



Agricultural & Irrigation Opportunity in Kenya

2030 WRG Roundtable #3

Moving towards Solutions

December 2016



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The following presentation was prepared by the 2030 Water Resources Group together with Open Capital Advisors. Information is subject to change and any commercial or other activity pursued as a result of this study should be done in conjunction with additional due diligence.

Increasing the productivity of agricultural water use in Kenya is a national priority, given the country's low water endowment, growing population, and changing climate. Expanding the use of modern irrigation technology, such as drip and sprinkler systems, will be fundamental to achieving water productivity because of the potential for such systems to increase yields relative to water withdrawals.

The following presentation provides an initial outline of the market opportunity for investing in water-productive irrigation technologies in Kenya. While the basic business case for farmers is compelling across a number of cash and staple crops, analysis demonstrates that barriers exist including poor market linkages, limited access to finance, credit-worthiness of borrowers, rural supply costs, and a lack of general knowledge and awareness of the benefits of irrigation technologies. Scaling up investment will therefore require partnerships amongst stakeholders across the value chain.

For more information on this analysis or for partnership opportunities, please contact Jennifer R. White, advisor to 2030 WRG, at jrw@isaacadvisory.com and Joy Busolo, Kenya 2030 WRG country Manager, jbusolo@ifc.org.

Agriculture, Water & Kenya

SESSION AGENDA

Time	Agenda	Speaker / Facilitator
7:30 - 7:35 am	Welcome and Introductions	Joy Busolo; 2030 WRG
7:35 - 7:45 am	Opening Remarks	Chair- PS Eng. Patrick Nduati
7:45 - 8:20 am	Irrigation Market in Kenya Presentation	Jennifer R. White; 2030 WRG
8:20 - 9:00 am	Discussion on Opportunities, Challenges and Solutions	Jennifer R. White; 2030 WRG & All Participants
9:00 - 9:10 am	Take Aways & Next Steps	Jennifer R. White; 2030 WRG
9:10 - 9:20 am	Closing Remarks	Chair- PS Eng. Patrick Nduati
9:30 am	Roundtable Ends; Networking	All

Key Discussion Questions

1 Is the market insight and analysis provided aligned with your perspective of the opportunity for irrigation in Kenya?

Is there missing information? Is information accurate based on your field work?

2 In what specific ways can the 2030 WRG proposed product be improved? Are there alternative mechanisms that might be successful in encouraging investment?

What has worked in the past for this sector or other sectors that are traditionally considered risky? What are other concepts/ideas that should be considered?

3 What are the incentives that would encourage each of you to invest/partner/participate in this initiative?

Financial institutions/Offtakers/Development Institutions/SHF/Government

4 In this room, who is prepared to act today? What timeline make sense? What immediate actions are required? What are the next steps?

Population growth, increases in per capita usage, urbanization plus climate change means humanity must improve water management

Five key global trends drive the need to increasingly improve water management

- 1 Population growth**
 - Global population is projected to grow from 7.3bn in 2015 to 8.5bn by 2030 (+16%)

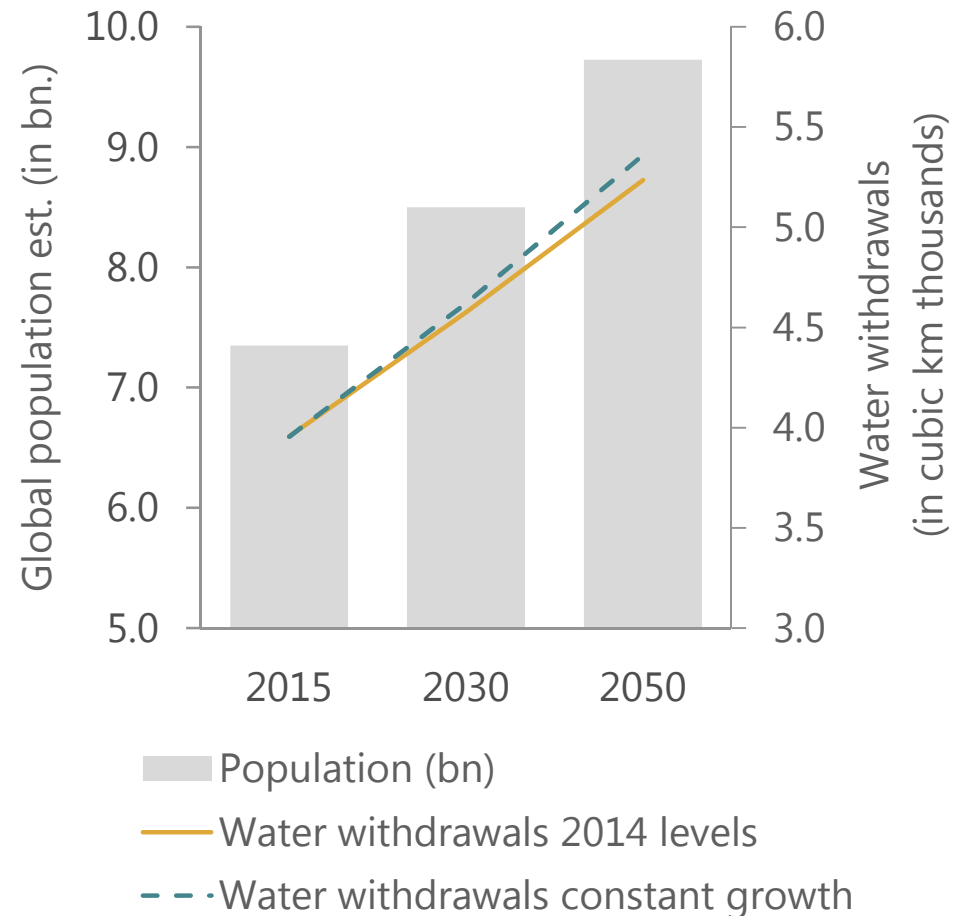
- 2 Business expansion**
 - Growing business activity translates directly into increasing intake & wastewater

