



Equitable Payment for Watershed Services-EPWS:

Ecosystem Based Approach in Water Resource Management.

A case of Lake Naivasha Basin, Kenya

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Presentation layout

- ☐ Introduction
- ☐ Basin Ecosystem Services
- ☐ PES Concept and Approach
- ☐ Some of the Results
- ☐ PES Conclusions and Lessons





Introduction

□ L. Naivasha Basin features

- Basin coverage: 3,400 Km²
- Altitude; 1,860- 3906m
- Rainfall 600mm around the lake and 1700mm on Aberdare ranges
- Basin Population 650,000 people
- Socio-economics; Agric, tourism, geo-thermal, livestock, fishing, off-farm SMEs
- Naivasha local GDP KSh 40 billion (2% - 3% of Kenyan GDP)





Lake Naivasha Basin Environmental issues

□ What are Basin Wide concerns?:

- Catchment degradation
- Unsustainable land mgt
- Siltation of water bodies
- Increased pollution
- Declining water inflows
- Lake water Levels fluctuation and invasive species
- Weak policy enforcement



Drivers

- Population growth-
Unsustainable Development
- Diminishing Livelihoods
- Weak institutional framework





EPW mechanism for Watershed Management

❑ Why EPWS Solution?

Manage ecosystems-maintain supply of ES goods and services

- Improve water **quality** and quantity
- Improve livelihoods
- Investments
- Protect biodiversity

❑ EPWS Naivasha initiated through WWF-CARE Kenya joint partnership



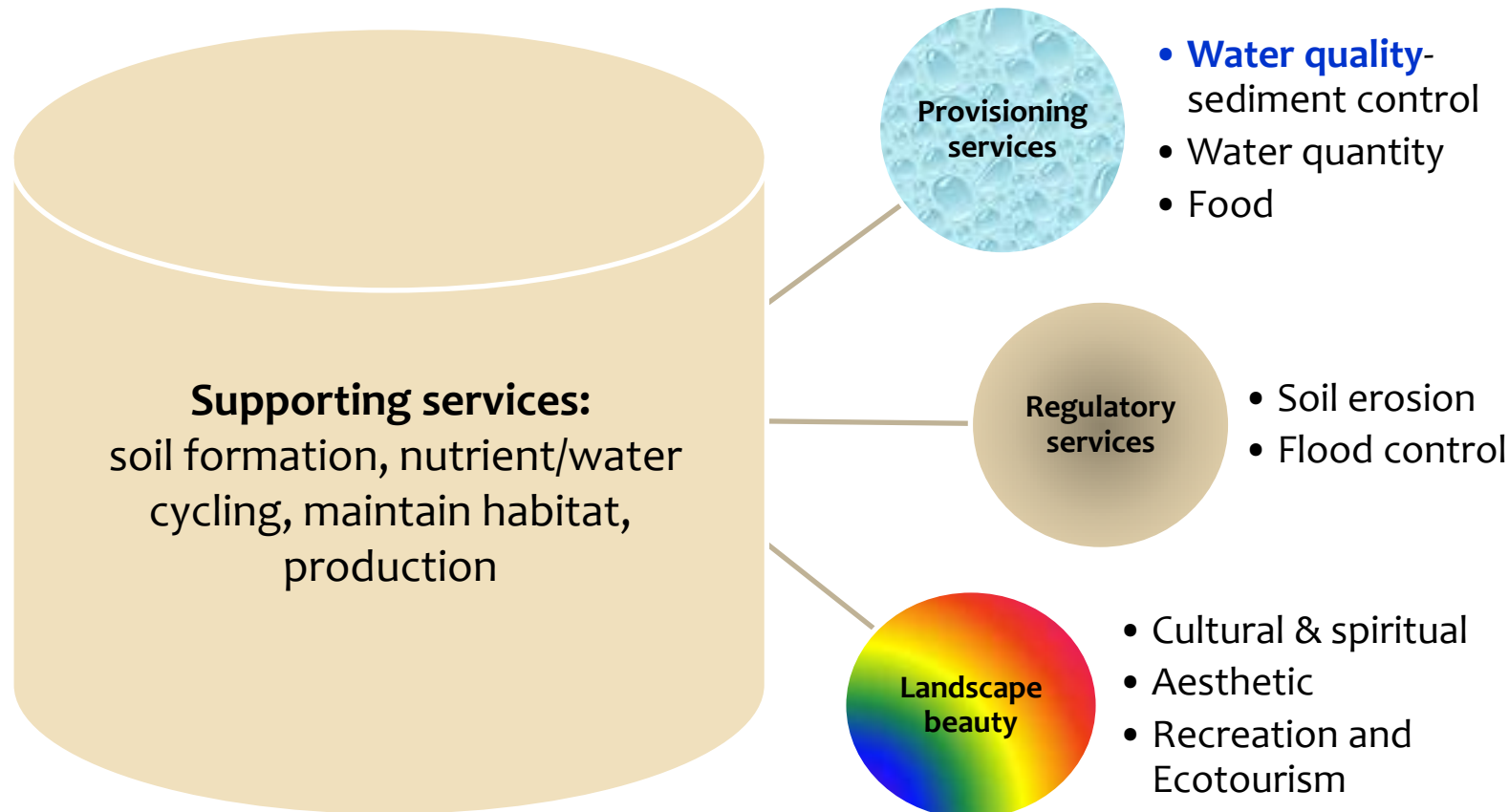
Section of flower farms around Lake Naivasha



