**Sustainable Intensification for Smallholders**

Project Drawdown defines *sustainable intensification for smallholders* as: sustainable intensification practices that increases the yield of smallholder farmers (both men and women), while increasing their socio-economic conditions. This solution considers three intensification practices. The first is agroecological pest management, which reduces crop losses to pests through agroecological means. The second is crop diversification and integrated crop-livestock system, which can increase yields of individual crops, at the whole farm level, or both. Third is capacity building that includes training and improved access to finance which enables the smallholder farmers to adopt innovative climate friendly agricultural practices. This solution replaces smallholder conventional cropland. The farmer is the agency level. Increasing productivity can reduce pressure to clear additional land for agriculture, and can free up some cropland for forest restoration, biomass crop production, or other uses.

Intensification can actually increase land use change under some circumstances – for example in the absence of enforced forest and grassland protection policies. In Drawdown’s integrated model, those policies are already known to be in effect. *sustainable intensification for smallholders*sustainable intensification for smallholders*sustainable intensification for smallholders***Methodology**

*Total Land Area[[1]](#endnote-1)*

This solution represents the non-degraded cropland areas, which are allocated to drawdown’s four annual cropping solutions, i.e., *conservation agriculture, regenerative annual cropping, improved rice production,* and *system of rice intensification*, but are not adopted under the *Plausible* and *Drawdown* scenarios. Therefore, it is the leftover smallholder land which varies based on the total adoption of the above listed four drawdown annual cropping solutions, estimated at 38 and 19 million hectares for the *Plausible* and *Drawdown* scenarios, respectively. Less area is available for the *Drawdown* scenario, as the corresponding drawdown scenarios of the four annual cropping solutions projects higher adoption which leaves limited area for this solution Current adoption is assumed to be 0, as this solution represent conventional cropping land which is not adopted by any of the four annual cropping solutions.

*Adoption Scenarios[[2]](#endnote-2)*

Three custom scenarios were built based on the global weighted potential adoption of agroecological pest management, crop diversification, and capacity building. One scenario projects 100 percent adoption by 2050. These scenarios were developed separately for the *Plausible* and *Drawdown* scenario, as the total land available allocated for the two scenarios is not fixed.

Impacts of increased adoption of *sustainable intensification for smallholders* from 2020-2050 were generated based on two growth scenarios, which were assessed in comparison to a *Reference*Scenario where the solution’s market share was fixed at the current levels.

* *Plausible* Scenario: Scenario analysis yields the adoption of 32.8 million hectares the *Plausible* Scenario.
* *Drawdown* Scenario: Scenario analysis yields the adoption of 16.3 million hectares the *Plausible* Scenario.

*Emissions and Yield Model*

Emissions are set at 0.22 tons of carbon dioxide-equivalent per hectare, based on 5data points from 5 sources and carbon sequestration is set at 0.63 tons of carbon per hectare per year based on one data point.

*Financial Model*

First costs are US$0 per hectare, as there is no cost to the land manager.[[3]](#endnote-3) For all agricultural solutions it is assumed that there is no conventional first cost, as agriculture is already in place on the land. Net profit is calculated at US$897.63 per hectare per year for the solution (based on meta-analysis of 10 data points from 2 sources), compared to US$483.9 per year for the conventional practice (based on 67 data points from 35 sources). While the operational cost is calculated at US$614.23 per hectare per year for the solution (based on 15 data points from 3 sources), compared to US$755.95 per year for the conventional practice (based on the 57 data points from 25 sources).

*Integration[[4]](#endnote-4)*

Drawdown’s Agro-Ecological Zone model allocates current and projected adoption of solutions to the planet’s forest, grassland, rainfed cropland, and irrigated cropland areas. This solution is applied to smallholder croplands on which no other solution is implemented.

**Results**

Total adoption in the *Plausible* Scenario is 32.8 million hectares in 2050, representing 86 percent of the total suitable land. Of this, 16.3 million hectares are adopted from 2020-2050. The emissions impact of this scenario is 1.36gigatons of carbon dioxide-equivalent reduced by 2050. Net savings in profit is US$171.05 and in operational cost is US$73.62 billion.

Total adoption in the *Drawdown* Scenario is 16.3 million hectares in 2050, representing 86 percent of the total suitable land. Of this, 16.3 million hectares are adopted from 2020-2050. The impact of this scenario is 0.68 gigatons of carbon dioxide-equivalent by 2050. Net savings in profit is US$344.64 and in lifetime operational cost is US$148.35 billion.

**Discussion**

*Benchmarks*

Climate impact benchmarks for this solution are unavailable. A highly-cited paper reports that agricultural intensification in general (all farm sizes, all genders, worldwide) can reduce emissions by a total of 3.6 gigatons of carbon dioxide-equivalent per year (Burney et al, 2010).

*Limitations*

Data on current and projected adoption, financials, and emissions reduction is extremely limited. Additional data would improve this study, should it become available.

*Conclusions*

Bringing resource access for sustainable intensification for smallholders to a level equal to men offers substantial emissions reductions due to avoided deforestation. It also offers co-benefits of human rights and food security. This strategy should be an important component of land-based mitigation efforts.

1. To learn more about the Total Land Area for the Land Use Sector, click the **Sector Summary: Land Use** link below. [↑](#endnote-ref-1)
2. To learn more about Project Drawdown’s three growth scenarios, click the **Scenarios** link below. For information on Land Use Sector-specific scenarios, click the **Sector Summary: Land Use** link. [↑](#endnote-ref-2)
3. All monetary values are presented in US2014$. [↑](#endnote-ref-3)
4. For more on Project Drawdown’s Land Use integration model, click the **Sector Summary: Land Use** link below. [↑](#endnote-ref-4)