

MONITORING OF SCARDA-INDUCED INSTITUTIONAL CHANGES AT CSIR-CROPS RESEARCH INSTITUTE, GHANA

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Abbreviations and acronyms

AGRA	Alliance for Green Revolution in Africa
ARM	Agricultural Research Management
AWARD	African Women in Agricultural Research and Development
CAADP	Comprehensive Africa Agriculture Development program
CIP	International Potato Centre
CMAP	Change Management Action Plan
CMC	Change Management Committees
CORAF/WECARD	Conseil ouest et centre africain pour la recherche et le développement agricoles/West and Central African Council for Agricultural Research and Development
CRI	Crops Research Institute
CRISSA	CRI Senior Staff Association
CSIR	Council for Scientific and Industrial Research
DONATA	Dissemination of New Agricultural Technologies in Africa
ECOWAS	Economic Community of West African States
FARA	Forum for Agricultural Research in Africa
FASDEP	Food and Agriculture Sector Development Policy
FTE	Full Time Equivalent
FWSC	Fair Wages and Salaries Commission
GAP	Gender Action Plan
GCP	Generation Challenge Program
GMO	Genetically Modified Organism
IAR4D	Integrated Approach for Research and Development
IITA	International Institute for Tropical Agriculture
IMC	Internal Management Committee
IPM	Integrated Pest Management
IPTA	Innovation Platforms for Technology Access
KNUST	Kwame Nkrumah University of Science and Technology
MDG	Millennium Development Goal
METASIP	Medium Term Agriculture Sector Investment Plan
MoFA	Ministry of Food and Agriculture
NCOE	National Centre of Excellence
NCOS	National Centre of Specialization
PRODIMEC	Project Development, Monitoring and Evaluation Committee
RCOE	Regional Centre of Excellence
SABIMA	Strengthening Capacity for Safe Biotechnology Management in sub-Saharan Africa
SARI	Savanna Agricultural Research Institute
SCAIN	Strengthening Capacity for Agricultural Innovation
SCARDA	Strengthening Capacity for Agricultural Research and Development
SSSS	Single Spine Salary Structure
SWOT	Strengths, Weaknesses, Opportunities and Threats
TEEAL	The Essential Electronic Agriculture Library
UGL	University of Ghana, Legon

WAAPP
WACCI
YIIFSWA

West African Agricultural Productivity Program
West Africa Centre for Crop Improvement
Yam for Improved Income for Food Security for West Africa

Summary

This is the second post-implementation review conducted by FARA to determine institutional changes at the Council for Scientific and Industrial Research-Crops Research Institute (CSIR-CRI) since completion of SCARDA activities in 2010.

As in the previous survey conducted in 2011, the Institute presents an overall positive change in institutional disposition based on the SWOT methodology. About 19 SWOT factors registered positive changes, 15 have remained the same and two have deteriorated over the last two years. Of the 19 SWOT factors that registered positive improvements, six cases relate directly to human capital formation activities under SCARDA. These are 1) ability to develop technologies, 2) national recognition for high quality research, 3) mobilizing funds through competitive bidding, 4) key management skills, 5) recognition by donor community, and 6) stakeholder collaborations.

Other areas with positive change include information exchange and access, acquisition of new research facilities, forging new linkages and partnerships, and recruitment of younger staff. The number of female researchers has also risen from 16.5% in 2008 to the current 21%.

These notwithstanding, CRI still needs to:

- Revise the strategy to clearly define future areas for priority focus
- Develop a robust operational structure for delivery of mandate
- Improve internal and external communication
- Improve ICT infrastructure
- Stimulate downstream innovations realizable from own research outputs
- Embrace agricultural innovation systems perspective in stakeholder engagements

Introduction

About two-thirds of Ghana's public agricultural research capacity falls under the Council for Scientific and Industrial Research (CSIR). CSIR comprises 13 research organizations of which nine deal with agriculture. Of the nine agriculture-focused organizations, the Crops Research Institute (CRI) is the largest in terms of full time equivalent (FTE) researcher deployment and mandate. Thus, CSIR selected CRI as a focal institute for SCARDA implementation. SCARDA sought to strengthen CRI's competencies and capacity in agricultural research management and capacity to conduct quality agricultural research (FARA, 2008³).

By the end SCARDA program in December 2010, nine different workshops on various aspects of agricultural research management had been conducted for a cumulative total of 110 CRI senior staff members; five staff members of middle-level cadre had been trained to MSc (4) and BSc (1) levels; and three technicians had been trained in IPM techniques and equipment maintenance (Roseboom, 2011⁴).

A review conducted by FARA in 2011 to determine the disposition of CRI after completion of SCARDA implementation indicated an overall positive institutional change at the Institute based on certain SWOT factors (Annor-Frempong et al., 2012). Some of the changes were attributable to SCARDA implementation although other concomitant programs also contributed.

The present review was conducted by FARA as a follow-up to the 2011 case study to determine incremental changes in the SWOT factors and assess the status of some key indicators of organizational performance of CRI. In the end, this is expected to institutionalize self-monitoring of change within the Institute.

Approach to the institutional review

The methodology outlined by Annor-Frempong et al. (2011) based on analysis of changes in SWOT factors was followed. Background information and SWOT changes were adduced in face-to-face interviews or group discussion with a team of key management staff of CRI. Where necessary, further information was obtained from official online publications posted on CRI and other Government of Ghana websites.

³ FARA (2008). Inception Report: Strengthening Capacity for Agricultural Research and Development in Africa (SCARDA). Volume 1. Main Report. Submitted by FARA to DFID, United Kingdom. Accra, Ghana. 100pp.

⁴ Roseboom, J. (2011). An Assessment of Institutional Change: Crops Research Institute (CSIR-CRI), Ghana. A consultancy report submitted to FARA. Unpublished.

In determining the changes in SWOT factors, the management and staff of CRI were asked to respond to the following questions (with reference to the SWOT tables compiled in 2011):

- 1) Have the listed SWOT issues have improved, stayed the same or deteriorated and why?
- 2) Which listed SWOT issues are no longer relevant or misplaced in a quadrant?
- 3) Are there new issues that should be added to any of the quadrants of the SWOT table?

The panellists were also required to rank the SWOT factors in each quadrant but, due to time constraints, it was not possible to accomplish this task in the discussion sessions.

Background information on sector performance in Ghana

In 2002, just around the time that the Comprehensive Africa Agriculture Development program (CAADP) was coming into being, Ghana formulated the first Food and Agriculture Sector Development Policy (FASDEP) principally to forge linkages in the agricultural value chain and modernize the sector. A second policy framework, FASDEP II, was elaborated in 2006 with key emphases on sustainable utilization of resources and commercialisation of activities in the sector (MoFA, 2007⁵). The vision for Ghana's food and agriculture sector embodied in FASDEP II was linked to that of the CAADP. Later, Ghana formally embarked on the CAADP process and signed the CAADP Compact in 2009. The focus of the CAADP country process in Ghana is to coordinate support and add value to the implementation of FASDEP II. Subsequent to signing the CAADP Compact, Ghana developed the National Agriculture and Food Security Investment Plan (also known as the Medium Term Agriculture Sector Investment Plan [METASIP, 2011 – 2015]) in 2010 as a vehicle to implement the FASDEP II.

