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Transforming African Agriculture: the challenge of irrigation

改造非洲农业：灌溉之困

COHD Seminar on Critical Issues in Agrarian and Development Studies (CIADS), at the College of Humanities and Development Studies (COHD) at China Agricultural University
中国农业大学人文与发展学院“农政与发展”系列讲座

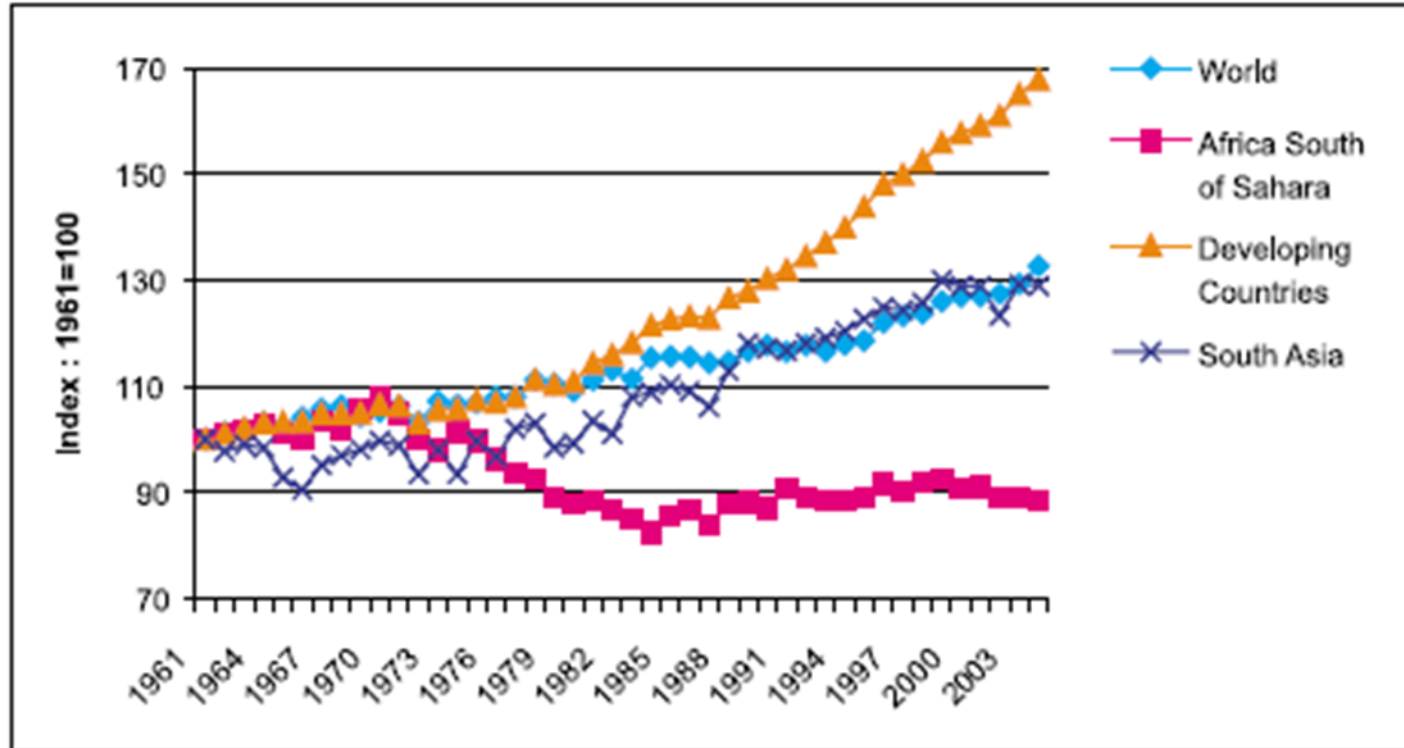
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Summary 概要

- African agriculture's productivity problem: investment risk 非洲农业的生产率问题：投资风险
- Risk is due to rainfall, but there is little irrigation development 风险来自于降雨，而灌溉体系几乎没有发展起来
- 'formal' irrigation is expensive and not always successful “正式的”灌溉费用不菲，而且不一定有效
- 'informal' irrigation is widespread but ignored by legislation and agricultural policy “非正式的”灌溉很普遍，但被法律和农业政策所忽视
- Irrigation development is taking place but needs attention to water rights, land rights, infrastructure 灌溉体系正在建立，但需要注重水权、地权以及基础设施

