



Harvesting Value from Agricultural Waste

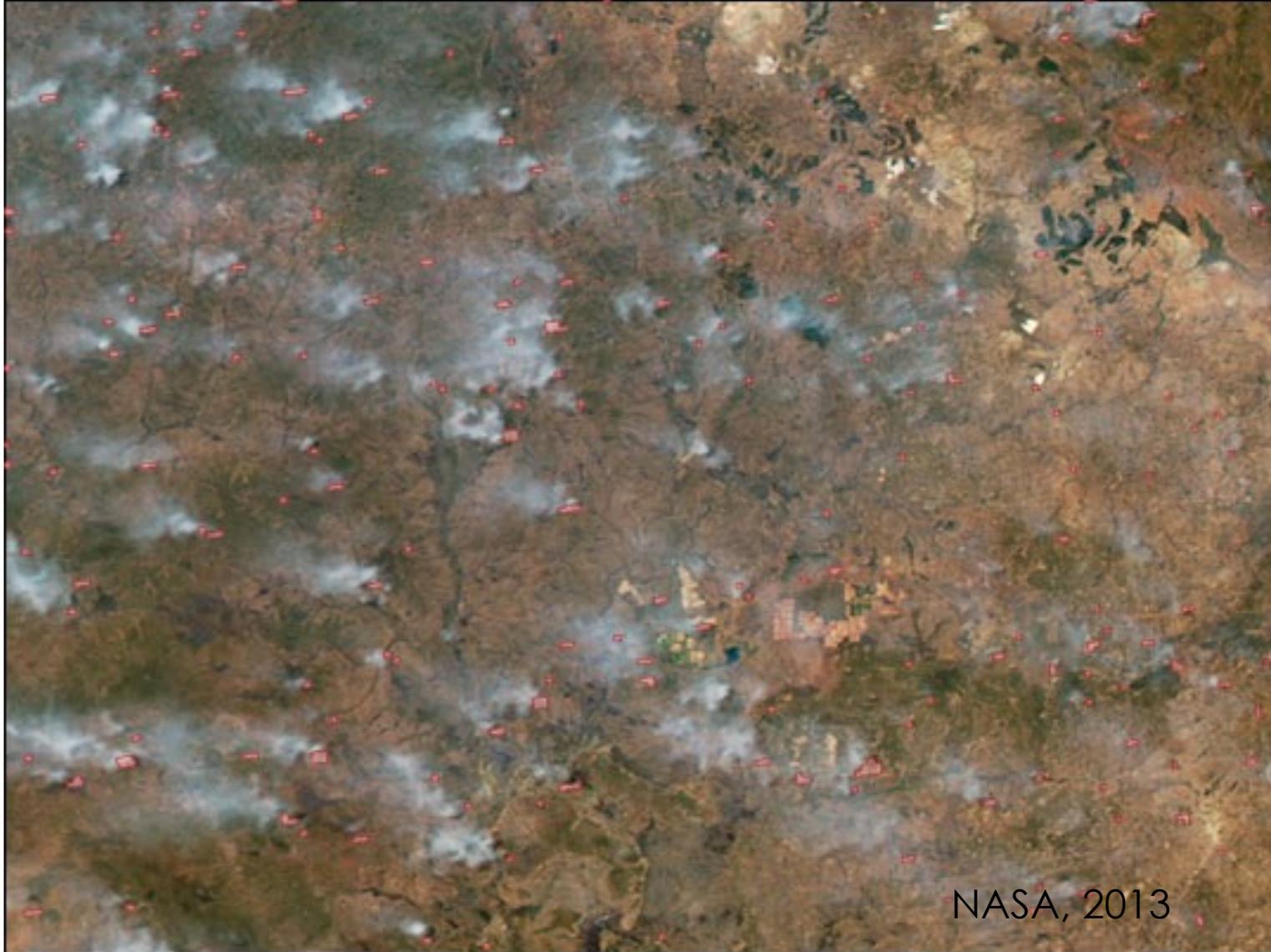
Vidyut Mohan

Co-founder & CEO

vidyut.mohan@takachar.com



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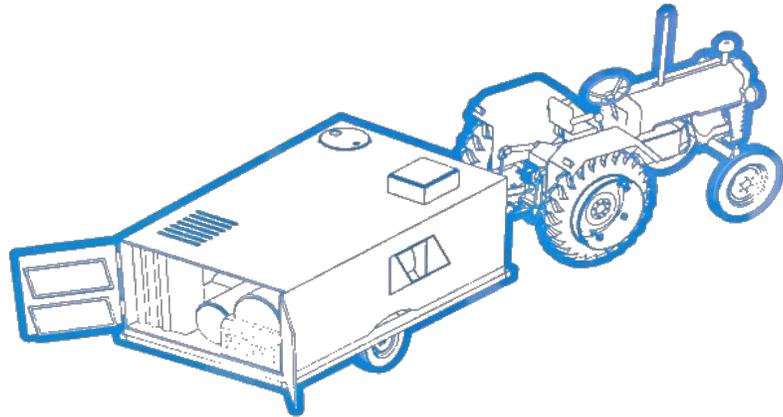


Problem & Opportunity:
More than US \$120 billion
/year of crop & forest
residues is burned in the
open worldwide

Between October 20 and November 14 this year, Delhi's Air Quality Index (AQI) had been in the severe zone (401-500) on seven days. On each of these days, the contribution of farm fires to Delhi's PM 2.5 contribution was between 26%-48%. (TOI, 2021)

Our Solution

Low-cost, small-scale, portable systems to “upgrade” crop residues at source



- Latched onto tractors, trailers, or shipping containers
- Requires no external heat/fuel (auto-thermal)
- 3 pending patents, published in leading journals
- Using the process of *torrefaction*

Loose, bulky and wet crop residues:



Upgraded, dense, carbon rich feedstock



Enabling new markets and lowering logistics & processing costs by up to 75%



**Can be powered
by batteries/solar
panels**

Pollution control

Our technology reduces particulate matter, volatile matter and CO emissions by >95% (Kung, 2017) as compared to open burning of crop residues

