

Hatch Lecture

KEEPING SCIENCE OUT OF AFRICAN AGRICULTURE

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As an outsider to the Land Grant system, it is a particular honor to deliver this lecture celebrating the 19th Century vision and leadership of William Henry Hatch (1833 – 1896). Of course I'm not a complete outsider, since my father and grandfather both taught at a Land Grant institution, as did two of my uncles; and I have a cousin currently teaching at a Land Grant, whose father previously managed the university farms at a Land Grant. By not teaching at a Land Grant myself, I became the black sheep of the family who strayed from the fold. But I am not a complete stranger to the values and virtues of our public and Land Grant universities, so perhaps for this morning at least you will be willing to treat me as an honorary insider.

If you read a bit about Congressman William Henry Hatch, you will learn that he came from a modest background and never gained more than modest national political visibility in his lifetime. A circuit-riding lawyer from Hannibal, Missouri, he was first elected to Congress in 1878, where he earned an affectionate nickname of "Bull Butter Hatch," after sponsoring the nation's first Oleomargarine Act. He was defeated for the Speakership, and never realized his life's ambition to become Secretary of Agriculture, but he did rise to Chair of the House Committee on Agriculture, and in that capacity in 1887 he sponsored what became a landmark piece of legislation that bears his name – the Hatch Act – providing, for the first time, federal aid to state Agricultural Research Stations, which were linked to America's new land grant colleges.

Thus it was thanks to Hatch that agricultural research gained formal and lasting taxpayer support from Congress. The experiment stations funded by the Hatch Act later provided, as well, a necessary foundation for the creation of state cooperative extension services, under the Smith-Lever Act of 1914. The final result was a powerful troika of publicly funded agricultural scientists, educators, and extension agents, working side by side within public universities, which brought more than a century of unprecedented productivity growth to our nation's commercial farms. I teach public policy at the Harvard Kennedy School, where there are not too many agricultural specialists, but I can assure you that most of my colleagues are fully aware of the proven success of the Land Grant system, as the "gold standard" when it comes to an institutionalized means to generate

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government-led innovation and productivity. Both they and I, as Land Grant outsiders, can make such statements without the usual taint of self-congratulation.

Yet in one sense, William Henry Hatch's original vision, 126 years ago, was not particularly bold, or even original. Governments in Western Europe had been devoting significant public funds to agricultural science ever since the state of Saxony created a research station in 1852, 35 years before the Hatch Act, an approach that came to be known as the "German" model. Spending public money this way would be naturally appealing to American politicians at that time as well. In 1887, nearly half of all Americans were still employed in the farming sector, so sponsoring a stronger application of modern science to that sector was certain to generate a payoff for the many, not just the few. We might even wonder why Congress didn't act sooner than 1887, since there was virtually no controversy when the step was finally taken. After no debate at all, the original Hatch Act passed the House of Representatives by an overwhelming final vote of 152-12. I might speculate about why today's Congress finds it so difficult to agree on bipartisan actions of this kind, but that would be the subject of a much longer lecture.

Moving from the past to the present, this early history of agricultural science in America makes me think about Africa. Africa today is a Continent just as agricultural, and just as poor, as America was back in 1887. I have been visiting Africa on a regular basis for the past two decades, to study and consult on agricultural development policy, and at latest count I have visited 16 different countries on the Continent, which is still fewer than one third of the total, but I hope it counts as a good start. I defy anyone to visit small farms in Africa and not come back in a state of urgent concern. Farmers in Africa today are still missing all of the things that farmers in the rest of the world have used to increase the productivity of their labor and escape poverty. Only about 25 percent of African farmers today plant improved seeds. Only 4 percent of African farms have irrigation, most still do not use any chemical fertilizer, and veterinary medicine is almost entirely absent. Farm tasks are performed without any powered machinery, in part because only a small minority of farmers enjoy access to fuel or electricity. Improved storage and transport is missing. Roughly 70 percent of African farmers live more than 2 kilometers from the nearest paved road, so nearly all household transport still takes the form of carrying things on foot. As a result of these deficits, cereal crop yields in Africa are only 1/10 as high as in Europe or North America, the average income of smallholders is only a bit more than \$1 a day, and one third of these smallholders are chronically undernourished.

