

Document of
The World Bank

Report No: ICR00004132

IMPLEMENTATION COMPLETION AND RESULTS REPORT

ON A
GRANTS

IN AN AMOUNT EQUIVALENT TO SDR 9.9 MILLION (US\$15 MILLION EQUIVALENT)
TO BURKINA FASO

AND

IN AN AMOUNT EQUIVALENT TO SDR 19.8 MILLION (US\$30 MILLION
EQUIVALENT) TO THE REPUBLIC OF COTE D'IVOIRE

AND A CREDIT

IN AN AMOUNT EQUIVALENT TO SDR 29.7 MILLION (US\$45 MILLION
EQUIVALENT) TO THE FEDERAL REPUBLIC OF NIGERIA

AND

GRANTS UNDER THE FOOD PRICE CRISIS RESPONSE CORE MULTI-
DONOR TRUST FUND

IN AN AMOUNT EQUAL TO US\$6 MILLION EACH TO BURKINA FASO,
THE REPUBLIC OF COTE D'IVOIRE AND THE FEDERAL REPUBLIC OF NIGERIA

AND

IN AN AMOUNT EQUAL TO US\$1 MILLION TO
THE CONSEIL OUEST ET CENTRE AFRICAIN POUR LA RECHERCHE ET LE
DEVELOPPEMENT AGRICOLES (CORAF)

FOR

THE 2ND SERIES OF PROJECT UNDER THE FIRST PHASE OF THE
WEST AFRICA AGRICULTURAL PRODUCTIVITY PROGRAM (WAAPP-1B)

June 27, 2017

Agriculture Global Practice
Country, Department: Regional Integration
Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective June 27, 2017)

Currency Unit =
 CFA (XOF)1.00 = US\$ 0.0017
 Naira 1.00 = US\$ 0.0032
 US\$ 1.00 = CFA 582.43
 US\$1.00 = Naira 305.81

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AAP	Africa Action Plan
AKIS	Agriculture Knowledge Information System
ANADER	<i>Agence Nationale d'Appui au Développement Rural</i> (National Extension Agency – IC)
APL	Adaptable Program Loan
ARCN	Agricultural Research Council of Nigeria
BCR	Benefit Cost Ratio
BF	Burkina Faso
CAADP	Comprehensive Africa Agriculture Development Program
CARGS	Competitive Agricultural Research Grant System
CGIAR	Consultative Group on International Agricultural Research
CI	<i>Côte d'Ivoire</i>
CNRA	Comité National de la Recherche Agricole (National Committee for Agricultural Research)
CNS/NCoS	<i>Centre National de Spécialisation</i> / National Center of Specialization
CORAF	<i>Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles</i> (West and Central African Council for Agricultural Research and Development)
CRE/RCOE	<i>Centre Régional d'Excellence</i> (Regional Center of Excellence)
GDP	Gross domestic product
ECOWAP	ECOWAS Agricultural Policy
ECOWAS	Economic Community of West Africa
ENSA	<i>Ecole Nationale des Statistiques et d'Economie Appliquée – CI</i> (National School of Statistics and Applied Economics – IC)
FPCR TF	Food Price Crises Response Trust Fund
ERA	Economic Rate of Return
FRR	Financial Rate of Return
ha	Hectare
IAR4D	Integrated Agricultural Research for Development
IBRD	International Bank for Reconstruction and Development
IC	Ivory Coast
ICR	Implementation Completion and Results Report
IDA	International Development Association
INERA	<i>Institut de l'Environnement et de Recherche Agricole</i> (Institute for the Environment and Agricultural Research – BF9)
IFPRI	International Food Policy Research Institute

IRR	Internal rate of return
kg	Kilogram
M&E	Monitoring and evaluation
MTR	Midterm Review
NCoS	National Center of Specialization
NEPAD	New Partnership for Africa's Development
NG	Nigeria
NGO	Nongovernmental organization
NIFFR	National Institute for Freshwater Fisheries Research
NIOMR	National Institute for Oceanography and Marine Research
NPV	Net present value
PAD	Project Appraisal Document
PDO	Project Development Objective
PI	<i>Plateforme d'Innovation</i> (Innovation Platform)
PMP	Pest Management Plan
PPAAO	<i>Programme de Productivité Agricole en Afrique de l'Ouest</i> (West Africa Agricultural Productivity Program)
R&D	Research and development
SRO	Sub-regional organization
t	Metric ton
TGD	Technology generation and dissemination
TTL	Task Team Leader
USAID	United States Agency for International Development
WAEMU	West Africa Economic and Monetary Union
WAAPP	West Africa Agricultural Productivity Support Project/Program
WECARD	West and Central African Council for Agricultural Research and Development (Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles)

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AFRICA
West Africa Agricultural Productivity Program APL (WAAPP-1B)

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Data Sheet

A. Basic Information			
Country:	Western Africa	Project Name:	West Africa Agricultural Productivity Program APL (WAAPP-1B)
Project ID:	P117148	L/C/TF Number(s):	IDA-48220, IDA-H6260, IDA-H6270, TF-10258, TF-98013, TF-98014, TF-98015, TF-98016
ICR Date:	06/27/2017	ICR Type:	Core ICR
Lending Instrument:	APL	Borrower:	BURKINA, COTE D'IVOIRE, NIGERIA
Original Commitment:	Total USD 109.00M	Disbursed Amount:	USD 88.42M
Revised Amount:	USD 109.00M		
Environmental Category: B			
Implementing Agencies: CORAF/WECARD			
Cofinanciers and Other External Partners:			

B. Key Dates				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	10/22/2009	Effectiveness:	07/25/2011	07/25/2011
Appraisal:	03/29/2010	Restructuring(s):		12/17/2014 05/11/2015 05/17/2016
Approval:	09/30/2010	Mid-term Review:	06/01/2013	11/30/2013
		Closing:	06/30/2016	12/31/2016

C. Ratings Summary	
C.1 Performance Rating by ICR	
Outcomes:	Moderately Satisfactory
Risk to Development Outcome:	Moderate
Bank Performance:	Satisfactory
Borrower Performance:	Moderately Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Satisfactory	Government:	Moderately Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Satisfactory	Overall Borrower Performance:	Moderately Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	Satisfactory		

D. Sector and Theme Codes

	Original	Actual
Major Sector/Sector		
Agriculture, Fishing and Forestry		
Public Administration - Agriculture, Fishing & Forestry	7	7
Agricultural Extension, Research, and Other Support Activities	93	93

Major Theme/Theme/Sub Theme		
Economic Policy		
Trade	5	5
Trade Facilitation	5	5
Environment and Natural Resource Management		
Climate change	50	50
Adaptation	50	50
Mitigation	50	50
Environmental policies and institutions	3	3
Private Sector Development		
Business Enabling Environment	69	69
Innovation and Technology Policy	69	69
Regional Integration	8	8
Urban and Rural Development		

Rural Development	15	15
Rural Infrastructure and service delivery	15	15

E. Bank Staff		
Positions	At ICR	At Approval
Regional Vice President:	Makhtar Diop	Obiageli Katryn Ezekwesili
Country Director:	Rachid Benmessaoud	Richard G. Scobey
Practice Manager:	Simeon Kacou Ehui	Karen McConnell Brooks
Task Team Leader(s):	Abdoulaye Toure	Abdoulaye Toure
ICR Team Leader:	Kadir Osman Gyasi	
ICR Primary Author:	Franz Schorosch, Kadir Osman Gyasi	

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

The development objective of WAAPP-1B is to generate and accelerate adoption of improved technologies in the participating countries' top agricultural commodity priorities areas that are aligned with the sub-region's top agricultural commodity priorities as outlined in the ECOWAP.

Revised Project Development Objectives (as approved by original approving authority)

Project Development Objective not revised.

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	Direct Project Beneficiaries, Number (% female)			
Value quantitative or Qualitative)	0.00	1,100,000 (40% women)	2,900,000	3,363,797 (44.3% women)
Date achieved	09/30/2010	10/06/2010	11/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and targets for this indicator were revised (upward) during MTR. The revised target was achieved by 116 percent. See Table 1 for country breakdown.			

Indicator 2:	Technologies generated by the Project with at least 15% productivity increase over the control technology			
Value quantitative or Qualitative)	0.00	28	34	42
Date achieved	09/30/2010	10/07/2010	11/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised during the MTR. It was achieved by 124%, overall. See Table 1 for country breakdown.			
Indicator 3 :	Area under improved technologies disseminated under the project			
Value quantitative or Qualitative)	0.00	800,000	900,000	1,032,486
Date achieved	09/30/2010	10/07/2010	11/17/2014	12/22/2016
Comments (incl. % achievement)	The target for this indicator was revised during the MTR. The revised target 116% achieved. See Table 1 for country breakdown.			
Indicator 4 :	Processors/Producers who have adopted at least one new technology			
Value quantitative or Qualitative)	0	630,000	950000	1,014,851
Date achieved	09/30/2010	10/07/2010	11/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator were revised during the MTR. The revised target was achieved by 107%. Table 1 presents country breakdowns.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1:	National regulations on genetic materials, fertilizers, and pesticides aligned to regional (ECOWAS) regulations and adopted			
Value (quantitative or Qualitative)	0	9		9
Date achieved	09/30/2010	12/30/2016		12/22/2016
Comments (incl. % achievement)	The indicator has been achieved fully. The specific country targets of 3 each have been achieved. See annex 2 for country specific details.			

achievement)				
Indicator 2:	Regulation for fertilizer at ECOWAS level developed and adopted			
Value (quantitative or Qualitative)	No	Y		Y
Date achieved	09/30/2010	10/07/2010		12/22/2016
Comments (incl. % achievement)	CORAF has supported ECOWAS Directorate of agriculture to prepare a common regulation on fertilizer which has been adopted by member countries.			
Indicator 3:	A system for data collection, analysis and reporting on agricultural technologies, researchers, and skills, and agricultural productivity is established at the national and regional level. See Annex 2 for country specific details			
Value (quantitative or Qualitative)	N	Y		Y
Date achieved	09/30/2010	10/07/2010		12/22/2016
Comments (incl. % achievement)	All WAAPP as well as CORAF countries have established the data base.			
Indicator 4:	Hits for national/regional web-based information system on agricultural technologies and research skills			
Value (quantitative or Qualitative)	0	157,000		297,207
Date achieved	12/17/2014	12/25/2014		12/22/2016
Comments (incl. % achievement)	This indicator is achieved by 189%. See Annex 2 for country specific details on achievement.			
Indicator 5:	National/regional action plan on gender, communication, climate change developed (breakdown by country)			
Value (quantitative or Qualitative)	12			12
Date achieved	09/30/2010			12/22/2016
Comments (incl. % achievement)	This indicator is fully achieved. by all WAAPP1-B countries. See Annex 2 for country specific details.			
Indicator 6:	Technology generated/adapted by NCoS and demonstrated by the Project in the project area			

Value (quantitative or Qualitative)	0	24	36	52
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised (upward) during MTR). The revised target was achieved by 144 percent. See Table 1 for country breakdown.			
Indicator 7:	Technologies generated/adapted by NCoS and demonstrated in at least 3 ECOWAS countries out the country of origin (breakdown by country)			
Value (quantitative or Qualitative)	0	12		14
Date achieved	09/30/2010	10/07/2010		12/22/2016
Comments (incl. % achievement)	The definition of this indicator was revised during the MTR. Overall, the target was achieved by 117 percent. See Annex 2 for country breakdown.			
Indicator 8:	Client days of Training provided (includes scientists, extension agents, agro-dealers, farmers, community members, etc.			
Value (quantitative or Qualitative)	0	14,500	30,000	107,038
Date achieved	09/30/2010			
Comments (incl. % achievement)	The definition and target for this indicator was revised (upward) during MTR). The revised target was overachieved (144 percent). See Table 1 for country breakdown			
Indicator 9:	Scientific exchange visits			
Value (quantitative or Qualitative)	0	30	45	44
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised (upward) during MTR). The revised target was achieved by 98 percent. See Table 1 for country breakdown			
Indicator 10:	Scholarships (disaggregated by MSc and PhD)			
Value (quantitative or Qualitative)	0		MSc -133; PhD - 65	MSc - 158 PhD - 59