Targeted Ecosystem Services-Hydrological Quesn?

❑ Watershed services-Form of PES concept in Naivasha

❑ 4 Broad Categories of ES :(Millennium Ecosystem Assessment, 2005)





Business Question?

- ❑ A market based voluntary scheme: ES stewards sell ES to buyers/beneficiaries

Mechanism (Incentive approach)

- Involves land use transformations by the upstream farmers
 - ✓ rehabilitation & maintenance of riparian zones,
 - ✓ grass strips,
 - ✓ terracing along steep slopes,
 - ✓ reduction in fertilizer & pesticide use
 - ✓ tree planting along riparian land
- **Contract:** sellers-Buyers sign binding agreement





Phased Approach

Three phased Approach:

- **Phase 1; feasibility assessment.**
 - ✓ Hydrological; socio-economic: identify ES buyers/sellers, HHs characteristics, farm activities, PWS potential; CBA: business case
- **Phase 2; implementation; initiating PES on a pilot scale**
 - ✓ Engage community in land transformation, build local capacity, EIA M&E, incentives
- **Phase 3; scale-up exit**
 - ✓ Project scale-up, Institutionalise PES, long term PES contracts, learning and sharing, intermediaries exit



Hydrology Study: Sub-basin Selection Criteria

- ☐ Water yield from sub basins
 - Total water yield
 - surface water yield
 - Groundwater contribution to flow
- ☐ Sediment yield from sub basins
- ☐ Also considered
 - Population density and poverty
 - Land use/ land cover dynamics
 - Potential buyers and sellers
- ☐ Hotspot farms selection; Steep-slopes exceeding 35%, Lack of protection or very little soil protection activities; river bank cultivation; land ownership, willingness to participate



Feasibility studies

Hydrology-Results:

□ Sub-basins significant to hydrological problem identified based on Soil Water Assessment Tool (SWAT) model- to predict impact of land Mgt practices on water, sediment and agro-chemical yields, (WWF, 2007)

Target	SWAT Subbasin	River	Area (Ha)	Surface Runoff (mm)	Groundwater discharge (mm)	Net water Yield(mm)	Sediment yield(tons/Ha)
1	39	River Wanjohi near Geta	700	82	369	483	62
	179	”	2074	55	198	327	50
	40	”	1906	34	213	286	31
3	84	Mkungi /Sasini	952	90	139	261	39
4	93	Kitirii/Rumaru	1418	90	159	253	10
2	166	Mkungi/Kangoya in Mkungi settlement	672	15	188	242	12
5	123	Turasha near Engineer	639	84	39	201	61



Feasibility studies...

Cost benefit Analysis(CBA)

- ☐ Objective; to assess costs and benefits of PWS implementation
- ☐ CBA linked to core hydrological problem and land use changes-Lus
- ☐ Economic valuation tool; quantify stakeholders preference cost/benefits to change ecosystem status in monetary terms
- ☐ **Approaches;**
 - Value Productivity change from change of ecosystem status; crops& livestock
 - Restoration cost (Riparian Land, eroded land/soil infertility)
 - Willingness to pay and to accept pay



Cost benefit Analysis(CBA)

- Choice Modelling; to prioritize LUC interventions-based on different characteristic
- Cost-benefit valuation of ES provision; opportunity cost, cost and benefit of the alternatives
- Techniques; Random sampling(for 3 sub-basins), Litt. Review, Mapping resources/current LU patterns, questionnaire, FGD, descriptive analysis; NPV computation
- CBA concern;
- ✓ **Buyers:** Are proposed LUCs efficient & have +ve significance to core problem?
- ✓ **Sellers:** Is PWS or PES effective and fair incentive to change land use practices?



