The challenging task of evaluating impact: COMPACI's evaluation framework and summary of results

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This article was published previously in CmiA and COMPACI News 14th Edition, 12/17

COMPACI's overall objective was to improve the livelihoods of smallholder cotton farmers and their families. Training in better and sustainable farming techniques (for example, good agricultural practices, conservation agricultural techniques, integrated pest management, safe pesticide use and handling) as well as better farm management (farming as a business), access to quality inputs and input pre-finance, empowerment of female farmers, and access to markets for sustainable cotton were meant to increase farmers' cotton as well as food crop production, and consequently income (see Figure 1).

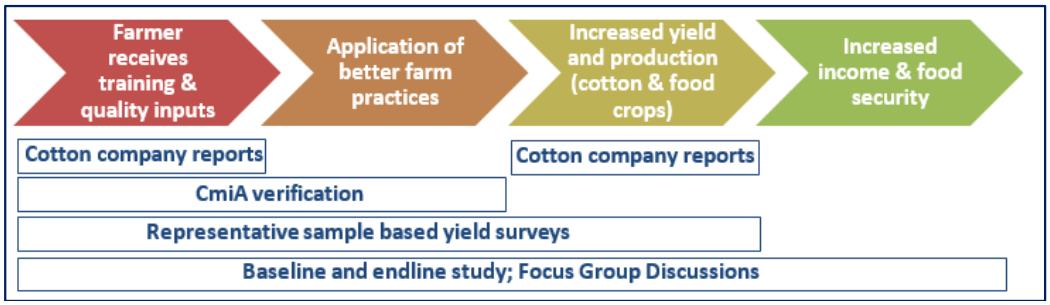


Figure 1: COMPACI's theory of change and evaluation framework

Monitoring and measuring outputs, outcomes and impacts were an important and integral part of COMPACI. This task was performed on different levels by different actors:

- The number of farmers trained in different techniques, the provision of quality inputs, cotton yields, and total cotton production were monitored bi-annually by the cotton companies (cotton company reports);
- External CmiA verification conducted every two years verified cotton companies' self-reported figures and assessed the application of agricultural practices by farmers;
- Since 2013, surveys have been conducted, during which cotton yield has been estimated by counting cotton bolls on the fields of a representative sample of cotton farmers;
- In addition to these measures, COMPACI's impact was externally evaluated by the National Opinion Research Center (NORC). NORC conducted a quantitative impact evaluation in the six original COMPACI I countries (Benin, Burkina Faso, Côte d'Ivoire, Malawi, Zambia and Mozambique) and supported findings with qualitative Focus Group Discussions.

The following paragraphs highlight the main findings from the various studies.[1]

Farmer training

By 2016, the final year of project implementation of COMPACI II, many more farmers had been reached by COMPACI than originally intended: COMPACI II was implemented by a total of 22 cotton companies in 12 countries. These companies trained almost one million smallholder farmers in sustainable agricultural techniques in sub-Saharan Africa, reaching out to 25% to 30% of all cotton farmers in sub-Saharan Africa. Many of these farmers attended regular training sessions, meaning COMPACI cotton companies organised more than 60,000 training sessions annually.

Additionally, 240,500 farmers learned intensively in one-week Farmer Business School (FBS) trainings which support farmers to lead their farm as a business. A third of trained FBS farmers were female.

Application of better farming techniques

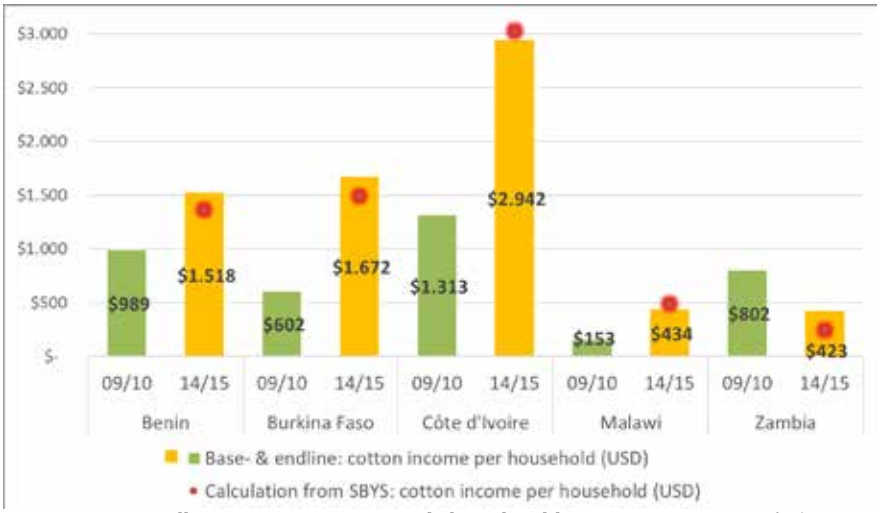
The application of better farming techniques increased over the course of COMPACI. Survey results show that, overall, 80% of COMPACI farmers apply good agricultural practices and 60% practice two or more soil fertility

