Water implications of large-scale land acquisitions for biofuel and food production in West Africa: the case of Ghana and Mali

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Presentation outline

- **Introduction: LSLAs in Ghana and Mali**
- **Study methods**
- **Water implications: Catchment moisture flux estimates**
- **Water implications: Ecosystems & livelihoods**
- **Concluding remarks**

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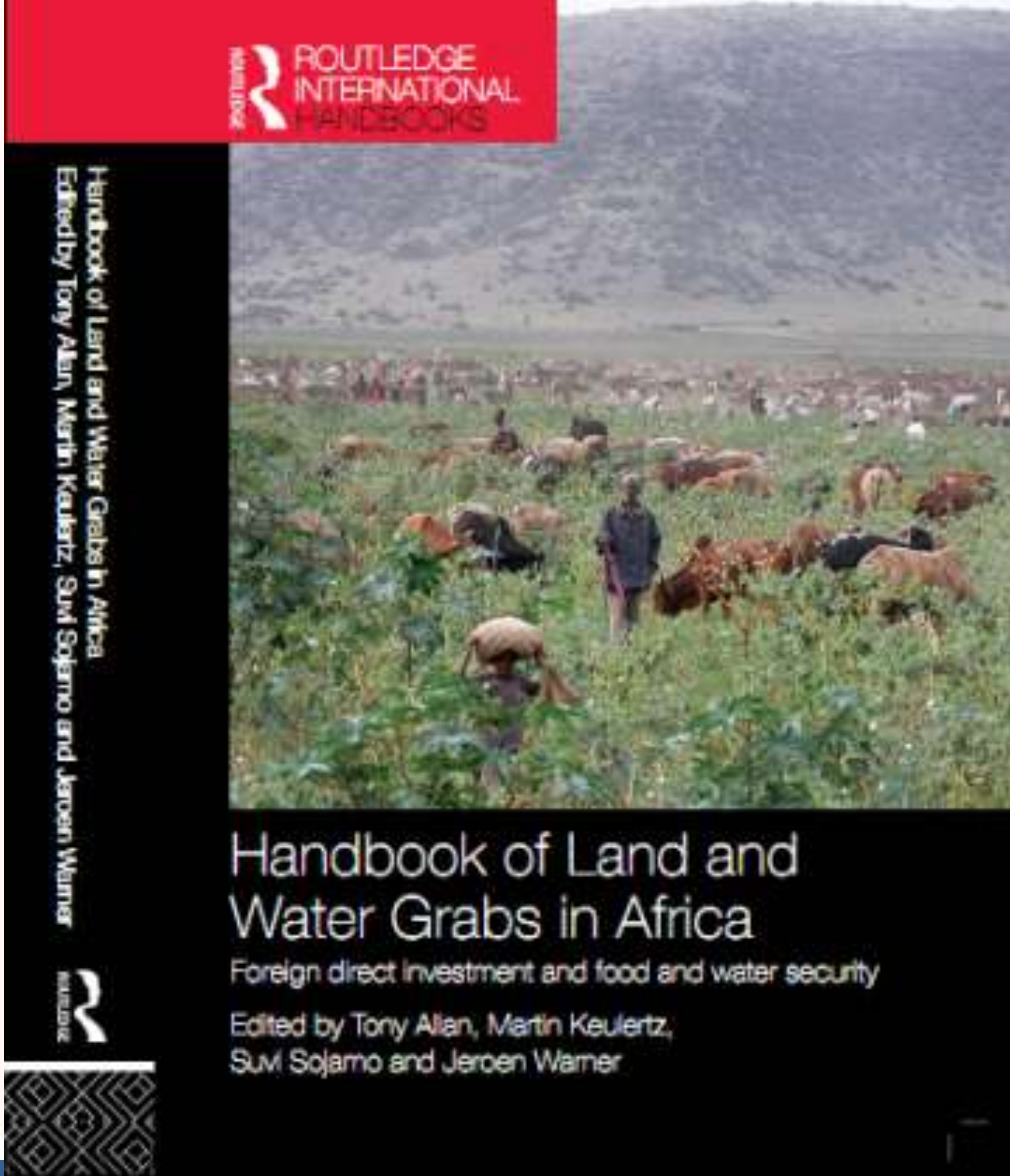
ROUTLEDGE INTERNATIONAL HANDBOOKS
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Handbook of Land and Water Grabs in Africa
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Russia
108.000
Pakistan
5.926
India
68.890
Bangladesh
24.456
iopia
26.270
Laos
308.994
Philippines
5.057.688
Somalia
21.500
Kenya
316.700
Cambodia
1.232.080
Tanzania
16.263
Malawi
196.037
Madagascar
2.150.000
zambique
75.922
Imprint
Authors: Elias Hodel, Kurt Geber
Organisation: CDE Centre for
Development and Environment
November 2010