Date achieved	12/17/2014		12/17/2014	12/22/2016
Comments (incl. % achievement)	This is one of the new indicators introduced at mid-term. The target for MSc was over achieved, while that for PhD was achieved by 91%. PhDs have longer during and so the project could fund studies that would go beyond its closing date.			
Indicator 11:	National demand-driven research proposal projects financed by the national Competitive Agricultural Research Grant Scheme (CARGS)			
Value (quantitative or Qualitative)	0	104	95	92
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The target for this indicator was revised at MTR. The revised target was achieved by 92%			
Indicator 12:	Multi-country research proposals financed by the regional Competitive Agricultural Research Grant Scheme (GARGS) maintained by CORAF			
Value (quantitative or Qualitative)	0	18	10	7
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	This indicator was revised at MTR. The revised indicator was achieved by 70 percent. It was a CORAF administer activity.			
Indicator 13:	Technologies generated under the national/regional CARGS demonstrated by the project in the Project areas (breakdown by country)			
Value (quantitative or Qualitative)	0	20	36	90
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised (upward) during MTR). The revised target was achieved by 250percent. See Table A2.3 for country breakdown			
Indicator 14:	Foundation seeds and breed stack produced with the project support			
Value (quantitative or Qualitative)	Cereal = 0 Vegetables = 0 Plantains = 0 Cassava = 0 Fingerlings = 0	Plantain = 50,000 Cereals = 4,700 Vegetables = 150 Cassava = 23,000 Fingerlings = 400	Cereals = 252,800 Plantain = 500 Cassava = 45,000 Fingerlings = 10,000,000	Cereals = 223,005 Vegetables = 800 Cassava = 49,200 Plantain = 30,685 Fingerlings = 16,159,502

Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised (upward) during MTR. All revised targets were over achieved, except for cereals which was achieved by 88 percent. See Table A2.3 for country breakdown.			
Indicator 15:	Demonstrations established			
Value (quantitative or Qualitative)	0		2000	3,146
Date achieved	12/17/2014		12/17/2014	01/22/2016
Comments (incl. % achievement)	This indicator was introduced during MTR. The target was achieved by 157 percent. See Table A2.3 for country breakdown			
Indicator 16:	Number of publications released in regional/national magazin			
Value (quantitative or Qualitative)	0	36	46	213
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised during MTR. The revised target was achieved by 463 percent. See Table A2.3 for country breakdown			
Indicator 17:	Procurement and FM activities executed in conformity with the timing of the procurement plan, the implementation manual, and IDA procedures			
Value (quantitative or Qualitative)	N	100%	Y	Y
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised during MTR. The revised target was fully achieved. See Table A2.5 for country breakdown			
Indicator 18:	Project Reports presented within 45 days of the end of the relevant period			
Value (quantitative or Qualitative)	0	100%	Y	Y
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	The definition and target for this indicator was revised during MTR. The revised target was fully achieved. See Table A2.5 for country breakdown.			

Indicator 19:	Harmonize M&E system is established is established and operational for data collection, analysis, and re			
Value (quantitative or Qualitative)	N	Y		Y
Date achieved	09/30/2010	10/07/2010		12/22/2016
Comments (incl. % achievement)	This indicator was fully achieved			
Indicator 20:	Sub-project granted with environmental management plan have implemented the plan effectively			
Value (quantitative or Qualitative)	0	100%	Y	Y
Date achieved	09/30/2010	10/07/2010	12/17/2014	12/22/2016
Comments (incl. % achievement)	This indicator definition was revised during the MTR. Fully achieved. See Table A2.5 for country breakdown.			
Indicator 21:	Disbursement rate of IDA funds			
Value (quantitative or Qualitative)	0		100	100
Date achieved	12/17/2014		12/17/2014	12/22/2016
Comments (incl. % achievement)	This indicator was introduced after the MTR. The target was fully achieved.			

G. Ratings of Project Performance in ISRs

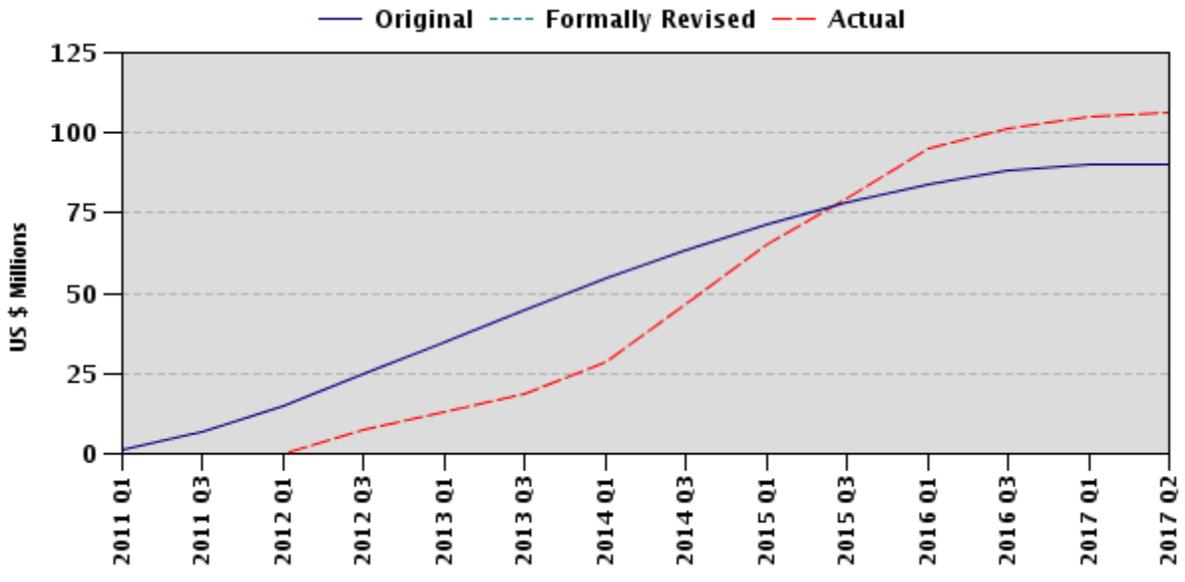
No.	Date ISR Archived	DO	IP	Actual Disbursements (USD millions)
1	03/26/2011	Satisfactory	Moderately Satisfactory	0.00
2	12/10/2011	Satisfactory	Moderately Satisfactory	4.32
3	07/01/2012	Moderately Satisfactory	Moderately Satisfactory	10.80
4	01/02/2013	Moderately Satisfactory	Moderately Satisfactory	15.28
5	10/27/2013	Satisfactory	Moderately Satisfactory	26.92
6	03/25/2014	Satisfactory	Moderately Satisfactory	40.81
7	10/01/2014	Satisfactory	Satisfactory	57.56
8	04/23/2015	Satisfactory	Satisfactory	69.60

9	08/19/2015	Satisfactory	Satisfactory	76.14
10	12/30/2015	Satisfactory	Satisfactory	80.40
11	06/29/2016	Satisfactory	Satisfactory	86.08
12	12/31/2016	Satisfactory	Satisfactory	88.42

H. Restructuring (if any)

Restructuring Date(s)	Board Approved PDO Change	ISR Ratings at Restructuring		Amount Disbursed at Restructuring in millions USD	Reason for Restructuring & Key Changes Made
		DO	IP		
12/17/2014		S	S	62.70	Align the WAAPP 1B results framework to that of WAAPP2A, and also to reallocate IDA funds to component 3
05/11/2015		S	S	74.33	Extend the closing date of the GFCRP Trust Fund to ensure full disbursement of trust fund resources
05/17/2016		S	S	96.00	Extend the closing date from June 30, 2016 to December 31, 2016 to ensure full implementation of all planned activities.

I. Disbursement Profile



1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

1. This second support project for the West Africa Agricultural Productivity Program, dubbed WAAPP, was appraised in September 2010. Leading up to this time, a range of circumstances converged to strengthen the case for a regional approach to increase agricultural productivity in Africa:

- The World Bank's Africa Action Plan (AAP), which was launched in 2005, reflected a strong demand across Africa for a focused and results-driven approach to attain the Millennium Development Goals (MDGs).¹ The AAP assigned high priority to achieving greater regional integration and raising agricultural productivity.
- The advantages of regional complementarity were coming to the fore in development planning across the continent, including that for the agricultural sector. The World Bank established a dedicated department in its Africa Region to support the growing number of operations seeking to foster regional integration. The West Africa Agricultural Productivity Program (WAAPP) was the first of its kind for such regional operation in agriculture in Africa.
- Across the continent a number of programs had focused on improving agricultural productivity at the national level, including programs in Ghana, Mali, and Senegal, which formed the first group of the WAAPP participating countries. Those programs generated a rich set of approaches and technologies that merited dissemination on a wider scale. Through this process WAAPP could foster a greater regional complementarity in the development and dissemination of such approaches and technologies, based on the specific strengths in agricultural innovation in each participating country.
- During the same period of time, African heads of state were engaging in high-level consultations to support regional collaboration and integration at both regional and continental levels. These include the development of common strategies and targets through the New Partnership for Africa's Development (NEPAD), the Comprehensive Africa Agriculture Development Programme (CAADP), and the Economic Community of West African States (ECOWAS). These initiatives provided research, institutional, and political frameworks to develop sub-regional organizations (SROs) in the continent. *For instance, the West and Central African Council for Agricultural Research and Development (hereby referred to by its*

¹ "The Africa Action Plan: An EIG Evaluation." Report No. 59126, January 2011.

French acronym, CORAF)² – the SRO for West Africa -emerged as the main regional entity with the capacity and potential to coordinate a program like WAAPP.

2. These converging developments were reflected in the design of the WAAPP 1B. National governments as well as regional organizations fully endorsed the project's overarching objective to enable countries to build on their strengths in agricultural innovation to generate and deliver public goods that would increase agricultural productivity across the region as a whole.

3. At appraisal, development conditions in West Africa, particularly in its rural areas, were among the poorest in the world. The 15 member states of the Economic Community of West African States (ECOWAS) were home to some 254 million people. About 65 percent of the population lived in rural areas. Most of these people derive their food and livelihoods from agriculture, which generated 35 percent of the regional gross domestic product (GDP) and over 15 percent of exports. The region was neither self-sufficient in food production nor food secure, particularly in the North (the Sahel) where food insecurity and poverty levels are still more acute. About 20 percent of regional imports were on food products, with the aim to complement the deficit caused by low agricultural productivity. As a net importer of cereals and livestock products and an exporter of raw materials, West Africa was severely affected by the volatility in global food and fuel prices and the world financial crisis. The changing and increasingly climatic variability placed additional burdens on rural livelihoods and natural resources that were already vulnerable, as it is the case today. The region has continued to face strong challenges in feeding its growing and increasingly urban population. Therefore, meeting the food requirement raised an urgent need to build up a strong regional agricultural market and promote sustainable development.