Overall, proactive policies and unwavering government support has contributed to outstanding sector performance and progress in fighting hunger. Currently, Ghana stands out as one of the few countries in sub-Saharan Africa to have achieved both the MDG 1 and the World Food Summit targets on undernourishment. According to FAO estimates, Ghana reduced the prevalence of hunger and undernourishment from 40.5% to less than 5% and the number of undernourished people from 6.16 million to less than 2.0 million people over the last decade. This is attributable to significant and sustained growth in the agricultural sector.

⁵ MoFA (2007). Food and Agriculture Sector Development Policy - (FASDEP II). Ministry of Food and Agriculture (MoFA), Republic of Ghana, Accra, Ghana. Available online at: http://mofa.gov.gh/site/?page_id=598. Accessed on 26 November 2013.

Figure 1 shows the agriculture value added (% annual growth rate) in Ghana over the last decade or so. Save for a dip in 2007, the annual growth rate in agriculture has averaged about 5%. Indeed, in 2004, 2008 and 2009, Ghana’s agricultural growth rate surpassed the CADDP target of 6% per annum. This indicates favourable sector policies even prior to signing the CAADP Compact in 2009.

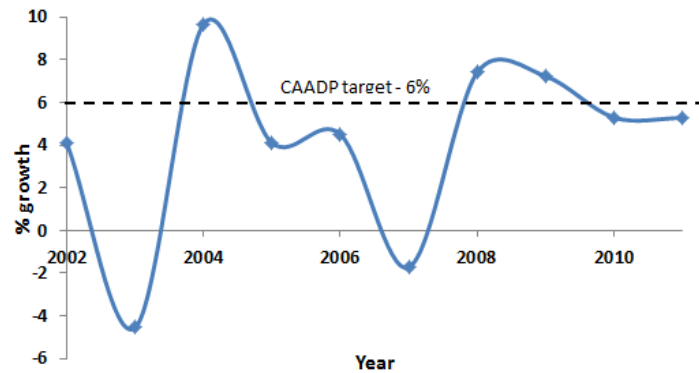


Figure 1: Agriculture value added in Ghana (World Bank, 2011)

Agricultural GDP growth rate in Ghana has been rather erratic over the last six years. According the Ministry of Food and Agriculture (MoFA, 2011⁶), the real growth rate was above 5% between 2008 and

2010, nosedived to about 0.8% in 2009 and thereafter showed some signs of increase. Between 2006 and 2010, the share of agricultural contribution to GDP averaged about 30.5%, with the major contributor being the crops sub-sector at an average of 66% (MoFA, 2011).

Figure 2 shows the production trends of major food staples in Ghana between 2000 and 2010. The total

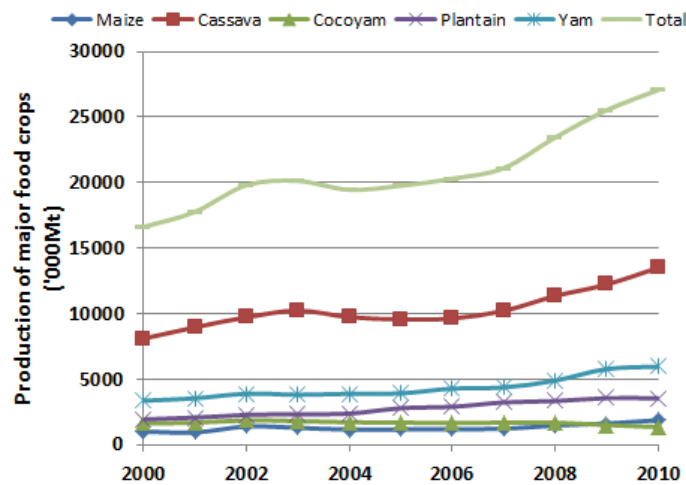


Figure 2: Production of major food staples in Ghana (MoFA, 2011)

annual production (includes figures for millet, milled rice and sorghum, which are not shown on the graph) exhibited an overall increase of about 63%, from 17000 Mt in 2000 to 27000 Mt in 2010. The starchy staples (cassava, yam and plantain) contributed the greatest share. Based on the 2010/2011 food balance sheets computed by SRID, Ghana produced net surplus in all the major crops, except for milled rice and wheat that had deficits of about 42000 Mt and 37000 Mt,

⁶ MoFA (2011). Agriculture in Ghana – Fact and Figures (2010). Ministry of Food and Agriculture (MoFA), Statistics, Research and Information Directorate (SRID), Government of Ghana, Accra, Ghana.

respectively. Thus, on a macro-level, the country has achieved self-sufficiency in the traditional staple foods.

Annual government spending on agriculture has increased considerably since 2003, averaging about the CAADP target of 10% between 2005 and 2008 (Fig. 3A). However, as shown in Figure 3B, the proportion of funds allocated to research out of the total expenditure on agriculture has been rather erratic with an overall decrease over the last decade (MoFA, 2011). Moreover, of the amount allocated to research, the predominant share goes into recurrent expenditures like salary payments rather than actual execution of research (Flaherty et al., 2010⁷).

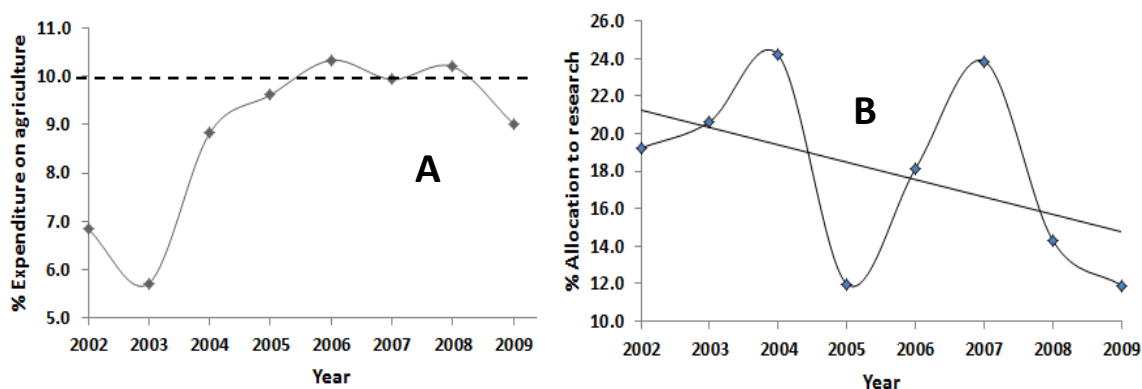


Figure 3: Government expenditure on agriculture and allocation to agricultural research in Ghana

Research has contributed significantly to the decade-long agricultural growth in Ghana mainly through increased yields of staple roots and tuber crops that averaged about 12 tonnes/ha in the mid-2000s. CRI has the mandate to conduct all aspects of research on major food and industrial crops (except cacao and oil palm). Over the years, CRI has contributed to increased agricultural productivity through development of improved varieties of root and tuber crops (cassava – 11, sweet potato – 8 and yam – 3); cereals and pulses (maize – 25, cowpea – 10, rice – 7, groundnuts – 4 and soybean – 4); and other starchy staples (plantain – 1 and yam – 3). CRI has also contributed to improved crop productivity through development of biological techniques for controlling mealy bugs and the popularization of split corm and tissue culture techniques for rapid multiplication of disease-free plantain and banana seedlings.

