

Bottom-up Greenness (BuG) Concept Paper

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1. Green Finance (GF) has become a policy priority among many national authorities. Various businesses on GF value chains are also emerging. This proposal is predicated on a central idea of objectively measuring 'greenness' of individuals (natural persons) and corporates (legal persons of small and large) in agricultural supply chains.
2. A business operation at any stage of a supply chain can be viewed as a collection of activity-weighted individuals and corporates by a bottom-up aggregation much like how one approaches an investment portfolio. In short, we intend to develop a **Bottom-up Greenness (BuG)** analytical platform to generate a **digital greenness certificate (DGC)** for a business large or small in agricultural supply chains through deploying modern IT and data analytics.
3. Two infrastructure components are central to the feasibility of this proposal. First, we need to develop an on-the-ground measurement system, taking real-time readings of individual production entities (farmers and MSMEs). Thanks to the collaborative effort of two FinTech companies, iAPPS and CriAT*, a prototype system utilizing internet of things (IOT) to take real-time readings of 200 plus farmers on over 40 defined attributes is already in operation in Sumatra, Indonesia. In addition, they have developed a preliminary system to produce a greenness score on these farmers.
4. The second component rests on improving the quality and objectivity of the greenness score. We propose to invite NGOs of international reputation specializing in green future to join the effort as partners to offer independent assessments on a sample of individual farmers and MSMEs to enable 'supervised learning' of a predictive model critical to production-level scaling up. In the language of modern data analytics, NGOs will provide to the training sample the 'greenness labels' whereas the IOT system of iAPPS and CriAT offers 'features', i.e., attributes.
5. The calibrated model (Model) linking 'greenness labels' to 'features' serves the basis for production-level scaling up when the IOT system extends to a wider coverage of farmers and MSMEs in Sumatra and elsewhere in Indonesia. NGOs will be invited to conduct periodic audits on the predictive greenness scores generated by the Model. The audit results will then be used to recalibrate the Model going forward to form a positive feedback loop.
6. **BuG** is a platform to generate real-time activity-weighted greenness scores for any entities on an agricultural supply chain operated in the covered region. For example, consider a palm oil producer, labelled as Company A, taking in supplies from 100 farmers and 5

* In the interest of full disclosure, Prof Duan is also a co-founder and the non-executive chairman of CriAT.

MSMEs in Sumatra, Indonesia. Each of these 100 farmers will be assigned a greenness score by the Model. The 5 MSMEs are five separate portfolios with each comprising likely different farmers also with greenness scores generated by the Model. Therefore, the greenness score for each MSME is simply a weighted score with the individual weight being a contributing farmer's supply quantity. Bottom-up aggregation to generate a **DGC** for Company A first takes place to the level for each of the 5 MSMEs before being further bottom-up aggregated along with 100 farmers much like an investment fund being a fund of funds plus positions on individual stocks.