Rationale for Bank assistance

4. There was substantial room for regional integration to strengthen food security and promote agriculture-led growth. The New Partnership for Africa's Development (NEPAD) had called for three percent annual growth in agricultural productivity through technology generation and dissemination and six percent growth in agricultural GDP to reach the Millennium Development Goals by 2015. To this end, NEPAD had initiated and laid the Comprehensive Africa Agricultural Development Program (CAADP) before the donor community. This program had four pillars, the fourth being agricultural research, technology dissemination, and technology adoption. The agricultural policy of the West African states (ECOWAP) provided the framework for implementing the CAADP framework in West Africa. At the regional level, the agricultural investment plan of ECOWAS was structured around three mobilizing programs that constituted the framework for major actions to integrate the agricultural sector over its implementation period. The first program focused on promoting strategic products for food sovereignty; the second program aimed at promoting an overall environment favorable to regional

² Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles.

agricultural development; and the third program focused on reducing food vulnerability and promoting sustainable access to food.

5. By supporting the generation and adoption of improved agricultural technologies, the WAAPP has helped to further ECOWAP's objectives. The WAAPP was aligned with the three mobilizing programs of ECOWAS to foster regional integration of agriculture. Furthermore, the first WAAPP countries (under WAAPP-1A series) already covered the high-priority value chains identified in one of the mobilizing programs: roots and tubers in Ghana, dryland cereals in Senegal, and rice in Mali. The countries that joined the program under WAAPP-1B series invested in other strategic ECOWAS value chains, expanding the range of commodities to include fruits and vegetables (mangoes and onions) in Burkina Faso, bananas and plantains in Côte d'Ivoire, and aquaculture (catfish and tilapia) in Nigeria.

6. The WAAPP was initially designed as a two-phase, ten-year, horizontal APL to support the implementation of ECOWAP through the implementation of CAADP's fourth pillar. The first phase (WAAPP-1A) started in June 2007 and involved Ghana, Mali, and Senegal. Successful results in these countries (in harmonizing regulations, setting up centers of specialization, operating demand-driven research systems, and exchanging researchers and released technologies) justified the Bank's support for extending the program to all ECOWAS member states, as originally envisaged. The design of the 2nd series of the program (WAAPP-1B for Burkina Faso, Côte d'Ivoire, and Nigeria) demonstrated the Bank's long-term commitment to generating and disseminating technology and knowledge, building capacity, and fostering regional integration. The Bank had already supported a number of ECOWAS member states at the national level in technology generation and dissemination and was well suited to create synergies among and added value to national projects.

1.2 Original Project Development Objectives (PDO) and Key Indicators

7. As the second of the series of projects under the West Africa Agricultural Productivity Program, the development objective of WAAPP-1B was to generate and accelerate adoption of improved technologies in the participating countries' top agricultural commodity priorities areas that are aligned to the sub-region's top agricultural commodity priorities as outlined in the ECOWAP. Those priorities were banana-plantain in Côte d'Ivoire; mango and onion value chains in Burkina Faso; and fisheries, specifically catfish and tilapia in Nigeria. Following the philosophy of the WAAPP series, the project was designed as the first phase of a regional two-phase, 10-year Adaptable Program Loan (APL).

8. The key Project outcome indicators were: (i) total direct beneficiaries of the Project have reached 2,000,000; (ii) at least three improved technologies have been released by each center of specialization, totaling to 28 technologies; (iii) for 100% of the released technologies there would be an improvement in yield by at least 15 percent over the control technology; (iv) a total area of 800,000 hectares covered by the improved technologies

disseminated by the project; and (v) an adoption of improved varieties by at least 630,000 beneficiaries of the project.

1.3 Revised PDO.

9. The PDO was not revised. However, the results framework and the intermediate outcome indicators were reviewed and aligned to the results framework along the one developed for WAAPP-2A (that as was executed in parallel) as follows: (i) Indicator 1: Direct project beneficiaries (direct/indirect), 40% of whom are female: 2,900,000; (ii) Indicator 2: Technologies generated by the project with at least 15% productivity increase over the control technology: 34; (iii) Indicator 3: Area under improved technologies disseminated under the project (hectares): 900,000; and (iv) Indicator 4: Processors/Producers who have adopted at least one new technology (number): 950,000. The latter were more descriptive and allowed an easy aggregation of the program results at the regional level. Five new intermediate outcome indicators were also added.

1.4 Main Beneficiaries

10. In the three countries covered by the projects of WAAPP-1B series (Burkina Faso, Cote d'Ivoire, and Nigeria), agricultural producers and agribusiness were the primary project's beneficiaries as main users of the improved technology. In addition, the project directly supported researchers, extension agencies, universities, producer organizations, and nongovernmental organizations (NGOs) to generate and disseminate technologies. These were also considered as secondary project's beneficiaries. Finally, the public sector institutions responsible for registration and regulation of genetic materials, pesticides, and other crop protection products also received support within the project framework. In sum, the ultimate beneficiaries were the region's consumers, particularly those in extreme poverty.

1.5 Original Components

11. As specified in the PAD, the project had four components. All four components were financed by IDA grant/credit of US\$ 90.00 million, whereas the Food Crisis Response Core Multi-Donor Trust Fund (FPCR) financed US\$ 18.00 million for component 3 and US\$ 1.00 million for CORAF only.

- **Component 1: Enabling Conditions for sub-Regional Cooperation in the Generation, Dissemination, and Adoption of Agricultural Technologies (US\$ 8.37 million; IDA: US\$ 8.30 million; Gov't/Beneficiaries: US\$0.07million).** The objective of the component was to support the strengthening of the mechanisms and procedures for generating, disseminating and adopting improved agricultural technologies and tools at the national level to benefit ECOWAS member countries, by creating a regional domain in which technologies can be developed and shared across the sub-region. This component supported: (i) the development of a sustainable financing mechanism and corresponding institutional arrangements for the generation, dissemination, and adoption of improved and climate-resilient agricultural technologies; (ii) the strengthening of

- CORAF's competencies in research and development as well as its knowledge management, information, and communication systems to accelerate the sharing of agricultural technology, tools, and best practices; (iii) the establishment of regional regulations on genetic materials and agrochemicals, including support for developing harmonized regulations on fertilizers (under preparation by ECOWAS) and for Project countries to align their national regulations with the ECOWAS regulations; (iv) the strengthening of National Registration Committees for the effective release of genetic materials, approval of pesticides, and management of IPRs; (v) the development of a strategy to mainstream climate change considerations in research and development (R&D) programs, with the aim to sustain growth in agricultural productivity under changing climatic conditions in West Africa; and (vi) the development of a strategy to mainstream gender considerations in R&D programs using similar tools as those for climate change.
- **Component 2: National Centers of Specialization (NCOS) (US\$29.45 million; IDA: US\$25.69 million; Gov't/Beneficiaries US\$3.76 million).** The objective of this component was to strengthen national centers of specialization (NCoS) in participating countries. The priority host institutions and commodities of focus for the centers were: (i) CNRA (the National Center for Agricultural Research) in Côte d'Ivoire, for the banana-plantain value chain; (ii) INERA (National Institute for the Environment and Agricultural Research) in Burkina Faso, for the mango and onion value chains; and (iii) NIFFR (National Institute for Fresh Water Fisheries Research) in Nigeria, for fisheries—specifically catfish and tilapia. The component supported: (i) the implementation of core R&D programs of NCoS, focusing on adaptive research conducted with effective participation from stakeholders, particularly producers and agribusinesses; (ii) capacity-building for researchers, along with the facilitation of regional and international partnerships (including support for research exchange programs, on-the-job-training of young researchers, and implementation of annual capacity building plans); (iii) construction and/or rehabilitation of core facilities, such as laboratories, buildings, and experimental fields, and the provision of equipment to strengthen or establish viable NCoS; (iv) supply chain analyses, impact studies, benchmarking, and monitoring and impact analysis for commissioned or strategic research; and (v) the financing of small grants to implement research activities to assess available technologies from within or outside the territory of the participating countries. The component also financed degree training of researchers and established links with development partners, CGIAR Centers, and other research organizations and agribusinesses to enhance the sustainability of the NCoS.
 - **Component 3: Demand-driven Technology Generation and Adoption (US\$67.95 million; IDA: US\$46.21 million; FPCR: US\$18.0 million for subcomponents 3.2 and 3.3 only; Gov't/Beneficiaries: US\$3.69 million).** This component aimed to strengthen priority-focused, transparent funding mechanisms for demand-driven agricultural R&D within participating countries and to accelerate the adoption of released technologies. Four sub-components were developed to help achieve the aforementioned objective as follows:
 - Subcomponent 3.1: Demand-driven technology generation.** This subcomponent supported the strengthening of the Competitive Agricultural Research Grant

Schemes (CARGS). It included: a) the regional CARGS managed by CORAF, and b) national CARGS existing in each participating country.

Subcomponent 3.2: Support to accelerated adoption of released technologies.

This subcomponent was financed by the IDA and the Food Price Crisis Response (FPCR) grant. It supported: (i) stakeholders' workshops to prepare national dissemination action plans for released technologies; (ii) the promotion of released technologies through various communications media to improve awareness of technologies and expand their use; (iii) the introduction of information technology in the technology transfer system; (iv) organization of participatory training on released technologies for extension service providers, including national extension services, nongovernmental organizations (NGOs), input providers, farmers' organizations, and other stakeholders; and (iv) establishment of field demonstrations of released technologies.

Subcomponent 3.3: Facilitating access to improved genetic material. This sub-component was also financed by IDA and the Food Price Crisis Response (FPCR) Grant. Its objective was to increase the availability of and enhance producers' access to improved genetic materials (seed, planting materials, fingerlings, and animal breeds). All relevant stakeholders along the supply chains were supported to scale up the production of breeder, foundation, and certified seed and planting materials and quality animal stocks, including the upgrading of the capacity of selected public research stations through investments in irrigation facilities, lab and storage equipment.

Sub component 3.4. Developing a yield prediction tool to help farmers on crop choices. This sub-component was to finance technical assistance to CORAF to develop the Earth Audit Agricultural Yield Pilot (AYP) concept. The primary purpose of this tool was to help African farmers who depend heavily on rain-fed agriculture to attain more consistent and predictable crop yields.

Component 4: Project Coordination, Management, Monitoring, and Evaluation (US\$12.19 million; IDA: US\$9.80 million; Gov't/Beneficiaries: US\$2.39 million). This component was to establish an effective coordination, management, and M&E system for the Project at the national and regional levels, and contributed to the attainment of the PDO by ensuring that the project's financial management, procurement, safeguards, monitoring and evaluation (M&E), and communication systems were functioning effectively.

1.6 Revised Components

12. The original components were not revised.

1.7 Other significant changes

13. There were no changes in the scope and scale of the project. However, during the implementation phase the project underwent restructuring on three occasions.

14. First, following the Mid-Term Review in November 2013, the project was restructured to: (i) modify the funding percentage of the Grant Agreement (Food Price

Crisis Response Core Trust Fund) so as to fully utilize the resources of the trust fund before its closing date of May 2015 as the Mother Trust Fund was due to close; (ii) reallocate IDA proceeds, particularly to Component 3, to accelerate adaptation/testing and dissemination of technologies generated in the sub-region; and (iii) revise the project's results framework to align the results indicators of WAAPP-1B series to those developed for WAAPP-2A³ which were more descriptive and elaborated. Some of the targets were revised upward and a few new intermediate indicators added. The alignment was to ensure consistency in data collection of project level results and facilitate aggregation of country level project results at the regional level.

15. Second, was a no cost extension of the closing date of the Child Trust Fund (GFPCR MDTF) by reducing the grace period from 4 months to 1 month, to enable the completion of on-going activities financed by the TF and ensure full utilization of the funds before the closing the parent trust fund. The GFCRP trust funds closed on August 31, 2015.