⁷ Flaherty, K., Essegbey, G. O., and Asare, R. (2010). Ghana – Recent Developments in Agricultural Research: Country Note. ASTI-IFPRI, Rome, Italy.

General Changes in Institutional Factors

Mandate and Functions

The principal mandate of CRI remains research (technology development) and technology dissemination through training, especially of farmers and extension workers (NGOs and public extension agents). The Institute also undertakes consultancies and commercialization of research results. The Commercialization Unit has existed since 2007 in direct response to policy outlines of FASDEP II, but also in line with the legislated changes in the CSIR mandate and operations in 1996 to embrace private sector issues and introduce market principles. According to key members of CRI Management, there are plans to establish a postgraduate university within the CRI campus, thereby heralding the new mandate of teaching.

The research mandate of CRI is specified in terms of crop coverage as follows:

- cereals (maize and rice);
- legumes (cowpea, soybean, groundnut and Bambara groundnut);
- roots and tubers (cassava, yam, sweet potato and cocoyam);
- horticultural crops [plantain and banana, tropical fruits (citrus, mango, avocado, pineapple, cashew and pawpaw),
- vegetables (pepper, garden eggs, tomato, onion and leafy vegetables); and
- industrial crops (rubber, sugar cane and tobacco).

At the start of SCARDA in 2008, CRI had 10 research programs, viz.:

1. horticulture (vegetables and fruit crops including plantain and bananas);
2. roots and tubers (cassava, yam, cocoyam, sweet potato);
3. cereals – maize;
4. cereals – rice;
5. legume and oil seeds;
6. plant health (plant pathology, nematology, virology, entomology, biological control, weed science);
7. resource and crop management (on-station agronomy, on-farm agronomy, agricultural economics and rural sociology);
8. socio-economics;

9. postharvest; and
10. biotechnology.

The Biotechnology program has been strengthened through training of staff and acquisition of research equipment under the West African Agricultural Productivity Program (WAAPP) program. Agricultural engineering has also been added as a new CRI program. This was one of the areas identified as lacking in the SCARDA Institutional Analysis of 2008. The CRI Management bought into the idea and established it in 2012. The WAAPP has also helped revamp the postharvest program in the area staff training for more effective research on value addition. As a result, value added products (e.g. sweet potato yoghurt) have been developed jointly with the Department of Food Science, Kwame Nkrumah University of Science and Technology (KNUST).

The research support services at CRI are largely unchanged as follows:

- Technical Services - (biochemistry, tissue culture, biometry, library, training and communication)
- Administration - (general administration, transport and farm mechanization, farm management)
- Accounts - responsible for financial transactions
- Business Development Unit- responsible for commercial activities

Elsewhere, new approaches of engaging stakeholders for research impact are being embraced. Especially, FARA's Integrated Approach for Research and Development (IAR4D) and the Innovation Platforms for Technology Access (IPTAs) popularized by the DONATA program have been embedded in research actions including the WAAPP and crop-livestock project, both coordinated by CORAF/WECARD.

Strategy and structure

The Institute has been running a ten-year Strategic Plan (2004 – 2013) with the stated vision of becoming “a Centre of Excellence for innovative and quality agricultural research for development” and the mission of “to develop and disseminate appropriate technologies for high and sustainable food and industrial crop production.” As the stated period ends, plans are underway to review the Strategic Plan, which may also entail a review of the strategic statements given the envisaged changes in mandated functions.

The governing body of CRI is the Management Board that oversees the Institute's research and administrative activities as well as financial transactions. Reporting to the Management Board, the Director is responsible for the day-to-day administration of the Institute assisted by the Internal

Management Committee (IMC). The IMC comprises the Director, Deputy Director, Heads of Administrative Divisions, and representatives from Recognized Identifiable Bodies, Trade Union Congress (TUC, the Local Chapter for Support Staff), Research Staff Association, and CRI Senior Staff Association (CRISSA). Due to funding constraints and the need to improve administrative efficiencies, the Divisions were reduced from 19 to 10 in 2010. Accordingly, the IMC membership was also reduced from 29 to 15.

The Institute has sub-stations in the major agro-ecological zones (AEZs) in Southern Ghana i.e. Forest Transition (one station), Forest (three stations), Coastal Savannah (three stations), and High Rain Forest (one station). CRI also deploys on-farm staff to live and work with farming communities in southern Ghana. The Savannah Agricultural Research Institute (SARI) was initially part of CRI but became an independent entity in 1995 to serve the northern regions of Ghana.

In terms of managerial functioning, a Director's Team Meeting is held every two weeks since 2008. Change Management Committees (CMC) were also formed within each of the Divisions in 2011 to consider specific issues affecting CRI and report the meeting outcomes to the Director. The CMC, a direct result of the SCARDA Change Management Workshops, also operates in the other Stations in an attempt to mitigate entrenched top-down management style. This has led to staff punctuality, more awareness on individual responsibilities, and changed attitude towards work. Since 2011, staff have also been sensitized on cost sharing due to dwindling government support. For example, staff members now pay for services like photocopy (previously perceived as free) and personal use of CRI vehicles.

However, what does not clearly come out is how the 10 administrative divisions are structured to implement the programs. A clear operational structure should be delineated in the Strategic Plan or Medium Term Operational Plan that CRI hopes to develop in the near future.

Internal management processes

In terms of research planning, priority setting and budgeting, an annual in-house research (and management planning) and review meeting is held at the beginning of every year. Research-extension linkage committees present the constraints and opportunities from the various AEZs during such meetings to ensure demand-driven research focus and information flow. This enhances participatory planning and focus on mandate. The meeting also serves a monitoring and evaluation function although some funded projects including WAAPP have own M&E components. However, there is no resident M&E specialist, as the position may not be catered for in the institutional organogram or personnel

establishment. As such, the Institute lacks a clear mechanism for consolidating individual program gains and accounting for aggregate delivery on mandated results.

The Institute conducts annual staff performance appraisals using instruments designed by CSIR Head Office and customized to the respective duties of staff categories. The evaluation forms have recently been shortened from six to only three pages. Reward systems have been revised internally to include material gains – e.g. clothes for best performing employees. There is also a Director’s award for the researcher who brings in the highest amount of funds and two scientists have benefited in this regard since 2011. Rewards for retirees and previous heads of divisions include objects such as TVs, fridges, and other household items.

To facilitate information exchange and access, CRI is currently creating a database for scientific publications by researchers. However, these efforts face challenges to do with outdated antivirus software (posing risk of data loss) and inappropriate database software. The Institute is in the process of acquiring the DSPACE software for institutional repository, but this needs an own server and/or a very high specification computer. The Institute currently subscribes to various online journals and databases although the FAO sponsorship of AGRIS Database had expired. An updated database for The Essential Electronic Agriculture Library (TEEAL) up to 2011 had been acquired on an external hard drive and will be used to network staff internally for remote access on their computers.