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Study methods

1. ## Surveys and questionnaires

Cohort group surveyed: LSLA buyers, Regulators and State agencies, Smallholder farmers;
Helped provide insight on the plight of farmers, links of water to livelihoods and ecosystem services

2. ## Conceptual model

Examined the inter-linkages between hydrological flows, ecosystem services and livelihoods

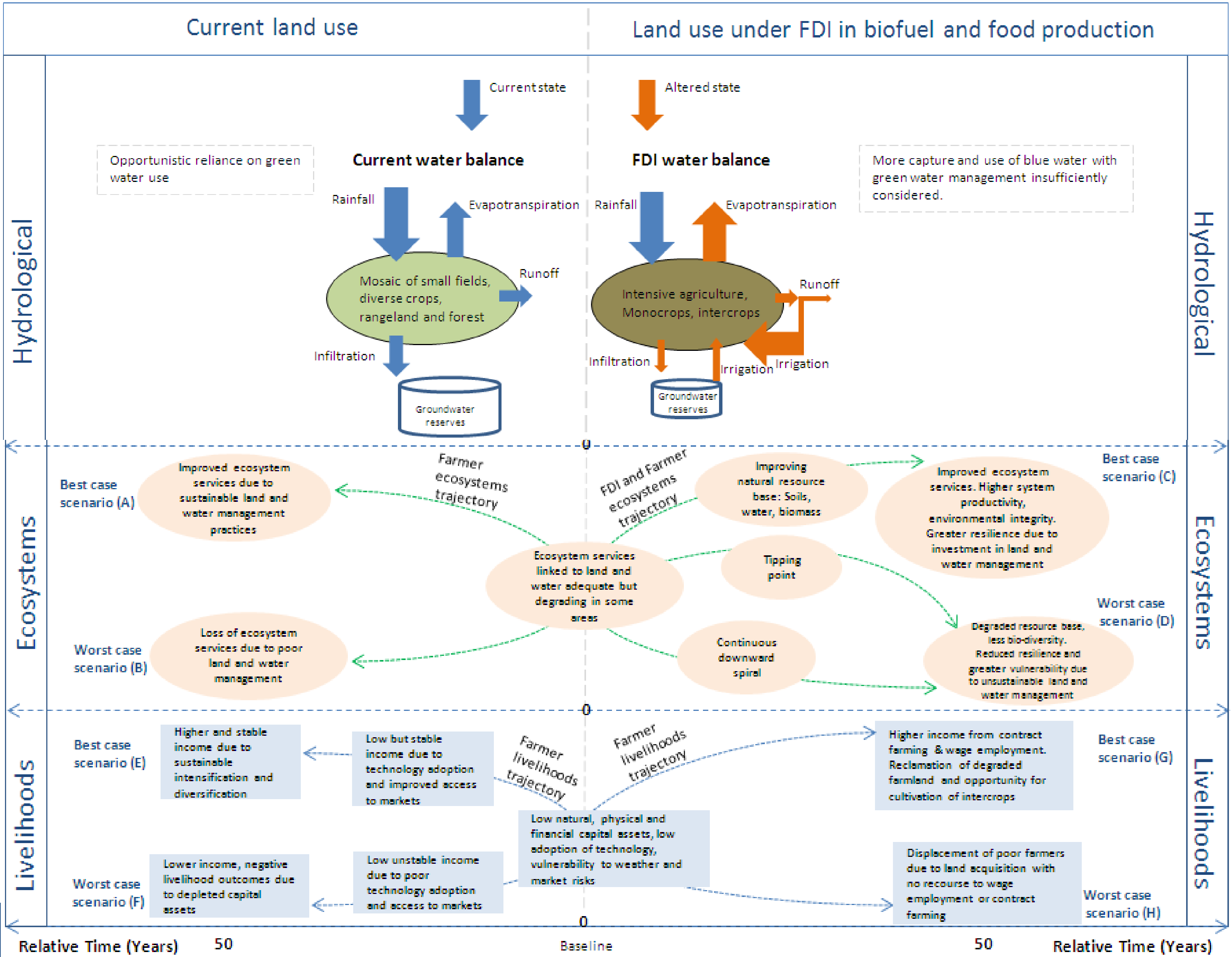
3. ## Hydrology model

Computed catchment water fluxes e.g. surface runoff and ground water recharge, that occur outside conventional crop water use.