16. Third, was also a no cost extension of the original project closing date by six (6) months (from June 30, 2016 through December 2016) to finalize the processing of a project additional financing, (being sought but eventually was not realized), purposely for a smooth transition between the project second phase and first phase without discontinuing project implementation. The same restructuring reallocated funds between disbursement categories for Burkina Faso and Côte d'Ivoire.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

17. *Soundness of the background analysis.* The project design incorporated key lessons from interventions by the World Bank and other development partners. It considered specific lessons learnt from WAAPP-1A and was also informed by new design options introduced in the sister regional agricultural program, the East Africa Agricultural Productivity Program (EAAPP), which in turn benefited from lessons from WAAPP-1A. For example, in lieu of the traditional linear model for technology generation, dissemination, and adoption, the project adopted like under WAAPP-1A an integrated *Agriculture Knowledge Information System (AKIS) model* to foster greater inclusiveness and innovation in technology generation and diffusion (TGD). It placed emphasis on attaining rapid impact through accelerating adoption of improved technologies. For similar reasons, the project continued to use a competitive agricultural research grant system (CARGS) to finance adaptive agricultural research. In other contexts, CARGS had improved the efficiency of agricultural R&D by incorporating users' demands and perspectives and promoting public-private partnerships, particularly in enhancing access

³ WAAPP-2A constitutes the second phase of the first series of WAAPP approved for Ghana, Mali and Senegal in October 2012.

to improved seeds, planting materials and fish fingerlings/livestock breeds. Furthermore, the project's design continued to envision the long-term development of *National Centers of Specialization* as a prerequisite for developing/transitioning into *Regional Centers of Excellence*.

18. Selection of priority intervention areas: The International Food Policy Research Institute (IFPRI) and CORAF conducted a preliminary quantitative study in 2006 to guide the selection of the priority R&D areas of in-country focus and to ensure that selected national priorities were aligned with regional priorities. The results of this study further helped to identify the commodity value chains that would most strongly contribute to the region's agricultural growth and hence maximize the Bank's funding in the region. Moreover, these results provided the basis for the selection of the specific area of specialization and institutional of NCOS in the three countries included in WAAPP-1 B. These were: banana-plantain value chain hosted at the National Center for Agricultural Research (CNERA) in Cote d'Ivoire; mango and onion value chains hosted at the National Institute for the Environment and Agricultural Research (INVERA) in Burkina Faso; and fisheries – specifically catfish and tilapia hosted at the National Institute for Fresh Water Fisheries Research (NIFFR) in Nigeria.

19. Countries' ownership of projects: To ensure ownership of the project within each participating country, the project was designed to address national interests and priorities as well as to provide regional public goods. Each country developed its own project preparation document to reflect its specific needs. An increased interaction among participating countries, project teams, and researchers improved cooperation right from the earlier stage of the project, facilitating the sharing of best practices possible already during the preparation stage. The sharing of information across borders created a network effect that benefitted all three participating countries as well as those of the other series of WAAPP.

20. ***Assessment of project design.*** Project objectives, components and subcomponents were well conceived and aligned to government priorities, and Country Partnership and Regional Strategies. They sought to support the agricultural transformation agenda that clearly identified technology generation and dissemination as a priority area for reforms and government support. In addition, WAAPP-1B was aligned with Pillar 3 of the World Bank Regional Integration Assistance Strategy for Sub-Saharan Africa

21. As under WAAPP-1A, the project's design of WAAPP-1B required all three participating countries (which were also members of CORAF) to contribute one-fifteenth of their IDA credit proceeds to finance CORAF's regional coordination tasks under the project. The Bank successfully negotiated this arrangement whereby each participating country provided a grant to CORAF. Specifically, those funds assisted CORAF to harmonize procedures, disseminate knowledge, and coordinate the monitoring and evaluation (M&E). This arrangement was vital to ensure stable and sustainable financing for CORAF as well as to secure CORAF's accountability to the member countries, with respect to its regional coordination mandate under the project. The Results Framework of

the program was robust, reflecting an elaborate results chain that portrayed the causal link of the interventions proposed to the achievement of the development objective.

22. ***Appropriateness of implementation arrangements.*** Project implementation arrangements relied on CORAF and the implementing agencies within each country. Entrusting CORAF with the overall coordination of the project was the right decision, in view of its mandate and institutional capacity. The arrangements at the regional level provided space for CORAF to play a critical role in project coordination and for the participating countries to improve implementation through shared learning and emulation. This arrangement represented a departure in Bank lending, which had largely focused on strengthening individual national agricultural systems. The peer performance rating system operated under the program (across the WAAPP fraternity) stimulated a healthy performance competition among countries, as each country sought to do better than others, a phenomenon which greatly helped to enhance project performance, overall.

23. ***Risk assessment and mitigation measures.*** As a regional project, WAAPP-1B faced many risks to the achievement of its development objective, but measures to mitigate those risks were identified properly and which helped to reduce the overall residual risks to a moderate level. The risk assessment was completed not only for the PDO but for each of the four project components, which helped to tailor the risk mitigation measures to each component. On one hand, the major sector-level risks identified in the assessment were related to: a) limited regional coordination capacity; b) complications with cross-effectiveness conditions; c) limited regional spillovers from NCoS research investments; d) inadequate private and public sector supply response for livestock breeds and planting materials; e) poor policy environment for facilitating regional technology transfer; and f) inappropriateness of technologies developed or delay in their generation. On the other hand, operation-specific risks and control risks were equally identified. In recognition of these risks, the project emphasized strong capacity building, complemented by close supervision and implementation support for project teams at CORAF and in the three countries. The combination of capacity building and intensive implementation support proved to be central to the project's success.

2.2 Implementation of WAAPP-1B

2.2.1 Delayed and uneven project start-up.

24. Project start-up was delayed for nine to 23 months. The project was approved by the Board on September 30th, 2010, but IDA financing was only declared effective in June 2011 for Burkina Faso, in September 2011 for Cote d'Ivoire. The IDA credit for Nigeria only became effective in July 2012. Initial project activities were delayed due to the temporary suspension of Bank operations in Cote d'Ivoire because of the unsettled political situation at the time. Credit effectiveness in Nigeria was delayed because of internal borrowing regulations that require parliamentary approval. This delay also negatively impacted the linked Global Food Crisis Response Program (GFCRP) financing. However, these delays did not cause much problems because: (i) retroactive financing had been included in the credit agreement that allowed the clients to initiate implementation prior to effectiveness, and (ii) in Cote d'Ivoire, the Inter-Professional Fund for Agricultural

Research and Extension (FIRCA) was able to finance project start-up activities. Project launch workshops were held at the regional level in April 2012 in Abidjan and at the national level in Burkina Faso, Cote d'Ivoire and Nigeria. Nevertheless, during the first two years, disbursements were low and procurement delays for works mainly in Nigeria and Burkina Faso were long.

2.2.2 Project activities before the mid-term review.

25. During the first two years of project execution, the implementing agencies performed below expectations and implementation progress was judged moderately satisfactory (MS), although noticeable progress was made progress under all the four project components. All three countries fully complied with ECOWAS regional regulations by publishing the seeds, fertilizer and pesticide regulations in their national gazettes. The NCoS developed research projects using participatory approaches and young scientists received additional academic training. Procurement procedures for the construction/rehabilitation and equipment of laboratories were launched. CORAF's capacity to coordinate the project and support implementation on demand was critical during this period. The countries increasingly requested for CORAF's involvement in technical support, including the identification of suitable experts for facilitating connections with the CGIAR and other advanced research centers, and also for direct support from CORAF's own experts. Among other activities, CORAF monitored overall implementation of the project and reported on progress related to the effectiveness of the dissemination mechanisms, the increase in agricultural productivity, and the increase in competitiveness for the commodity subsectors supported by the project. CORAF also acted as an advisory body for the CARGS and NCoSs implemented in each country. CORAF's M&E system collated and synthesized the information from the M&E systems of each country.

2.2.3 Project mid-term review – turning point.

26. The mid-term review conducted in November 2013 confirmed the relevance of project objectives, components and overall institutional arrangements. It considered that despite implementation delays, the project was progressing satisfactorily towards meeting its development objective. It rated the PDO as moderately satisfactory (MS). However, it upgraded the rating for Cote d'Ivoire to satisfactory (S), while it maintained the moderately satisfactory (MS) ratings for Burkina Faso and Nigeria. Most importantly, and in order to accelerate project implementation, the mid-term review mission proposed to restructure the project along the following lines: (i) reallocate IDA proceeds, particularly to Component 3, to accelerate adaptation/testing and dissemination of technologies generated in the sub-region (ii) align the result framework with the one developed for WAAPP-2A because the indicators of the later were better defined, additional indicators were also introduced to capture the regionality of the project; and (iii) modify the funding percentage of the Grant Agreement (Food Price Crisis Response Core Trust Fund) so as to fully utilize the resources of the trust fund before its closing of mother trust fund on May 31, 2015 In the case of Nigeria, the mid-term review mission also modified the concept of NCoS to expand its membership to three institutes, which are working in close collaboration to develop technologies along the value chain for fisheries. These events helped to enhance technology dissemination interventions and accelerated technology adoption across the three countries.

2.2.4 Implementation after mid-term review.

27. Following the mid-term review and the occasioned restructuring, WAAPP-1B continued to progress satisfactorily towards achieving its PDO. The program matured and got more and more results on the ground: exchange of technologies, best practices and innovations continued to be scaled up in the participating countries, graduate and post-graduate training of young scientists increased, and the country seed systems were strengthened with the production of certified seed growing. The program enhanced its visibility across the region due to tangible achievements in the field and a strong appreciation from stakeholders, including Government officials and ECOWAS. A large number of technologies has been developed or pulled out of the shelves of research institutions and were disseminated and adopted by producers and other end users in the sub-region. WAAPP-1B continued the transformative nature of the overall WAAPP program. It influenced institutions in the agricultural sector of the sub-region, enhanced collaboration between countries, and promoted the elimination of cultural and linguistic barriers between francophone and Anglophone countries.

2.2.5 Implementation towards the end of the project.

28. The closing date for the Grants under the Food Price Crisis Response Core Multi-Donor funds was extended once, from 31-May-2015 to 31 Aug-2015. The IDA grant also was extended once, from 30-Jun-2016 to 31-Dec-2016. The fact that the IDA grant and the Food Price Crisis Response (FPCR) grant did not have the same disbursement percentages and different closing dates complicated financial management and contributed to project delays. In the months leading up to project closing, the Bank missed to adequately inform the Borrowers and executing agencies about the fact that there would be no second phase WAAPP-1B

2.2.6 Developing specific mechanisms to enhance regional integration and extend the benefits of technology generation and dissemination.

29. By design, regional integration was central to the West Africa Agricultural Productivity Program, but mechanisms for fostering regional integration in technology generation and diffusion (TGD) were still in their infancy when WAAPP-1B began. CORAF's definitive contribution has been to work with each country to design, develop, and promote the use of mechanisms, frameworks, strategies, action plans, and guidelines that effectively and proactively ensured that regional integration remained at the core of project activities. This achievement has been significant. For example, given the emphasis of WAAPP 1B on TGD, it was understood early on that a strong communication system would be critical to optimize activities for generating as well as disseminating and fostering the adoption of technology and best practices. CORAF coordinated the preparation of a regional communication strategy, on the basis of which each country developed its own communication action plan. The action plans heightened WAAPP's visibility both nationally and regionally. CORAF also prepared a regional gender strategy, assessed the

extension systems in the three countries, commissioned other studies, and organized regional workshops to articulate a harmonized vision for the project and developed common strategies and priority action plans at the national and regional levels. Finally, to support the accelerated adoption of improved technologies, CORAF created regional technology market, “*Marchée des Innovations et des Technologies Agricoles (MITA)*”, which is largely an online database of available technologies and related source information for easy access. This database at the end of 2015 had 1,800 technologies and the profile of 723 researchers. And also, to improve producers’ access high quality certified seeds CORAF facilitated the creation of a regional seeds market, in collaboration with a USAID funded West Africa Seed Project. Through that initiative a West African Seed Information Exchange (WASIX) has been created, which is an electronic seed platform for information on stakeholders and their activities, seed markets and business forecasting. These interventions, among others, have enforced the programs efforts at providing a regional framework through which ECOWAS countries could collaborate on technology generation and dissemination.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

30. ***M&E design.*** The project was designed to further strengthen CORAF’s M&E system and to help each participating country to establish and/or strengthen its own M&E system. A well-designed results framework was put in place with very pertinent and measurable project outcome and intermediate outcome indicators. The M&E system was designed to collate and process information collected by the participating countries, CORAF, and additional data derived from special studies. Based on the experience gained from WAAPP-1A, baseline studies were conducted at the beginning of the project. and the outcome indicators included measures of crucial aspects such as the dissemination and adoption of technologies by farmers and the area covered under new technologies.