The Librarian, a SCARDA-sponsored graduate, had also instituted a number of improvements in the Institute’s library. These involve assigning accession numbers, cataloguing and classification of books by subject areas. A ‘Question and Answer’ service has also been introduced in which literature requests are posted by staff to the Librarian. The Library is also networked with other libraries elsewhere in the country (e.g. KNUST, UGL, and others) mainly through e-mail services. This affords cross-library borrowing and acquisition of literature material. The Librarian also posts newly published articles (especially by CRI researchers) on the notice board and by email to all staff. Photocopy and printing services for a fee was also introduced in 2011 as part of the Institute’s cost-sharing strategy.

Staffing

Table 1 gives the status of CRI staff disaggregated by cadre and gender. As at October 2013, the total number of staff at CRI was 722 compared to 503 determined during the SCARDA scoping studies conducted in 2007. Whilst the number of technicians and support staff increased, the number of researchers reduced over the last six years. This may be due to various causes of attrition coupled with

government freeze on employment of new staff. That notwithstanding, it is instructive to note that the number of support staff nearly doubled over the same duration even though an appreciable deficit still exists in the establishment.

Table 1: CSIR-CRI Staff Disaggregated by Cadre and Sex

Category	Baseline 2007 ⁸	Current, 2013						
	Filled	Est.	Filled	Not filled	% Filled	Male	Female	% Female
Researchers	83	86	73	13	85	68	15	21
Technicians	100	113	106	7	94	77	29	27
Support (incl. Admin & Finance)	320	625	543	82	87	419	124	23

The gender dimension received salient consideration under SCARDA and all program activities targeted a rate of 30% women participation. At onset of SCARDA implementation in 2008, a study conducted in 11 government research institutes and four universities in Ghana gave the overall percentage professional women researchers as 16.5% (Beintema and Di Marcantonio, 2010⁹). Currently, about 21% of researchers at the Institute are women (Table 1). Further, the proportion of women amongst technical and support staff were 27% and 23%, respectively. This represents notable progress on the gender parity front for CRI. Further, in 2012, CRI formulated the Gender Action Plan (GAP) as an explicit attempt to mainstream gender issues under Strengthening Capacity for Agricultural Innovation (SCAIN). SCAIN was the extension of SCARDA beyond June 2010 to enable completion of pending activities and consolidation of lessons learnt in the program.

At individual level, a senior female scientist at CRI, Dr. Stella Ennin (also SCARDA focal person), is a mentor for younger women and a spirited national campaigner on gender issues in agricultural research through her association with the African Women in Agricultural Research and Development (AWARD) programme. It is not clear whether the Government of Ghana has any set targets for percentage of women in agricultural research and perhaps not much recruitment of new researchers has occurred at CRI post-SCARDA. However, SCARDA implementation at the Institute has raised a significant degree of gender awareness, and - as new programs are initiated and new opportunities for employment arise – it can only be hoped that more women researchers will come on board.

⁸ FARA (2007). Inception Report on “Strengthening Capacity For Agricultural Research And Development In Africa (SCARDA)”, Volume 2”Preliminary Institutional Analyses of Focal Institutions. FARA, Accra, Ghana

⁹ Nienke M. Beintema, N. M. and Di Marcantonio, F. (2010). Female Participation in African Agricultural Research and Higher Education: New Insights Synthesis of the ASTI–Award Benchmarking Survey on Gender-Disaggregated Capacity Indicators. IFPRI Discussion Paper 00957, March 2010. IFPRI, AWARD, and ASTI.

The overall technician-researcher ratio for CRI is about 1.3; but, as shown in Table 2, this varies greatly across the various Divisions ranging from 0.71 to 3. In 2008, ASTI (2010) reported that the T/R ratio for Ghana was about 1.1. Others have recommended a T/R ratio of about 2 to 1 (Peterson et al., 1989¹⁰).

Table 2: Distribution of Staff amongst Divisions

	Chief Research Scientist	Principal Research Scientist	Senior Research Scientist	Research Scientist	Assistant Research Scientist	Technicians	T/R ¹¹ Ratio	Total
Main Divisions								
Plant Health	0	0	3	9	1	12	0.92	25
RCM & Socio-economics	1	0	12	0	0	17	1.31	30
Legume and Oil Seeds	0	0	1	2	0	9	3	12
Roots and Tubers	1	0	3	3	1	11	1.38	19
Cereals - Maize	0	0	0	2	0	5	2.5	7
Cereals - Rice	0	0	1	4	0	10	2	15
Biotechnology, Seed and Food Science	0	0	1	12	0	21	1.62	34
CSSSD	0	1	0	3	3	5	0.71	12
Horticulture	0	0	0	7	2	7	0.78	16
Sub-stations								
Aiyinase	0	0	0	1	0	0		1
Farm Mgt. - Fumesua	0	0	0	0	0	1		1
Farm Mgt. - Kwadaso	0	0	0	0	0	1		1
Ejura	0	0	0	0	2	2	1	4
Akumadan	0	0	0	0	0	1		1
Assin Fosu	0	0	0	0	0	1		1
Pokuase	0	0	0	1	0	2	2	3
Kpeve	0	0	0	0	0	2		2
Ohawu	0	0	0	0	0	1		1
Total	2	1	21	44	9	108		185

As shown in Figure 5, the age distribution of research staff exhibited a bimodal pattern with those > 50 years and < 40 years accounting for 45% and 40%, respectively. The middle age group (40 – 50 years) accounts for about 30%. Overall, this represents a somewhat balanced succession planning, save for the

¹⁰ Peterson, W. E., Sands, C. M. and Swanson, B. E. (1989). Technology development and transfer systems in agriculture. Urbana, IL. INTERPAKS Interchange, USA.

¹¹ T/R – technician researcher ratio

apparent dip in the proportion of middle agers probably occasioned by an interlude of civil service recruitment freeze due to various macro-economic factors. This mirrors the changes in full-time equivalent (FTE¹²) research staffing for Ghana (Figure 6) over the last two decades as reported by Beintema and Rahija (2011).