Why Cost Benefit Analysis?-need for results

- ☐ Build/establish Business Case(BC); adopt PWS to changes Land use practices
- ☐ Base for buyer-seller agreement negotiations
- ✓ Justify Economic –Ecological opportunities to ES buyers and sellers (how they will both benefit)-for informed socio-economic decision making
- ☐ Value linkages; livelihoods-ecosystem-long term return on investment for ES buyer-business case/financial capital
- ☐ Determine willingness to sell and Willingness to pay
- ☐ So CBA will prove PES as *Eba* solution to **water** and land management



Cost Benefit Analysis...

❑ CBA computed (Fishers Effect)

$$NPV = \sum_{t=1}^N \left[\frac{NACF_t}{(1+k)^t} \right] - I$$

by expression: $(1+r)(1+i) = (1+k)$, Where;

NPV= net present value,

N=sample size,

NACF_t=net annual cash flow over period t=14 years (hypothetical project life)

k= nominal cost of capital weighted over the 14 year period,

i = average inflation rate and r= real cost of capital based lending rates

I= initial PES cash outlay-total cost

❑ Opportunity cost (I) computed: Ksh. 18,981.97/year/ one acre (WWF, 2007)

❑ NPV \$430 /acre/farmer/yr

❑ CBA established PWS a feasible mechanism (+NPV)

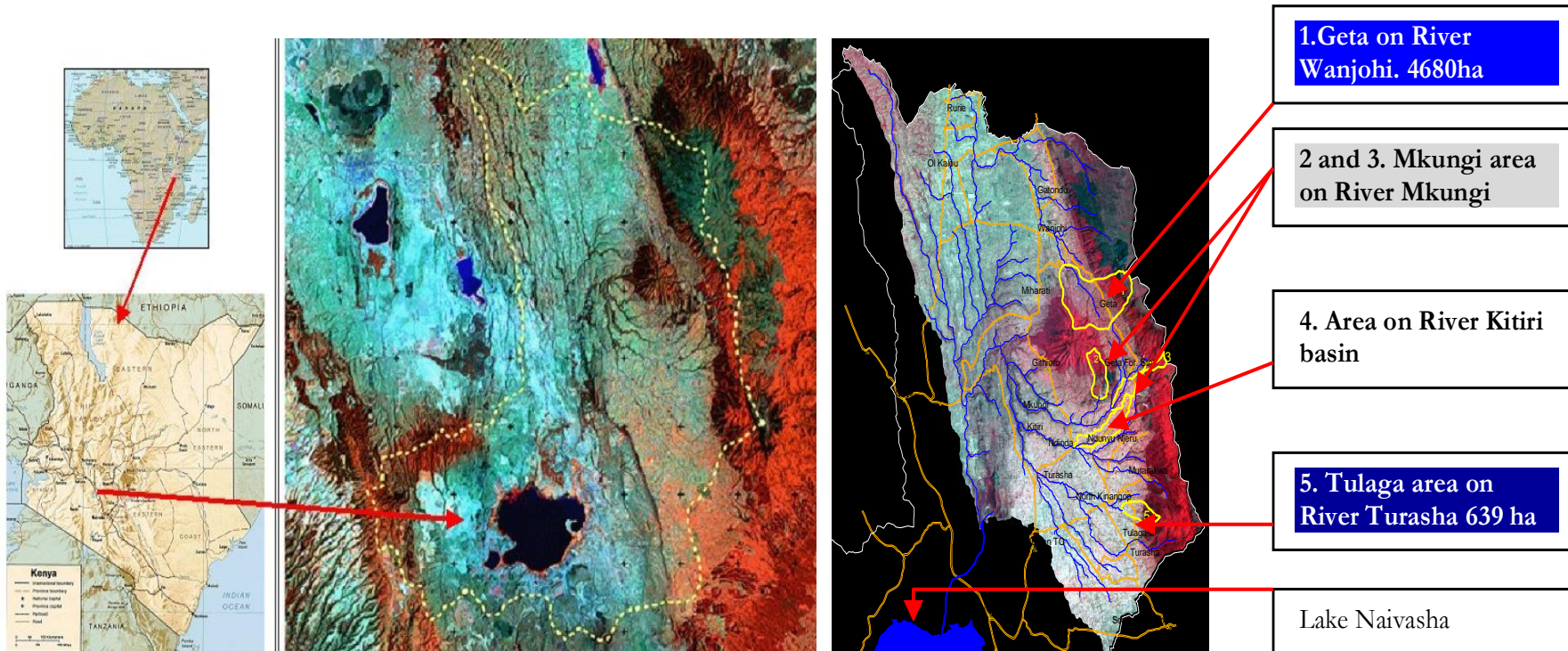


Farm characteristics and subjective measures of willingness to pay for water resource conservation (WWF, 2007)