(a) Status quo conversion



(b) Our technology

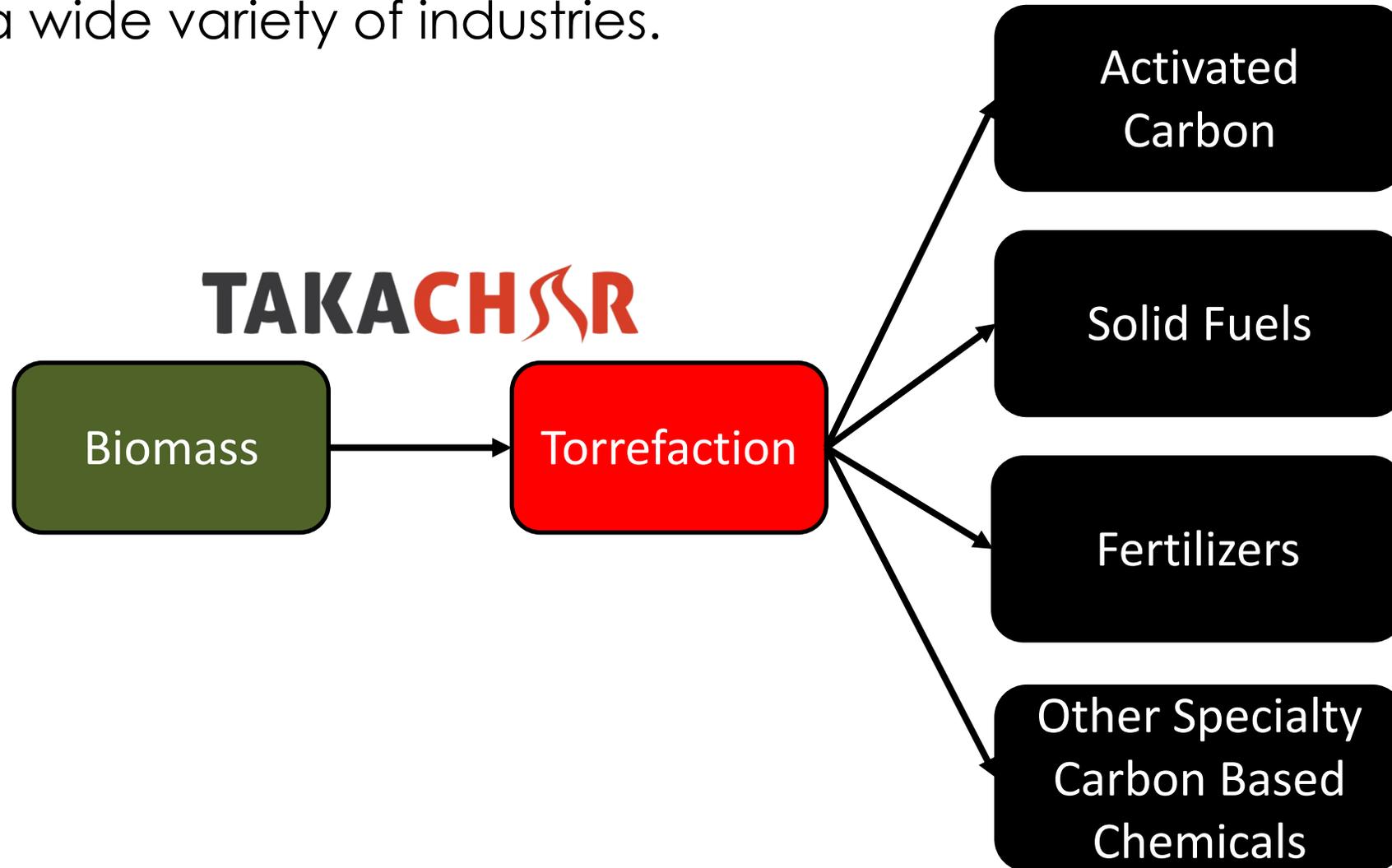


Our design simplifies the reactor and makes it flexible

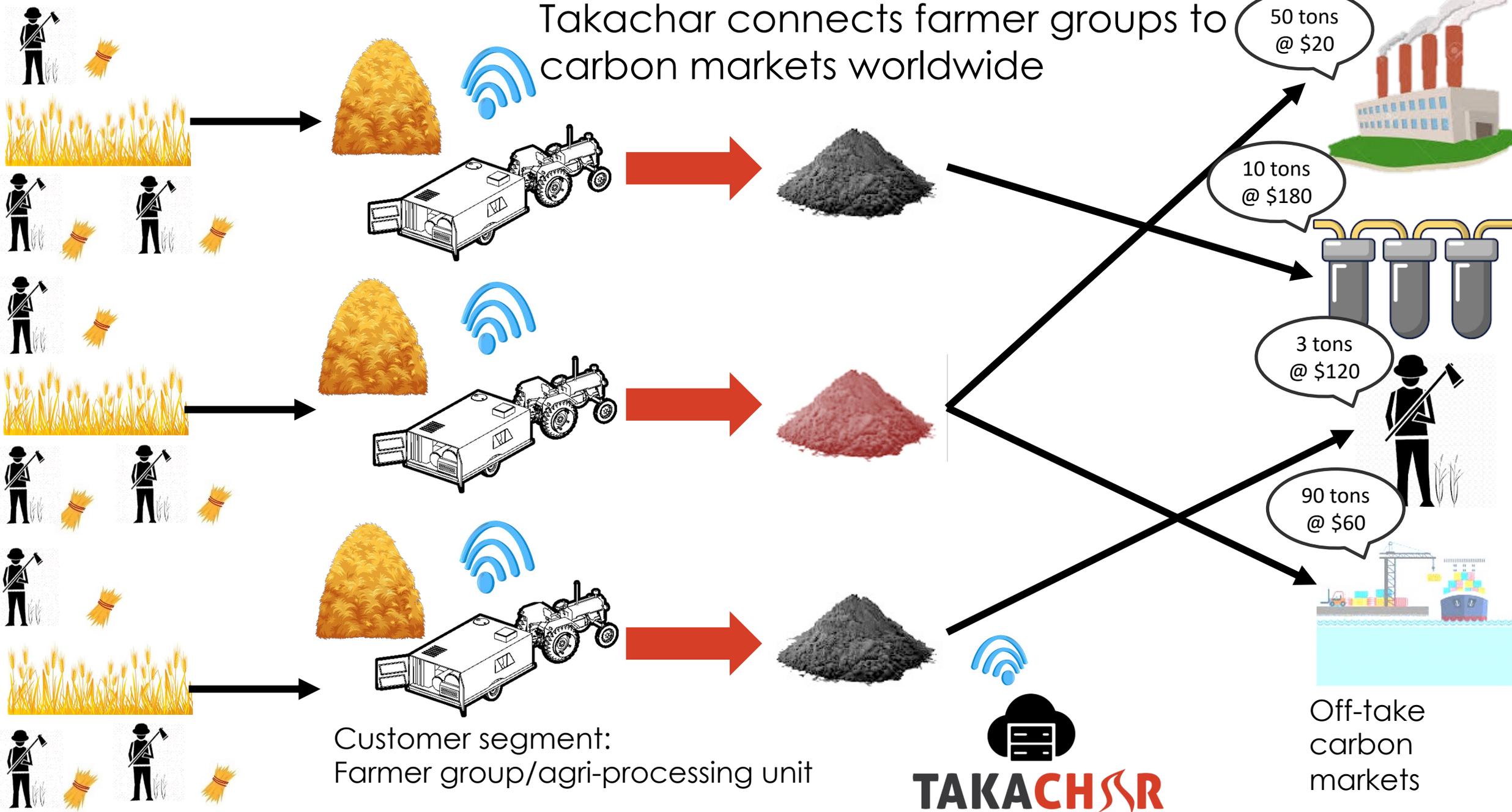
Requirements	Status Quo	Takachar system
Gas reactant	Heated special gases	Room temperature air
Gas handling	Scrubbing, drying	None
Minimum feasible scale	100+ tons/day	5 tons/day
Minimum viable cost	US \$ 500,000+	US \$ 10,000
Biomass input flexibility	Specific	All kinds of crop residues
Output characteristics	Specific	Process-controlled as per end use application

The biomass agenda

Biomass and its uses are diverse. Takachar's technology provides bio-based raw materials for a wide variety of industries.