- 3 Increasing affluence**
 - Higher incomes correlates with higher per capita water consumption

- 4 Climate change**
 - Rising temperatures increase the rate of evaporation
 - Risk of storms and flooding

- 5 Urbanization**
 - Higher usage levels & concentration of demand
 - Requires investment in supply and wastewater processing

Global population projected to grow 16% while water withdrawals to grow by 17% by 2030



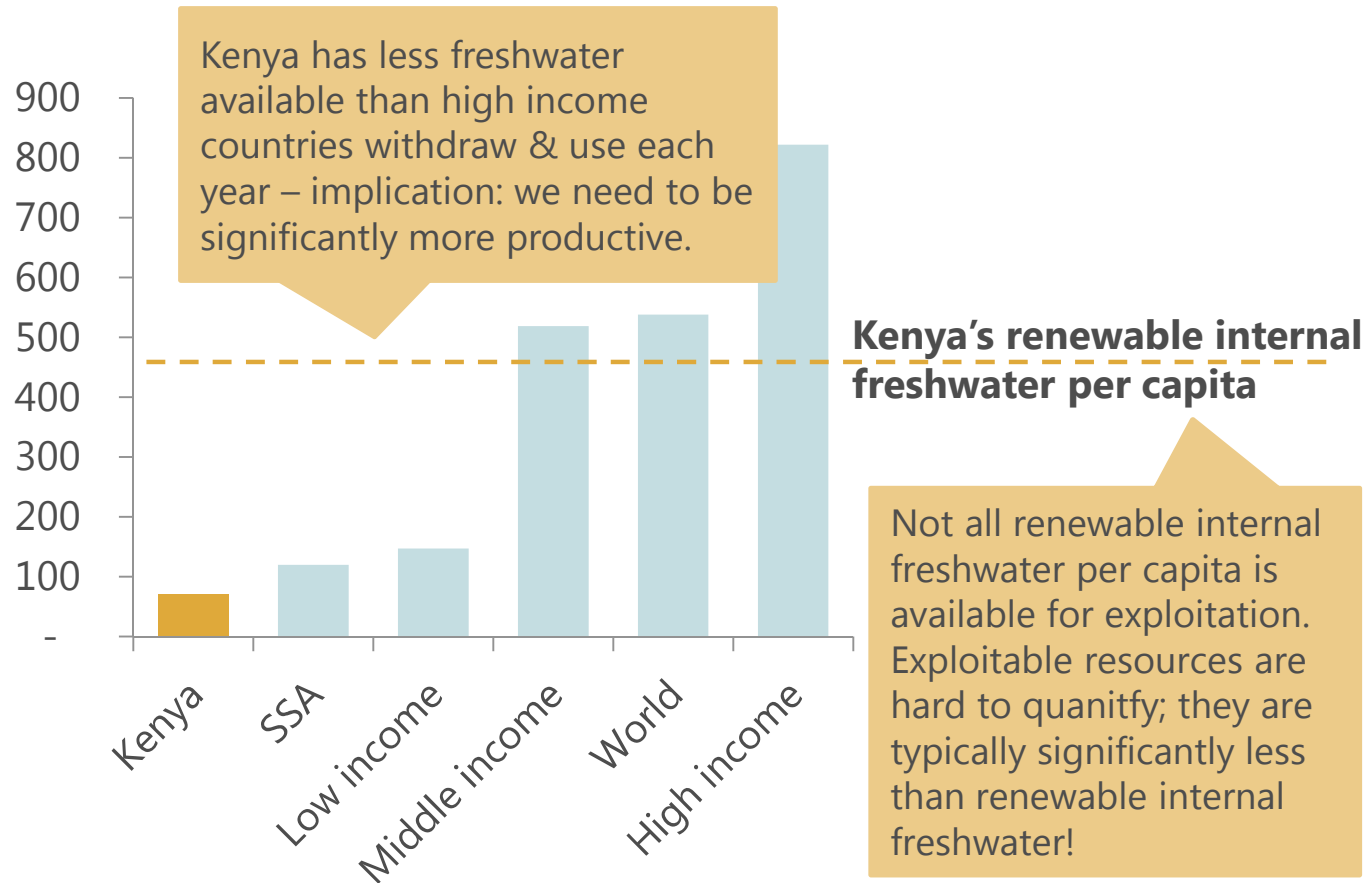
Source: OCA Analysis; United Nations -- World Population Prospects, 2015 revised; World Bank -- World Development Indicators; IWMI -- Global Water Demand Projections, 2014

Notes: 'Water withdrawals constant growth' is an extrapolation based on the growth trend from 1995 to 2010.

Kenya's maximum available freshwater is less than withdrawal in most middle income countries

Annual withdrawals per capita

(in cubic meters)



Water efficiency key to Kenya's development

- Kenya has very low per capita resources, <10% of middle income country average
- Kenya's water productivity is ~80% of global average – need significant increases in water productivity to continue to grow
- Kenya's resources per capita are less than middle income withdrawals per capita
- High water productivity a necessity, else water will constrain growth

Source: OCA Analysis; The World Bank – World Development Indicators

Notes: Renewable water consists of internal river flows and groundwater from rainfall. Internal resources exclude water inflows from neighboring countries, such as river runoff and groundwater transfer between countries, as well as a part of the resources of shared lakes and border rivers. The exclusion of external water resources leads to an understatement of water availability in Kenya. In contrast though, not all natural freshwater, surface water or groundwater, is accessible for use; accessible resources cannot be quantified reliably.