	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Error	Std Deviation Statistic
Expected cost of conservation in ksh/acre/year	0.00	150,000.00	16,686.89	4,096.12	31,991.73
Estimated loss in revenue by allocating land to conservation ksh/acre/year	0.00	200,000.00	18,981.97	4,853.48	37,906.91
Expected future private gain in ksh/acre/year	0.00	3,000,000.00	141,663.93	50,579.06	395,035.11
Amount willing to be given to conserve river water ksh/acre/year	0.00	250,000.00	54,688.54	7,560.30	59,047.86
Amount willing to be paid to change to agro forestry only ksh/acre/year	0.00	1,800,000.00	137,979.18	32,345.20	252,624.09
Amount willing to be paid to change to pasture only ksh/acre/year	0.00	800,000.00	95,204.92	16,691.62	130,365.68
Amount willing to be paid to change to strip cropping only ksh/acre/year	0.00	300,000.00	35,834.43	7,018.50	54,816.26
Amount to be paid to plant 10M of strip grass ksh/acre/year	0.00	400,000.00	74,368.85	11,835.13	92,435.29
Amount to be paid to plant 25M of strip grass ksh/acre /year	0.00	550,000.00	79,657.38	15,250.31	119,108.76
Amount to be paid to plant 100Mof strip grass ksh/acre /year	0.00	400,000.00	75,172.13	12,969.56	101,295.48