African agriculture's productivity problem 非洲农业的生产率问题

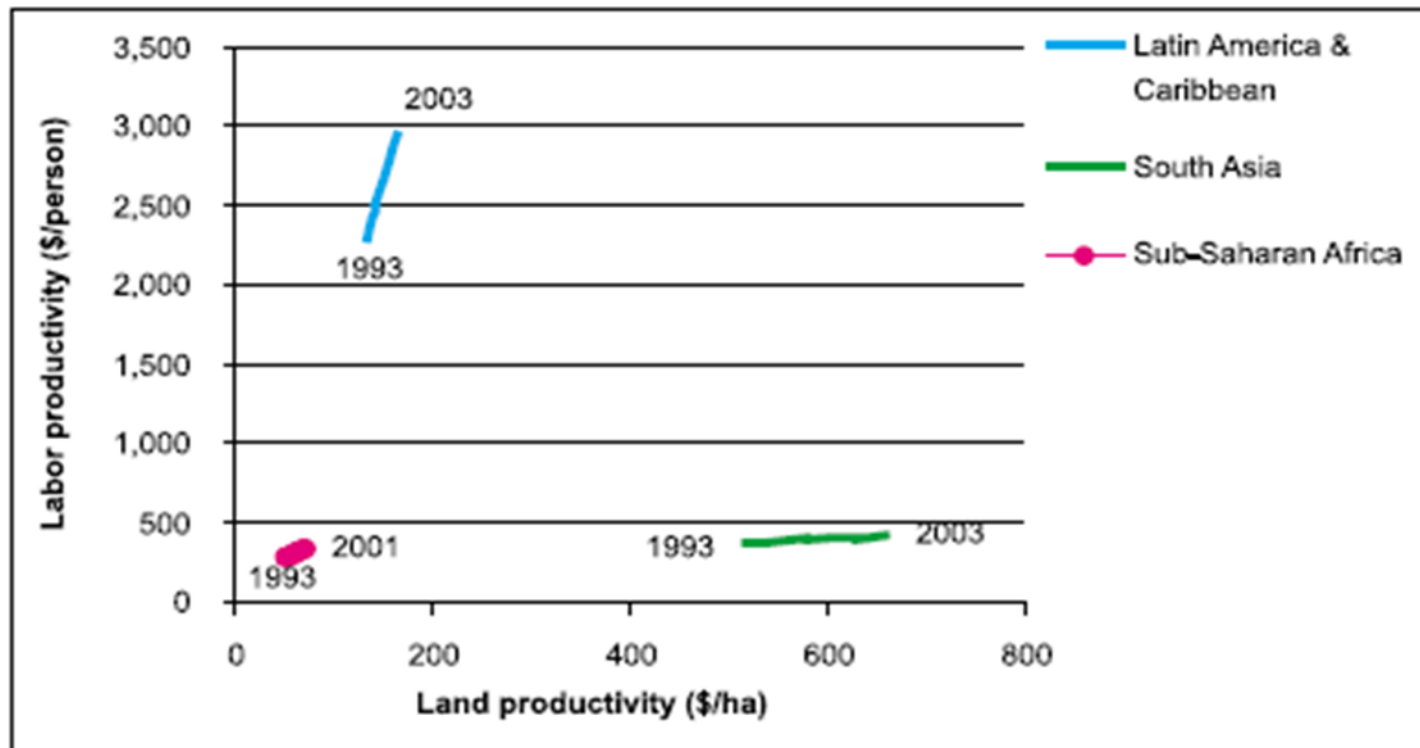


Source: FAOSTAT, 2006

Per capita value-added output of agriculture
人均农业增加值

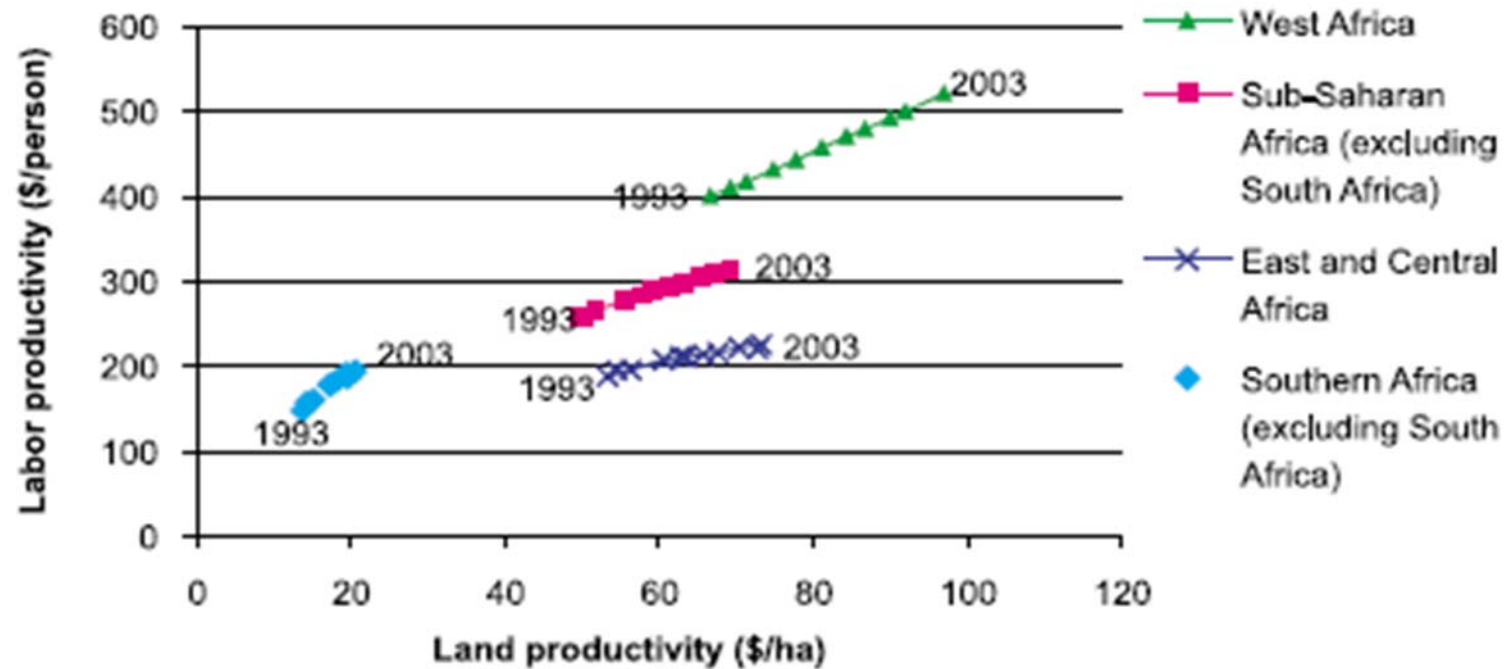
Land and labour productivity change 1993-2003
in Africa was lower than Asia or Latin America
(CAADP, 2006)

1993到2003年间非洲土地和劳动生产率的增长低于亚洲或拉美（CAADP, 2006）



Land and labour productivity *is* growing in
Africa (CAADP, 2006)

非洲的土地和劳动生产率在增长(CAADP, 2006)



The water constraint in African agriculture 水对非洲农业的制约

- 66% of sub-Saharan African is savanna: 非洲撒哈拉沙漠以南66%的地区属于热带草原
 - Very seasonal rainfall: 4-5 months per year 典型的季节性降水：每年4-5个月有雨
 - Large inter-year variation 每年降雨量变化幅度很大
 - ‘meteorological’ drought once or twice a decade 每隔五年或十年出现气候性干旱
 - dry spells of >10 days in 74-80% of rainy seasons 即便是在雨季，也有74%-80%的可能出现超过10天的干旱期。
- Rainfall unreliability inhibits investment: 降雨不确定阻碍了投资
 - e.g. in fertilizer, improved seed; 例如对化肥、良种的投入
- Low agricultural income causes young people to leave agriculture. 农业的低收入使年轻人放弃农业

BUT: Africa is using only 2-3% of its water compared to 25-35% in Asia 但是：非洲对水的利用率只有2-3%，亚洲是25-35%。

Sub-Saharan Africa lags behind in irrigation development

非洲撒哈拉以南地区的灌溉体系发展滞后

African agro-ecological region.	Formal (or "equipped") irrigation area / total area cultivated	% use of "equipped" irrigation area	Total area of water management / total area cultivated	"Equipped" irrigation as % of potential
Northern	28.1	80.4	28.1	88
Sudano-Sahelian	6.9	63.3	9.2	50
Gulf of Guinea	1.5	73.5	3.3	8
Central	0.7	47.5	2.8	1
Eastern	2.6	24.0	1.8	11
Southern	4.2	80.7	4.8	36
Indian Ocean Islands	30.4	99.4	30.7	71
Average Sub-Saharan Africa	3.5	71	4.5	18
Average Asia	33.6	66.9	34.3	

(adapted from Svendsen et al, 2009, using data from FAO, 2005)