Kenya has ~5.5M hectares of arable land, but only 17% is suitable for rain fed agriculture; productive crop areas shrinking

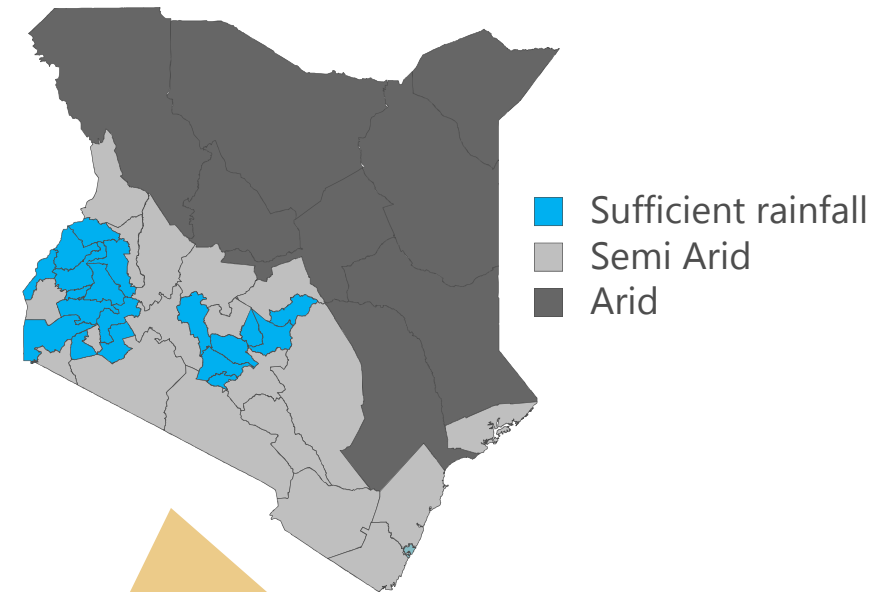
Opportunities for rain fed agriculture are limited to Western and Central Kenya

Productive crop areas represent 17% of land & support 80% of rural population

- 56% of Kenya's water resources are in the Lake Victoria basin
- Productive crop areas are shrinking
- Long rains have declined more than 100mm in rainfall since the mid-1970s

Kenya by climatic zone	Rainfall p.a. (mm)	Land area (%)
Sub-humid	1,000 - 1,600	12%
Semi-humid to semi-arid	600 - 1,100	5%
Semi-arid	450 - 900	15%
Arid	300 - 550	22%
Very arid	150 - 350	46%

83% of Kenya is Semi Arid or Arid Land (ASAL) which supports ~20% of rural pop.

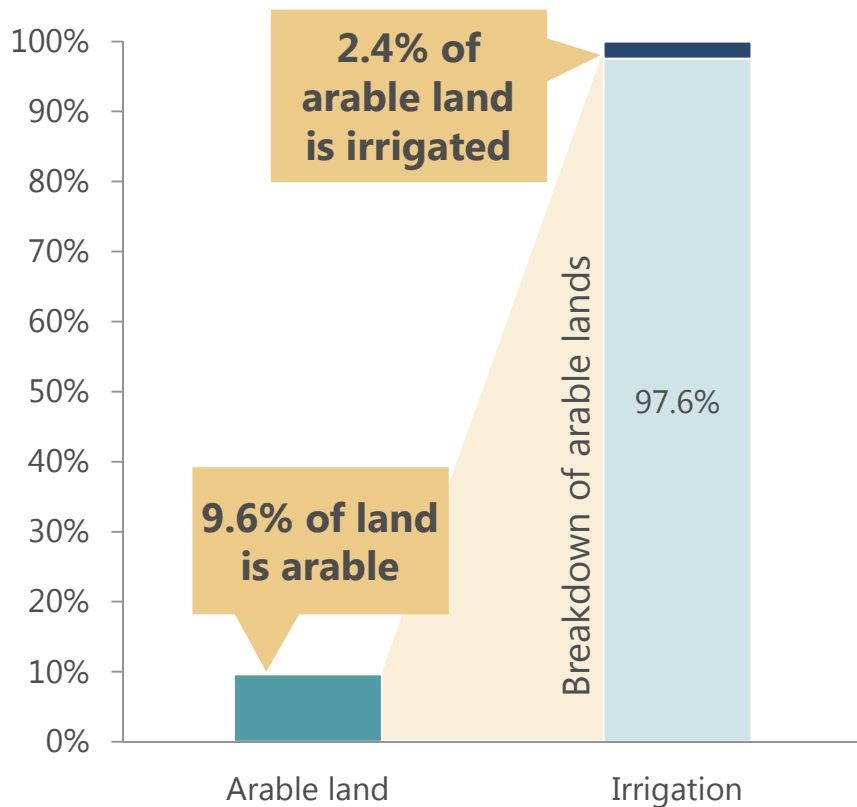


Around 10% of Kenya is arable land; today's crop production is highly concentrated in subset with sufficient precipitation for rainfed agriculture

~3% of Kenya's arable land is irrigated and the top 5 users of water are primarily rain fed

