


Application of Lime Sulphur for Coffee Rust

Case Study Background Data			
Tool Category: Adaptation on the farm		Detail: Planting Density: ☉ 4000 /ha Soil Type: Clay Loam Shade Regime: 41-50% Farming System: Traditional agro-forestry system Yield Range (kg cherry/ha): 5000 ☉ rain: 1500	
Variety: Arabica			
Climatic Hazard: <ul style="list-style-type: none"> • Intermittent rain • Temperature 			
Expected Outcome: <ul style="list-style-type: none"> • Prevent the damage of rust in susceptible varieties with a cheap product 			
Implementation Date: 01.03.13 – on going	Altitude: 98 m GPS: 14°48'18.1"N 89°19'18.1"W	Slope of plots: small inclination ☉ Age of trees: 5-10 years	
No. farmers: 150	☉ Area under coffee: 0.25 ha/farmer	Tested on demo plots	
Results			
<p>Lime sulphur is applied as a preventive product to control rust. The product has been applied after 20 days of the main flowering and then again after 40 days. The product has protected the plant from rust and also from other diseases. Also on plantations which suffer from severe defoliation the tool helps to protect new leaves. These applications have been accompanied by a farm management plan including fertilization, tissue management and weed control.</p> <p>Farmers who applied lime sulphur perform better than the ones who do not. The rust problem occurred earlier and more severely on farms without lime sulphur application. So far it is showing promising results, but await more detailed trials.</p>			
Pros & Advantages + Learnings		Cons, Disadvantages + Things to take into account	
<ul style="list-style-type: none"> • Protective function to the plant • Low costs • Protection to other diseases and pest • Low human and animal toxicity 		<ul style="list-style-type: none"> • No application during flowering possible • If the attack is greater than 10% the product will not have effect and you will need to apply a systemic fungicide 	
Acceptability	High	Effectiveness	High
Affordability	High	Timing / Urgency	High

What is the objective of applying the adaptation option and how do we expect the objective to be met?

Reduce the incidence of live rust (orange) in the coffee plantations through the application of lime-sulphur.



Description of climatic hazard and associated problem: Through the triangulation process, rain and temperature had been identified as a climatic risk related to rust attack. One of the conditions for the germination of the rust is water, also some studies, for instance “An analysis of the weather and climate conditions related to the 2012 epidemic of coffee rust in Guatemala ”reports as key finding from the analysis that the weather conditions in 2012 displayed considerable variations from the climatological data. Further information related to the study could be found in the toolbox, *see tool ‘rust management’*.

Description of expected outcome:

Reduce the attack of rust to an incidence below 10%.

How is the adaptation option applied?

Nr.	Step	Picture
1	Prepare the ingredients 1. Calcium oxide 2. Sulphur 3. Ash 4. Container 5. Firewood 6. Water	

<p>2</p>	<p>Prepare the bonfire:</p> <ol style="list-style-type: none">1. Boil up the water (10 liters)2. Add the sulphur (2 kg) to the hot water3. Add the calcium oxide (1 kg) and ash (1 kg)4. Keep moving the mixture continuously (30 minutes)5. The mixture should turn from yellow to red or dark red6. Wait until the mixture cools, then transfer to a bottle	 A woman in a pink shirt is stirring a large metal pot filled with a yellow liquid. The pot is placed over a fire. The background shows a building with a 'tigo' sign and some outdoor items.
<p>3</p>	<p>Dosage:</p> <ol style="list-style-type: none">a. Nursery: 100 ml/16 litersb. Mature plant: 200 ml/16 liters <p>Recommendation:</p> <p>Apply after the main flowering assuring to cover all the undersurface of the leaves.</p> <p>Repeat application if incidence of the attack is below 15%.</p>	 A hand is pouring a red liquid from a small bowl into a larger bowl. The larger bowl is green and blue. The background shows a dirt ground and some people.

Implementation framework

During the 2012-13 harvest, coffee rust (*Hemileia Vastatrix*) attacked coffee plantations. This caused loss of production as well as defoliation and as a consequence had a negative impact on farmers' income. As part of the rust management plan, c&c tried to identify low cost possibilities. In countries like Colombia one of the alternatives has been lime sulphur, a product based on sulphur and calcium oxide. This tool has been introduced to farmers in Trifinio and is currently being tested on multiple plots (+150). So far it is showing promising results, but more detailed trials await.

It is important to emphasize that lime sulphur is a product to protect against and control rust and will not work if the incidence or attacked area is greater than 15%.

Measurement strategy for effectiveness

The evaluations have been performed during farm visits by means of farmer interviews on how their farms had reacted to the applications compared to other farms who did not apply this kind of rust management.

Incidence evaluation had been performed in demo plots to measure effectiveness after 10 days of the lime sulphur application.