A brief history of investment in ‘formal’ irrigation in Africa 非洲“正式”灌溉体系投资简史

- 1920s -1950s colonial ‘modernisation’: large-scale irrigation (Gezira model: small-scale tenants) 20世纪二十到五十年代殖民地的“现代化”：建设大型灌溉体系（杰济拉模式：小规模佃农）
- 1960s -1970s Post-independence dams for national development (Aswan, Akasombo, Kariba etc): 20世纪六十到七十年代：独立后为国家发展而修建大坝（阿斯旺大坝、阿卡松波大坝、卡里巴水库等）
- 1980s public debt crisis, public irrigation investment seen as expensive and inefficient, 20世纪80年代公共债务危机，对公共灌溉体系的投资被认为贵而不惠
- 1990s moratorium on large irrigation schemes and dams 20世纪90年代，叫停了大型灌溉方案和水坝建设
- 2005 – return to investment in large water infrastructure (hydropower, irrigation??) but using private, foreign capital 2005年——再次投资大型水利基础设施（水力发电，灌溉？）但引入了私人资本和外来资本

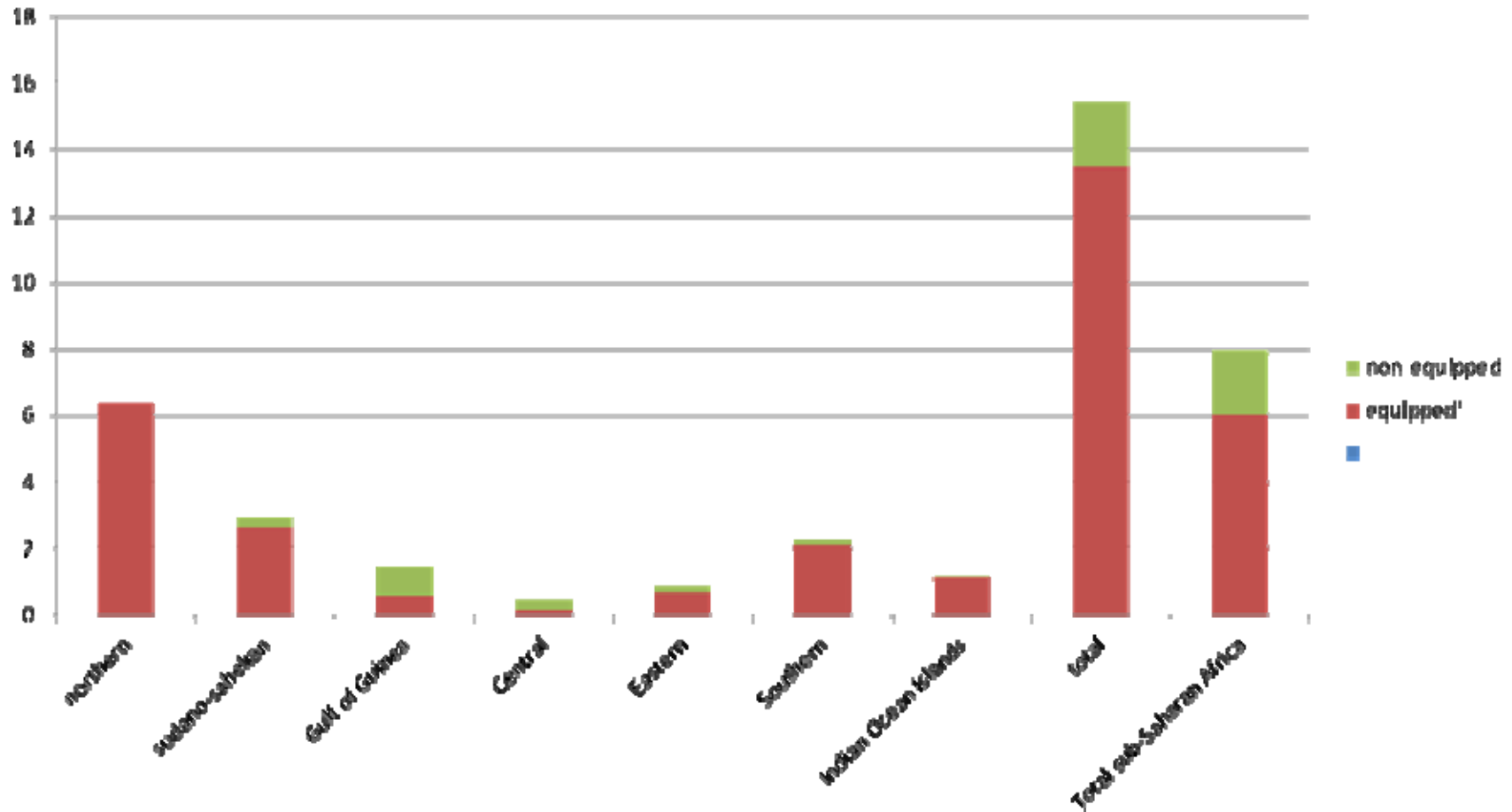
Drivers of current irrigation investment