Use of irrigation in Kenya's arable lands

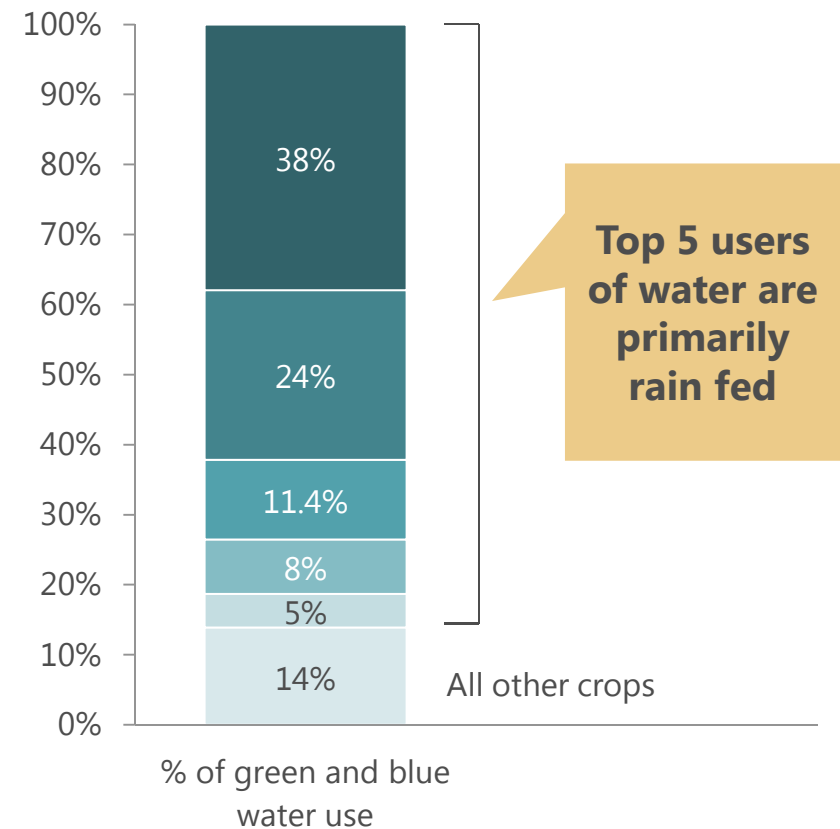
% of area



■ Arable land ■ Non-irrigated ■ Irrigated

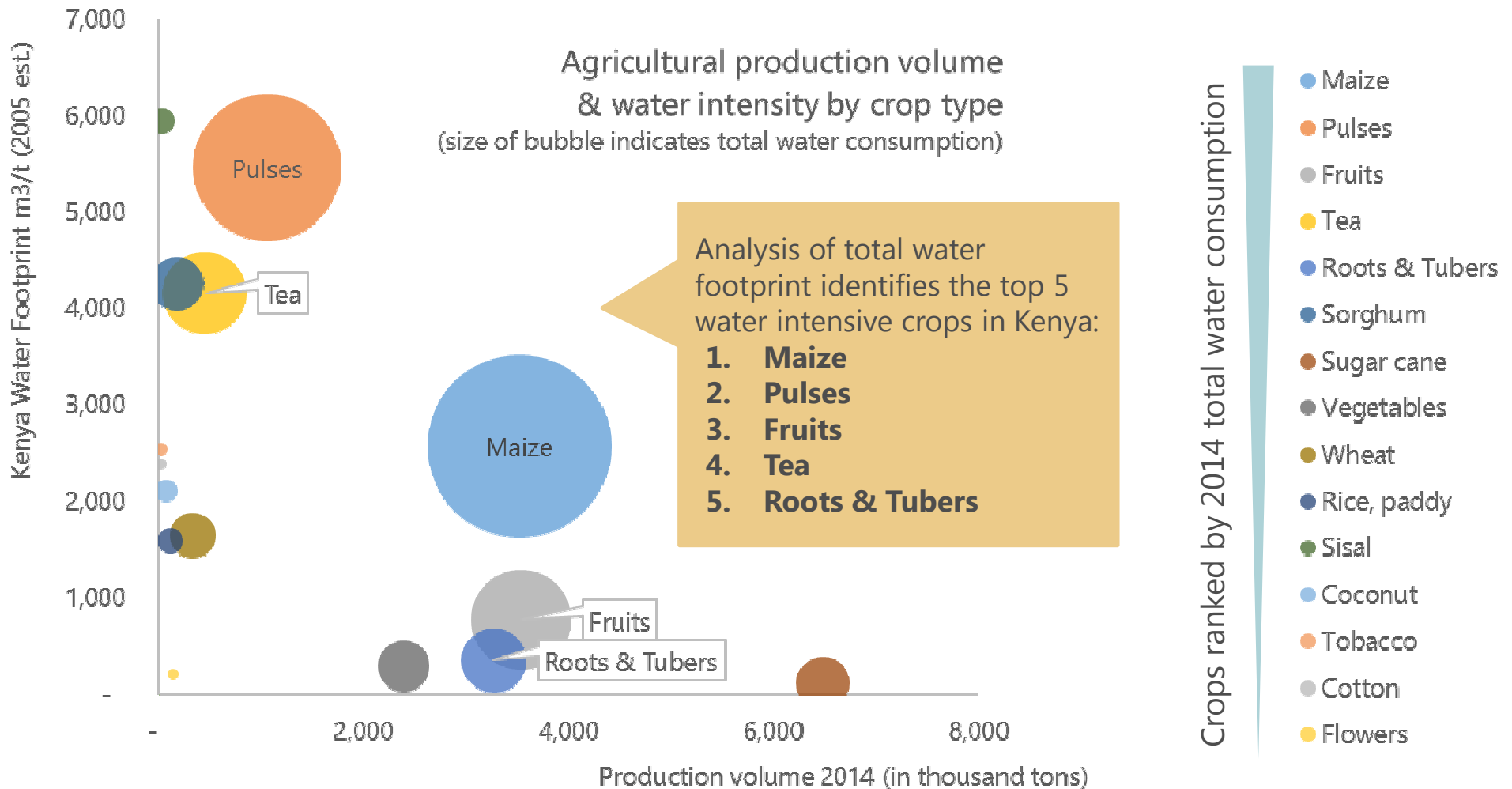
>80% of crop water use is by five crops

% of total green and blue water use in agriculture



■ Other ■ Roots & tubers ■ Tea
■ Fruits ■ Pulses ■ Maize

After analysis on the Kenyan landscape, the largest total users of water are maize, pulses, fruits, tea and roots & tubers