Roughly 60 percent of African citizens are farmers, so overcoming these crippling deficits should be seen as Africa's number one development task, and this is a task that cannot be accomplished without much larger local investments in agricultural education, research, and extension. Farming technologies cannot be

parachuted into Africa from the outside, because Africa's crop mix is distinct, and because its soil, water, climate, labor, and capital endowments are highly diverse, implying needs for a broad research effort based on site-specific and locally-done technical adaptation and development.

Given the clear example of what Europe and America did for farm productivity using modern science, plus the more recent example of what Asian farmers gained from the green revolution science of the 1960s and 1970s, you might think that today's political leaders in Africa would be eager to move down this same proven path. You might guess that these leaders would have been busy in recent years building strong public agricultural research systems, linked to public agricultural universities and extension services. You might think this, but in 8 of 10 cases you would be wrong. Most governments in Africa have remained surprisingly disinterested in farm science as a pathway out of rural poverty.

To judge the commitment of these governments to agriculture and farm science, you have to follow the money – or in this case, the lack of money. Even though more than 60 percent of their citizens depend on agriculture for income and employment, national governments in Africa have persistently spent only about 5 percent of their public budgets on any kind of agricultural development. By contrast, during the original green revolution in Asia governments typically spent 15 percent of their budget on Agriculture, three times the African rate. In 1972 the Government of India was spending 22 percent of its budget on agriculture, more than four times the average in Africa today.

Africa's leaders have repeatedly promised to do better, but so far with little result. At an African Union summit meeting in Maputo in 2003, Africa's heads of government pledged to be spending at least 10 percent of their budgets on agriculture by the end of 2008, but when that deadline arrived only six countries had met that target, while 39 had not, and in many of those 39 the share of spending going to agriculture had actually declined between 2003 and 2009. Earlier this year, the ONE campaign did an updated review of the spending patterns of 19 African countries, and found that only 4 of the 19 had met the 10 percent target. Meanwhile 7 were "seriously off track," with less than 5 percent of their expenditures going to agriculture. Three of the worst performing governments were Kenya, Tanzania, and Nigeria. In all 19 of these countries together, government spending was falling \$4.4 billion short of the pledged level.

Regarding agricultural R&D specifically, spending by governments in Africa has been dangerously low for decades. According to a 2006 study by Beintama and Stads, between 1991-2000, the annual rate of growth of agricultural research spending in all of sub-Saharan Africa (minus Nigeria and the Republic of South Africa), was *negative* 3/10ths of 1 percent. Since 2000, there has been scant improvement. Africa's own governments (through NEPAD) have established an investment "target" for R&D spending of 1 percent of agricultural GDP, but as of 2006-08, out of 11 countries for which data was available, only 5 had met this

“research intensity” target, and many were actually going in the wrong direction. In fact, according to data from Pardey, Alston, and Chan-Kang, out of 43 countries in Sub-Saharan Africa in 2009, 20 were actually maintaining a lower research intensity for agriculture than back in 1980. According to the Forum for Agricultural Research in Africa (FARA), based in Ghana, even a doubling of the current level of public spending on agricultural R&D in Africa would still fail to repair local capacity deficits, particularly in areas such as agronomy, soil science, and pest management.

Africa’s public agricultural research systems are employing a growing number of scientists, but too often they work without the labs, computers, chemicals, vehicles, or the greenhouse facilities needed to do actual research. This is little more than thinly disguised unemployment, generating little in the way of genuine agricultural science. Average spending per agricultural scientist in Africa also declined by about half between 1971 and 2000, so we can surmise that not even salaries have been keeping up. In parallel fashion, while Africa’s agriculture-related universities, colleges, and schools have increased in number, fewer than a half-dozen actual researchers may be employed at each of these institutions, so the actual research gain is minimal. As for Africa’s public-sector agricultural extension systems, they have long been underfunded and moribund.

Many of Africa’s deficits in other areas can be traced to the colonial era, but when it comes to agricultural research, Africa’s colonizers actually spent a larger share than today’s independent African governments. In 1960 under colonial rule, the region of Sub-Saharan Africa benefitted from 10 percent of total global public sector agricultural R&D. By 2009, that share was down to just 6 percent. If we combine public and private R&D spending on agriculture today, sub-Saharan Africa accounts for less than 1 percent of the global total.