1) All prices in the following summary are inflation-adjusted and converted to USD using the 2015 PPP conversion factor for private consumption of the World Bank.

techniques to maintain or improve the fertility of soils and prevent erosion at the end of COMPACI. More than 80% of trained FBS farmers apply their knowledge to their farm and started, for example, keeping record of their farming activities. The proper use and handling of chemicals also improved greatly over the course of COMPACI, but still has room for improvement, as 60% to 75% of farmers store and dispose of chemicals correctly and wear protective clothing when spraying pesticides.

Cotton yield, production and income

Cotton income per COMPACI household increased massively in four out of six countries over the course of implementation (compare to Figure 3). On average, COMPACI farmers increased their cotton income by more than 98% and are therefore much better off at the end of the project. Figure 3 also shows the huge gap between West African (WA) cotton farmers and cotton farmers from Eastern and Southern Africa (ESA): While WA cotton farmers have an average cotton income between $1,500 (Benin) and $2,942 (Côte d'Ivoire), ESA cotton farmers' cotton income ranges from only $204 (Mozambique) to $434 (Malawi).



Source: NORC endline reports; NORC sample based yield survey reports 2014/15

Figure 3: Cotton income per COMPACI farm household (USD)

Cotton income is, however, not only determined by COMPACI participation, but heavily affected by external factors such as weather and prices. The introduction of *comparison groups*, experiencing the same external effects as COMPACI farmers but not receiving COMPACI support, was supposed to make it possible to single out the effect of *COMPACI* in NORC's impact survey.

However, it was not possible to preserve this survey setup in all six countries. Over the course of the program implementation, many *comparison* farmers in Zambia, Mozambique and Côte d'Ivoire became COMPACI farmers. In Benin, Malawi and Burkina Faso *comparison* farmers did not become part of COMPACI, but received training by other actors, such as NGOs, government extension or others. It was thus in many cases difficult to properly determine the effect of COMPACI in the NORC surveys.

Nevertheless, it is still interesting to look at different components that influence cotton income (such as cotton yield, area, production, costs of production and farm gate prices) and how they developed between the baseline survey (2010) and the endline survey (2015).

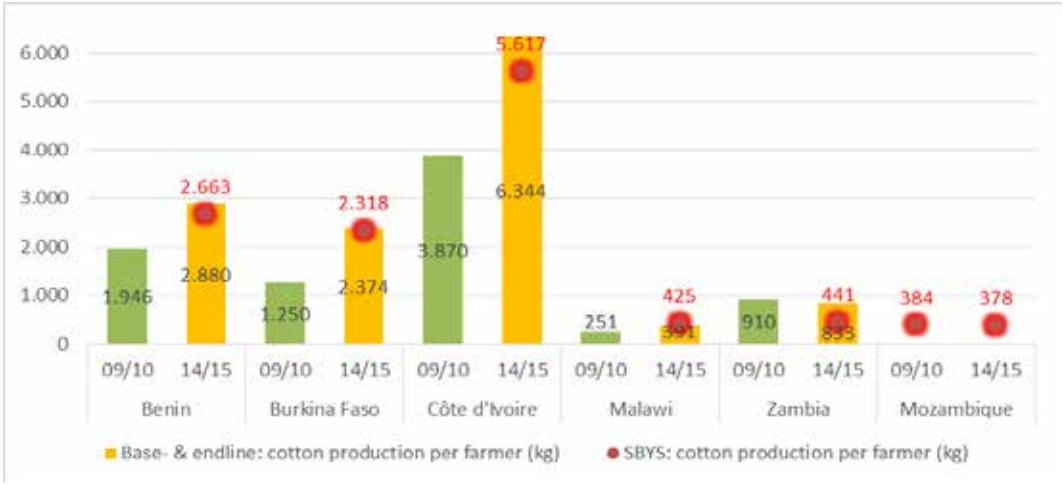
Cotton yield (kg/ha) of COMPACI farmers increased in Malawi and Burkina Faso and stayed more or less constant in the other countries, between baseline and endline. The yield increase in Burkina Faso, however, is mainly caused by farmers switching from conventional cotton to GM cotton; statistical analysis cannot determine a significant effect of COMPACI on yields. In Malawi, cotton yield increased much more for COMPACI farmers (50%) than for comparison farmers (14%), but the positive relation between COMPACI and cotton yields is not statistically significant. In Benin, COMPACI farmers maintained their cotton yields, while, at the same time, comparison farmers' cotton yield *decreased* by 33%. Statistical analysis therefore reveals a significant positive effect of COMPACI on yields in Benin.