Indicator	% of rust incidence
Definition	Number of leaves affected by live (orange) rust in a coffee plant, selecting more than 40 trees per hectare.
Purpose	The indicator measure the effectiveness of the product applied after 10 days of the first application.
Baseline	14%
Target	Reduce the attack below 10%
Data Collection	Incidence had been measured by technicians and farmers on 9 demo plots after 10 days of lime-sulphur application. There was no control group because no farmers were willing to not control rust. More information on how to measure rust incidence and severity could be found at: http://amecafe.org.mx/downloads/FichaT%C3%A9cnicaRoyadelCafeto.pdf
Tool	Incidence data collection sheet

Frequency	Twice, status quo and after 10 days of lime sulphur application
Responsible	c&c Coordinator, M&E Director
Reporting	Farmer and technician measure rust incidence and fill in the data in a collection sheet. 10 days after the lime sulphur application they repeat the measurement. Where a camera was available, pictures had been taken as evidence.
Quality Control	A measurement procedure has been developed including the parameters for incidence and severity. c&c team evaluate the data and analyze the effectiveness.

Measurement Strategy for acceptability, affordability, timing & urgency

Interviews with farmers and technicians had been carried to answer the indicators. Additional group discussions on lime sulphur applications.

Main Findings of Case Study

Farmers who applied lime sulphur could better manage coffee rust, delaying the attack and saving 1 to 2 applications of fungicides (around US\$ 30 each), depending on how severe the attack has been in their region. The cost of lime sulphur is between US\$ 1-1.5 /liter.

Rust control using lime sulphur in Trifinio region	Altitude (m)	Incidence %		
		Before	After	Change
Chalatenango, El Salvador	1256	16	10	6
Chalatenango, El Salvador	1160	13	8	5
Chalatenango, El Salvador	982	14	10	4
Chiquimula, Guatemala	1348	10	2	8
Chiquimula, Guatemala	870	21	10	11
Chiquimula, Guatemala	1219	18	6	12
Ocotepeque, Honduras	1105	10	4	6
Ocotepeque, Honduras	1240	12	8	4
Ocotepeque, Honduras	980	10	8	2
Average		14	7	7

Acceptability	
Leading Question: To what extent did farmers readily accept this tool as useful for implementation and implement it as planned?	
High	x
Low	
Don't Know	
High: Farmers readily accepted this tool for implementation and continue to implement it as planned.	Low: Farmers generally did not accept this tool; <i>Or</i> the tool was met with resistance later on, even though farmers initially accepted it.
Please Comment:	
If there was resistance to adopting this tool, why?	-
If farmers discontinued tool implementation later on in the process, even though they initially accepted it, why?	As coffee price has increased, some farmers have chosen to apply systemic fungicides rather than preventive products; they are more expensive but more effective.
Did this tool have any external issues or impacts (positive or negative) which influenced its acceptability? (community, value chain?)	Positive: low implementation costs, farmer can make lime sulphur themselves; farmers are interested in low cost alternatives after the devastating rust attack.
Any other comments:	-

Affordability	
Leading Question: Are the costs of the tool affordable to farmers taking into account the initial investment, maintenance costs and the availability of inputs?	
High	x
Low	
Don't Know	
High: The initial investment and the maintenance costs of this tool are affordable to farmers from their regular operations and the time it takes to recover the investment is reasonable to farmers. <i>Inputs (e.g. labor, electricity..) are available when they are necessary so that no extra costs are incurred from timing related issues.</i>	Low: The initial investment or the maintenance costs of this tool go beyond what is affordable to farmers from their regular operations <i>or the amount of time it takes to recover the investments are unreasonable to farmers.</i>
Please Comment:	
Are there any external costs? (to society or environment?)	Not identified yet, further evaluations required. External costs could arise, as firewood is required in order to make lime sulphur.
If costs are high because inputs are not available, what inputs? And why?	Costs could be higher, if firewood is not available in the area.
Any other comments:	-

Effectiveness	
Leading Question: Does the tool provide the expected benefits to farmers?	
High	x
Low	
Don't Know	
High: The objective of the tool has been met for the farmers.	Low: The tool did not fulfill its objective entirely.
Please Comment:	
What benefits did farmers expect from this tool?	A more resilient coffee plant to confront the rust attack.
If the objective has not been met, why?	-
Have there been any significant external issues which influenced the effectiveness (positive or negative) of this tool? Please explain.	Entire farm management, it is important to implement all activities correctly.
Any other comments about effectiveness	Efficiency still under evaluation.

Timing / Urgency	
Leading Question: Is the amount of time that this tool takes to implement (from starting implementation until benefits accrue) reasonable to farmers?	
High	x
Low	
Don't Know	
High: The tool takes a reasonable amount of time to implement (taking into account the coffee growing season, inputs necessary, preparation time and implementation time); <i>And</i> this tool accrues the effects expected within a reasonable amount of time.	Low: It takes too long to implement this tool (taking into account the coffee growing season, inputs necessary, preparation time and implementation time); <i>Or</i> it simply takes too long for this tool to accrue benefits.
Please Comment:	
If implementation takes too long why?	-
Any other comments about timing:	Still under evaluation.