**Farmer-led Measurement/Synthesis: VT PES WEBINAR 11/8/2019**

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**Background on Presenter:**

Abe is a VT grazing consultant and the co-founder of LandStream, a measurement technology and consultancy company.

**Key Takeaways:**

* **Hire farmers** as land managers (contractors) to grow measured natural capital (NC) and ES
  + Increase farm and community viability while decreasing government expenses and human tragedies relating to natural disasters
  + Farmers know how to grow topsoil and soil diversity and know their farms best
* **Farmers should lead** the PES system as key data contributors and system drivers
* Current models and measurements are insufficient to capture NC/ES
  + **Measurement and synthesis should be** **comprehensive and landscape-scale**
  + LandStream’s vision of a “New Scale” of measurement would synthesize on-farm measurement with remote sensing, land manager records, and soil mapping to model landscape function across broad spatial and temporal scales
    - This measurement synthesis would create a matrix of values representing field-by field “total mass balance” of multiple ES.
  + A **pilot project** on 6+ farms is necessary to start developing the appropriate ground-truthing for such a system, and then ongoing measurement once the remote sensing models were in place would be necessary on all participating farms, but less intensive

**Theory of PES:**

* We need to invest in managing whole systems to increase natural capital, not just paying for ecosystem services
  + Natural capital is the “Soil-plant-animal-atmosphere continuum”
  + Analogy: bridge = natural capital, movement of goods across bridge = service
* Ecosystem services are worth way more (100x) than the food alone, and that gap should be compensated to the farmers. Otherwise the system will fail.
  + Disaster prevention is a major ecosystem service with known associated costs

**Learning from the past**:

* Rewarding private landowners for conserving public interest can be more effective than regulation (Aldo Leopold)
* "Do civilizations fall because the soil fails to produce - or does a soil fail only when the people living on it no longer know how to manage their civilization?" (Charles Kellogg)
* VT disaster relief has been hugely expensive and so risk reduction from paying for well-managed fields would be very cost-effective

**Necessities for a farmer-based PES system:**

* Skilled farmers on land they know and care for
* Farmer-centered, accurate measurement of landscape-function, natural capital (NC) and ecosystem services (ES)
  + “Environmental Biophysics” is the study of energy and mass exchange between living organisms and their environment
  + You need accurate energy, water, biomass and nutrient accounting
  + Can’t just measure one thing, need to select a few measurements to synthesize in order to get the full picture.
  + Remote sensing + 3d soil mapping + hand-held field tools + watershed scale monitoring + farmer’s knowledge = comprehensive look at NC, ES, and landscape function
  + LandStream equips farmers with tools based on Env Biophysics to measure their own ES
* Real-time regional learning system, e.g. bottom-up, farmer-centered, real-time "landscape MRI"
  + Provides daily farm management decision support and feedback to land managers
  + Landscape feedback in farmer-led, distributed management learning systems
* Payment based on actual rather than estimated performance
* Quantified value creation: Farmers paid fairly for the NC and ES they grow
  + You need to quantify ES in order to monetize PES and make the system credible
  + In order to be sustainable it needs to be affordable
* Pilot projects for development of system based on current realities
  + Measure energy, water and biomass across VT by satellite
  + Include 6+ pilot farms for ground-instrumentation and soil mapping
  + Farmers lead discovery as key data contributors and researchers
  + Measure production of natural capital and ecosystem services
  + ES producers and beneficiaries collaborate to set fair price for NC/ES
  + Government partners invest and work with farmers to provide $ for consulting, infrastructure, supplies and services

**LandStream’s Vision: The “New Scale”**

* Input: large-scale measurement synthesis
  + Continuous measurements on-farm with localized instrumentation
  + Farmers record land management actions and observations
  + SIS soil mapping using Trimble technology
  + Regional remote sensing via satellite
  + Regional ground-truthing of remote sensing models via intensive initial measurement
  + Synthesis via landscape intelligence software: simulates landscape function across broad landscapes in real-time and into the future.
* Output: Quantified natural capital - ***Regenerative Ecosystem Metric (REM)***: an suite of indices
  + Daily landscape feedback and asses tracking for all stakeholders
  + Globally consistent index for trade
  + Quantifies field-by-field: Stock, productive capacity, direction, and rate of change of natural capital and the magnitude of flow of multiple ES.
* Example technologies: ***GrazeStream*** (grow more grass, livestock and topsoil) and ***PlantStream*** (easily create cover crop and pasture mixes)