Coffee rust – Backround and Strategies

Coffee rust was first discovered in 1868 on cultivated coffee trees in Sri Lanka. This disease is caused by the fungus *Hemileia vastatrix*. It attacks arabica strains and causes the trees to shed their leaves and even whole plantations to die off. About 150 years ago, Sri Lanka (formerly Ceylon) was a world-leader in the production of coffee, the plantations covering an area of over 162,000 hectares. Within five years this new disease had spread throughout the whole island and caused harvest short-falls of up to 50%. This led to the end of coffee production in Sri Lanka and its replacement with tea and rubber.
This fungal disease has caused the production of coffee to stagnate in many countries in South-East Asia. As a result Latin America is now one of the world's major coffee producing areas.

For many years thereafter, coffee rust almost disappeared from memory. However, this fungal disease returned to importance in 1970, when coffee plantations in Brazil became infected with coffee rust. Within ten years, this fungal disease had spread to almost all Latin American coffee producing areas. Coffee rust appeared in Central America in 1976 for the first time. The harvest worst affected in this region was that of 2012/2013.

The diagram below shows the area affected as a percentage of the total area cultivated (included plantations managed to organic principles) in various countries in Central America for the harvest of 2012/2013. The worst affected, with two thirds of the total area cultivated infected, were the Dominican Republic, El Salvador and Guatemala, followed by Costa Rica (64%), Nicaragua (37%), Jamaica (28%), Honduras (25%) and Panama (24%).

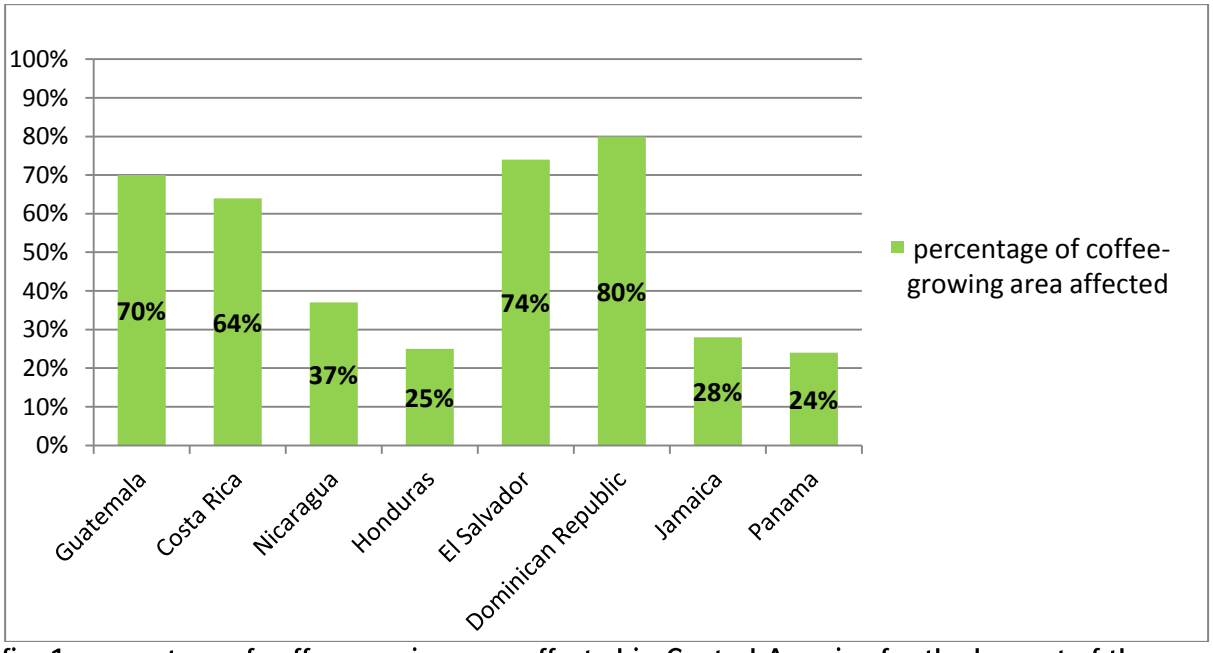

fig. 1: percentage of coffee-growing area affected in Central America for the harvest of the year 2012/2013

(figures from PROMECAFE and International Coffee Organization, 2013)

The coffee growers are expecting even greater short-falls for the harvest 2013/14. This forecast can be made at this stage on the basis of the potential yield in the previous season. In the state of Chiapas in South Mexico, current reports for the 2014 harvest show that 70% of the coffee has been infected.

The coffee rust epidemic in 2012 in Central America cannot be attributed to one single cause. On the contrary, a wide range of factors has contributed to the spread of the disease. At a conference called "Let's talk Roya" (www.letstalkroya.org), organised by "Sustainable Harvest", a non-profit organisation, in November 2013 in El Salvador, four theories were propounded as possible causes of the epidemic spread of this fungal disease.