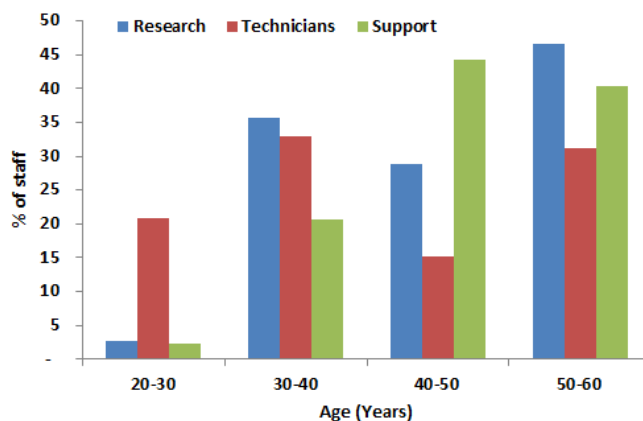


Figure 2: CSIR-CRI Staff Categories by Age

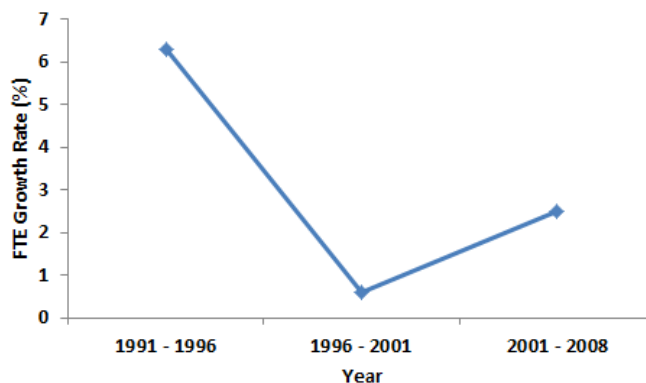


Figure 3: FTE Growth Rate for Ghana (Beintema and Rahija, 2011)

Financial Management and Funding

Disbursement of project funds at CRI faced undue delays arising from an inordinate number of steps in the approval process. During the agricultural research management (ARM) courses administered under SCARDA, key CRI staff were sensitized on measures to achieve efficiency in financial management.

¹² FTEs take into account the proportion of time researchers spend on R&D activities. University staff, for example, spend the bulk of their time on nonresearch-related activities, such as teaching, administration, and student supervision, which need to be excluded from research-related resource calculations. As a result, four faculty members estimated to spend 25 percent of their time on research would individually represent 0.25 FTEs and collectively be counted as 1 FTE

Applying some of the principles, the management has acted to stem inherent bureaucracy and reduced the approval process from 13 to nine steps. Further, a second signatory was introduced for each of the nine steps to forestall any possible delay caused by absence of a signatory at any point in the process. Previously, the average turnaround time for ordinary disbursements was more than two weeks. Currently, it takes less than a week to receive requested funds.

The Government of Ghana solely funds CRI staff salaries. In the recent past, the Government instituted salary restructuring to even out disparities in remuneration for comparable cadres of staff in different public service sectors. This is in accordance with the Constitutional provision of “equal pay for work of equal value/worth”. Previously, the Ghana Public Service was awash with varied salary structures. The Fair Wages and Salaries Commission (FWSC) was charged with the responsibility of rationalizing the over 100 salary structures into one 25-grade Single Spine Salary Structure (SSSS). Implementation of the FWSC recommendations under the SSSS started in January 2013 backdated to January 2010. At CRI, the SSSS has greatly motivated research staff by doubling salaries for some cadre and considerably beefing up retirement packages. All CRI researchers interviewed in this survey aver that the SSSS is the greatest incentive to Ghanaian agricultural researchers in several decades.

In terms of support to CRI’s research portfolio, the Government of Ghana has provided no funds in over four years. Rather, the Institute has leveraged on the capacity of its staff to secure funding for research. A Project Development, Monitoring and Evaluation Committee (PRODIMEC) comprising the Director and four senior researchers was formed in 2008 to aid CRI’s resource mobilization efforts. This was in response to actions specified in the Change Management Action Plan (CMAP) developed for CRI during the SCARDA agricultural research management (ARM) workshops. PRODIMEC performs the following functions:

- disseminates information to CRI staff on calls for funding
- constitutes relevant teams of staff to respond to calls
- facilitates write-up of proposals in response to calls
- administers and monitors implementation of funded projects

Over the last two years, PRODIMEC has facilitated responses to xxx calls in the areas of xxx and xxx of which have secured funding. A list of some funded projects in CRI is shown in Table 3. Over 30% of active projects are funded by AGRA in the areas of tubers, cereals and legumes.

Table 3: Current funded projects at CRI

	Project Area	Donor(s)	Project Leader	Duration	Amount (US\$)	Remarks
1	Crop Livestock	AusAID, CORAF/WECARD	Dr. Stella Ennin	2010 - 2013	1,200,000	Dr. Stella was SCARDA Focal Person and benefited from proposal development training in the program
2	Cassava Phase 2	AGRA	Dr. Joe Manu Aduening	2011 - 2013	120,000	
3	DONATA	CORAF/WECARD, FARA	Dr. Grace Bolfrey-Arku	2011 - 2013	70,628	
4	YIIFSWA	IITA	Dr. E. Otoo	2012 - 2016	477,969	
5	Maize Phase 2	AGRA	Dr. K. Obeng-Antwi	2013 - 2015	130,580	
6	Rice	AGRA	Dr. Kofi Dartey	2010 - 2013	184,820	
7	NUE-ST Rice	AATF	Dr. Kofi Dartey	2009 - 2018		
8	Plantain	CORAF/WECARD	Mr. Paul Mintah	2010 - 2013		
9	Tomato IPM	USAID, Virginia Tech, USA	Mr. M. Osei Kwabena			Mr. Kwabena was sponsored and completed MSc training under SCARDA
10	Tomato	KAFACI, Korea	Mr. M. Osei Kwabena			
11	Groundnut Phase 2	AGRA	Dr. J. Y. Asibuo	2013 - 2016	132,300	
12	Cowpea	AGRA	Dr. Hans Adu Dapaah	2011 - 2013	160,000	
13	Socio-economics	IFPRI	Mrs. Patricia P. Acheampong	2012 -	33,714	
14	Aflatoxin in maize	Premium Foods Ltd	Mr. Martin L. K. Tengan			Mr. Tengan was sponsored and completed MSc training under SCARDA

Another recent development that has boosted the research fund envelope at CRI is the advent of the WAAPP. The WAAPP is a World Bank funded programme for the ECOWAS sub-region with the aim of making agriculture more productive and sustainable while supporting regional integration. It is implemented based on phased Adaptable Program Loans disbursed to each participating country. Phase I of the WAAPP began in 2007 and was implemented over a five-year period in three pilot countries of Ghana, Mali, and Senegal. Under the WAAPP, CRI is the designated national centre of specialization (NCOS) for roots and tuber crops in Ghana. The NCOS generate innovations relevant to the country's priority commodities and which have potential for spillovers in the greater sub-region. In time, CRI is expected to mature into a regional centre of excellence (RCOE), allowing for resource pooling and concerted approach to trans-border issues on roots and tubers in the ECOWAS sub-region. To date, the WAAPP has brought in a total of US\$75 million to CRI, US\$15 million in Phase I (2007 – 2012) and US\$60 million in Phase II as from 2013.

Physical Infrastructure

A new biotechnology facility funded by the WAAPP to the tune of US\$2.5 million was completed in 2013. The Facility includes an extensive building and state-of-the-art biotechnology equipment for tissue culture and molecular biology. This effectively positions CRI as a centre of excellence in crop biotechnology, especially for roots and tubers. CRI has collaborated with the West Africa Centre for Crop Improvement (WACCI) at the University of Ghana, Legon, for training of staff to steer the biotechnology facility. About four CRI employees have since graduated with PhD degrees in plant breeding and biotechnology.

Screen houses for tissue culture, plant health and plant breeding were completed in 2013 with funds from the International Potato Centre (CIP) and WAAPP and a glasshouse for plant health and breeding is under construction. CIP also helped in securing analytical equipment like freeze dryer and NIR in 2011.