Takachar connects farmer groups to carbon markets worldwide

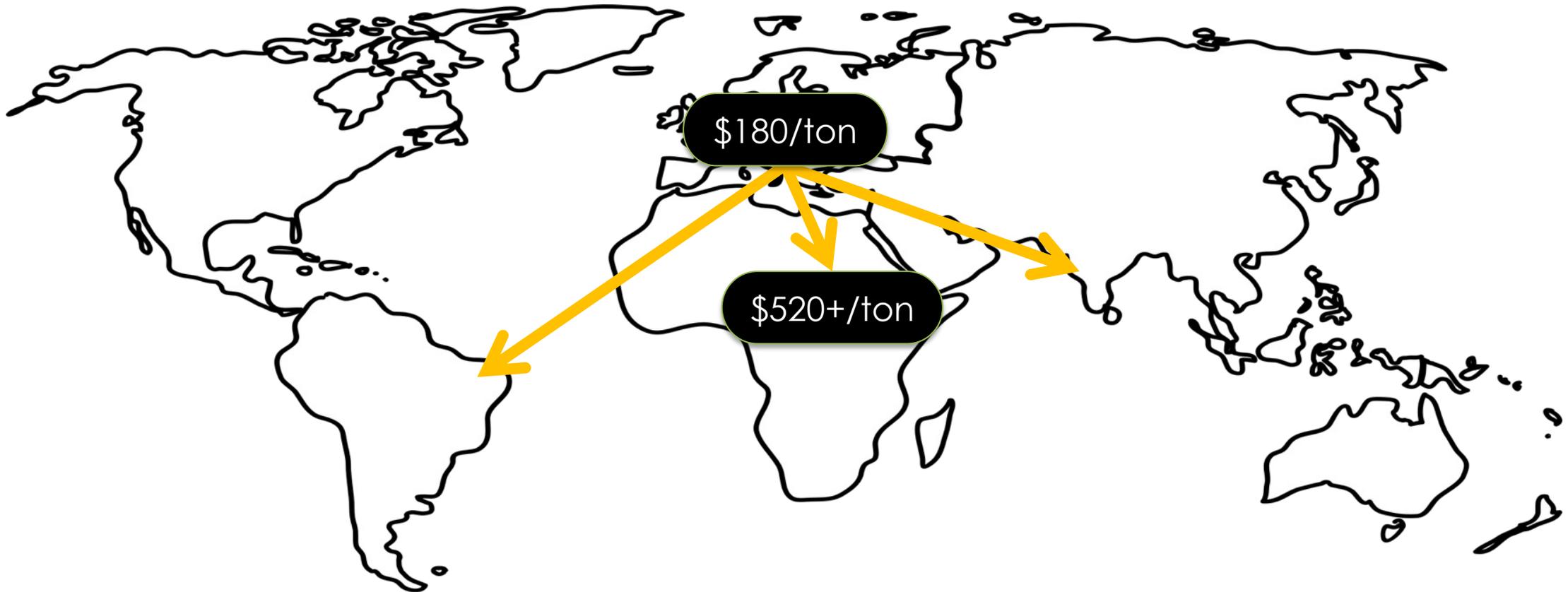


Farmers

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Fertilizer opportunity: The Problem

Farmers in Africa/Asia pay 2-3 times the price of world fertilizers, due to logistics cost of importation or the local governments have to heavily subsidize fertilizers



Fertilizer production today is incompatible with rural farming.



Fertilizer production

- Large-scale
- Centralized
- Logistically complex
- One-size-fits-all

Rural challenges

- Expensive
- Uncustomisable
- Soil degradation
- Food insecurity

Solution

We use technology to decentralize and downsize the fertilizer production process, making it feasible to implement localized fertilizer production in rural villages.



Conversion Process



1 Collect



2 kg of crop residues (rice husks, bagasse, coconut shells, etc.)