31. ***M&E implementation.*** During the mid-term review in October 2013, the results framework was revised to be aligned with the one of WAAPP 2-A which is more comprehensive, as decided during the regional M&E workshop in Dakar. The proposed changes were made to clarify and improve measurability. Also, to give greater attention to the regional dimension and the spread of technology across borders, new indicators were introduced: “Beneficiaries who are using technologies generated by other WAAPP countries” and “Technologies generated/adapted by NCoS and demonstrated in at least 3 ECOWAS countries outside the country of origin.” Based on suggestions by the Bank in teams of three M&E specialists were established (as opposed to the single M&E officers working on the project before) to enhance efficiency through peer mentoring and effective coordination. This new arrangement proved very effective, given the transaction costs associated with obtaining reliable information from such varied sources as the research institutes, ministries of agriculture, and extension services. Since then, the monitoring systems have functioned well. CORAF developed web-based M&E system at the regional level, were also adapted the country coordination units for effective data capturing and collation. Consequently, information about the project’s progress was generated in a timely manner and consolidated at the regional level. Towards the end of the project, impact

evaluation studies to measure the uptake of new technologies by farmers in all three countries and beneficiary assessments were undertaken under terms of reference approved by CORAF.

32. CORAF and the entities implementing the project in the participating countries have used new technology (digital media, the internet) in addition to traditional media (newspapers, scientific journals) to communicate project results effectively to different groups of stakeholders. WAAPP 1 B results, technology success stories, and other achievements have been featured on radio, television, and online.

2.4 Safeguard and Fiduciary Compliance

33. *Environmental and social safeguards and gender.* WAAPP-1B was classified as a Category B project and triggered two safeguard policies: Environmental Assessment (OP 4.01) and Pest Management (OP 4.09). A regional Environmental and Social Management Framework (ESMFs) and a regional Pest Management Plan (PMP) were prepared with inputs from each participating country and published in each country and the WB InfoShop. The PMP framework not only made proposals to harmonize national and sub-regional policies, but also to strengthen national capacities to effectively implement measures designed to minimize risks related to environmental impact and pest management. The roles and responsibilities for the various stakeholder groups involved in each participating country for screening, reviewing, and approving research activities, as well as implementing and monitoring mitigation measures for such activities were defined and agreed upon. During project execution, all research projects and the laboratories that were constructed were screened to ensure that there would be no negative environmental impact.

34. *Gender mainstreaming:* WAAPP-1B was very cognizant of the fact that in West Africa women farmers play a critical role in local food production for both regional and international markets. For this reason, the project developed and implemented a gender strategy through which concerns of women were taken into account in the priority setting for both core research and development interventions as well as the Competitive Agricultural Research Grant Scheme (CARGS). Also, the key project outcome indicator: number of project beneficiaries established that there should be a minimum of 40% female beneficiaries. To sensitize the NARS and especially the NCoS and extension services on the importance of inclusion of engaging women farmers in the management of new technologies and practices, CORAF hired a Regional Gender Advisor who provided training to the national gender specialists in each project coordination unit. The Regional Gender Advisor also organized video conferences with the WAAPP-1B counties gender focal points to review the state of implementation of each county's Gender Action Plan and to discuss experiences and best practices, and the way forward in the strategy to foster gender integration. There was agreement that as a next step in the gender strategy the following issue needed to be addressed: how to provide access to resources, especially land, to women and youth as part of overall socio-economic empowerment effort.

35. *Financial management.* The project's financial management system was adequate, both at the national and regional level. The Bank's initial assessment of CORAF's capacity for regional oversight of the program proved sound and CORAF did an excellent job in

coordinating financial management for the three WAAPP1-B countries. At the individual country level, the financial management systems also performed satisfactorily. Well-trained financial management teams and appropriate tools were in place, the accounts were well maintained, and the requests for withdrawal of funds were sent regularly to the Bank. Project financial reports (including Interim Financial Reports) were submitted to the Bank within the 45 days deadline by end each quarter. All audits were submitted on time and were unqualified.

36. **Procurement.** Procurement under WAAPP-1B was most of the time moderately satisfactory (MS). Major procurement activities were the construction, rehabilitation, and provision of equipment for the key R&D laboratories (biotechnology and seed labs) in the three countries. The local teams in charge of procurement needed time to master World Bank procurement guidelines and the late release of counterpart funds, together with cumbersome national procurement procedures, led to procurement delays. However, with support from CORAF, by the end of the project these problems had been overcome.

2.5 Post-completion Operation/Next Phase

37. WAAPP-1B was conceived as part of a 10-year APL consisting of two phases, each lasting five years. Results of the first phase are satisfactory and triggers for moving to the next phase have been met, except for adoption of sustainable funding mechanism schemes for the Competitive Agricultural Research Grant System, which are still being debated. Nevertheless, according to Bank internal documents, a decision has been taken not to finance WAAPP-2B as a strict continuation and deepening of WAAPP-1B, but rather to pursue its objectives through a broader agricultural transformation agenda. The decision not to continue with a second phase seems to have been a Bank internal decision. This decision was communicated to the borrowers very late and in the case of Burkina Faso is likely to lead to disruptions in the financing for agricultural research as it has the weakest agricultural research establishment in terms of number of scientists and annual budget allocations.

38. The up-coming agricultural transformation program will seek to consolidate and expand the achievements of WAAPP in general and WAAPP-1B series in particular but will go beyond productivity increases. It will address the overall need to enhance the food system to respond to the demand of a rapidly growing population in the ECOWAS countries that is estimated to evolve from 300 million in 2011 to about 500 million people by 2030. The new project will continue to support key features of WAAPP-1B such as the: (i) regional dimension, (ii) support for research and the transition from NCoS to Regional Centers of Excellence (RCoE), (ii) widespread diffusion and adoption of new technologies and innovations, and (iii) harmonization of regional policies and regulations to enhance cross-border trade. Other features will be added, especially related to technical issues of climate change, strengthening of sustainable private seed industries, appropriate mechanization and soil fertility management. Furthermore, the new program will pay increased attention to post-harvest management, value addition and nutrition, and job creation for youth.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation

39. **WAAPP-1B's objective continues to be highly relevant.** It is fully consistent with the agricultural development strategies of the three countries involved, as well as the Bank's country assistance strategies and its regional strategy for agricultural development. It responds to ECOWAS' regional agricultural policy (ECOWAP), which in turn is aligned with the Africa-wide initiatives of CAADP and NEPAD. Enhancing agricultural productivity remains a central development objective of the national agricultural investment plans in each participating country, where it is regarded as the most effective means of achieving food security, reducing rural poverty, diversifying the economy, and expanding exports. Improving agricultural productivity is also central to the Bank. The development objective and interventions supported under WAAPP have also remained aligned with the Country Partnership Strategies of the individual participating countries, as a key pillar of these strategies has been increasing productivity to boost competitiveness for rapid inclusive economic growth and poverty reduction. Agriculture is a key sector for driving the achievement of the World Bank's twin goals in the participating countries. In achieving these objectives, the program has provided a sub-regional framework on the basis of which ECOWAS countries could collaborate to implement national and regional agricultural strategies in the area of technology generation and dissemination in country-specific priority commodity sub-sectors.

40. The project's continued relevance is underscored by the fact that: (i) the program expanded rapidly to practically all the ECOWAS countries, (ii) it served already as a model for other World Bank agricultural programs in Sub-Saharan Africa (East Africa Agricultural Productivity Program – EAAPP; Agricultural Productivity Project in Southern Africa – APPSA; the Sahel pastoralism support project – PRAPS; and the Sahel Irrigation Initiatives Program – SIIP); and (iii) it will serve as the basis for an even more ambitious agricultural transformation program with added features in 2017. WAAPP-1B was able to mobilize significant non-IDA financing, including funding from the Global Food Price Crisis Response Program. Indirect funding became available to CORAF from other sources, including the West African Seed Program, which is funded by the United States Agency for International Development (USAID) and implemented in tight coordination with WAAPP.

41. The project's flexible design allowed to adjust to changing circumstances and to react to the food crisis in the countries affected by EBOLA (Guinea, Sierra Leone and Liberia). In May 2015, WAAPP-1B delivered more than 5,000 tons of seeds (breeder, foundation and certified seeds that are resistant to stresses, and yield at least 3-4 times more than the older varieties used in the three countries) to a total of about 200,000 farmers in these countries. The seeds arrived in time for the planting season so that farmers could restart their lives. Also, this flexibility allowed to shift resources to the seed sector and activities to support accelerated adoption of released technologies that are two of the main bottlenecks for improving agricultural productivity. The project components nurtured stronger and more productive interactions between research, extension, private enterprise,

producer organizations, and civil society—not only at the national level but at the regional level, as intended. The establishment in each country of a center of specialization that had something to offer to the other countries and that focused on the entire value chain (from production to commercialization) for key commodities brought important economies of scale into the R&D process. The exchange of technologies and researchers improved the quality of R&D and investments in academic training of young scientists allowed to build up the human resource base.

42. The decision to strengthen CORAF and entrust it with project coordination continues to pay off. CORAF - increasingly viewed by participating countries as their own organization - is greatly enhancing the vibrancy of national TGD systems and gradually breaking down the isolation that many researchers and other stakeholders have experienced. The CORAF staff plays an important role in providing implementation support and following up on the recommendations of World Bank supervision missions. Thanks to CORAF and project funding for regular regional meetings, workshops, and professional debates, as well as the exchange of information via the Internet and CORAF's web portal, a more sophisticated R&D community is developing in the participating countries. Now that most ECOWAS countries are covered by WAAPP, the network effect has become important and links with the CGIAR system have become stronger.

43. Based on the above, *overall relevance of the PDO, design and implementation is rated as Substantial.*

3.2 Achievement of Project Development Objectives

44. WAAPP 1-B largely achieved its development objective. As was the intention of the first phase of the series, the program strengthened its regional framework by supporting the development of mechanisms for regional cooperation in developing and sharing of technology (including adoption of common regional regulations) that have greatly boosted scientific exchange and transfer of technology across the sub-region. Through improvements in core research and extension capacities, including training of young scientists, the program established National Centers of Specialization (NCOS) in agricultural research and development through which the participating countries have acquired substantial capacities in developing and disseminating productivity ameliorating technologies.

45. The PDO of WAAPP-1B, as defined in the PAD, was to generate and accelerate adoption of improved technologies in the participating countries' top agricultural commodity priorities areas that are aligned with the sub-region's top agricultural commodity priorities as outlined in the ECOWAP. The first phase was intended to strengthen the program's regional framework by developing mechanisms for sharing technology, establishing NCoSs, and funding technology generation and dissemination (TGD).

46. As Table 1 demonstrates, the project attained or surpassed most of the targets. Overall, the program has delivered 52 technologies to over 1.01 million producers covering over 1.02 million hectares, across the three countries. These technologies, in addition to making farmers more productive, are helping them to be resilient to climate change.

