

Memo on: **Critical Path in Rice**

and its solution by using HERBAGREEN®:

Decreased output:

A 2010 study found that, as a result of rising temperatures and decreasing solar radiation during the later years of the 20th century, the rice yield growth rate has decreased in many parts of Asia by 10-20%.

The mechanism of this falling yield was not clear but might involve increased respiration during warm nights, so expending energy without being able to photosynthesise.

Impact by HERBAGREEN®: (mode of action and observation)

Two elements in HERBAGREEN® mode of action are working against two critical issues causing yield decrease in rice:

1) Low photosynthesis:

After applying HERBAGREEN® on leaves, CaCO_3 is split inside of leaf into CaO and CO_2 . The CO_2 delivered by HERBAGREEN® increases the Photosynthesis in the plant by up to 65%! This explains the results in all our field tests: the recovery of the plants and an increase of the rice yield of at least 30% !

2) High environmental temperatures:

HERBAGREEN® delivers CO_2 and reduces the stress for plants in its uptake from the air. Stomata reduce their opening and therefore respiration is reduced. Plants show a continued strong growth resulting in a higher yield.

Pest in Rice:

A variety of factors can contribute to pest outbreaks, including the overuse of pesticides and high rates of nitrogen fertilizer application.

There is evidence that farmers' pesticide applications are often unnecessary, and even facilitate pest outbreaks !

Misuse of insecticides can actually lead to pest outbreaks.

Major rice pests include the brown planthopper, the rice gall midge, the rice bug, the rice leafroller, rice weevils, stemborer, panicle rice mite, rats, and the weed *Echinochloa crusgali*.

Major rice diseases include Rice ragged stunt, Sheath Blight and tungro. Rice blast, caused by the fungus *Magnaporthe grisea*, is the most significant disease affecting rice cultivation. There is also an ascomycete fungus, *Cochliobolus miyabeanus*, that causes brown spot disease in rice.

Parasitic Weeds

Rice is parasitized by the weed eudicot *Striga hermonthica*. This parasitic weed is a devastating pest on the crop

High temperatures and low rainfall are ideal for development of large populations of panicle rice mites in the field.

Panicle rice mites cause damage to plants by directly feeding on leaf tissue in the leaf sheath and developing grains at the milk stage, indirectly transmitting fungal pathogens. During feeding, they inject a toxic saliva. The mites have been associated with sheath rot as well as bacterial panicle blight. The mites can carry sheath rot spores on their body.

There is evidence that some insecticides increase the protein content of BPH male accessory glands, and thereby increase plant hopper fecundity. Some insecticides increase the amount of amino acids and sucrose available in the phloem of rice plants, and thereby increase BPH survival

Impact of **HERBAGREEN®**: (mode of action and observation)

HERBAGREEN® is a supercharged micronized mineral. When sprayed over the field, Pests and Fungi are affected by its electrical charge.

The effect can be observed rather fast in that Pests become kind of paralyzed, mobility is reduced and eventually within a few days the insects disappear or die.

The same effect is seen on fungal infestation of plants. After applying **HERBAGREEN®** spreading of fungal infections stop and all new leaves grow clean and healthy.

Tests showed that **HERBAGREEN®** needs to be applied in its own form without mixing with pesticides or fungicides. If mixed, the efficiency of **HERBAGREEN®** will be reduced.

On the other hand, when pesticides and fungicides can be stopped, the health of farmers is protected since **HERBAGREEN®** is certified for organic growth and absolutely safe for humans and the environment.

Using **HERBAGREEN®** in damaged plants, recovery is visible faster and show healthy and strong growth. The plants also develop very well into the reproductive phase with long, full and healthy pinnacles. (all affected farms displayed the same recovery modus and outstanding yield)

By using **HERBAGREEN®** from the beginning (treating seeds with **HERBAGREEN®**) and spraying every 3 weeks after seeding, no pests or fungal infestations appeared in any of our test sites or farming plots.