Cotton area per COMPACI household more than doubled in Benin and Côte d'Ivoire, while it increased by more than 30% in Burkina Faso and Malawi. In Zambia and Mozambique, cotton area remained constant. Food crop production was, however, not jeopardized in any country. The percentage of cotton area to total farm area only increased slightly and ranges between 30% and 39%. Therefore, crops other than cotton still constitute the majority of production in all countries.

Cotton production per COMPACI household increased in all countries but Zambia and Mozambique, mainly due to increased cotton area. Figure 2 shows that COMPACI households in WA countries produce much more cotton than farmers in ESA.

Costs of cotton production per hectare for COMPACI farmers (e.g. costs of cotton seeds, pesticides, herbicides, fertilizers and hired labour for cotton production) increased by up to 45% in all countries but Malawi and Mozambique. Absolute costs at endline are much higher in WA countries ($430 to $520) than costs in ESA countries

2) The following findings thereby only refer to the six original COMPACI countries and cannot be extrapolated to the other six COMPACI II countries.



Source: NORC endline reports; NORC sample-based yield survey reports 2014/15

Figure 2: Average cotton production per COMPACI household (kg)

($31 to $100), because most farmers in ESA countries do not fertilise their cotton.

Farm gate price per kilogram of seed cotton increased in all countries but Zambia and Mozambique. While farm gate prices in WA countries increase slowly but (more or less) linearly between 2009 and 2015, farm gate prices in ESA countries mirror the world market price for cotton and thus fluctuate heavily from year to year.

Country summary findings

Benin

COMPACI farmers in Benin were able to maintain their average cotton yield per hectare in declining conditions (in which comparison farmers had declining cotton yields). By increasing their cotton area by 27%, COMPACI farmers were thus able to raise their cotton income from $989 to $1,518. Comparison farmers had a similar cotton income at endline but had to increase their cotton area by 150% to offset their declining yields. Regression analysis hence shows that COMPACI had a positive impact on cotton income (when controlled for area). According to statistical estimates, the effect of COMPACI exposure would be an average cotton income increase of almost $150 per cotton hectare when inflation-adjusted.

Burkina Faso

In Burkina Faso, cotton income per ha increased more for COMPACI farmers than for comparison farmers, but income per household increased more for comparison farmers than COMPACI farmers. This is because comparison farmers increased their cotton area to 2.9 hectares while COMPACI farmers only grew 1.9 hectares of cotton on average at endline. Overall, one can conclude that COMPACI farmers' average cotton income mainly increased due to a combination of farmers switching to GM cotton, increasing cotton area and increased farm gate prices. Regression analysis cannot detect any effect of COMPACI on cotton income when it controls for farmers switching to GM cotton.

Malawi

Cotton income per farm household increased for both, COMPACI and comparison farmers, but much more for COMPACI farmers. This difference can largely be explained by lower cotton yields of comparison farmers and higher costs of cotton production for comparison farmers. Statistical analysis shows a positive significant relationship between COMPACI and cotton income increase.

Côte d'Ivoire

Côte d'Ivoire has no comparison group and only 41 farmers were interviewed at base- and endline, which is why results must be treated with care. This small group of farmers had an impressive increase of cotton income, mainly due to a combination of increased cotton area, higher farm gate prices and constant cotton yield. Statistical analysis could not detect a correlation between COMPACI training attendance and cotton income.

Zambia

Comparison group farmers became COMPACI farmers over the course of COMPACI in Zambia. For the 118 farmers interviewed at baseline and endline, cotton income decreased by 47% on average. The main reasons for this decrease are the following: falling farm gate prices and increasing input prices at constant cotton yield and cotton area. Statistical analysis indicates a positive but weak relationship between COMPACI training attendance and cotton income.

Mozambique

Different farmers were interviewed at baseline and endline and no statistical analysis on the effect of COMPACI on cotton income could thus be conducted.