Table 1: Status of PDO Indicators for WAAPP-1B

Key Performance Indicators	Countries	Baseline	Target	Actual	% achieved
Indicator 1: Direct Project beneficiaries (breakdown 40% of whom are female[F])	TOTAL	0	2,900,000	3,367,379	116%
	B. Faso	0	400,000	287,766	72%
	C. d'Ivoire	0	500,000	783,200	157%
	Nigeria	0	2,000,000	2,296,413	115%
Beneficiaries who are using technologies generated by other countries/*	TOTAL	0	27,500	96,800	352%
	B. Faso	0	2,500	2,700	108%
	C. d'Ivoire	0	10,000	54,000	540%
	Nigeria	0	15,000	40,100	267%
Number of released technologies by NCOS.	TOTAL	0	34	52	153%
	B. Faso	0	10	20	200%
	C. d'Ivoire	0	12	20	167%
	Nigeria	0	12	12	100%
Area under improved technologies disseminated under the project.	TOTAL	0	900,000	1,039,954	116%
	B. Faso	0	250,000	273,854	110%
	C. d'Ivoire	0	150,000	346,000	231%
	Nigeria	0	500,000	420,100	84%
Producers/processors who have adopted at least one technology.	TOTAL	0	950,000	1,014,851	107%
	B. Faso	0	200,000	273,851	137%
	C. d'Ivoire	0	250,000	431,000	172%
	Nigeria	0	500,000	310,000	62%

/* Introduced after the mid-term review to capture regional spillover effects.

47. The achievement of the PDO is measured by performance indicators which essentially contributed to the PDO achievement: improved technology generation; improved technology access, and accelerated technology adoption.

3.2.1: Improved technology Generation

48. In **improving technology generation**, WAAPP strengthened national research systems, particularly NCoS and the allied institutes with physical infrastructure (building, lab, equipment, etc.), building scientific and research capital (through over 107, 000 client training days; 217 higher academic studies (MSc-158, PhD-59), 44 scientific exchange visits, etc.), using own capacity and small grants to carry out adaptive research, and

deploying participatory varietal/technology development and release strategies⁴ to accelerate the generation of technologies. Consequently, WAAPP1-B countries released 52 new improved technologies, achieving its target for the number of the number of released technologies by the NCoS by 153% (Table 1 above). The areas of focus for the adaptive research were derived through national and regional planning sessions which identified key national and regional productivity constraints requiring research interventions, as well as the required additional technologies to contribute to improved productivity in the selected value chains. Furthermore, the project used the competitive grants as well as commissioned research/studies, that roped in research capacities outside of the NCoS (including other national research institutions, Universities, private sector and NGOs, etc.) by this out-sourced research at the country level and, at the regional/multi-country level (by CORAF) to generate technologies to address constraints (and gaps) identified by value chain actors, which also resulted in the generation of additional 52 technologies from 102 project financed competitive grants (7 regional and 95 country level research proposals). See Table A2.4.

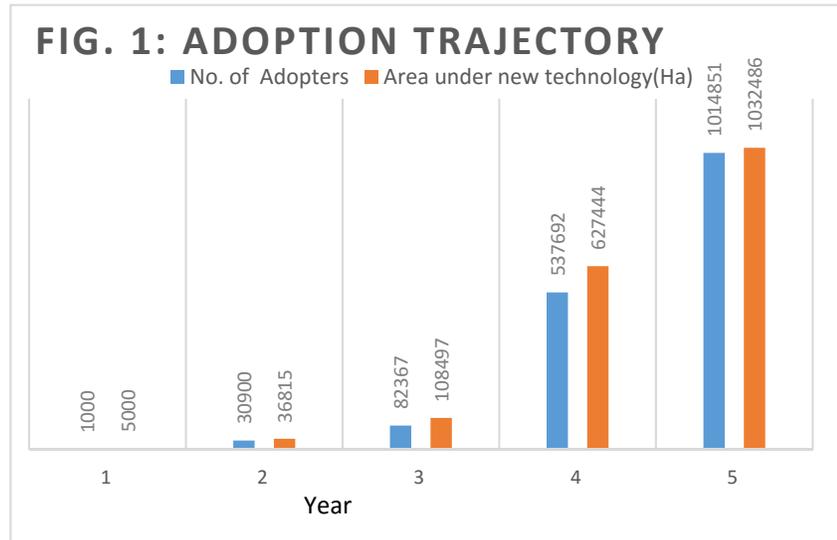
3.2.2: Improved Access to technology

49. Having generated the technologies, **access to technologies** is absolutely critical to successful adoption. This meant three things: (i) ensuring that there is harmonization of the regulatory framework relating to genetics, fertilizers and pesticides across the countries so that technologies could flow seamlessly across the countries – for instance, Burkina Faso, Cote d’Ivoire, and Nigeria respectively received 10, 30, and 7 technologies from other WAAPP countries while these countries also shared 15, 5 and 7 technologies, respectively with other countries (Table A2.1.1); (ii) strengthening the national Registration Systems to accelerate the registration and release of the technologies (for example, seeds); and (iii) scaling up the availability of the technological inputs – through the strengthening the national seeds systems and also sourcing the capacity of the private sector to contribute to the process of scaling up planting materials and fingerlings multiplication, which a results of production of foundation seeds, fingerlings, etc. that supported adoption and helping the project to achieve its target for foundation seed and certified seed/fingerling, ending up with the project achieving and surpassing its targets for foundation seeds and breed stock (Table A2.3). For instance, over 224 tons of foundations seeds of cereals as well as over 16 million fingerlings, among other seeds, were produced for multiplication by certified seed producers so as to improve availability of certified improved planting materials and breeds. The adoption of the harmonized regional framework (particularly for genetic materials) aided the exchanged of technologies across borders, helping the WAAPP 1-B to over achieving its modest target for “Beneficiaries who are using technologies generated by other countries” introduced after the MTR to captured the regional spill-over effects (see Table 1 above)-

⁴ The participatory varietal development strategies involved stakeholders at the onset, at each stage of the development process, to assess the usefulness of the improved technologies.

3.2.3. Accelerated technology adoption

50. WAAPP prepared and deployed **solid communication strategies**, including use of ICT and web-based info systems (receiving over 281,00-hits). The project also piloted the e-extension system in Cote d’Ivoire, trained extension workers and the conducted of field demonstration (over 3,147 demonstration plots), among other actions to **disseminate/demonstrate** project results. WAAPP 1-B carried out all its key actions for technology adoption, which broadly paid off. Overall, the technology indicator for area under improved technologies disseminated by the project was achieved by 116% while that for the number of producers/processors who have adopted at least one new technology was achieved by 107%. Indeed, most of these



dissemination/demonstration strategies implemented after the MTR (Project Year 3) succeeded in helping the project to accelerate the adoption of technologies as Figure 1 presented earlier depicts. For instance, the number of adopters shot up from about 82,000 in PY3 to over 537,000 in PY4 and then to over 1 million hectares in PY5. Similarly, the area under improved technology saw rapid increase, from about 10000ha in PY3 to over 627,000ha in PY4 and then to over 1 million hectares in PY5.

51. Achievements of PDO indicators varied considerably from country to country. The number of project beneficiaries overall, was achieved by 116% (approximately 3.4 million compared to the end of project target of 2.9 million) and only in Burkina Faso failed to reached its target. The number of technologies generated was achieved by all, with Burkina Faso and Cote d’Ivoire recording higher percentage of achievement. The area of improved technologies disseminated under the project was slightly above original estimates, with Nigeria lagging behind (92%) and Ivory Coast surpassing the target by 232%. The number of processors/producers who adopted at least one new technology was surpassed (107%) and only Nigeria did not achieve the target (62%).

52. Based on these results, **overall achievement of the PDO is rated Substantial**. All three countries also met the conditions for moving to a second project phase of the APL, except for adoption of a sustainable funding mechanism scheme for the CARGS which is still under consideration by the governments, whose are putting in place the building blocks for establishing such as a scheme, following the example from Cote d’Ivoire (FIRCA). They ratified and implemented the common ECOWAS regulations for registering genetic materials and pesticides; they strengthened their national registration systems for plant

materials and pesticides; they established operational NCOSs, each of which has received several researchers from participating countries as visiting scientists; and they each successfully operate competitive grant systems, which have been playing a major role in bringing together traditional and non-traditional stakeholders of the national and regional agricultural research systems.

53. ***Achievement of intermediate results indicators.*** All of the original intermediate results indicators contained in the PAD were achieved. As a result of the mid-term review, and based on lessons learned from the monitoring system, five indicators were added to better capture specific aspects as the project evolved. The five indicators were: (i) hits for the national/regional web-based information system on agricultural technologies and research skills; (ii) development of national/regional action plans on gender, communication, and climate change; (iii) number of scholarships for scientists (MSc and PhD training); (iv) multi-country research proposals financed by the regional Competitive Agricultural Research Grant System (CARGS); and (v) number of demonstration plots established. As the table below shows, the targets for the key additional intermediate results indicators were also achieved.

Table 2: Status of Intermediate Results Indicators Introduced at Mid-Term

Intermediate Results Indicators	Target	Achieved	Percentage achieved	Comments (% achieved)
Indicator 1: Hits for the national/regional web-based info system on agricultural technologies and research skills	187,000	281,535	151%	Web-sites of CORAF and Nigeria well visited. BF and CI lagging.
Indicator 2: National/regional action plan on gender, communication, and climate change	12	12	100%	A regional and national action plans in all three countries were developed
Indicator 3: Scholarships for MSc and PhD granted	198	217	110%	BF – 108 PhD and MSc CI – 78 PhD and MSc NG – 31 PhD and MSc
Indicator 4: Multi-country research proposals financed by the regional CARGS and maintained by CORAF	10	7	70%	Regional research proposals took longer to prepare than originally expected
Indicator 5: Demonstration plots established	2,000	3,146	157%	Number of demonstration plots twice as many as planned in CI and NG. BF achieved target

54. ***Summary of achievements.*** A summary of achievements under each project component follows. For more detail, see Annex 2.

55. ***Achievement of Component 1: Enabling Conditions for sub-Regional Cooperation in the Generation, Dissemination, and Adoption of Agricultural Technologies is rated Satisfactory.*** Common regulations for registering genetic materials and pesticides have been put in place in all three WAAPP-1B countries, along with functional national registration systems for genetic materials and pesticides. Each country has the necessary regulatory and control bodies, and they are performing satisfactorily, although it will take time until border agents are familiar with the regional regulations. The

mechanisms for exchanging technologies and researchers have progressed considerably with strong support from CORAF. Technologies have moved across the region under WAAPP-1B and 90,000 producers are using technologies that were developed in other countries. By facilitating these exchanges of technology and research skills, the NCOSs have become part of an emerging regional network of researchers. Gender action plans have been developed and mainstreamed into project implementation. 44 percent of project beneficiaries are female versus an initial target of 40 percent. Also, as mentioned under the intermediate results indicators above, a regional and country specific actions plans for dealing with climate change were developed. For its part, CORAF considerably strengthened its web-based information system and consolidated the information available from various other databases. With the support of CORAF, each country has implemented its own national information strategy. These information measures contribute to strengthening regional integration of the agricultural research community.

56. **Achievement of Component 2: National Centers of Specialization (NCOS) is rated Satisfactory.** The centers in Burkina Faso, Ivory Coast and Nigeria are fully functional and have added skills that support a more professional level of performance. The planned investments in laboratory buildings and equipment in all three countries were carried out.

57. In Burkina Faso, the administrative building at the research station of Banfora and the central laboratory in Fardako-Ba have been finished, although with delay and have been equipped. In Ivory Coast, the laboratories of the two institutes were rehabilitated and equipped. Also, experimental plots and the infrastructure for research, training and housing of researchers and visitors were upgraded. In Nigeria the project established a DNA analysis laboratory with fully functional molecular biology equipment.