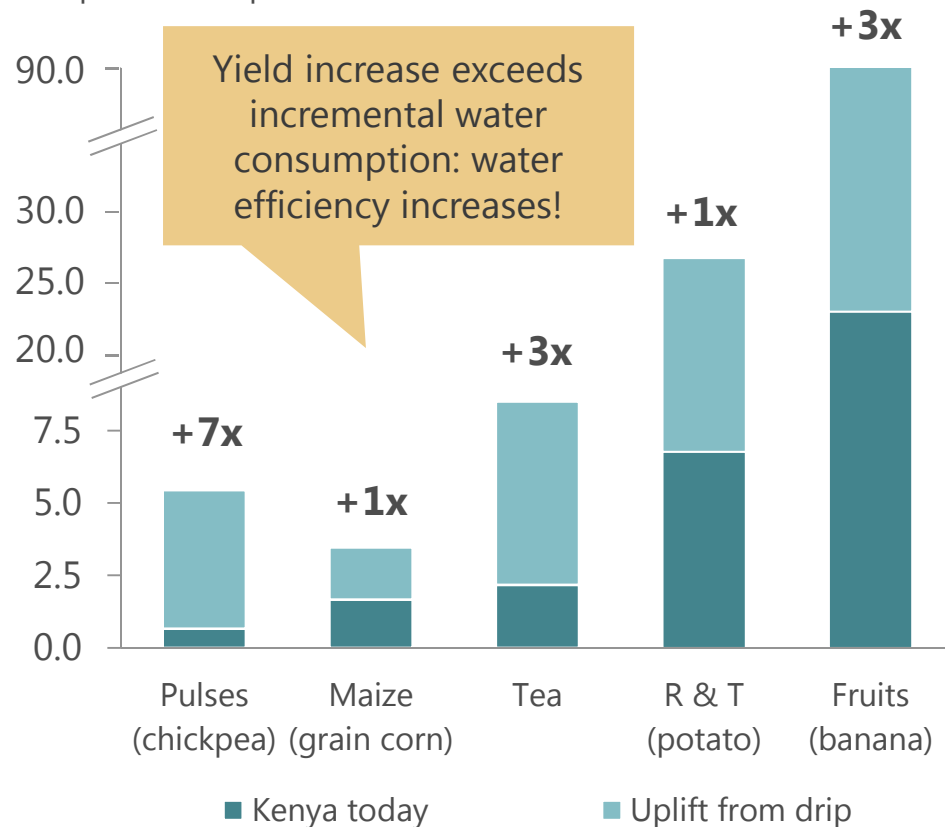


Due to Kenya's growing population, higher water efficiency will be crucial to increase total food production with limited water resources

Drip irrigation can increase yields of the top 5 crops by 1-7x vs. Kenya's predominantly rain fed yields today...

Yield increase - drip irrigation vs. Kenya today

Tons per hectare per harvest



Drip increases yields significantly – but assumes farmers are able to access water

- Drip irrigation can improve yields of Kenya's top 5 crops by up to 1-7x what Kenya achieves today through rainfed agriculture
- Kenya's agriculture is primarily rainfed; less than 3% of arable land is currently irrigated
- Yield increases from implementing drip irrigation systems can only be achieved if water is available – requires nearby infrastructure or rainwater harvesting

Yield gains from drip irrigation assume that farmers have access to a source of water for irrigation

Source: 1) Pulses (Chickpea), Maize (Grain Corn), Roots & Tubers (Potato) and Fruits (Banana) yields from Sunculture; 2) Tea yield under drip from <http://www-naweb.iaea.org/nafa/swmn/water-docs/Tanzania-Tea-plantation-drip-irrigation.pdf>; 3) Base yields from FAOStat for Kenya

... But high efficiency irrigation can *still lead* to increased water abstraction and consumption; an opportunity exists to improve water security factoring in crop water intensity into national agriculture growth strategies