These inadequate African investments in agricultural science come at a heavy cost. Calculations made at USDA in 2008 revealed that the rate of growth of total factor productivity in African agriculture was only one third as high as in the developing countries of Asia between 1991-2006, even though Africa was starting at a lower level and in terms of growth rates should have had a catch-up advantage. Africa’s much slower growth rate in total factor productivity has meant the Continent is not closing the gap, but instead is falling farther behind. Calculations just recently published by the Global Harvest Initiative show that Total Factor Productivity growth in African agriculture averaged only 1 percent annually between 2001-2010, while Africa’s projected annual growth in food demand between now and 2030 will be close to 3 percent. Only 25 percent of this added demand will be satisfied through productivity growth if the current trend continues, so the rest will have to be imported, or produced in Africa using today’s low-yield techniques, which will imply still more area expansion, soil degradation, forest loss, and habitat destruction.

Corrective actions by governments will be essential to avoiding this nightmare. If African governments fail to make adequate investments in agricultural science, private companies will not come in to make up the deficit. Some private companies today are investing in Africa's farm to market value chains, but little private money is going into local research. Only 2 percent of all agricultural R&D investments in East Africa are being made by private companies, and in West Africa, only 1 percent.

For those with long memories, this should not be surprising. Remember that the original green revolution of the 1960s and 1970s was not funded by private investments; it was a project conceptualized and launched by philanthropic foundations such as Rockefeller and Ford, and then driven forward by public sector spending from national governments, USAID, our own Land Grant and public universities, international financial institutions such as the World Bank, and also a number of not-for-profit NGOs.

China's remarkable take off in agricultural productivity after 1978 was similarly driven by public rather than private investments, and in the case of China even the philanthropic foundations, foreign donors, Land Grants, and NGOs were missing. Africa has plenty of NGOs, and they are good at some kinds of service delivery, but they provide little basic infrastructure such as roads, power and irrigation, and few are in a position to fund local agricultural R&D.

All of this raises the question, "Why are governments in Africa not spending more on agricultural research?" The slow payoff from research investments isn't a good excuse, because the slow payoff has not stopped governments in other regions from investing. Moreover, the best evidence shows that returns on farm research investments are actually higher in Africa than in some other regions. A 2003 study by Thirtle, Lin, and Piesse found the average rate of return to agricultural R&D in Africa was 22 percent, more than three times as high as for Latin America, and only a bit lower than the rate of return for developing countries of Asia, which was 31 percent. The authors of this study concluded that the farm output growth resulting from every dollar spent on agricultural research in Africa is more than enough to repay the investment cost, and every \$144 spent *permanently* brings another African citizen out of poverty. You can't say that for most of the things African governments actually do spend money on.

The chief reason for Africa's underinvestment in its own farming sector is something outsiders can do little about, namely an unfortunate maldistribution of political power within Africa, between the city and the countryside. This is something Americans have a hard time understanding. Here in the United States, farmers are few in number but well organized, and politically powerful. In Africa, however, farmers are numerous but poorly organized, and politically weak. Smallholder farmers in Africa have little or no political voice because they are mostly women, not yet literate, poorly informed about their government, and physically cut off from the capital city by bad roads and geographic distance.

Compared to urban dwellers in Africa – including the army, the police, government workers, students, and laborers – smallholder farmers in the remote countryside are all too easy for governments to ignore.

The result is a damaging “urban bias” in African policy that hurts poor farmers. This is a problem outsiders cannot solve, but they should at least resolve not to make it worse. We have to admit that foreign governments did worsen matters in the 1980s and 1990s, when they cut back sharply on foreign assistance to African farming. Between 1980 and 2006, United States agricultural assistance to the countries of sub-Saharan Africa actually declined by 86 percent, even as farm yields on the Continent were flattening and the number of chronically undernourished people in Africa was doubling. International financial institutions also abandoned the agricultural development task. In 2005, World Bank President Paul Wolfowitz said in an off-hand comment to journalists, “My organization’s mostly gotten out of the business of agriculture.” Because the donor community was walking away from supporting agriculture in Africa, it should have been no surprise that so many of Africa’s aid-dependent governments did the same.

