔ nhyehyɛɛ ahodoɔ nkabom (policy integration). Asiakwan ahodoɔ binom te sɛ nnipa dodoo a wɔnte ho asɛm, adwumayɛ mu sintɔ ahodoɔ, ne dimmɔne a wɔde bebata ho nso wɔ hɔ. Yɛbetumi asi wei ano a, yɛhia akwankyerɛ ahodoɔ a ɛmu da hɔ, abɔdeɛ ahodoɔ a nkwa wɔ mu ahobammɔ ho anammɔntuo ahodoɔ (biosecurity protocols), nkyerɛkyerɛ a ɛgyina brane, sika fam nkuranhyɛ ahodoɔ, ne kwan pa a yɛde sika behyɛ adwuma no mu de aboa ama nimdeɛ a BSF wɔ, sɛ ɔde bebɔ aduane ho ban, atumi ama yɛne ewiem nsakyeracɛ ho haw ahodoɔ adi asie, ne nkuraase mpontuo a ɛno nso ho hia akɔ so no ada adi.

ASEDA

Norwegian Agency for Development Cooperation (Norad) na wɔbɔɔ policy brief yi ho ka, Norway grant number QZA-21/095, a wɔnam International Institute of Tropical Agriculture (IITA) so sɛ wɔn ne kuo titire a wɔmaa dwumadie yi baa so: “CHICKEN, FISH AND PIGS FEED AND ORGANIC FERTILIZER VALUE CHAIN DEVELOPMENT USING BLACK SOLDIER FLY- BASED URBAN BIOWASTE PROCESSING IN DRC, GHANA, MALI AND NIGER”. Atwerɛ ne ɛho nhyehyɛɛ no ho agyinasie no firi adwumakuo a wɔsɔɔ yɛn asene no nko ara hɔ.

MMOA NWOMA

Duque-Acevedo, M., Belmonte-Ureña, L. J., Cortes-García, F. J., & Camacho-Ferre, F. (2020). *Agricultural waste: Review of the evolution, approaches, and perspectives on alternative uses*. *Global Ecology and Conservation*, 22, e00902. <https://doi.org/10.1016/j.gecco.2020.e00902>

Food and Agriculture Organization of the United Nations (FAO), 2017. Strategic Work of FAO for Sustainable Food and Agriculture. <http://www.fao.org/3/a-i6488e.pdf>.

Makkar, H. P. S., Tran, G., Heuzé, V., & Ankers, P. (2014). *State-of-the-art on use of insects as animal feed*. *Animal Feed Science and Technology*, 197, 1–33. <https://doi.org/10.1016/j.anifeedsci.2014.07.008>

WWF, U. (2021). Driven to waste: The global impact of food loss and waste on farms. Retrieved from WWF.

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