Deeper Polybags

Case Study Background Data		
Tool Category: Adaptation on the farm **Variety:** Coffea arabica - Catuaí **Purpose:** • Drought resistance **Climatic Hazard:** • Drought		**Details:** Planting Density ⃠ 3001-3500 Soil Type: Oxisol Shade Regime: No shade Farming System: Intense Mechanised Monocul. Yield Range (kg cherry /ha) [Range] ⃠ rain : 1529,7 mm/y
Implementation Date: 07.01.13 - 07.01.13	**Altitude:** 1036 m **GPS**: 21º02'26.15"S 45º01'10.92"W	**Slope of plots:** Small inclination ⃠ **Age of trees**: <5 years
No. farmers: 1	⃠ **Area under coffee:** 5,10 ha/farmer	Tested with smallholders

Results

Larger seedlings performed better compared to the conventional seedlings according to the statistical analysis of the following characteristics: Plant height, stem diameter, percent survival, number of primary branches, length of the first primary branches, number of internodes.

Pros & Advantages + Learnings	Cons, Disadvantages + Things to take into account
• Larger seedlings have a more developed root system and are therefore better prepared to face droughts after planting. • In this experiment, using large seedlings reduced the number of deaths after planting by 20%. • In the initial development stages, these seedlings performed better compared to conventional seedlings with regards to the following characteristics: Plant height, stem diameter, percent survival, number of primary branches, length of first primary branches, number of internodes. • - According to this experiment, the first harvest of the larger seedlings will be higher than the conventional seedlings.	• The costs of the larger seedlings normally are twice as high compared to conventional seedlings. • The transport costs of these seedlings are higher. • Application of hydrogel did not influence the growth of plants after the planting. • It is difficult to find nurseries that sell large seedlings; normally they are produced in small scale.

Acceptability	High	**Effectiveness**	High
Affordability	Low	**Timing / Urgency**	Low

How is the adaptation option applied?

Nr.	Step	Picture
1	Preparation of the seedlings Size: Large bags: 15 x 28 cm Conventional bags: 11 x 22 cm	
2	Identification of the area for the planting of the seedlings. Preparation of the soil, demarcation of the area and planting the seedlings.	
3	Preparation of the hydrogel and application. Mixture: 1kg of hydrogel for 400 liters of water. Application: 1,5 liter per plant (under or on soil)	
4	Monitoring and evaluation of the growth of plants. Plant height, stem diameter, percent surviving, number of primary branches, length of the first primary branches, number of internodes.	

Appendix

Implementation Framework

The experiment was implemented by Associação Hanns R. Neumann Stiftung do Brasil (AHRNSB) as part of the initiative for coffee & climate (c&c), in partnership with farmers from the community of Retiro dos Pimentas in Perdões Minas Gerais (MG). The seedlings were donated by two nurseries of Santo Antônio do Amparo MG.

One farmer started with the implementation of the experiment in January 2013. In April 2013, AHRNSB organized a field trip, where a group of 25 smallholder farmers from Santo Antônio do Amparo visited the experiment in Perdões. Nowadays, already seven additional farmers have used larger seedlings, as they were convinced by the first results of the experiment (higher survival rate of plantlets).

Table 1: Plant height (PH), stem diameter (SD), percent surviving (S), number of primary branches (NPB), length of the first primary branches (LFPB) and number of internodes in the first primary branches (NI) of coffee plants. Two evaluations took place, comparing two types of seedlings.

Type of seedlings	**PH (cm)**		**SD (cm)**		**S (%)**		**NPB**		**LFPB (cm)**		**NI**	
	45 T.A.P	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**
Conventional	13,76 b	21,08 b	3,34 b	4,93 b	85,00 b	77,50 b	0,00 b	2,63 b	0,00 b	5,65 b	0,00 b	1,56 b
Larger seedling	32,41 a	40,25 a	6,84 a	9,76 a	98,33 a	97,50 a	7,62 a	11,20 a	15,45 a	21,26 a	3,91 a	6,01 a

Means followed with by the same letter in the column don't differ by the Skott-Knott test at 5% significance level.

T.A.P – Time After Planting

Table 2 Plant height (PH), stem diameter (SD), percent surviving (S), number of primary branches (NPB), length of the first primary branches (LFPB) and lumber of internodes in the first primary branches (NI) of coffee plants. Two evaluations took place, comparing different forms of application of hydrogel in Perdões – MG.