PES Sites Identified



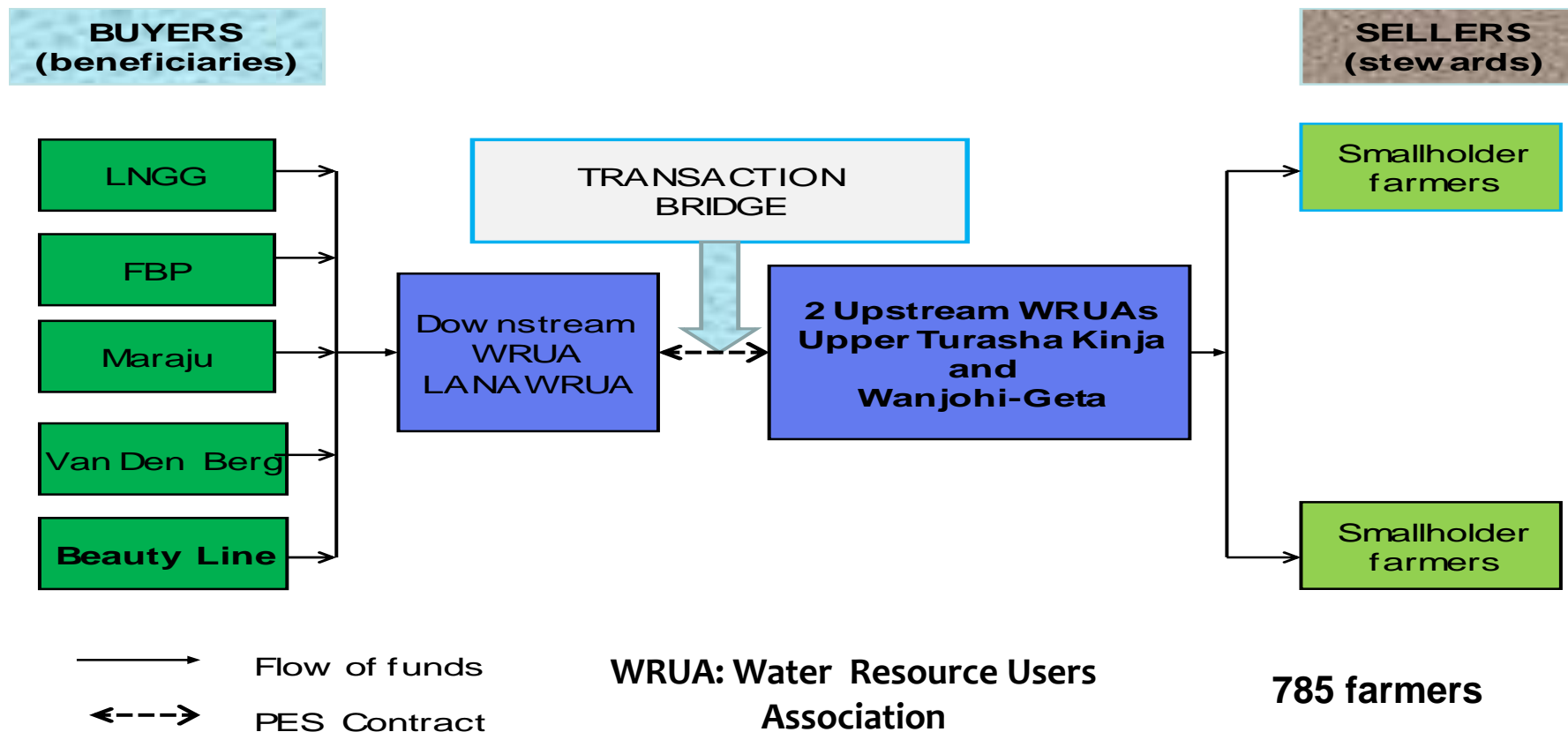
PES Project sub-basin targets

WWF., 2007

Pilot sites: **Upper Turasha –Kinja WRUA** (Turasha River and its tributaries) & **Wanjohi –Geta WRUA** (River Wanjohi & tributaries)



PES entry point and design



Current buyers

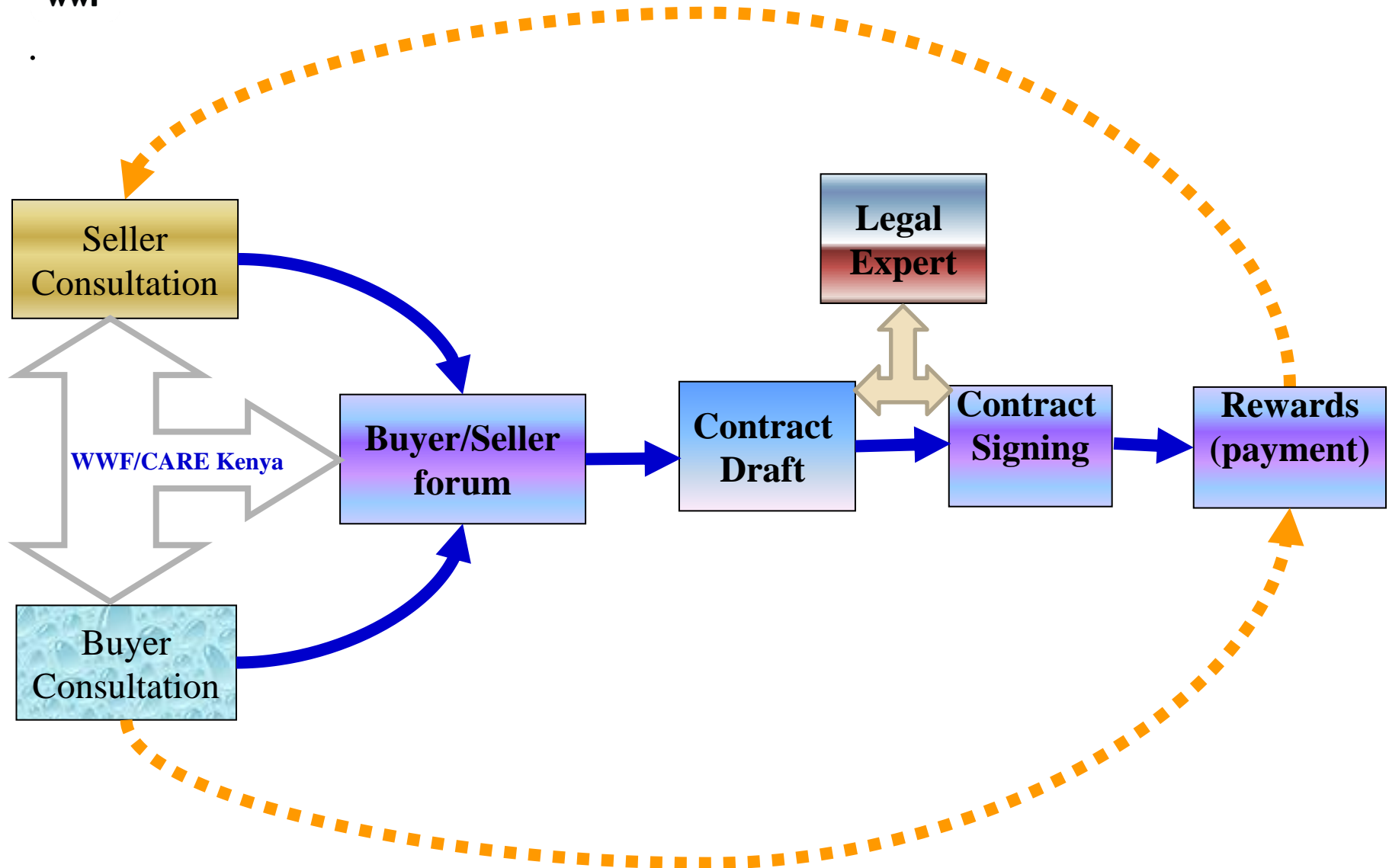
- LNGG-Lake Naivasha Growers Group
- FBP-Flower Business Park
- Maraju
- Van Den Berg
- Beauty Line