To make things even worse, some in the international NGO community began using their influence to argue that applying agricultural science to farming in Africa would actually be a mistake. These organizations pursue a vision they call “food sovereignty,” which celebrates traditional seeds and indigenous knowledge rather than productivity-enhancing farm science. This science-free approach has gained surprising influence; it was indirectly endorsed by a highly publicized 2008 International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), prepared under the auspices of the United Nations and the World Bank. The content of this unhelpful report had been shaped by non-governmental organizations such as Greenpeace International, Friends of the Earth, and the Pesticide Action Network. The report warns that the science-based green revolution approach to agricultural innovation will bring too many “unintended social and environmental consequences.” In place of agricultural science, this widely cited report calls for more emphasis on agroecological approaches, organic approaches, and the incorporation of “traditional and local knowledge.” This sounds to me too much like an acceptance of the status quo. Most of Africa’s poorest smallholder farmers today are already *de facto* organic, because they don’t use any synthetic fertilizers or pesticides, and that does not make them any more productive, or any less poor.

For the African political leaders who had fallen under the spell of this bad advice, the dramatic spiking international food prices in 2008 should have been a wake-up call. When prices spiked, and urban consumers rioted in the streets, some African governments did try to stimulate their own food production through measures such as fertilizer subsidies, but unfortunately they continued to skimp on longer-term investments in rural infrastructure, or agricultural research. One multi-country study, due to be published next year, found no example of a

government in Africa that responded to the 2008 food price spike with significantly increased spending on agricultural research.

Fortunately, the 2008 price spike did have a healthy impact on the foreign assistance policies of rich countries. In 2009 at a G8 summit in Italy, the donor countries pledged to spend \$22 billion over the next three years to support sustainable agriculture and food security in poor countries. The Obama Administration went forward to meet America's share of this pledge, through its multi-agency Feed the Future (FtF) initiative. Then at the Camp David summit in 2012 these same G8 leaders announced a New Alliance for Food Security and Nutrition, the fruition of a Grow Africa partnership earlier launched between the African Union and the New Partnership for Africa's Development (NEPAD), plus the Davos World Economic Forum. This New Alliance carries a hope that more than 100 private companies, half of them from Africa, will eventually contribute \$4 billion in new private investments to support farming and food security. Simultaneously at the urging of the G20, a new multilateral Global Agriculture and Food Security Program (GAFSP) was created at the World Bank. And the Bill and Melinda Gates Foundation expanded its own grant-making through an Alliance for a Green Revolution in Africa (AGRA). I have celebrated this long overdue revival of international support for agricultural development in Africa, yet I fear one piece of the puzzle is still missing: increased resource commitments from African governments.

For example (and I apologize for naming names), the government of Tanzania has been a prominent participant in all of the new initiatives I just mentioned, including Feed the Future, GAFSP, Grow Africa, the New Alliance, and AGRA. On its own, the Tanzanian government even launched an Agriculture First ("Kilimo Kwanza") initiative in 2009, and it became host to a new Southern Agricultural Growth Corridor for Tanzania project (SAGCOT). Yet the share of Tanzania's own budget going to agricultural development, at latest count, remains below 7 percent, in a country where 70 percent of all citizens live in the countryside and depend on agriculture. As a result, smallholder farming in the country continues to underperform. Fertilizer use in Tanzania remains negligible, at only 4 kg/ha, which is only half the average for the rest of Africa, and less than 10 percent of the official 50 kg African target set by CAADP. Consequently, according to the latest data from FAO, average maize yields in Tanzania in 2012 were only 1.2 tons per hectare, which is actually *40 percent below Tanzania's own maize yield average from a decade earlier*. Instead of using science to boost maize yields, Tanzania has simply been putting more acreage under the plow. Cultivated maize area in Tanzania has actually increased three-fold since 1995, which means production is moving onto dry and sloping lands that of course produce lower yields, plus greater soil erosion, plus escalating conflicts with pastoralists.

The Government of Tanzania has no excuse for this performance. It gets plenty of foreign aid, it isn't land-locked, and it has not had a civil war. Yet it persistently takes a "worry later" approach to its own desperate farm productivity needs.

So, you can see where I'm going here. Without more political and resource commitments from Africa's own governments, our recently revived international support for farming on the Continent will fall short. What Africa's smallholder farmers need today is the same thing America's own low-resource family farmers needed from their government 126 years ago: much larger public investments in agricultural research, education and extension. Not to mention rural roads, rural power, and irrigation.

To put it another way, African governments in the 21st Century need multiple reincarnations of our own 19th Century visionary leader in public resource commitments to farming, William Henry Hatch, the worthy namesake of this annual lecture, which I am pleased to deliver today, in his memory and honor.