Forms of application of hydrogel	**PH (cm)** ^{ns}		**SD (cm)** ^{ns}		**S (%)** ^{ns}		**NPB** ^{ns}		**LFPB (cm)** ^{ns}		**NI** ^{ns}	
	45 T.A.P	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**	**45 T.A.P**	**155 T.A.P**
Under soil	23,07	30,69	5,04	7,25	93,75	90,00	3,77	7,06	7,50	13,75	1,83	3,83
On soil	23,23	30,73	5,20	7,59	86,25	82,50	3,83	7,07	7,97	13,89	2,10	3,89
Without hydrogel	22,95	30,59	5,02	7,18	95,00	90,00	3,83	6,61	7,70	12,72	1,94	3,63

^{ns}: Not significant at 5% de probability, by F test.

Case Study Methodology

After the implementation of the experiment in the field, the plant growth is being monitored and evaluated.

- Data collected were: Plant height, stem diameter, percent surviving, number of primary branches, length of the first primary branches, number of internodes.
- Data was collected twice, 45 days after planting (DAP) and 155 days after planting. A tape-measure was used to verify the height of plants and the length of the branches, as well as a caliper rule to verify the diameter stem. Number of branches and the number of internodes were counted.
- All data collected were analyzed by Statistical Program called SISVAR. A Scott-Knott test was applied and also F test at 5% of significance.

This experiment was implemented in the field with the objective to counteract and adapt to increasing incidence of drought in the region. This information was collected by the c&c *triangulation methodology*. Larger seedlings have a better developed root system which improves the resistance of plants against drought. Applying hydrogel can support the plantlet with the absorption and release of water. However, in this case, the application of hydrogel did not show any significant results.

Main Findings of Case Study

Larger seedlings are produced in plastic bags of 15 x 28 cm and stay at the nursery for 1 year. Normally these larger seedlings are used only for replanting. The conventional seedlings stay at the nursery for 6 months and are produced in plastic bags of 11 x 22 cm. These seedlings are used in almost all plantings in Brazil.

The costs of the larger seedlings are initially higher compared to the conventional seedlings, but they prove to be more drought resistant and are likely to survive better and produce more in the first harvest.

Using larger seedlings in new plantings is very promising because it can reduce the mortality of plantlets. In this case study the mortality rate of plantlets with larger polybags was 20% lower compared to conventional seedlings. Despite initial investment costs, a higher return on yields is expected. As droughts become more intense, this tool should become more advantageous.

Acceptability					
Leading Question: To what extent did farmers readily accept this tool as useful for implementation and implement it as planned?					
High	☒	**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; Or 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?			-		
Did this tool have any external issues or impacts (positive or negative) which influenced its acceptability? (community, value chain?)			Higher investment costs might influence the acceptance of this tool (transport costs, higher costs for larger seedlings).		
Any other comments:			As droughts become more intense, this tool should become more advantageous. First results, such as the reduced mortality rate (using larger seedlings) have convinced farmers. Seven additional farmes have already adopted this tool.		

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	☐	**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. Inputs (e.g. labor, electricity..) are available when they are necessary so that no extra costs are incurred from timing related issues.*			**Low:** *The initial investment or the maintenance costs of this tool go beyond what is affordable to farmers from their regular operations or the amount of time it takes to recover the investments are unreasonable to farmers.*		
Please Comment:					
Are there any external costs? (to society or environment?)			-		
If costs are high because inputs are not available, what inputs? And why?			Costs of larger seedlings are twice as high as the costs for conventional seedlings. Transport costs for larger seedlings have to be calculated as well. Normally, nurseries do not offer larger seedlings. Thus, it is necessary to order them in advance.		

Any other comments:	Despite initial investment costs, a higher return on yields is expected. Long-term evaluation ongoing.

Effectiveness					
Leading Question: Does the tool provide the expected benefits to farmers?					
High	☒	**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?			Higher survival rates after planting and increased production.		
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.			Rainfall timing and frequency have a positive or negative influence on the effectiveness of this tool. If precipitation is evenly distributed throughout the year, larger seedlings may proove less advantageous.		
Any other comments about effectiveness			-		

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	☐	**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); And 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); Or it simply takes too long for this tool to accrue benefits.*		
Please Comment:					
If implementation takes too long why?			The tool can only be implemented during the rainy season (in Brazil: Novermber to January)		
Any other comments about timing:			The initial investment in larger seedlings is higher than for conventional seedlings. However, higher return in yields is expected. Benefits may only accrue several years later (2 or 3 years later).		