4. ## Crop water use model

Estimated crop water requirements and irrigation demands of biofuel (LSLAs) and food crops (current land use systems with smallholder farming) over a given period of time.

Conceptual Framework

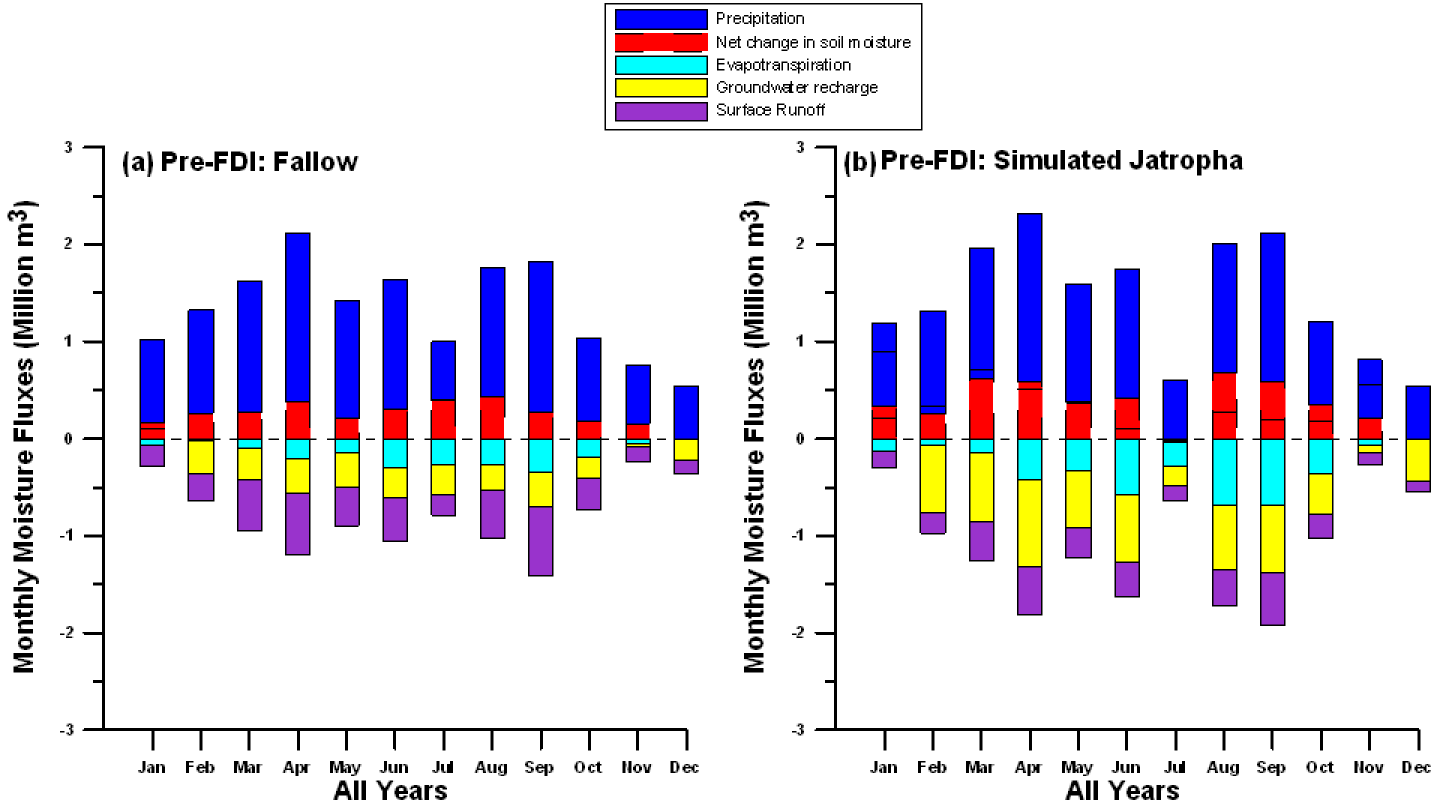


Models: CropWat8 and WEAP

- Rationale: Provides ability to estimate CWR using potential evapotranspiration independent of the spatial scale
- Actual water requirement under the prevailing climate for both Ghana and Mali were estimated for both the growing season and the whole year (i.e. including periods when the land was fallow).
- Combined and single Kc values were used to estimate the CWR of intercropped fields and that of *Jatropha* sole cropping