58. Concerning the training of researchers, summary achievements were as follows:

Altogether, 217 scientists were trained to the MSc and PhD level: Burkina Faso - 108; Cote d'Ivoire – 78; Nigeria – 27. In addition, some 44 scientific exchange visits took place.

59. By generating 52 new technologies—20 in Burkina Faso, 20 in Ivory Coast, and 12 in Nigeria—they have exceeded the target (34) by 53 percent. Of those technologies, 10 are being adapted or disseminated in the region. Several exchange visits have been organized at the original NCOSs, and the heads of the centers in Burkina Faso, Ivory Coast and Nigeria and their key staff have been regularly invited to the other countries during joint regional implementation review missions.

Box 1: Job creation - creation of entrepreneurship

A silent revolution has started under the project – the development of smallholder entrepreneurs that produce seeds and seedlings. The emergence of these private sector agents is crucial for the development of the agricultural sector as improved seeds and seedlings/cuttings are the key ingredients for productivity increases. Government run nationwide seed systems are dysfunctional. Private entrepreneurs, in collaboration with research institutes that produce breeder and foundation seed, do have the flexibility, knowledge and capacity to provide quality seed and thereby respond to demands of their fellow farmers. Such individual entrepreneurs and seed producer groups have emerged in all three countries and there are also many that produce cuttings and planting material for tubers and

banana/plantain. Especially in Ivory Coast, many private nurseries have emerged that use new multiplication techniques in banana/plantain to produce improved planting materials for the market. The project played a key role in connecting these entrepreneurs with research institutes and with training them so that they mastered all the necessary technology aspects.

60. The project's emphasis on funding of biotechnology and seed laboratories is especially noteworthy. That support enabled the countries and the region to benefit from the latest technologies. Investments in biotechnology can considerably reduce the time needed to develop new varieties, and adequately equipped seed laboratories are indispensable for proper seed certification as well as the phytosanitary controls required to move and trade seed internationally.

61. Building the scientific capacity of young researchers through academic and on-the-job training is another vital step in developing functional centers of specialization. It also allowed the three participating NCOS to replace scientists who have retired. The exchange program has gained momentum as CORAF has defined practical modalities for such exchanges among researchers and other stakeholders. CORAF has also conducted several studies that have helped to develop the strategic options for a better regional approach to increasing agricultural productivity, including a study of exchange mechanisms for value chain actors, options to strengthen NCOSs, strategies to develop synergy among sub-regional actors, and mechanisms to develop technology transfer capacity at the regional level. These studies have benefited all participating countries.

62. ***Achievement of Component 3: Funding of Demand-driven Technology Generation and Adoption, is rated Satisfactory.*** The following paragraphs summarize achievements under each participating country. For more detail see Annex 2.

Burkina Faso. The NCoS in Burkina was the National Institute for the Environment and Agricultural Research (INERA) responsible for the mango and onion value chains.

Key technologies developed by WAAPP 1B in Burkina Faso were:

- Integrated pest management against the fruit fly that attacks mangoes, causes heavy losses and impedes exports
- Development and release of new rainy season tomato varieties that were introduced from Brazil, Cape Verde and Japan
- Development and release of new onion varieties that have good storage performance, are tolerant to hot and humid season, and are resistant to bolting and pest and diseases
- Two natural pesticides against tomato pests
- Broyeur/trieur (shredder/sorter)
- Chemical treatment against la fonte des semis d'oignon et contre la pourriture de bulbes au champ

Box 2: Burkina Faso – New rainy season tomato varieties. Based on an ambitious varietal research program on tomatoes that included the importation of genetic material from several countries (Brazil, Cape Verde and Japan),

researchers of the NCoS of INERA in Burkina Faso, succeeded in selecting three new varieties of tomatoes that can be successfully grown in the rainy season. Developing such varieties was crucial. In the past, with existing varieties rainy season tomato production was not economically feasible even while prices during this period are a multiple of what they are during the dry season. These new varieties are spreading to neighboring countries as they are being sought after by farmers.

On the institutional side, CNS-FL was converted into a scientific department of INERA. This is to facilitate its evolution into a Regional Center of Excellence (RCoE) and should improve its sustainability.

Cote d'Ivoire. The NCoS in Ivory Coast was the National Center for Agricultural Research (NCAR) which concentrates on the banana-plantain value chain, and the Tropical Technology Institute (ITT). Key technologies developed by WAAPP 1B in Ivory Coast were:

- Development of agro-processing techniques that allow to mix corn, cassava, and plantain flour with wheat flour for bakery products
- New improved banana plantain varieties
- Development of interplanting techniques between plantain and short-cycle crops
- Determination of fertilizer recommendations for vegetable growing in the off-season
- Frequency of irrigation for high value crops in the off-season
- Development of plantain flour for the preparation of local dishes (foutou and fofou)
- Development of in-vitro seedling multiplication techniques for banana plantain (plantain plant derived from stem fragmentation. The PIF technology allows production of healthy material in 03-04 months and at any period of the year. This technology has already been transferred to Mali.

On the institutional side, WAAPP 1B in Ivory Coast has stimulated the emergence of smallholder seed entrepreneurs and nursery producers that supply quality planting material for the market. It introduced E-extension on a pilot basis with a call center and automated messages in local languages. This system goes beyond delivery of simple text messages and allows for feedback from the users. The country's extension agency (ANADER) is managing the system.

Nigeria. NCoS in Nigeria consisted of 3 research institutes that deal with aquaculture, namely: National Institute for Fresh Water Fisheries Research (NIFFR), New Bussa; National Institute for Oceanography and Marine Research (NIOMR), Lagos; and National Stored Product Research Institute (NAPRI), Ilorin. These institutes concentrated their research on fisheries, specifically catfish and tilapia.

Key technologies generated by Nigeria WAAPP 1B are as follows:

- Improved catfish breeding and management techniques (production of all-male tilapia) that increase the survival rate of fingerlings from the present 60 percent to

- over 80 percent, and reduces the growth rate/culture period for fingerlings by 33 percent
- Detachable Fish Smoking Kiln designed to address the many problems of traditional smoking method (lack of control over the drying process, exposure to dirt and dust, insect infestation, exposure to contaminants and low capacity which often lead to production of unstable and unsafe smoked products)
 - Fish feed production (fish meal processed from Lantern fish)
 - Briquette machine
 - Fish solar tent dryer that is easily dismantled and thus very portable and with a higher batch capacity than earlier wooden models
 - Multi-crop solar dryer
 - Fish retail tables that will reduce post-harvest losses, improve quality and hygiene, enhance marketability and increase availability of fresh fish
 - Fish cooling boxes (plastic and aluminum) for better preservation, distribution and marketing of fish
 - Technique to produce all year-round fingerlings – clarias species

Box 3: Nigeria – Post-harvest technologies for fish production.

Aquaculture in Nigeria is extremely important and a main source of protein. Forty percent of total dietary protein consumed in Nigeria (and as much as 80 percent for coastal and riparian communities) comes from fish. With fish capture decreasing each year, the growing demand for fish products can be met only by developing aquaculture at a rapid pace. Yet at the same time, over 30 percent of fish production goes to waste because of storage problems as fish need to be either cooled or smoked, or consumed immediately. For these reasons, the NCoS in Nigeria have developed a series of practical solutions to this storage problem. They have developed improved small-scale smoking and cooling techniques that can be used by the thousands of fishermen. All of these technologies are more environmental friendly (use less wood or charcoal) and more hygienic and therefore better protect the consumer from negative health effects.

On the institutional side, the project provided support to the Agricultural Research Technology Transfer Centers (ARTTC) so that they can carry out on farm trials, through which all proven technologies from Agricultural Research Council of Nigeria, state and federal institutions as well as other partners are evaluated, with ARTTC scientists acting as facilitators and knowledge-back stoppers in the field. The project also promoted the transformation of the Agricultural Research Council of Nigeria (ARC�) from a consultative into a more executive body. It organized study tours to Brazil and China to study models of reforming agricultural research systems. To speed up technology adoption, the project worked with the National Agricultural Research System (NARS); Agricultural Development Programs (ADPs); the Federal Institute for Industrial Research (FIIRO); IITA; ICRISAT; the private sector and NGOs. Several technology dissemination tools such as adopted villages and schools, innovation platforms, extension publications, radio programs, and training workshops were used, which allowed to reach 2.3 million direct beneficiaries out of which 49 percent were female farmers. Entrepreneurship training was given by the NCoS.

Box 4: All three countries test new extension approaches, especially innovation platforms (IP) and e-Extension. To accelerate adoption and diffusion of new technologies and in view of the low ratio of extension agents to farmers and the high costs of direct interactions between them, WAPP-1B has developed new tools to deal with this issue. Innovation platforms (IPs) have been developed that bring together all the actors along a given value chain (producers, researchers, extension agents, agro-processors, input suppliers, traders, etc.) with the objective to share information and knowledge and to optimize the benefits for all stakeholders. Dozens of such IPs have been created that allowed to identify and resolve bottlenecks that hinder successful commercialization of various agricultural products. Concerning e-Extension, starting with Ghana under WAAPP-1A, WAAPP has also developed a voice-based smart-phone system that allows two-way communication between the extension/advisory service and farmers and other rural stakeholders. A huge database of information on available technologies was created, and for a small fee per week, farmers (and anybody else interested in the service) can obtain and exchange information on marketing and prices as well as production issues. In Ivory Coast e-extension has been introduced on a pilot basis and is managed by the country's extension agency (ANADER). This will allow ANADER to provide clients with information that is appropriate to their needs while significantly reducing the unit costs of farmers reached. This new e-Extension system represents a departure from earlier applications of ICT in agriculture, which allowed only for the delivery of simple text messages, with limited feedback from the users. It is likely to have applications outside the agricultural sector, especially in health and marketing.

63. ***Component 4: Project Coordination, Management, Monitoring, and Evaluation is rated satisfactory.*** Both the national coordination units and CORAF fulfilled their roles satisfactorily with regard to financial management and procurement; planning and executing and project activities in a timely manner; M&E and communication team developed sound communication strategies. Audits were prepared in time and unqualified. CORAF played a leading role in coordinating the overall program and preparing and disseminating studies. These efforts have helped to develop a harmonized vision, supported by shared strategies and priority action plans for strengthening regional cooperation.

3.3 Efficiency

64. The appraisal stage Economic and Financial Analysis (EFA) was a hugely complex analysis which relied on a number of assumptions relating to productivity, adoption rates, spill over adoption to other project countries, and to other West African countries. Given that different technologies would invariably have different productivity improvement impacts, that different farmers could potentially adopt different improved technologies, and the area under different improved technologies could therefore vary across countries and value chains, it would be a seriously demanding (and yet not nearly as reliable as expected) effort to carry out surveys to collect data on all of these aspects and then gross these up to total adoption area for different technologies for different value chains in different countries. Clearly, the minimum requirements for the project to be economically viable would have been embedded in the appraisal targets set for the various activities. In other

words, if those appraisal targets were achieved, the return expected at appraisal could be realized. So while the ICRR team did not carry out a comprehensive EFA at the project level, it adopted an alternative approach to validating some of the key assumptions of the appraisal ex-ante EFA to ascertain whether the project was indeed economically viable.

Three steps were involved in this process:

65. (a) comparing the appraisal targets with the achievements relating to the number of technologies generated, the minimum improvement in productivity that would be essential for the release of the technologies compared with the closest rival control technology, the number of farmers adopting the improved technologies, and the area covered under improved technologies. So we indicate that the project completed all of the actions related to technology generation, access, and dissemination which resulted in accelerated adoption of improved technologies. The project data base shows that overall, a total of 52 technologies (compared with the target of 34) were developed in the three countries that generated at least 15 percent productivity increases over the control technology. The area under improved technology was 1,039,654 hectares (compared with the target of 900,000ha) and the number of processors/producers who have at least adopted one technology was 1,014,851 (target was 950,000). In other words, the project was super-efficient in using the funds allocated to generate the outputs that were targeted to contribute to PDO achievement. That the basic assumptions in the appraisal EFA relating to technologies, minimum productivity, and adoption as manifest in the PDO indicator targets were achieved indirectly validates that the appraisal ERR probably was realized.