Apart from hands-on research, CRI also doubles up on demand as an advocacy agency. Recent sensitization of the Parliamentary Select Committee on Biotechnology on issues around GMOs is one case in point. Combined with similar efforts from other quarters, this led to parliamentary assent of the Biotechnology and Biosafety Bill in Ghana in 2012. Three research staff from CRI attended FARA's Strengthening Capacity for Safe Biotechnology Management in sub-Saharan Africa (SABIMA¹³) stewardship trainings and, together with the Director, constituted the advocacy team.

Drip and overhead Irrigation facilities were installed at the in CRI Experimental Farm in 2012 with funds from WAAPP and AGRA. The drip component covers five hectares, while the overhead component covers 10 hectares. There are plans for expansion to cover more hectares subject to availability of funds.

A weather monitoring station was constructed in 2012 with funds from Generation Challenge Program (GCP) and AusAID (CORAF). Between 2011 and 2013, the Institute also managed to acquire computers by all funded projects. The Institute also acquired vehicles through a number of projects i.e. seven from WAAPP, five from AGRA projects, three for a rice project funded by JICA and others, one from AusAID (CORAF), and two from IITA in the Yam for Improved Income for Food Security for West Africa (YIIFSWA) project. A CRI welfare bus was also acquired in 2012 with funds contributed by staff. This was as a direct result of lobbying by SCARDA-trained advocates.

¹³ <http://www.fara-africa.org/our-projects/sabima/>

There is a component for Internet connectivity improvement under the WAAPP project. Funding to this end was initiated in 2010. Currently, wire connectivity is on-going, while Wi-Fi installation has been completed in some quarters. The main challenge on this issue is resource allocation and channelling to CRI from the CSIR Head Office. It is also noteworthy that the Staff Credit Union managed to build an office facility within CRI campus in 2012.

External linkages and partnerships

The following linkages and partnerships have been forged with various organizations over the last two years:

- MoU with KNUST to use research facilities and for CRI to co-supervise KNUST students in 2011
- MoU with WACCI – students come for breeding practical and co-supervised by CRI staff from 2010
- MoU with AusAID-CORAF to coordinate crops-small ruminant project in four countries – Ghana, Benin, Mali and The Gambia from 2011

There is considerable and unexploited scope for collaboration with other research institutes within CSIR and in the wider Ghanaian agricultural sector. Research partnerships with other institutes and universities are still weak. Perhaps due to proximity, the only notable collaborations on some key fronts are with KNUST. On the demand side, clear and meaningful linkages with extension agencies and farmer groups to inform research foci are missing. Private sector engagement either in the oversight team (Management Board of CRI) or on research themes is also lacking. In short, the CRI management does not appear to have sufficiently grasped and embraced the spirit of agricultural innovation systems in the delivery of its mandate.

Additionally, as a key national agricultural research agency, the engagement of CRI in the Ghana CAADP Country processes is obscure and it is also unclear as to the extent to which the research priorities specified in the METASIP (2011 – 2015) are reflected in the CRI research portfolio.

Wider policy environment

The Government of Ghana has formulated a number of key policies to stimulate agricultural innovation. These include:

- Biotech and biosafety policy – existent since 2012

- Seed policy – a new seed and fertilizer policy is under review (regulations not yet formalized) based on a West African framework; a process being facilitated by WAAPP
- Extension policy is embedded in the national agricultural sector policy (METASIP, 2011 – 2015)
- Science, Technology and Innovation Policy, exists and has been updated regularly
- IPR Policy is currently under review
- ICT Policy exists
- Land policy exists

Impact and reputation of the institute

At home, the CRI Director won the best National Scientists Award in 2011. In the Junior Category, the silver award went to Dr. Stephen Amoah, and bronze award to SCARDA scholar Mr. Michael Osei. Also in 2011, CRI/SARI and others shared the Drought Tolerant Maize for Africa Award for their IITA-funded research on the Maize Technology Development and Dissemination. The Women of Excellence award was given to Dr. Stella, a senior CRI staff, in 2012 for her contribution to agricultural research and development. Governor General of Canada gave the Gold Medallion Award to CRI in 2013 for work done 20 years ago with CIDA funds (1979 – 1996) on maize and legumes – QPM, production technologies.

Changes in the SWOT Factors

Table 4 shows the overall SWOT status for CRI in 2011 when it was observed that the Institute had undergone positive institutional changes since onset of SCARDA implementation in 2007. SCARDA had partly contributed to this positive change amongst other parallel initiatives implemented by the Institute. This was particularly so in the area of ARM training, a unique attribute of SCARDA as no other project initiative offered this type of training. The ARM trainings and mentorships stood out as particularly crucial, as they greatly helped CSIR-CRI to implement a new management culture and structure (Roseboom, 2011).

Table 4: SWOT factors for CRI in 2011

Strengths	Weaknesses
# Ability to develop technologies	# Inadequate funds for research from Government of Ghana
# Multi-disciplinary team	# Low internally-generated funds
# Participatory research team	# Weak in commercializing research results
# Strategic location	# Weak in mobilizing funding through competitive bidding
# Key actor in the development of crop varieties	# Inadequate ICT infrastructure and support
# Highly skilled in technology dissemination	# Inadequate laboratory equipment
# National recognition for high quality research (Gold)	

Award, Recipient of 8 Best National Agricultural Research Awards) # Improved internal communication	# Lack of key management skills at all levels # M&E system requires strengthening # Financial administration still paper based and time-consuming / inability to provide relevant information about costs # Aged staff composition, which will cause high staff attrition in the coming years # Relative low staff remuneration undermines staff motivation and causes staff to leave # Insufficient documentation of the impact of CSIR-CRI activities
Opportunities # Farmers and stakeholders willing to participate in CSIR-CRI research activities and adopt findings # Good image in Donor Community for food security research activities # Potential to attract other stakeholders in collaborative research activities # Generation of funds through training of students, Agricultural Extension Agent, Non-Governmental Organisations, farmers, etc # Attracting additional funding from donors e.g. WAAPP # CSIR-CRI to be upgraded from National Centre of Specialization to National Centre of Excellence # A Post-graduate School to be established # Research –Extension-Farmer Linkage Committee revived # Irrigation facilities being improved	Threats # Competition for qualified staff by other agencies (such as universities and private sector) offering better remuneration # Frequent power cuts - reducing efficiency # Internet connection slow and unstable # Government budgetary cuts # Encroachment on research lands # Competition from other research institutions, universities and NGOs for funds

As shown in Table 5, about 19 SWOT factors have registered positive changes since 2011, 15 have remained the same and two have deteriorated. In addition, one factor was modified and four others were removed as they no longer applied or were erroneously included. The Institute has posted improvements in the following key areas: ability to generate technologies, functional multi-disciplinary teams, nationwide recognition for high quality research, resource mobilization, managerial skills, succession planning, demand for CRI outputs, collaborative research, and expansion of mandate.

