

Research Application Summary

Public-Private-University partnerships in agriculture science research for economic development in Africa: Lessons from North Carolina's Research Triangle Park

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Abstract

The objective of this paper was to discern how public-private-university partnerships (PPUPs) in Africa can support agriculture science research for economic development, similar to what Research Triangle Park (RTP) has done for North Carolina and the South East United States. Agriculture departments provide research, extension, and training services as public goods. In addition, the Private Sector, Non-governmental Organizations, University Faculties and Colleges of Agriculture, Farmer Organizations, and Commodity Groups also provide similar services. The various service providers rarely work together, let alone set common goals. This lack of collaboration leads to duplication of effort, inefficient and ineffective services delivery, resources waste, and little impact. Agriculture is the main economic activity in most African countries. Therefore, little impact in agriculture translates to food and nutritional insecurity, unemployment, and poverty. Underperforming agriculture in Africa is attributed among others to: (a) lack of capacity; (b) inaccessible financial resources; (c) inappropriate research; (d) ill-focused extension services and illiterate farmers; (e) lack of business and resource management skills; as well as (f) communal land tenure system that discourages private investments and indirectly nurtures resources overexploitation and leads to the phenomenon of "*The Tragedy of the Commons*." In the 1950s visionary leadership in North Carolina conceived the RTP. The area was then, economically depressed. The RTP includes the land within the perimeter of a triangle formed by University of North Carolina at Chapel Hill, Duke University in Durham, and North Carolina State University in Raleigh. This ultra-successful public-private-university partnership can serve as a model for partnerships in Africa. Today, the RTP is an economic-hub, not only for North Carolina, but for the South-East United States. It is home to some of the world's largest agricultural and biosciences companies. The RTP partnership pooled resources and worked and achieved common economic development goals. Agriculture is local. Therefore, PPUPs in Africa should be in line with local agricultural and economic development goals. How the RTP's public-private-university partnership can serve as a model for similar partnerships in Africa is discussed.

Key words: Africa, agricultural science, economic development, PPUPs, research and development, RTP

Résumé

L'objectif de cet article était de discerner comment les partenariats universitaires public-privé (PPUPs) en Afrique peuvent soutenir la recherche en sciences de l'agriculture pour le développement économique, semblable à ce que le « Research Triangle Park » (RTP) a fait pour la Caroline du Nord et du Sud-Est des États-Unis. Les départements d'agriculture font de la recherche, la vulgarisation et les services de formation en tant que biens publics. En outre, le secteur privé, les organisations non gouvernementales, les facultés universitaires et collèges d'agriculture, les organisations paysannes et les groupes de produits fournissent également des services similaires. Les différents prestataires de services travaillent rarement ensemble, fixent seuls les objectifs communs. Ce manque de collaboration conduit à la duplication des efforts, à l'inefficacité et ineffectivité de la prestation des services, aux déchets des ressources, et à peu d'impact. L'agriculture est la principale activité économique dans la plupart des pays africains. Par conséquent, peu d'impact dans l'agriculture se traduit par l'insécurité alimentaire et nutritionnelle, le chômage et la pauvreté. La sous performance en Afrique est attribué entre autres: (a) au manque de capacité; (b) à l'inaccessibilité des ressources financières; (c) à la recherche inappropriée; (d) aux mauvais services de vulgarisation et à l'analphabétisme des agriculteurs; (e) à l'absence des compétences d'affaires et de gestion des ressources, ainsi que (f) au manque d'un système foncier communal qui décourage les investissements privés et qui indirectement nourrissent la surexploitation des ressources et conduit au phénomène de «*The Tragedy of the Commons*». Dans les années 1950 un leadership visionnaire en Caroline du Nord a conçu le RTP. La région était alors économiquement déprimée. Le RTP comprend le terrain dans le périmètre d'un triangle formé par l'Université de Caroline du Nord à Chapel Hill, Duke University à Durham, et North Carolina State University à Raleigh. Ce partenariat public-privé-université ultra-réussie peut servir de modèle pour les partenariats en Afrique. Aujourd'hui, le RTP est une autoroute économique, non seulement pour la Caroline du Nord, mais pour le Sud-Est des États-Unis. Il abrite quelques-unes des plus grandes entreprises agricoles et biosciences du monde. Le partenariat RTP mise en commun des ressources et a travaillé et a atteint les objectifs économiques communs de développement. L'agriculture est locale. Par conséquent, PPUPs en Afrique devraient être en ligne avec les objectifs locaux de développement agricole et économique. Comment le partenariat public-privé-université de la RTP peut servir de modèle pour des partenariats similaires en Afrique est discuté.