目前灌溉体系投资的推动力

- Increased volatility of international food commodity markets since 2007
2007年以来国际粮食市场价格更加动荡不定
- Sense of food insecurity due to increasing cost of food imports 粮食进口成本增加，粮食不安全感增强
- Increasing interest of commercial financial investors and sovereign wealth funds in agricultural land 商业金融投资者与主权财富基金对农业用地日益感兴趣
- African governments seek commercial investment to raise agricultural output. 非洲政府寻求商业投资以提高农业的产出

FAO data 2005: How much is known about
'informal' irrigation in Africa ?

来自联合国粮农组织的2005年的数据：我们对非洲“非正式”灌溉体系了解多少？



More irrigation is found when detailed mapping is undertaken 细致的地图能展示更多的灌溉体系

	2003 ha	2010 ha	2011 ha
Messica	–	529	1,145
Manica district	300	6,677	14,000**
7 districts	1,208	10,035	21,500**
Mozambique	6,400	53,000*	115,000**

* Extrapolated from the PROIRRI results.

** Extrapolated from the MIPP results.

Local-level ('Messica') mapping of furrow irrigation by two different projects leads to much larger estimates for total at District level than is recorded by government agencies. (Beekman et al, 2014)

相比于官方记录，本地地图（由两个不同项目所绘制的梅斯卡地图）记录的沟渠灌溉体系更为丰富。

Farmers' initiatives in irrigation development 农民发起的灌溉体系建设



Techniques in expanding 'farmer-led' irrigation 扩大农民建设的灌溉体系的技术

- Peri-urban vegetable production (buckets and watering cans, some pumps) 近郊蔬菜种植 (水桶和水罐, 加上一些水泵)
- Hill-furrow (stream diversion) gravity irrigation 山地-沟渠 (山溪改道取水) 自流灌溉体系
- Drainage of wetlands and valley bottoms 湿地和谷底的排水系统
- Cheap motor pumps to raise water from shallow wells or rivers and lakes 廉价的机动泵, 从浅井或湖河抽水

Socio-economic aspects of 'farmer-led' irrigation 农民建设的灌溉体系之社会经济分析

- Commercial orientation: very responsive to market conditions 商业导向：对市场条件迅速做出反应
- Attracts immigrants from other areas, generates markets for land and labour 吸引了其他地区的移民，形成了土地和劳动力市场
- Generally governed by customary ('traditional') authority, rarely involves 'statutory' property (e.g. land titles) although transactions may be recorded 尽管也记录交易，但一般由习俗（“传统”）权威管辖，很少涉及“法定”资产（比如土地权）
- Water rights are locally agreed among irrigators 当地灌溉者共同决定水权
- Irrigators may seek investment for improvements (e.g. cement lining of earth furrows) from government or non-government agencies. 灌溉者可能为改善设施而向政府或非政府机构寻求投资（例如水泥沟渠）

What are the challenges? 有哪些困难？

- ‘informal’ or ‘farmer-led’ irrigation may be allowed (not always) but is rarely measured or registered as ‘water use’: no water is officially allocated. 政府或许会准许修建“非正式的”或“农民的”灌溉系统，但这些很少被计量，也很少做“用水”登记：没有官方配给的用水。
- Such irrigation is vulnerable to being displaced/destroyed by ‘official’ investment projects, without compensation. 这样的灌溉系统很容易被“官方”投资项目废弃或毁坏，得不到赔偿。
- Irrigation increases land value and there may be pressure for people to sell their land (or to lose their land to other family members): there will be ‘losers’ as well as ‘winners’. 灌溉能让土地升值，人们有可能因此被迫卖出土地（或者将土地让给其他家庭成员）：将有人获利，有人受损。

What are the challenges?

- Successful irrigation increases the demand for other inputs (fertilizer). 这类灌溉体系的成功让其他投入也增多了（如化肥）
- Access to markets (for products and inputs) is essential: poor infrastructure (roads especially) is a major obstacle. 与市场的连接至关重要（获取农业投入、出售农产品）：基础设施不善（尤其是道路）成为重大障碍。
- How can official investment increase the social benefits of farmers' initiatives? 官方投资如何能让农民发起的灌溉体系产生更多的社会效益呢？