Increasing water intensity (m³ per \$ of output) ▲

Low water intensity

< 1.0 m³/\$

- Tomatoes
- Pineapples
- Cabbages
- Potatoes
- Tobacco

< 2.5 m³/\$

- Mangoes
- Cassava
- Sugar cane
- Bananas

Medium water intensity

< 5.0m³/\$

- Maize
- Beans (dry)
- Rice
- Tea
- Cinnamon
- Cotton

>5.0 m³/\$

- Coffee
- Wheat
- Sisal

High water intensity

> 7.5 m³/\$

- Cloves
- Cashew nuts
- Cocoa beans
- Sorghum

> 25 m³/\$

- Vanilla beans
- Kola nuts

Regulatory Framework is also needed to ensure environmental impact is monitored

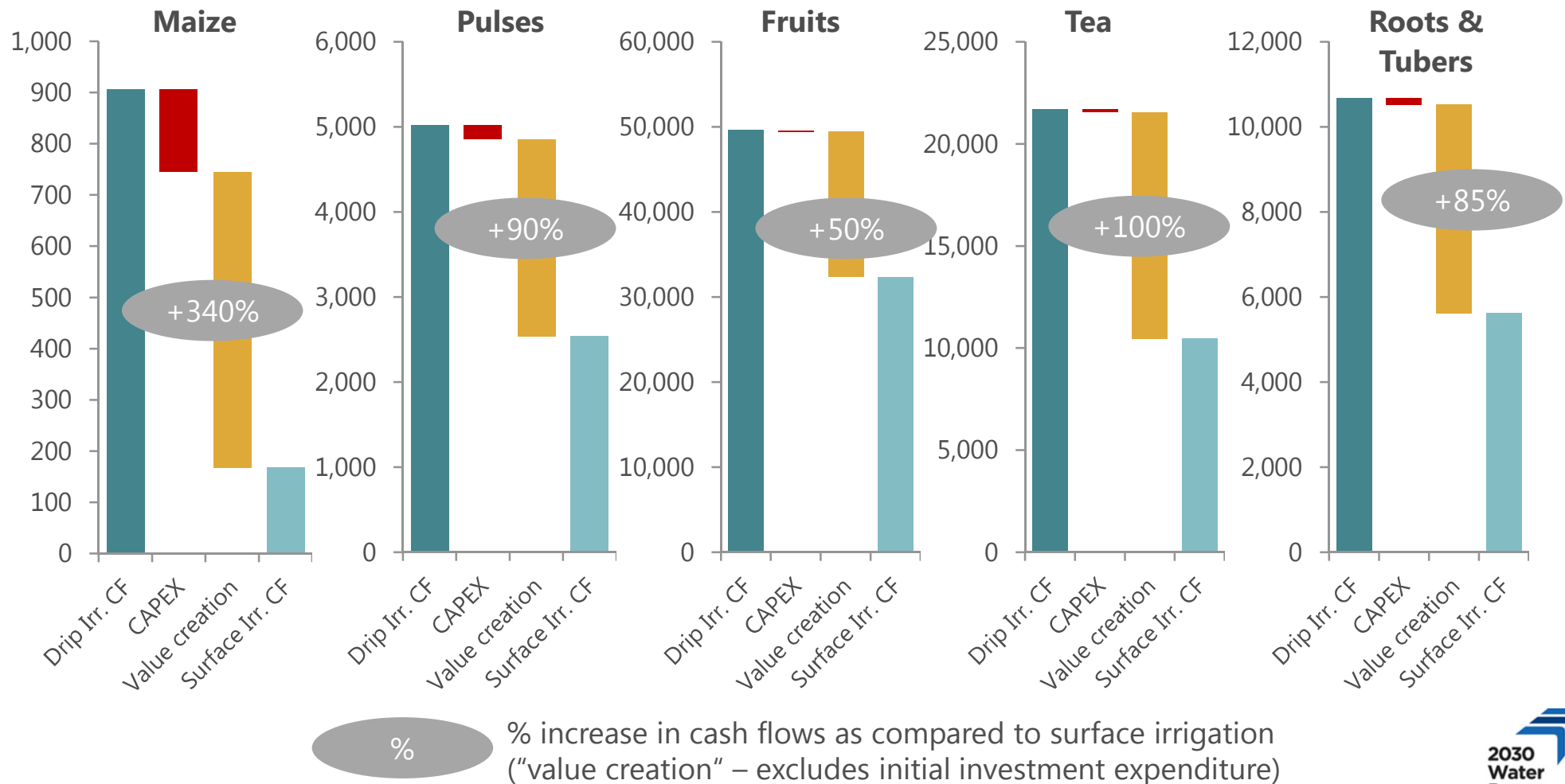
Note: Water intensity refers to total footprint including green, blue and grey water. Prices are 2010-2014 global averages in USD per ton

Source: 1) Mekonnen, M.M. and Hoekstra, A.Y. (2010) <http://www.waterfootprint.org/Reports/Report47-WaterFootprintCrops-Vol1.pdf>; 2) FAOStat – Price Statistics

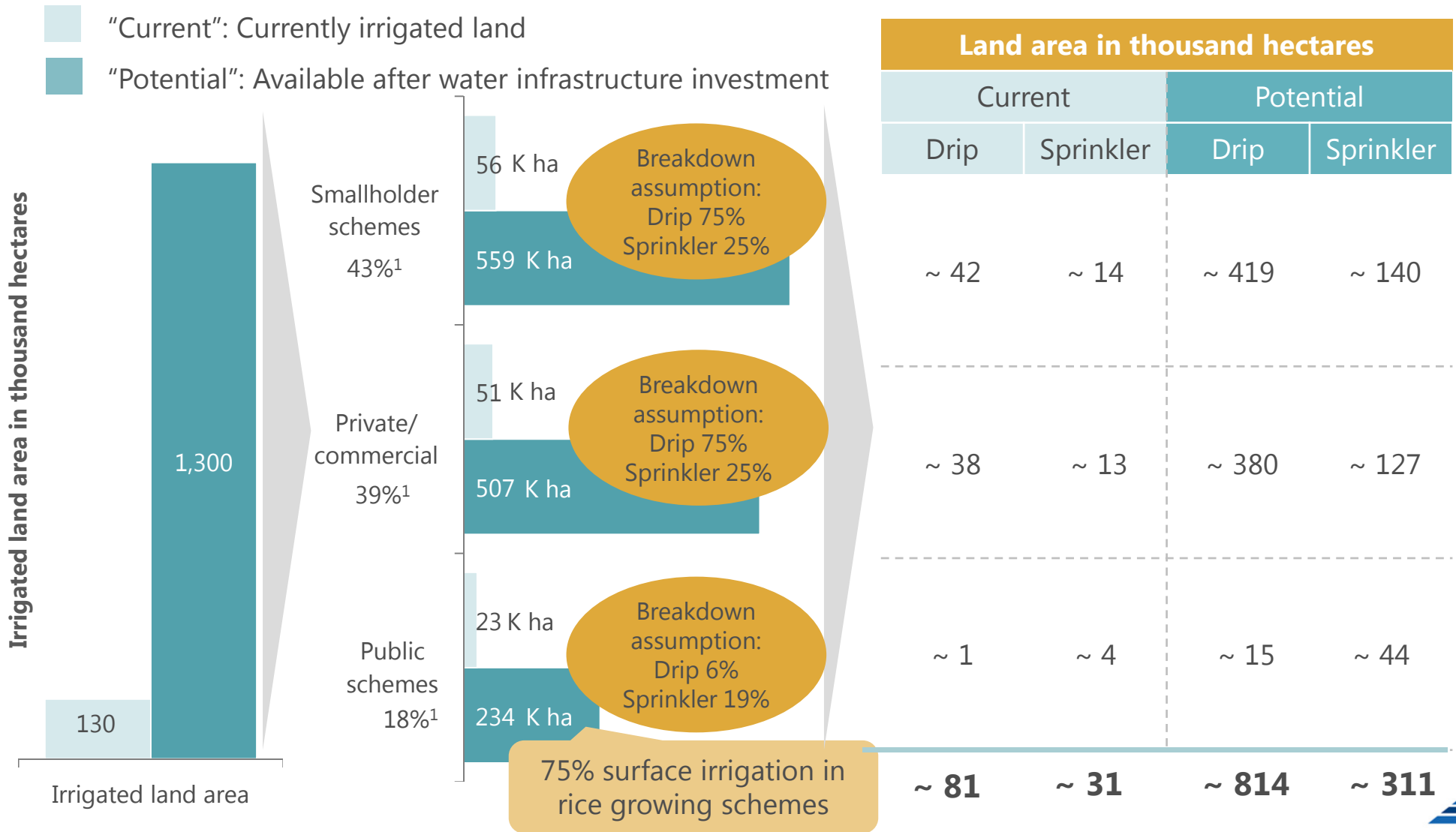
While investment in irrigation technology amortises faster for cash crops, there is a business case for all top 5 water intensive crops