2 Torrefy



250-400°C, 5-30 minutes, oxygen-lean conditions

3 Collect



1-2 mm particle size

4 Mix

Nutrient recipes

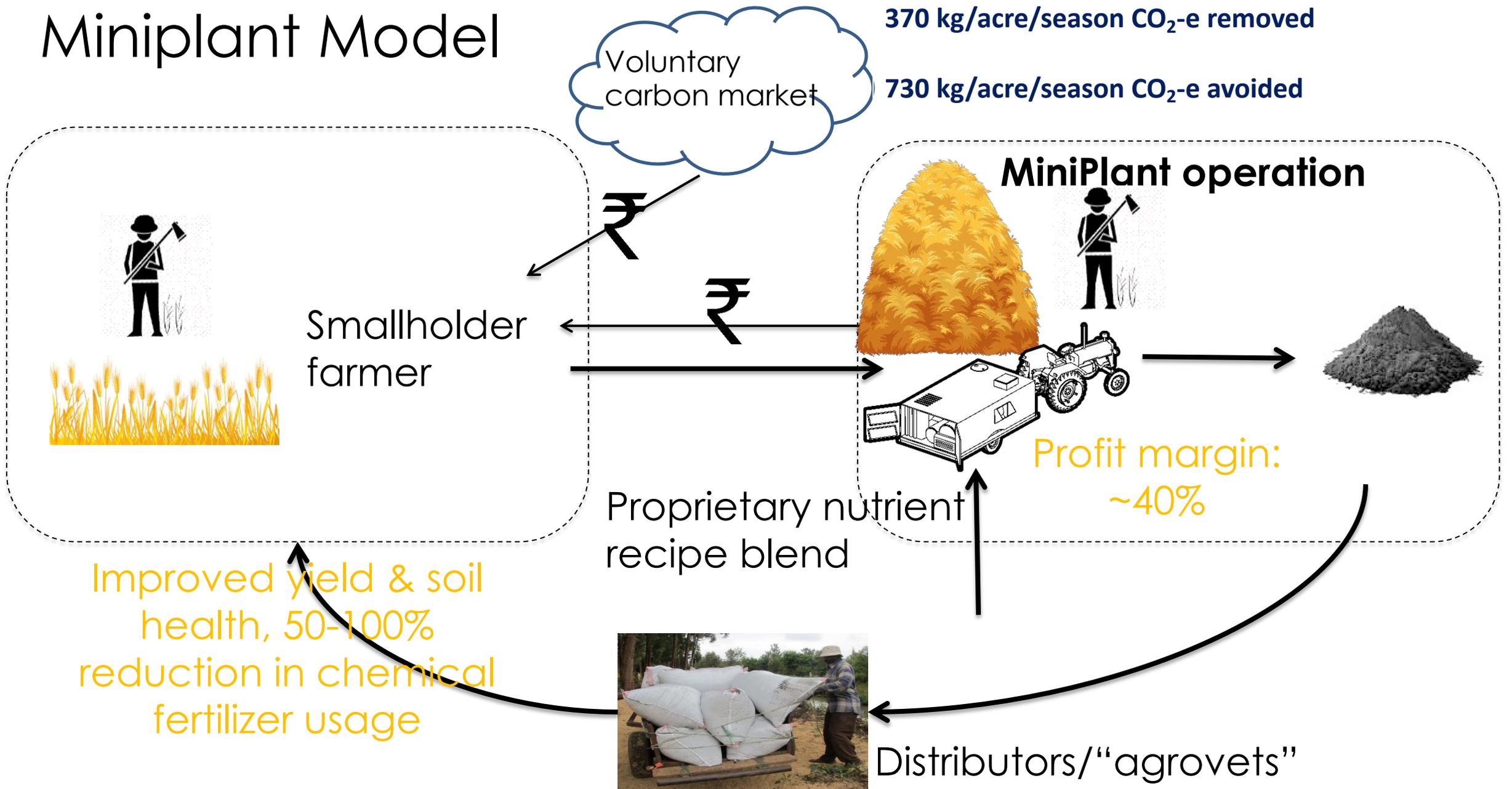
Around 0.1-0.2 kg of nutrient additive (compost, urea, etc.)

