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Ghana's Research System

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INTRODUCTION

Ghana's agriculture sector accounts for 35 percent of the country's gross domestic product (GDP) and nearly two thirds (60 percent) of the employment (Breisinger et al. 2011). Ghana is one of the top five performers in the world in terms of agricultural growth. Benefiting from favorable weather conditions, the world market prices for cocoa, and an abundance of arable land, its agricultural sector has been growing at an average annual rate of 5.1 percent over the past 25 years (ODI 2010). While agricultural production growth rates in Ghana have been impressive, these have come mainly from area expansion rather than yield increases. Gaps exist between current and achievable yields for various crops. By closing these yields gaps, agricultural productivity can be increased significantly.

Tapping into the vast potential of Ghana to expand its agricultural production requires greater availability and wider use of existing knowledge (Nin-Pratt et al. 2011). Technologies are needed to increase the productivity, stability, and resilience of sustainable production systems. At the same time, farmers find themselves in need of new uses of science and technology to mitigate and adapt to emerging challenges like climate change. Thus the generation, dissemination, and adoption of agricultural technologies play a critical role in increasing yields (Nin-Pratt et al. 2011). Some of the technology development and dissemination constraints in Ghana include limited availability of appropriate technologies, low adoption of existing technologies, and a supply-driven approach to technology generation and dissemination that has led to low technology adoption and has highlighted a need for greater responsiveness.

THE GOVERNMENT'S RESEARCH SYSTEM

Ghana's national agricultural research system is composed of various agencies. The Council for Scientific and Industrial Research (CSIR), established in 1968, is the country's largest and oldest research and development institution. Other agencies in Ghana's research system include non-CSIR agencies that conduct agriculture-related research (e.g. the Crops Research Institute and the Ministry of Food and Agriculture [MoFA]), and 15 higher education agencies.

Between 1971 and 2008, the total number of agricultural staff in full-time equivalents (FTEs) increased steadily with the largest increase having taken place within the CSIR, where FTE researchers jumped from only 87 in 1971 to 358 in 2008 (Flaherty et al. 2010). Ghana's total agricultural R&D FTE researchers reached 537 in 2008, of which 67 percent were employed by CSIR. While there has been a growth in research staff overall, many agencies are faced with an aging pool of scientists, recruitment restrictions, limited support for training, and a government proposal to significantly cut salary costs (Flaherty et al. 2010). For CSIR, a main concern is finding a way to retain existing staff and to attract young staff.

This study was motivated by a request several years ago from MoFA to support a dialogue with CSIR on technology development issues and to take a stock of technologies developed by CSIR to facilitate this dialogue. The objectives of this study were to obtain a list of technologies generated by agricultural research institutions in Ghana over the past decade and to gain insights into how the research system functions. The methodology for the study included a desk review followed by interviews of scientists and case studies of selected technologies. The stocktaking exercise identified 109 technologies that were mostly (91 percent) developed by CSIR researchers. The majority of the technologies (64 percent) were related to crop production. About 16 percent were agroprocessing technologies, 14 percent were applicable to livestock and poultry production, and only about 2 percent were fisheries-related.

CASE STUDIES

Ten case studies were conducted for high-adopted technologies that represent various subsectors and types. Of the 10 studies, five were crop-oriented, three of which covered varieties (cowpea, cassava and soybean). The other two focused on integrated pest management (IPM) practices on oil palm and groundnut. One examined industrial processing of cassava and the other four fell into a livestock category: snail farming, poultry breeding, improved brooding for guinea fowl, and fish farming. Of the 10, only 4 required commercialization. The other 6 represent knowledge that can be disseminated. The case studies cover the motivation for developing the technology, the nature and extent of collaboration, the technology development process, dissemination or commercialization, and the outcomes in terms of adoption. The 10 case study technologies were:

1. Improved cowpea variety Asontem
2. Early warning system for the control of oil palm leaf miner
3. Aribro broiler nucleus population
4. Integrated approach to pest management of groundnut
5. Snail farming
6. Improved cassava variety Afisiafi
7. Development of *fufu* flour
8. Improved brooding management of local guinea fowl
9. Improved soybean variety Jenguma
10. Polyculture of tilapia with catfish

To achieve success, an innovation system must introduce technological changes demanded by the sector. In this capacity, the system is doing quite well; nearly 70 percent of the scientists surveyed indicated that they developed technologies in response to demands from MoFA as well as from farmers. The bulk of the technologies studied were developed with funding from special projects or sources outside the research system. Many were funded by projects managed by MoFA. Only in two cases were the technologies developed with funds from internal sources, and these took much longer to develop.

The motivation for developing technologies reflects the quality of linkages within the system. In all cases, technology development got under way once an existing problem had been observed or when an opportunity to increase farmers' incomes presented itself. The articulation of the problem did not always emerge from farmers themselves but from scientists who were aware of the situation faced by farmers. The bulk of the case technologies were produced under collaborative arrangements between organizations within the country and international research organizations. Collaboration was guided by the need to bring together organizations with mandates over different ecologies and those with specific capabilities. For example, crop technology development involved considerable international collaboration. MoFA was also considered a partner in the development of nearly all the technologies, often providing support by conducting on-farm testing and demonstrations, and by identifying and selecting farmers.

One of the most important factors within the research system is the adoption and availability of technologies. Over half the scientists involved in the survey were aware of availability of the technologies to farmers and the extent of their adoption. About a third indicated that their technologies were unavailable to famers. When technologies were adopted, a third of the farmers indicated that the extent of adoption of technologies they developed was high, another third felt the adoption was medium, and another third felt it was low. It should be noted that about 5 percent indicated that their technologies were not adopted at all, and 11 percent claimed to have no knowledge about the adoption rate.

The scientists also identified some factors that hindered the adoption of the agricultural technologies they developed. Approximately 28 percent identified limited publicity as a major factor hindering adoption. About 21 percent indicated limited supply or poor distribution of technology as a limiting factor, and 28 percent indicated high cost of adopting the technology (either high cost of the technology itself or the required inputs for its use) as inhibiting adoption.

CONCLUSION

Technologies can be categorized as soft or hard. Soft technologies essentially involve knowledge, the adoption of which can be sustained by producer-to-producer exchanges or sustained dissemination by extension agencies. In many cases soft technologies appear to have been abandoned by extension after initial dissemination. Hard technologies require that a product be made available for adoption, the typical example being a new variety. To guarantee continued adoption, hard technologies must be either publicly distributed or commercialized and made available to producers at a reasonable cost so that making a profit is possible. In cases where commercialization was absent adoption and sustained use of hard technologies suffered.

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