Simulation of lifetime value of drip irrigation technology for the top 5 crops

Farmer lifetime cash flows ("CF") in KES thousands per hectare; lifetime of 4 years



Based on currently irrigated land, opportunity for drip of ~ 81K ha; opportunity grows by 10x with further infrastructure investment



Source: OCA Analysis; The market size is based on a simplified simulation based on limited data available. It shows the market potential for drip and sprinkler irrigation systems for currently irrigated land and irrigated land area potential if further investment is made in water infrastructure. The current split of land area into smallholder farms (43%), commercial farming (39%) and public schemes (18%) is held constant to determine current and future potential land area by farm segment. The simplified allocation of land area to different irrigation technologies (75% drip and 25% sprinkler) for smallholder farmers and commercial farming is based on estimates gathered during consultations and is not scientifically valid information on the best irrigation methodology for Kenya's crop production. The estimated breakdown for public schemes was derived from the current breakdown reflecting the preference for flooding and pivot irrigation in these catchments.

Note: 1- Land breakdown held constant. // Market breakdown by irrigation technology not scientifically proven but simply based on approximate average breakdowns indicated by commercial farmers consulted.

A directional market size indicates current market opportunity for drip irrigation technology at \$46M with a potential market size of \$460M

	Land area in thousand hectares				Annualized market size in million US\$ ¹			
	Current		Potential		Current		Potential	
	Drip	Sprinkler	Drip	Sprinkler	Drip	Sprinkler	Drip	Sprinkler
Smallholder schemes	~ 42	~ 14	~ 419	~ 140	~ 24	~ 7	~ 236	~ 79
Private/commercial	~ 38	~ 13	~ 380	~ 127	~ 21	~ 6	~ 214	~ 59
Public schemes	~ 1	~ 4	~ 15	~ 44	~ 1	~ 2	~ 8	~ 21
Simplified market size approximations in US\$ millions:					~ 46	~15	~ 458	~ 159

If the demand and supply side challenges in the market for irrigation technologies can be overcome, there is a significant market for irrigation technology, especially for drip irrigation technology

Source: OCA Analysis; simplified approximations based on limited data available; reflects total cost incl. pump and power source. 1 - Calculated based on the weighted average cost of irrigation technology per hectare (US\$ 2,252 for drip, and US\$ 1,876 for sprinkler systems). Weighting assumes that smallholders pay the average price per hectare for systems < 2.5 hectares, and private/commercial and public schemes pay the average price per hectare for systems > 2.5 hectares. The market size is annualized to reflect the 4-year lifetime of irrigation systems.

Challenges for Financing Irrigation

Lenders struggle to adapt their products to the unique risk profile of SHF due to limited formal collateral and seasonal cash flows

Agricultural borrowers often:	... which means banks must:
Operate in remote, sparsely populated regions	<ul style="list-style-type: none"> • Provide more bank branches and more innovative distribution models such as MFS and MFIs have
Have limited or no banking track record	<ul style="list-style-type: none"> • Reduce high collateral requirements • Seek credit guarantees
Face seasonal cash flows	<ul style="list-style-type: none"> • Provide flexible repayment to coincide with harvest • Focus on cash crops and non-seasonal produce such as dairy and eggs
Present crop risk from weather, pests, etc..	<ul style="list-style-type: none"> • Extend short dated loan tenors • Provide crop insurance
Often lack formal ownership of land	<ul style="list-style-type: none"> • Expect other formal collateral (property, machinery, stocks, savings) or guarantees from existing customers
Rarely have a business track record	<ul style="list-style-type: none"> • Require significant asset/cash collateral requirements • Charge high interest rates of ~18-34%
Work in complex and unstructured supply chains	<ul style="list-style-type: none"> • Focus only on structured supply chains (tea & dairy) • Limit supply chain finance to SME and large commercial farms • Base lending on assets

Challenges to uptake: water supply required to implement irrigation, high costs and access to financial services to fund investment

1 Lack of access to water infrastructure

Investment in irrigation technology requires ready access to a water source – whether through rainwater harvesting, borehole or larger scale irrigation infrastructure

2 Farmers unaware of benefits

Irrigation technology and drought resistant seeds are not yet common so extent of benefits are not widely known. Some farming techniques have been common practice for generations

3 High upfront costs

Majority of farmers currently rely only on rainwater so any upfront investment cost is viewed as high. Investment in seeds difficult to justify as high upfront costs and uncertainty of yield uplift

