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# Identifying synergies and trade-offs between food security and agricultural mitigation and adaptation

by

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# Context of Our Work Program

•Renewed interest/funding for investing in smallholder ag. systems (reduce poverty/improve food security)

•Need to increase adaptive capacity of agricultural systems to weather events (likely to become even more in the future due to CC)

•Agricultural SLM practices that improve food security/adaptation (level and stability of food production) also generate mitigation (attract new and additional funding to the sector)

•Documenting evidence on changes in average/variance of yields, estimates of mitigation potential, and the costs of adoption are key to developing policies for adaptation/mitigation.

• 2009: ESA/NRD initiated work (Barcelona/Copenhagen)

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**Food Security Potential**

| | |
|---|---|
| **Food Security Potential : High**<br>**C. Seq. Potential: Low**<br><br>• Expand cropping on marginal lands<br>• Expand energy-intensive irrigation<br>• Expand energy-intensive mechanized systems | **Food Security Potential : High**<br>**C-Seq. Potential: High**<br><br>• Restore degraded land<br>• Expand low energy-intensive irrigation<br>• Change from bare to improved fallow<br>• Agro-forestry options that increase food or incomes<br>• Conservation tillage and residue mgmt, where limited trade-offs with livestock<br>• Improved soil nutrient management |
| **Food Security Potential : Low**<br>**C-Seq. Potential: Low**<br><br>• Bare fallow<br>• Continuous cropping without use of organic or inorganic fertilization<br>• Slope ploughing<br>• Over-grazing | **Food Security Potential : Low**<br>**C-Seq. Potential: High**<br><br>• Reforestation/afforestation<br>• Restore/maintain organic soils<br>• Expanding bio-fuel production<br>• Agro-forestry options that yield limited food or income benefits<br>• Conservation tillage and residue mgmt, where limited trade-offs with livestock |

**Carbon Sequestration Potential**

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**Food production and resilience impacts of changes in agricultural production systems**

| Food Security/Adaptation Options | Impacts on Food Production | | Impacts on Yield Variability and Exposure to Extreme Weather Events | |
|---|---|---|---|---|
| | Positive | Negative | Positive | Negative |
| **Improved Cropland Management** | | | | |
| Improved agronomic practices | Higher yields (increased soil fertility) | Reduced cropping intensity may compromise household food security in short-run | Reduced variability (increased soil fertility and water holding capacity) | |
| Integrated nutrient management | Higher yields through more efficient use of N fertilizer and/or manure | | Lower variability | Potentially greater variability where drought frequent and inexperienced users |
| Water management | Higher yields, greater intensity of land use | | Reduced variability in well-functioning systems | |
| Agroforestry | Greater yields in medium-long term; and where tree cash crops improves food accessiblity | Potentially less food, at least in short-term, if displaces intensive cropping patterns | Reduced variability of agro-forestry and adjacent crops | |

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**Adoption costs of mitigation technology options in developing countries**

| Technology options | Practices | Case study | Establishment costs |
|---|---|---|---|
| | | | US$/ha |
| Improved cropland management | Improved agronomic practices | Natural vegetative strips, The Philippines | 84 |
| | | Small level bench terraces, Thailand | 275 |
| | | *Fanya juu* terraces, Kenya | 320 |
| | | Vetiver grass contour lines, South Africa | 140 |
| | Water Management | Enhanced runoff harvesting for olives, Syria | 88 |
| | | Water harvesting on cropland and grazing land, India | 240 |
| | Agroforestry | *Grevillea agroforestry* system, Kenya | 160 |
| | | Belters of trees for farmland, China | 125 |

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# Estimating C sequestration potential

2009: ESA/TCS/TCI developed

<u>EX-Ante C balance Tool (EX-ACT)</u>

- Measures C-balance with/without project
- Land-based accounting system, measuring C-balance changes per unit of land
- IPCC default values (*Tier 1*) and *ad hoc* coefficients (*Tier 2*)
- Easy to be used in ex-ante project formulation (quick appraisal)
- Helps project designers to integrate climate response activities in agriculture projects

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# Initial findings and some inputs for integrating work

Current Use of WOCAT data

•Data on relative net benefits (food security) and adoption costs

•Baseline EX-ACT (C sequestration potential)

Findings:

•Synergies/trade offs differ across localities: need to identify where they occur in specific cases

•Benefits and costs of adoption/implementation also vary by geographical area and farming systems

Inputs for integrating work**:**

•Wider geographical coverage (more countries...)

•More economic data (opportunity costs....)

•WOCAT database provide an in-depth evaluation of SLM projects and understanding of the adoption process – any way to harness this knowledge in designing household-survey sub-modules on adoption?

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# THANK YOU