Mots clés: Afrique, sciences agricoles, le développement économique, PPUPs, recherche et développement, RTP

Introduction

During the 1950's North Carolina's economy was in decline, and like today's Eastern Cape Province, South Africa, the state could not employ all its college graduates leading to emigration of talent to other states (Link and Scott, 2000). Visionary leadership in the state's treasurer, the president of Wachovia Bank, and a Greensboro building contractor bore the idea in 1954 of "a research park" in the triangle area defined by North Carolina State University in Raleigh, University of North Carolina at Chapel Hill and Duke University in Durham. The

trio envisaged using research expertise from the three universities to collaborate with the public and business and address North Carolina's needs for Industrial Growth. These leaders agreed to keep the Research Triangle project private, and hoped universities, "by the research atmosphere that their very existence creates," would attract industry, "by providing a wellspring of knowledge and talents for the stimulation and guidance of research by industrial firms" (Link, 1995). That vision was realized. The first research companies arrived in 1959, and today, the RTP spans 6,900 acres and is home to 137 organizations with 41,600 employees including 104 research companies with over 40,000 research employees. And among many companies started by academics, the world renowned StrataCorp (SAS Statistical Software) is one of them. The RTP set aside land to bring faculty from the three universities and Park scientists to work collaboratively in what is "park within a park" called the *Triangle Universities Center of Advanced Studies, Inc.* (Link and Scott, 2000). Collaboration between industry and university science bore fruit.

While African countries do not have the resources to set up local RTP equivalents, they have universities and Faculties of Agriculture and Science that should set aside the academic Ivory Tower mentality and become epicenters of economic development in their respective locations. Research collaboration with all stakeholders should be nurtured, if the farming communities are to benefit. When that happens, agricultural productivity will increase and economic growth ensue. This paper examines how PPUPs can be effective instruments to bolster R&D, boost agricultural productivity in Africa and grow the economies of Africa. During the last few years, Japan has experienced economic hardships. This may have prompted the Nation Island to create a Center for Collaboration among Agriculture, Industry and Commerce, Tokushima Prefecture. The Center is to be the nucleus of revitalization, and its mandate is to coordinate with other universities, local government to conduct R&D related to collaboration between agriculture, industry and commerce, providing education and educational support to foster personnel in the sixth-sector industry (<http://www.tokushima-u.ac.jp/ccaic>). Could this be Japan's copycat RTP? Only time will tell.

Framework for PPUPs success

University Faculties of Agriculture in developed countries work closely with the private sector in all aspects of agriculture value chains (Tartari *et al.*, 2012). In line with that development, universities in Africa must adopt and adapt this strategy and promote entrepreneurship among faculty and students, especially Graduate Students. That will keep these institution current and competitive while they play significant roles to develop their country's agriculture and economy.

Over the last decade or so, public investment in production agricultural (R&D) has declined the world over, except in China (Syngenta Foundation for Sustainable Agriculture, 2016). However, private investment in agriculture activities and capability continue to grow. This bodes well for R&D partnerships that bring resources of the private and public sectors and universities together to benefit farmers. PPUPs are necessary to advance R&D and meet global challenges in food and nutritional security. They have various stakeholders including, private companies, Non-Governmental Organizations, universities, local and international

research institutes, foundations, communal, smallholder and commercial farmers among others.

PPUPs bring comparative advantages and utilize expertise to the maximum, and they achieve more than when partners operate independent of each other. To function properly, partners in PPUPs need (i) to trust one another, (ii) to agree on the objectives of what they are working on, (iii) identify the roles each takes, and (iv) to have the responsibilities, and incentives. When Intellectual Property arises from research, all partners must benefit. In addition to the above, Canhoto and Quinton (2016) reported of five other practical principles to make university-industry collaborations work. These are (1) sharing information in ways that are accessible and relevant to partners; (2) identifying discrepancies in models and investing in establishing a common language; (3) leveraging third-party brokers; (4) developing trust through small wins and regular interaction; and (5) assembling teams with common attitudes and complementary skills.

This encourages partners towards a common vision and will lead to increased agricultural productivity. And, PPUPs leverage the strengths of all sectors in partners. For example the highly skilled agricultural researchers in universities and at government stations can be complemented by excellent and efficient managers from industry. This interaction with stakeholders in the agricultural continuum will assist universities to fine tune their curricula to meet changing societal needs. For example, in view of climate change, course relating to climate smart, precision and sustainable agriculture as well as on agricultural trade and regulations should be introduced to familiarize students with the complexities of today's agriculture.