4 Difficult to reach remote populations

SHFs often operate in remote, hard-to-reach regions

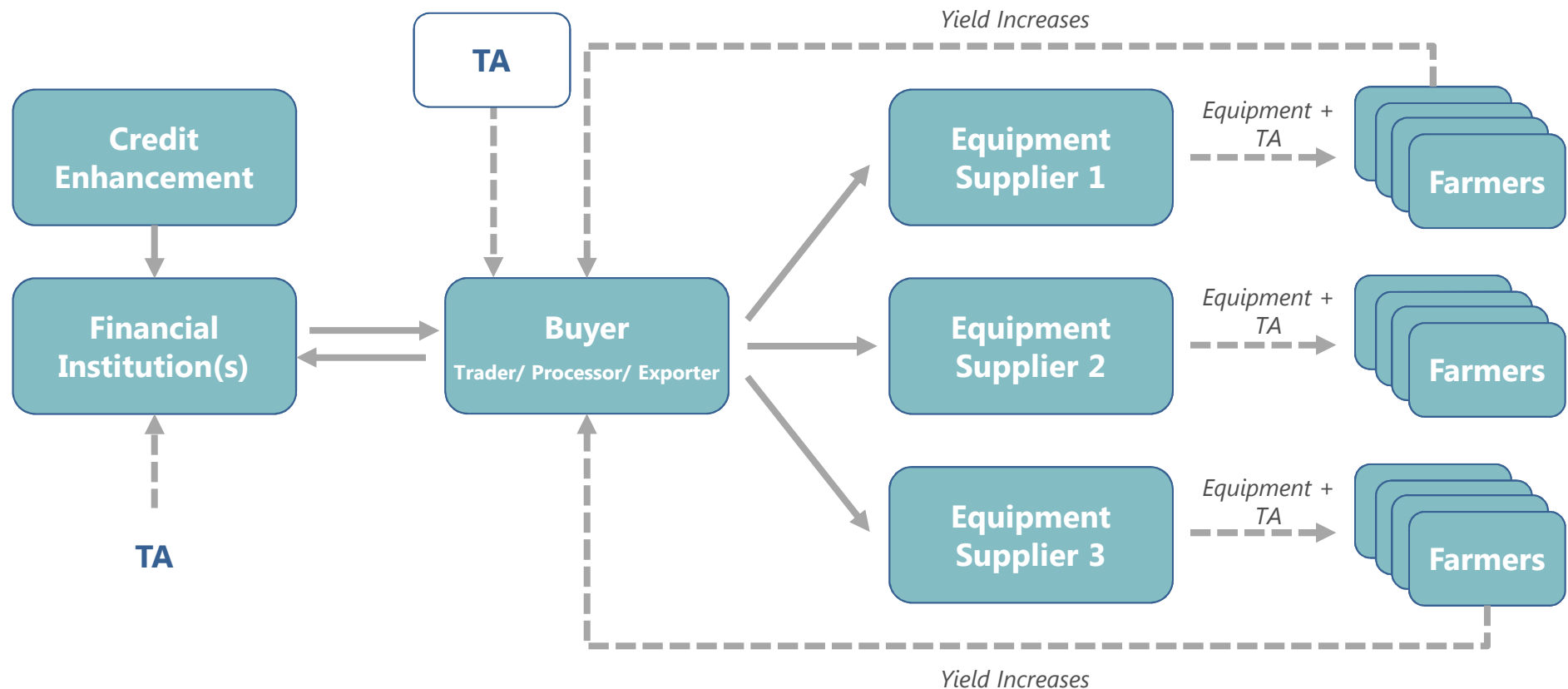
5 Access to financial services

31% of rural population have no access to formal financial services to fund investment

Potential Solutions & Next Steps

2030 WRG is convening stakeholders from across the value chain to identify and develop a potential financing model to catalyze increased investment in efficient irrigation in Kenya

With a first loss guarantee in place, financial institution lends to “buyer”* to purchase equipment on behalf of farmer(s); equipment supplier (ES) provides equipment + TA to farmer(s); buyer pays back loan to the financial institution thanks to increased yield



- > Product/ service flows
- > Financial flows

Note - *buyer can mean trader, aggregator or buyer

A number of financial institutions, buyers and equipment suppliers have expressed interest as potential partners

Financial Institutions

- Commercial banks, MFIs, asset finance lenders and other non-bank FIs
- Existing experience with agriculture and financial innovation (e.g. value chain financing) preferred



ONE ACRE FUND



REPUBLIC OF KENYA

MINISTRY OF WATER AND IRRIGATION

Buyers

- Traders, processors and exporters
- 'Anchor' player at centre of value chain
- Access to farmer networks and established linkages to market preferred



REPUBLIC OF KENYA

MINISTRY OF WATER AND IRRIGATION

Equipment Suppliers

- Suppliers of drip irrigation technology
- Existing experience with SHFs and capacity to provide after-sales services preferred



2030 WRG is looking for partners to catalyze investment...

1 Financial Service Players

2030 WRG is looking for financial institutions that want to expand their agriculture portfolio through innovative approaches such as leveraging data to innovate around new financial models

2 Government

2030 WRG is looking to further engage the Ministry of Water & Irrigation in creating an enabling environment for investment in water efficient irrigation.

3 Offtakers/Buyers

2030 WRG is looking for agricultural players that have existing relationships with outgrowers in Kenya; we are interested in working with companies that have at least 500-1000 existing growers but want to increase that number significantly

4 Development Partners

2030 WRG wants to partner with leading development institutions for funding opportunities including co-investment opportunities and/or grant opportunities to fund partnerships and new models

5 Irrigation Technology Suppliers

2030 WRG is already working with some of the leading global equipment suppliers to facilitate partnerships; we continue to look for other interested parties that want to increase their market footprint in Kenya

2030 WRG has plans to scale this to thousands of farmers across Kenya over the next 3-5 years and are looking for ambitious partners to help us achieve our goals!



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