Climate change:

Rising nocturnal temperatures, falling average temperature during the day, and fewer hours of sunshine in previous years have created conditions more favourable to the spread of this fungus. Besides this, the number of extreme weather events in Central America increased markedly in the period 1990 – 2008 as compared to the years 1970 – 1989, having a detrimental affect on the general condition of the coffee trees.

Poor infrastructure:

In recent decades many research bodies and coffee institutes have had to cut down their services (advisory services, financial support) to the coffee farmers because of reduced access to financial assistance from the government.

More aggressive fungal strains:

The possibility that a new, more aggressive strain has occurred has not been excluded but is still hotly disputed.

Organic collapse:

Dr. Peter Baker referred to Professor John Vandermeer who attributes the coffee rust problem to intensive monocultures where the coffee is grown without the shelter of shade trees. He claims that growing coffee as a monoculture without shade trees, the resulting higher density of the coffee trees, and the use of agrochemicals all lead to poorer soil fertility, a reduction in biological diversity and thus to the disappearance of natural enemies.

Many organic coffee growers are affected by coffee rust, too. Many Naturland farmers have successfully adopted various methods of inhibiting the coffee rust. A Naturland questionnaire in October 2013, addressed to 19 coffee experts in Latin America and to 15 Naturland coffee growers and grower groups which comprise a total of 6,161 coffee farmers, produced the following result:

Measures helping to inhibit coffee rust in organic coffee growing

The following factors strengthen the plants to help them survive coffee rust:

	very successful as a defence against coffee rust	more or less	**little effect**
soil fertility	**90%**	**5%**	**5%**
green manuring to avoid soil erosion	**27%**	**45%**	**27%**
good shade diversification	**77%**	**23%**	**0%**
a lot of shade	**6%**	**30%**	**64%**
little shade	**12%**	**33%**	**55%**
shade trees only of the Inga genus (leguminous trees)	**11%**	**36%**	**53%**
well nourished coffee plants	**90%**	**10%**	**0%**
organic foliar fertiliser	**71%**	**18%**	**11%**
old coffee trees	**3%**	**18%**	**79%**
choice of coffee variety	**86%**	**8%**	**6%**
use of bacterial preparations	**40%**	**34%**	**26%**
use of copper compounds allowed in organic coffee growing	**22%**	**56%**	**22%**

According to organic coffee experts and Naturland coffee growers, the following measures promise the greatest success in combating coffee rust in organic agriculture:

1. Shade trees in various forest strata: coffee plants require a temperate climate. Shade trees level out differences in temperature. This reduces stress for coffee shrubs during arid periods. Shade trees shed considerable amounts of foliage which reduces soil degradation and is the basis for the creation of humus (soil fertility). An agro forestry system with a good variety of trees, different age structures and a multitier forestry structure helps maintain the organic balance between pests and beneficial organisms.

2. Organic coffee growers obtain good soil fertility by using the leaf litter from the shade trees and applying organic fertilisers which considerably reduce soil degradation and increase the proportion of humus. The amount of humic matter contained in the soil results in greater water-retention capacity and thus makes ground water available to the coffee plans for a longer period. Nutrients, too, can be fixed in the soil more effectively by a higher ratio of humus and it also stops them being washed out so easily. (Humus acts like a sponge.)

3. Well nourished coffee plants: Naturland coffee growers fertilise their plants with composted coffee pulp, worm compost, compost and organic liquid fertiliser made from cow dung and vegetable residue. Lime and stone meal are often added to the organic fertilisers. In order to break down the soil more effectively, and to provide nitrogen, legumes such as trees of the Inga genus are suitable.

4. Organic foliar fertilisers rapidly provide the plants with important nutrients. As a result, new shoots reappear more quickly on infected coffee trees.

5. Regenerating coffee plants/planting new trees: old coffee plants are particularly susceptible to coffee rust. By pruning the bushes regularly, new growth is encouraged, which reduces infection with coffee rust.

6. Coffee varieties: planting new, more resistant but nevertheless high quality strains can be recommended. However, many of these resistant strains are significantly poorer in taste and are more susceptible to other diseases.

7. Application of copper compounds permitted in organic coffee growing: lime sulphur and copper sprays ("caldo bordelés", "caldo sulfocalcico", "oxicloruro de cobre") are used. Naturland permits 3 kg maximum of cuprous salt per hectare and year. The copper compounds only have a preventative effect and must be applied in a professional manner before any infection breaks out.

8. Application of bacterial preparations and preparations made from natural enemies: Naturland farmers make use of effective microorganisms (sometimes abbreviated to EM) and *Lecanicillium lecanii* (Lecanium). Many farmers are currently experimenting with various natural compounds and often mix them to make organic fertilisers enriched with lime and stone meal.

There are as many measures available to combat this fungal disease as there are reasons for its occurrence. Coffee rust can only be dealt with effectively by implementing a strategy tailor-made to local conditions.