5 Package



1 kg of final product; retailed at around \$220/ton

Miniplant Model





- Solving for logistics of residue management is key

Integrating with existing farming practices



Integrating with existing farming practices



Value Proposition

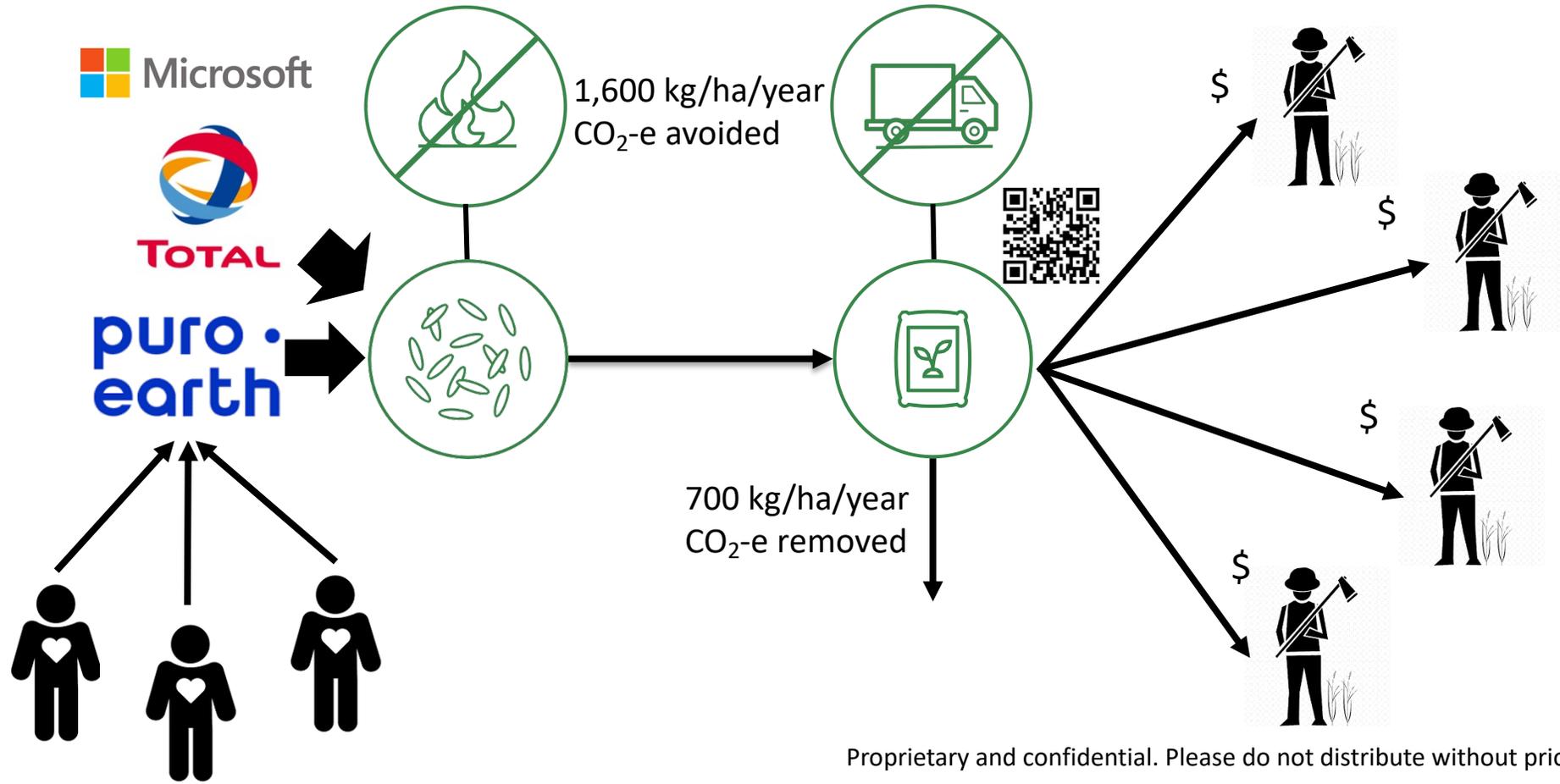
At the same price that farmers pay for their fertilizer inputs per season per hectare:

- We increase their yields on average by 27%
- We increase their net income by up to 50%



Carbon removal and climate justice

By sequestering carbon-rich fertilizer blend into the soil, we have potential to remove ~ 2.4 GT/year CO_2e .
By reducing open-air biomass burning and chemical manufacturing/transportation, we avoid ~ 5.6 GT/year CO_2e .
Furthermore, our real-time control system uniquely advances climate justice by enabling rural, underserved communities verify and earn carbon credits for the first time.



Pilot's Actual Impact to Date



10,000
farmers



US \$ 800,000
added rural livelihood



9,000 tonnes
waste recycled



11,000 tonnes
CO₂-e removed

At-scale vision

We serve biomass generators and consumers worldwide

Forestry residues



Mitigation of 1 billion tons of CO₂ equivalent and 75,000 tons of particulate matter per year

\$3 billion/year (U.S.)

Biomass based solid fuel

Fertilizer

Biofuels

Other chemicals

\$2 trillion/year, 2% growth

\$168 billion/year, 5% growth



Agricultural residues

TAKACHAR

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