Agriculture science research is cornerstone to economic development

Agriculture is a multidisciplinary science encompassing basic and applied, natural and human sciences. Basic sciences in agriculture include botany, biology, bioinformatics, chemistry, genetics, genomics and all-omics, geology, hydrology, mathematics, microbiology, engineering, physics, physiology, statistics; and applied sciences aquaculture, bio- and nano-technology, climatology, geography and geographic information systems, all areas of animal and veterinary sciences, plant, crop and weed sciences, soil sciences, environmental sciences, economic, legal, marketing, political, and social sciences. Therefore, for agricultural R&D to be effective there is need for collaboration by scientists with different skills.

As a multidisciplinary science, agriculture is, best research should be conducted collaboratively by universities, the public and private sectors through multidisciplinary teams, and when needed international partners. African economies are agriculture-based. Therefore, economic growth is often associated with concomitant agricultural growth. And, agricultural growth is closely associated with application of new technologies from R&D. Research creates value for communal, small-scale, and commercial farmers, and Ocholla and Onyancha (2006) reported the significant role research has, in increasing agricultural productivity in Africa. The private sector is driven by profits. And, due to prohibitive acquisition and operational costs, private companies often do not have large research facilities as those in the public-

sector. Therefore, collaboration should enable best use of large public and university research farms and facilities (Ayyappan *et al.*, 2007). Involving the private sector to promote R&D in Africa should reduce poverty and drive economic development, because most economies in the region are agricultural. The continent needs local and foreign private development investment. From the foregoing I believe the anonymous quotation “*good science depends on effective collaboration and linkages with other top quality research institutions, industry and potential end-users*” holds.

Universities: Hotbeds for innovation and technical progress

Like the RTP and most universities in developed nations, African universities should be hotbeds of innovation. Governments must be made to understand the potential of direct economic benefits from R&D so that treasuries can fund research infrastructure upgrades and maintenance. When researchers James Watson, Francis Crick, Maurice Wilkins and Rosalind Franklin co-discovered the double helix structure of DNA in the 1950s, (Pray, 2008), our understanding of the genetics of inheritance in humans, plants, animals and all living things has never been the same. They collaborated to explain the principles underpinning Mendelian inheritance, what the monk Gregor Mendel, an agricultural researcher in his own right, had sought to do in 1865 and 1866. Crick and Watson’s (1953) discovery heralded the birth of modern-day biotechnology industry and its numerous scientific and industry applications.

Similarly, another researcher “*the father of the fertilizer industry*” Justus Freiherr von Liebig discovered fertilizer at University of Giessen, Germany in the 1840s, and forever changed the limits of agricultural production. To encourage R&D and nurture entrepreneurship, African universities must consider to have small business incubators on their campuses or as consortia in a province. Even with its ultra-success, the RTP continues to support a thriving business incubator to develop the next generation of entrepreneurs and products.

Technical progress in agriculture

Ever since humans left hunter-gathering some 10,000 years ago, agriculture has witnessed numerous trail blazing technological developments that increased productivity. These technological developments result from R&D and reach farming communities through extension services. Technical progress has been, and still is, being achieved in all multidisciplinary science areas comprising agricultural sciences.

Technical progress leads to increased productivity and to improved efficiency in crop and animal husbandries. Most breakthroughs in agriculture can be traced to universities of agriculture around the world. The Land-grant University System in the United States of America, set up by an Act of Congress proposed by Vermont Senator Justin Smith Morrill (The Morrill Acts of 182 and 1890) to develop agriculture and the military sciences has a lion’s share of these contributions. Suffice to say that, the system’s contribution to agricultural progress has been felt around the world. This visionary agricultural development system has

moved America from a rural economy to the most industrialized and the only super power in the world. The land-grant system illustrates how success is achieved when collaboration among main services provider in agriculture of research, extension, and training is nurtured. Today, the system is at the forefront of collaborating with all agriculture stakeholders including the private sector. Unfortunately, most African universities and their faculties of agriculture do not work as closely with government researchers and extension personnel, let alone with industry. This I believe is a major cause of ineffective services delivery and concomitant little impact on farming communities. By weighing available data, and drawing from my experience on three continents, research partnerships among governments, research, industry, community organizations, non-governmental actors and when need be, with overseas partners will improve food safety and nutritional security, increase animal and crop productivity in view of changing climate, improve animal welfare, boost economic wellbeing and improve the quality of life in Africa.