Whereas external funding situation has improved due to successful proposals and the WAAPP, CRI has not capitalized on the opportunities for internal fund generation e.g. from commercialization of research outputs, consultancies and capacity development. In this regard, plans to establish a postgraduate school in the near future may be worthwhile; but it should not compromise the ability of CRI to uphold its traditional mandate of technology generation. Indeed, in extension of CRI mandate, it would appear more apposite to stimulate downstream innovations from CRI research outputs (i.e. through extension and doubling up with private sector for agribusiness ventures) rather than lessening the full-time equivalents (FTE) of researchers through teaching graduate school. Thus, CRI could opt to establish a technology incubation centre rather than a post-graduate school, in keeping with Ghana’s

policy emphasis on agriculture-led economic development. One could argue that research undertaken by the students under supervision by the researchers would compensate for potential loss of FTEs through time allotted to teaching. Ultimately, it is a question of where there currently exists greater constraint to Ghana's agriculture-led development strategies. Is it lack of research capacity (to justify postgraduate training) or lack of uptake of generated technologies (to promote agribusiness and agro-industry with its manifold linkages)?

Table 5: Changes in CRI SWOT factors by 2013

SWOT factors	Change --,=,+,++	Remarks on the change	Estimated quantitative change (%)
<i>Strengths</i>			
# Ability to develop technologies	+	Over the last two years CRI staff have been trained in key areas at postgrad level (e.g. biotechnology – 1 PhD) and employed new staff (e.g. 2 agricultural engineers; developed new crop varieties/cultivars – 4 sweet potato, 3 cocoyam (1 st ever released in Ghana), 3 cowpea, 4 groundnuts, 6 maize varieties developed by 2012; prior to 2011)	10%
# Multi-disciplinary team	+	WAAPP has improved the funding situation and thus strengthened the multi-disciplinary teams	10%
# Participatory research team (to be rephrased)	+	Enhanced by the adoption of FARA's IAR4D	5%
# Strategic location	=		
# Key actor in the development of crop varieties	=	SARI has come on board	
# Highly skilled in technology dissemination	+	MSc graduates in Extension have re-joined CRI	2%
# National recognition for high quality research	++	More awards in the last two years – see above	50%
# Improved internal communication	=	However, there is less staff communication from some Heads of Divisions; lack of feedback loops from staff; divisional heads irregularly submit reports to the Director	
<i>Weaknesses</i>			
# Inadequate funds for research from Government of Ghana	+	WAAPP I started in 2009. Under WAAPP II from 2013, increase in funding flows; thus, government support to research has improved	Ghana: WAAPP I (15 million) to WAAPP II (60 million); 300%
# Low internally-generated funds	=		
# Weak in commercializing research results	=		
# Weak in mobilizing funding through competitive bidding	+	More competitive proposals have been funded	5%
# Insufficient resources to interact with farmers and to participate effectively in the Research-Extension Linkages Committees	+	Through WAAPP funding, RELC meetings are now being held	50%
# Inadequate ICT infrastructure and support	=		
# Inadequate irrigation facilities	++	See above	100% (for

and other field and laboratory equipment			irrigation); 100% (for biotech)
# Poor communications across divisions, lack of coordination of meetings	=		
# Lack of key management skills at all levels	+	Staff have attended a series of management workshops and on-the-job experience	20%
# M&E system requires strengthening	=		
# Financial administration still paper based and time-consuming/ inability to provide relevant information about costs—(should not have been a weakness)			
# Aged staff composition, which will cause high staff attrition in the coming years	+	Younger scientists have since joined CRI; 7 in 2011 and 9 in 2012; includes 10 technicians employed in and 24 in 2012	About 20%
# Relative low staff remuneration undermines staff motivation and causes staff to leave	++	No longer a weakness since the SSSS implementation from January 2013	
# Inefficient use of available human resource	+	Internal reshuffling has improved staff performance	6%
# Insufficient documentation of the impact of CSIR-CRI activities	=		
<i>Opportunities</i>			
# Farmers and stakeholders willing to participate in CSIR-CRI research activities and adopt findings	+	Due to increase in RELC activities; farmers asking for more planting materials; stakeholders open in field/open days	10%
# Good image in Donor Community for food security research activities	+	More proposals are being accepted for funding; the Gold Medallion Award in 2013 by CIDA	20%
# Potential to attract other stakeholders in collaborative research activities	+	Increased number of requests for collaboration i.e. World Vision on SATISFY project; SeedCo on planting material development; etc. Emerging issues that are multi-disciplinary and cross border like climate change, IAR4D, regional policy formulation	10%
# Generation of funds through training of students, Agricultural Extension Agent, Non-Governmental Organisations, farmers, etc	=		
# Attracting additional funding from donors (e.g. WAAPP, ...)	+	Not only WAAPP, but other donors like AGRA, EU	
# CSIR-CRI to be upgraded from National Centre of Specialization to National Regional Centre of Excellence (rephrased)	=		
# A Post-graduate School to be established	+	In the last two years, the process has reached the national Accreditation Board; syllabuses and models developed	50%
# Research-Extension-Farmer Linkages Committee revived	+	RELC more functional under WAAPP; IAR4D has enabled linkages with wider stakeholders	50%
# Irrigation facilities being improved			
<i>Threats</i>			

# Competition for qualified staff by other agencies (such as universities and private sector) offering better remuneration	-	The threat to move is lessened to remuneration parity as result of the SSSS	100%
# Frequent power cuts - reducing efficiency	=		
# Internet connection slow and unstable	=		
# Government budgetary cuts	=		
# Competition from other research institutions, universities and NGOs for funds	=		
# Encroachment on research lands	-	A protective wall is being constructed at the Fumesua Station, but other stations have lost almost all experimental farms – chiefs repossessed land due to non-renewal of land rents	

(Key: -- - decreased much; - - decreased slightly; = - remained the same; + - increased slightly; ++ - increased much)

Communication, internal and external, remains a challenge for CRI. Poor communication across the Divisions and uncoordinated inter-divisional meetings negate the assertion of functional multi-disciplinary teams within CRI. Further, ‘national recognition for high quality research’ and ‘good image in donor community for food security research activities’ are stated as a strength and an opportunity, respectively. However, ‘insufficient documentation of the impact of CRI activities’, which is stated as a weakness, would appear to mar the visibility of the Institute. It would help to specify the number of technologies developed by CRI and successfully adopted by farmers, say over the last 10 years, and have impinged upon their food security and economic status. Toward consolidating its position as a potential regional centre of excellence, CRI should commission an impact study to bring out the real worth of its technological outputs over the years.

Possible SCARDA contribution to the SWOT changes

Of the 19 SWOT factors that registered positive improvements over the last two years, six cases relate directly to SCARDA activities. These are 1) ability to develop technologies, 2) national recognition for high quality research, 3) mobilizing funds through competitive bidding, 4) key management skills, 5) recognition by donor community, and 6) stakeholder collaborations (Table 6). SCARDA contribution in all these areas was in terms of human capital formation. At least five CRI researchers were trained under SCARDA in key areas of specialization. SCARDA workshops also provided necessary managerial and proposal-writing skills that have helped improve efficiencies in financial management and stakeholder engagements as well as successful funding bids by research staff.