Potential buyers

- NARUWASCO-Nakuru Water and Sanitation Company
- KENGEN-Kenya Electricity Generating Company Limited
- Hotels

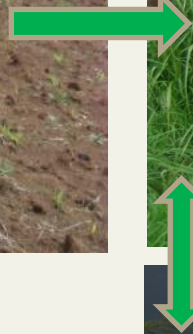


PES Negotiation process



Results

Strategic Partnerships - PES and Markets



☐ Payments through voucher system

- Redeemable for farm inputs
- Through selected agro-dealers
- Voucher value US\$ 17 /farmer (flat rate)
- Current PES farmers-785
- Contractual fulfillment



ES Buyers Incentives Equity contribution (Negotiation Bundles)

Categories based on Water use and Hotel Ratings	Water use M ³ (per day)	Contribution- Ksh (per year)
1. Commercial water users; Irrigators, ranchers		
	Over 750	250,000
	250-750	150,000
	Up to 250	80,000
2. Hotels and Camping sites- categories are based on Hotel rating star rating		
	5 & 4	250,000
	3 & 2	150,000
	1 & not rated	80,000
	Camps	80,000



Results...



- ☐ Adoption of new farming technologies
- ☐ 1570 acres(800 Wanjohi;770 Upper Turasha) (under Sustainable land management practices: 785 farmers(400 Wanjohi; Upper Turasha385)
- ☐ Gender equity and involvement of marginalized community in socio-economic development



Results...



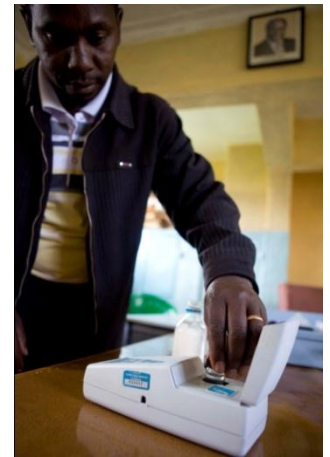
- ❑ Improved crop varieties, nutrition
- ❑ 40% increase in farm yield translating into improved livelihoods
- ❑ Community gain Knowledge /Skills; Hay/Silage Making



Results... Monitoring



Soil build up along the grass strip-PES farm (Left) and Mature grass strips-notice s marked peg: less soil gets into the rivers(Right);
water quality analysis (far Right)





Conclusion-Lessons

- ❑ PES benefits both environmental stewards and beneficiaries, and therefore a sustainable mechanism for integrated ecosystem management through People private partnership)
- ❑ The more the ES sellers and buyers the greater the impact and success (indeed mutual agreements between sellers and buyers is indeed as perquisite)
- ❑ Equity, Efficiency and Effectiveness are key to PES sustainability
- ❑ Ecosystem changes can be realised in the long-run so the need for patience to realize impact
- ❑ Need to integrate PES in National Policy(s)

➤ Related links

- <http://www.guardian.co.uk/global-development/video/2012/may/15/flower-kenya-lake-naivasha-video?INTCMP=SRCH>
- <http://gvn.panda.org/?c=1746&k=385e7fbe2b>



Acknowledgement



Special thanks to **IUCN**



Thanks for your
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