Challenges in research collaboration

Public-private-university partnerships in R&D in Africa must prevail, if the end users are to benefit. However, certain challenges must be addressed to increase the chances of success in collaboration. These include clarification of issues of Intellectual Property and patents emanating from R&D. Transparent legal agreements in research partnership documents can go a long way toward addressing this. There is also need for clear guidelines on how collaborative research is financed and how technologies are later transferred to clientele. The risks associated with investment in agriculture production also influence agricultural R&D in Africa. They include among others uncertainties of return on investment especially in smallholder agriculture. This risk is compounded by the fact that governments in developing countries have neglected implementing agriculture friendly policies, and view agriculture as old-fashioned (Foresight, 2011). Even after the Maputo Declaration on Food Security in Africa (2003), where Heads of States in the African Union committed to the Comprehensive Africa Agriculture Development Program (2003) to increase the portion of agriculture in national budgets to at least 10 per cent, there is no evidence that this has happened. Paradoxically, support for agriculture activities including research has increased in industrialized nations (Sahan and Mikhail, 2012) to the point of transforming urbanized economies. This commitment to agricultural development is evidenced by the rise of urban and peri-urban agriculture activities within and around cities and even atop skyscraper in Berlin, Chicago, London, Los Angeles, New York, Paris, Sydney, and Tokyo.

Underdeveloped arable land and natural pastures in Africa pose further challenges, as is lack of effective water resources management, lack of R&D capacity, and high costs of agricultural production inputs such as fertilizer, seed, and agro-chemicals because they are imported. Other challenges include underdeveloped irrigation, communication, markets, transport infrastructure, and credit facilities (IEG, 2011). The dependence on rainfall for agriculture is a further risk factor that is exacerbated by global warming and climate change. Agriculture and agribusiness activities are multidisciplinary. Therefore, investing in R&D requires investments at all levels of agricultural value chains from inputs, infrastructure, production of raw materials, through to processing and marketing. This is complex, and

requires holistic effort. And yet, because of its multidisciplinary nature, benefits of investing in agricultural R&D are also multifaceted. The International Food Policy Research Institute (IFPRI) supports this stance, and reported that investment in agricultural R&D, extension services, and road infrastructure have largest returns for agricultural growth and poverty reduction (IEG, 2011). Irrespective of the many challenges collaboration in research is invaluable. Katz and Hicks (1997) noted increased interest of collaboration in policy circles, and demonstrated positive effects of collaboration on citations of scientific publications. Katz and Hicks (1997) demonstrated that an author collaborating with an author from home institution or from another domestic institution increased the average impact of a research publication by about 0.75 citations, while collaborating with one from a foreign institution increased the impact by approximately 1.6 citations.

Conclusions and the way forward

African universities have no choice but to develop policies that nurture and promote entrepreneurship if they are to remain competitive, relevant, and at par with sister universities around the globe. They have to be the epicenters of not only education, but also of economic development in their localities. There is need for collaboration among public, private sectors with local, and international partners to drive Africa's agricultural R&D agenda to the next level and support economic growth. United Nations Secretary Ban-Ki-moon (2000) listed partnerships as being essential to delivering the Sustainable Development Goals and used the term public-private-people partnership, also known as P4. Africa's agriculture is endowed with second-to-none animal and plant biodiversity, and a herbal heritage for medicinal and nutraceutical use. R&D in these areas in addition to R&D in conventional crops and livestock is bound to pay dividends. Agriculture has significant impact on the environment due to anthropogenic greenhouse gas emissions, soil degradation and water pollution. Therefore, environmental science research must be part and parcel of any agricultural R&D program, if sustainability issues are to be successfully addressed. History of the RTP indicates how collaborative R&D not only increase agricultural productivity, but also contributes to cross-sectoral development and economic growth. Collaborative R&D will benefit Africa and contribute to growing its economy to the fullest potential. With dwindling public funding for research and little research infrastructure in the private sector, collaboration through PPUPS will pool resources together needed to implement R&D to realize the objective of the Maputo Declaration on Food Security in Africa. When that happens, Africa will achieve Sustainable Development Goal 17 – *Strengthen the means of implementation and revitalize the global partnership for sustainable development* (UN, Open Working Group, 2014). R&D is an essential component in the puzzle to improve productivity and sustainability of agricultural production in Africa. If anything, the lessons from the RTP point towards the need for strong collaborative R&D as a stable foundation for sustainable agricultural production and economic growth. PPUPS have a central role to make this happen in Africa.

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