Table 6: SCARDA contribution to change

	Change --,=,+,++	SCARDA Contribution ++, +, =	Description of SCARDA contribution	Primary contributor to change if not SCARDA
<i>Strengths</i>				
# Ability to develop technologies	+	++	SCARDA MSc trainees completed in 2010 and have boosted technology development capacity Michael Osei, one of the SCARDA graduates, has at least three funded projects to his credit e.g. Kafaci Tomato breeding program funded by Korean Government	
# Multi-disciplinary team	+			Internal management
# Participatory research	+			Internal management
# Highly skilled in technology dissemination	+			MSc graduates in Extension have re-joined CRI
# National recognition for high quality research	++	+	Director, Focal Person and Mike Osei were awarded medals; both attended SCARDA Trainings	
<i>Weaknesses</i>				
# Inadequate funds for research from Government of Ghana	+			WAAPP
# Weak in mobilizing funding through competitive bidding	+	++	SCARDA provided the skills through workshop on proposal writing and fund mobilization through PRODIMEC	
# Insufficient resources to interact with farmers and to participate effectively in the Research-Extension Linkages Committees	+			WAAPP
# Inadequate irrigation facilities and other field and laboratory equipment	++			WAAPP, CIP for irrigation and biotechnology
# Lack of key management skills at all levels	+	++	SCARDA ARM workshops; gender workshops under SCAIN; Gender Action Plan	
# Aged staff composition, which will cause high staff attrition in the coming years	+	=	Younger scientists have since joined CRI; 7 in 2011 and 9 in 2012; includes 10 technicians employed in and 24 in 2012 (How many of these were SCARDA-sponsored?)	
# Inefficient use of available human resource	+			Internal reshuffling has improved staff performance
<i>Opportunities</i>				
# Farmers and stakeholders willing to participate in CSIR-CRI research activities and adopt findings	+			Due to increase in RELC activities; farmers asking for more planting materials; stakeholders open in field/open days
# Good image in Donor Community for food security research activities	+	+	More proposals are being accepted for funding; SCARDA influence thro' proposal writing	
# Potential to attract other stakeholders in collaborative	+	+	Soft skills acquired in SCARDA trainings may contribute in multi-stakeholder	

research activities			processes	
# Attracting additional funding from donors (e.g. WAAPP, ...)	+	+	SCARDA Proposal writing and negotiation skills workshops	Not only WAAPP, but other donors like AGRA, and EU
# A Post-graduate School to be established	+			Internal management
# Research–Extension-Farmer Linkages	+			WAAPP; IAR4D (SSA CP)
Threats				
# Competition for qualified staff by other agencies (such as universities and private sector) offering better remuneration	-			The threat to move has been lessened due to remuneration parity as a result of the SSSS
# Encroachment on research lands	-			A protective wall is being constructed at the Femusua Station, but other stations have lost almost all experimental farms – chiefs repossessed land due to non-renewal of rents

Updated SWOT table

The revised SWOT factors for CRI are shown in Table 7. In order to use the SWOT factors to gauge future institutional changes, it would be appropriate to rank them (e.g. in order of perceived importance) in the respective quadrants and select key ones for periodical monitoring. Of immediate interest, however, is the imminent review of CRI's strategic plan. It is not certain if Table 7 gives an exhaustive list of SWOT factors pertaining to CRI. For example, there should be more strengths than the seven specified here. However, based on the identified SWOT factors, the Institute should delineate key strategic directions to guide its future actions by using strengths to capture opportunities, minimize weaknesses and defend against threats.

Table 7: Updated CRI SWOT table as at 2013

<u>STRENGTHS</u>	<u>WEAKNESSES</u>
<ul style="list-style-type: none"> # Ability to develop technologies # Multi-disciplinary team # Participatory research team # Strategic location # Key actor in the development of crop varieties # Highly skilled in technology dissemination # National recognition for high quality research 	<ul style="list-style-type: none"> # Inadequate funds for research from Government of Ghana # Low internally-generated funds # Weak in commercializing research results # Weak in mobilizing funding through competitive bidding # Insufficient resources to interact with farmers and to participate effectively in the Research-Extension Linkages Committees # Inadequate ICT infrastructure and support # Inadequate irrigation facilities and other field and laboratory equipment # Poor communications across divisions, lack of coordination of meetings # Lack of key management skills at all levels # M&E system requires strengthening

	<ul style="list-style-type: none"> # Aged staff composition, which will cause high staff attrition in the coming years # Inefficient use of available human resource # Insufficient documentation of the impact of CSIR-CRI activities
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> # Farmers and stakeholders willing to participate in CSIR-CRI research activities and adopt findings # Good image in Donor Community for food security research activities # Potential to attract other stakeholders in collaborative research activities # Generation of funds through training of students, Agricultural Extension Agent, Non-Governmental Organisations, farmers, etc # Attracting additional funding from donors (e.g. WAAPP, ...) # CSIR-CRI to be upgraded from National Centre of Specialization to National Regional Centre of Excellence (rephrased) # A Post-graduate School to be established # Research–Extension-Farmer Linkages Committee revived # Irrigation facilities being improved 	<p>THREATS</p> <ul style="list-style-type: none"> # Competition for qualified staff by other agencies (such as universities and private sector) offering better remuneration # Frequent power cuts - reducing efficiency # Internet connection slow and unstable # Government budgetary cuts # Competition from other research institutions, universities and NGOs for funds # Encroachment on research lands

Conclusions

CRI continues to play an important role in Ghana’s agricultural progress through development of crop technologies. Implementation of SCARDA at the Institute between 2008 and 2010 has engendered incremental and positive institutional changes in key areas that impinge on delivery of mandated functions. The following remarks obtain:

- a) The CRI mandate is oriented to crops and easily amenable to the agricultural product value chain (APVC) approach to research programming. As the Institute prepares to review its strategic and operational plans, this could be an option. As it is now, the structure for delivery of programs is rather obscure.
- b) Good progress has been registered in terms of information exchange and access. This is attributable to the singular efforts of a SCARDA graduate; but there is need to improve the ICT infrastructure to support this function
- c) There is high research staff morale at the Institute due to the recently restructured salary scales and retirement benefits. Moreover, younger researchers have joined the Institute thereby ensuring continuity as older researchers prepare to retire. However, more still needs to be done on gender equality amongst research staff and the technician to researcher ratio.
- d) Notable progress has also been realized regarding research funding. This has been chiefly facilitated by an institutionalized mechanism (PRODIMEC) formed under SCARDA and the advent of the WAAPP. However, there is need to capitalize on opportunities for internal fund

generation especially by stimulating downstream innovations realizeable from CRI research outputs.

- e) New facilities have been acquired by the Institute on biotechnology, irrigation, weather monitoring and transport thereby enabling the environment for research execution
- f) Although CRI has forged important linkages and partnerships in the last two years, there is still considerable and unexplored scope for collaborative ventures. The CRI management does not appear to have sufficiently embraced the agricultural innovation systems approach in the delivery of its mandate
- g) Communications remains a challenge for CRI. There is need to develop a comprehensive communication strategy/policy to help improve internal and external communication channels, the latter having important implications on corporate image and reputation.
- h) SCARDA has contributed to positive changes in a number of areas including quality research and technology development, resource mobilization, managerial skills, and partnership building and collaborations mainly through human capital formation.

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