- Rationale: Allows for catchment moisture estimates while considering hydrology and climate parameters
- Moisture fluxes were estimated using the catchment module in the Water Evaluation and Planning (WEAP) model
- Module uses the FAO Irrigation and Drainage Paper 56
- This allows for simulation of climate driven rainfall-runoff relationships in conjunction with dynamic calculation of crop irrigation demands.
- WEAP model uses the rainfall-runoff method where it computes runoff as the difference between precipitation and a plant's evapotranspiration.

Catchment moisture flux estimates



Source: Kizito et al., 2012

Key outputs:

- **Hydro-literacy: Informs policy on the lack of consideration of water in land deals**
- **Will pave way for further assessment of FDI impacts on livelihoods and ecosystems services**

Fallow Vs Biofuel: Flux trends

Fallow	Net change in soil moisture	Evapotranspiration	Groundwater recharge	Precipitation	Surface Runoff
Sample Mean	-0.492	-0.161	-0.254	1.083	-0.382
Standard Error	0.081	0.034	0.035	0.114	0.055
Jatropha					
Sample Mean	0.366	-0.307	-0.506	1.083	-0.294
Standard Error	0.066	0.070	0.082	0.114	0.042

Source: Kizito et al., 2012

- **Study results indicate that the choice of crops grown and land management practices can significantly impact water resources.**

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Crop Water Requirements

Location	Cropping system	Rainy season		Dry season		Annual	
		CWR (mm)	Deficit (mm)	CWR (mm)	Deficit (mm)	CWR (mm)	Deficit (mm)
Yendi	Jatropha only	503	1	-	-	750	**267**
Kobre	Intercropping/Intercropping	370	0	931	880	1301	**880**
	Intercropping/sole Jatropha	370	0	1519	1311	1889	**1311**
	Jatropha only/Intercropping	600	102	1031	942	1631	**1044**
	Jatropha only throughout the year					1545	**923**
	Oil palm	504	0	513	267	1017	**267**
Segou	Sugarcane	1791	5	397	1221	2188	**1226**
San	**Hybrid rice**	**934**	**3**	**107**	**797**	**1041**	**800**

Source: Kizito et al., 2012

- **CWR results indicate the need for irrigation to meet crop demands.**
- **Regardless of the cropping options, ideally over 60% of CWR would be fulfilled by irrigation during the dry season**

LSLA Impacts on ESS and livelihoods

1. LSLAs on marginal lands can serve as an ecosystem benefit; conversely heavy input use without adequate regulation will negatively impact ESS.

2. Survey results indicated that LSLA displacement of poor farmers with no recourse to wage employment or compensation is detrimental to the farmer livelihood trajectory

3. The CWR of current land users indicate that supplementary irrigation will be needed to improve agricultural productivity.

- **Balanced approaches that combine investment /knowledge/technologies/market access/regulation that are adapted to local conditions while providing local benefits are urgently needed if the negative consequences of LSLAs are to be avoided.**

Sustainable soils, crops, water resources mgt. = thriving ecosystems and viable livelihoods?

1. Crop choices and land management decisions (LSLAs or not) impact catchment fluxes through productive & non productive losses

2. The sensitivity of moisture flux responses depends on climate and soil conditions as well as the type of vegetation cover

3. The presence of vegetative cover in a given area can lead to higher infiltration leading to more regular flow regimes and reduced erosion (affects water quality) yet water quality can be affected negatively by agricultural inputs as in the case in LSLAs.

4. Thus, if soils, water and vegetation cover are well managed, they can have ecosystem service benefits; conversely dis-benefits which must be managed for local and downstream effects.

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Concluding Remarks

1. Study results indicated that the choice of crops grown and land management practices can significantly impact water resources

2. The modification of water fluxes through LSLAs will have significant impact on ecosystem services on which rural livelihoods depend.

3. Efficient water management demands that green and blue water resources be managed in an integrated manner to reduce the risk of investment failure and environmental degradation and to enhance the food security and livelihoods of poor rural farmers.

4. We argue that the new wave of LSLAs calls for institutional arrangements that will allow for water availability, use and management while factoring in transparent pro-poor social and environmental standards (that include effective regulation) into LSLA deals.

Thank you

Questions?