66. (b) confirming that productivity and adoption rates in-country are indeed acceptable. To get credible data on productivity and adoption rates (in-country), a number of surveys were conducted in the three countries (covering project and non-project beneficiaries, see Annex 3 for summary of survey results). The farm level survey data from Burkina Faso show yield increases for all commodities supported under the project, ranging from 3.5% for mangoes (fruit trees) to 57% for maize, as well as technology adoption rates of 35% for varieties and a range of 21% to 29% yield ameliorating good agricultural practices. The Cote d'Ivoire study posts encouraging adoption rates of 20% for plantain-bananas (bulky vegetative planting materials) to 70% for cereals all with yield increases above 15%. And in Nigeria increases among project beneficiaries range from 32% for rice to 48% for maize, with the majority of fish farmers estimating over 60% productivity increase. Additionally, the survey data shows increases in household and improvement in poverty status of the majority of the project beneficiaries. These results demonstrate a good impact of the project on productivity, given that ex-ante economic analysis used to determine whether the proposed Project can, under a reasonable set of operating assumptions, produce the desired minimum benefit stream, require, in all three cases, incremental modest adoption rates (rates of less than 2.4% – BF; 4% – CI; and 10% – NG) and modest incremental yield increases of less than 0.6 percent to break even.

67. (c) confirming that in-country adoption is sustainable and would most likely have spill-over effects to other WA countries. For this, the ICRR team prepared *specific value chain farm profitability models*. Should the operational financial models with the improved technologies demonstrate higher profitability, the probability that these

technologies would be mainstreamed would be high, providing comfort that these would have the potential of spreading to other West African countries yielding multiplier spill-over effects. Farm level data from the Financial and Economic Analysis of WAAPP-Nigeria in December 2016 showed that profit of a typical fish farm increased by 31 percent and that the benefit/cost ratio (BCR) was 1.70 (financial) and 1.29 (economic). Sensitivity analysis of a 10 percent increase in costs and a 10 percent decrease in revenue showed that these changes did not have a major impact (FBCR 1.69 and EBCR 1.29 and FBCR 1.52 and EBCR 1.16 respectively). Farm level data from the economic and financial analysis of the additional phase of WAAPP-Ivory Coast in August 2016 showed that on a typical farm using improved plantain varieties annual production increased by 50 percent (120 to 180 tons), and the internal rate of return (IRR) was 78 percent. For the whole of the country, the economic internal rate of return was estimated at 18 percent. In the case of Burkina Faso, economic and financial analyses were not done, but for all commodities yield increases were observed that ranged from 3.5 percent for mangoes to 57 percent for maize. Farmers revenues except for onions, increased for all commodities between 16 900 FCFA and 466 800 FCFA per year and household.

68. However, project level ERR was not computed. The economic viability was derived indirectly by validating appraisal targets which were a reflection of the viability assumptions. Viability was further confirmed by value chain specific productivity and adoption rates through extensive in-country surveys. Although viability has been confirmed, given the indirect approach that was adopted the team, efficiency was rated **Modest**.

3.4 Justification of Overall Outcome Rating

Rating: Moderately Satisfactory

69. The overall outcome rating is Satisfactory, based on the high relevance of the development objectives and design, and the satisfactory achievement of the PDO and the intermediate outcome indicators and the triggers for moving to the next phase. By expanding the regional approach to three more countries, the project contributed significantly to revamping the technology generation, dissemination, and adoption agenda in West Africa; strengthened the physical research infrastructure and built up the human and institutional research capacity; strengthened the capacity of the other actors involved in agricultural R&D; and fostered regional cooperation to optimize the use of scarce financial and human resources. The team has rated the overall outcome as Moderately satisfactory due to the modest rating for efficiency.

3.5 Overarching Themes, Other Outcomes and Impacts

70. What started under WAAPP 1A, namely the transformation of subsistence crops into commercial crops has continued. Increasingly, tubers (cassava) and maize are becoming partial substitutes for wheat flour in baked goods, cassava for all kinds of industrial uses, and maize and sorghum for the brewing industry. The strong growth of urban food markets in Africa represents an opportunity for farmers to profit from meeting

an expanding array of consumer and industrial needs for agricultural products. To benefit from these opportunities, farmers in all three countries realized that they have to become better organized so that they can purchase inputs and sell products as organized groups and not as individuals. The trend away from subsistence agriculture towards commercial agriculture also has led to the creation of value chains in which producers can only effectively participate if they achieve a higher degree of organization.

(a) Poverty Impacts, Gender Aspects, and Social Development

71. Under WAAPP 1B, gender activities were mainstreamed in TGD and an ambitious target for women participation of 40% was set. This target was surpassed, as in the end female beneficiaries were 46 percent and 49% in Ivory Coast. Women are highly involved in growing of tomato and onions and in transforming and conserving fruits, especially mangoes. In all three countries, as part of country specific gender action plans, technology generation and diffusion were targeted to women and men; demonstration plots were planted on plots owned by men as well as plots owned by women.

(b) Institutional Change/Strengthening

CORAF

72. A silent revolution has started under the project – the development of smallholder entrepreneurs that produce seeds and seedlings. The emergence of these private sector agents is crucial for the development of the agricultural sector as improved seeds and seedlings/cuttings are the key ingredients for productivity increases. Government run nationwide seed systems are dysfunctional. Private entrepreneurs, in collaboration with research institutes that produce breeder and foundation seed, do have the flexibility, knowledge and capacity to quality seed and thereby respond to demands of their fellow farmers.

73. The development of innovation platforms that bring together all stakeholder in a value chain from producers to markets, is providing an incentive for farmers to get organized. If they want to engage in commercial agriculture, they need to be competitive which means they need to lower their costs. This in turn requires that they buy and sell in bulk which they can only do if they are part of farmer organizations.

(c) Other Unintended Outcomes and Impacts (positive or negative)

Ebola crisis

74. The flexible design and reach of WAAPP-1-B allowed to contribute to mitigate the impact of Ebola in the rural areas of the three affected countries through a regional Ebola emergency program. Through its regional network the program was able to organize the supply and timely distribution of almost 8,500 tons of improved certified seeds to a total of more than 300,000 beneficiaries in the three impacted countries (Guinea, Liberia and Sierra Leone) using a combination of funding resources. This operation was coordinated by CORAF under the leadership of ECOWAS. CORAF successfully coordinated the identification of supply countries, the procurement and regional transportation of the seeds, and ECOWAS facilitated border crossings. The national WAAPP coordination units

ensured the procurement and distribution of the seeds. The operation was implemented in partnership with the USAID's West Africa Agricultural Seeds Project (WASP) and the African Development Bank (ADB). This operation significantly helped farmers in EBOLA affected countries to restart their agricultural activities to restore their livelihoods.

75. Secondly, while the PAD foresaw that the program would strengthen one National Center of Specialization and one key agricultural commodity, in the end, WAAPP1-B allowed to reinvigorate clusters of research institutes working on the same commodity. Also, the constant focus of supervision missions on the diffusion of available technologies allowed to reinvigorate extension efforts covering a much wider range of commodities and technologies than initially planned.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

76. In all three countries towards the end of the project, impact evaluation studies were carried out. They were very comprehensive as they not only covered the key commodities included under the project but also commodities that benefitted indirectly from project activities. These evaluations compared the situation of project and non-project beneficiaries before and after the project. All evaluations used multi-stage sampling techniques, primary and secondary data, farmer questionnaires, and interviews with key stakeholders. In summary, the results were as follows:

77. Burkina Faso: The impact evaluation study was carried out by *Societe d'études, de Conseils et d'assistance Multisectorielle* and published in March 2017.

78. Ivory Coast: The impact evaluation of WAAPP 1B concerning banana plantain was carried out by *Ecole Nationale Supérieure de Statistique et d'économie Appliquée* and the report was issued in November 2016. The main findings were: (i) the total number of beneficiary banana growers all over the country increased from 2.6% to 3.9% (2.3% to 8.9% of women beneficiaries); the number of growers that benefitted from training and seedlings went from 33% to more than 80%. The biggest impact of the project was on the area cultivated under bananas and total banana production. The project area under bananas increased 10 fold and went from 6,364 ha to 64,298 ha and production increased from 175,528 tons to 2,246,758 tons.

79. Nigeria: The study by the Institute of Food Security, Federal University of Agriculture Makurdi, Nigeria of December 2016 concluded that WAAPP 1B – Nigeria created significant positive impact on the beneficiaries from 2011 to 2015. Productivity for aquaculture increased by 60.2%, awareness and adoption of WAAPP technologies among beneficiaries went from 28.5% to 71.5%; access to productive inputs increased; farm income from aquaculture increased by 88%; and poverty among project beneficiaries decreased from 88% to 42.2%. In addition, a beneficiary assessment of WAAPP-Nigeria was carried out by the Department of Agricultural Economics and Farm Management, University of Ilorin, Ilorin, Nigeria, September 2016. Its main finding was that the overwhelming majority of beneficiary farmers were satisfied with the relevance, affordability and appropriateness of the technologies disseminated to them.

4. Assessment of Risk to Development Outcome

Rating: Moderate

80. The immediate risk to the development outcome is Moderate, as the proposed follow-on regional West Africa Agricultural Transformation Project is under preparation and expected to start in 2018. Nevertheless, some of the momentum that was built up under WAAPP 1B will be lost in the interim. Especially the transformation of the NCoS into RCoE will be slowed down as will be the diffusion and adoption of some technologies that were being developed toward the end of the project.

81. ***Sector-level risks are Moderate.*** The major risk foreseen in the PAD, namely the limited coordination capacity, did not materialize. CORAF was able to maintain a coherent program across all three countries as well as the other ECOWAS countries. CORAF continued to gain significantly in strength and maturity over the course of project, performed well, and became an indispensable partner for TGD. Consequently, donor interventions in TGD have become more coordinated and the response to the Ebola crisis in Guinea, Sierra Leone and Liberia where WAAPP 1 B in 2015 helped to deliver 5000 tons of seed proved the capacity of WAAPP to contribute to addressing regional food crises. The risk of limited spillovers from NCOS investments was overcome by focusing on regional dissemination activities; and the fear that there would be an inadequate supply response by the private sector for production of seeds and planting material was proven wrong by the emergence of a large number of smallholder seed entrepreneurs encouraged by the project.

82. ***Operation-specific risks are Moderate.*** The lack of good technical skills to address research and extension problems, was overcome by pooling human resources through the CARGS system. The massive training program at the MSc and PhD level under the project has significantly strengthened the human capital base for agricultural research. Issues of limited sustainability of NCOS investments were being addressed by greatly raising the visibility of TGD activities and demonstrating to the public and policy makers the benefits of sound regionally coordinated research. Risks related to poor management of project activities and inadequate coordination with other donors were largely overcome by capacity building measures and close supervision of CORAF and the Bank through the arrangement for co-TTLs.

83. ***Control risks are Moderate.*** Systemic corruption, poor financial reporting, audit delays and weak project governance were addressed through training of key project staff, close Bank supervision by specialized teams, and the regular updating of project implementation manuals.

84. ***Political risk to development outcome is High.*** Project implementation was delayed by the political crises in Ivory Coast and Burkina Faso and West-African countries remain vulnerable to similar risks. The future of regional technology cooperation and exchange will be intertwined with political stability and the economic process of establishing a more closely integrated economic space in the ECOWAS countries.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Satisfactory.

85. Based on the experience under WAAPP 1A where project preparation was judged insufficient, under WAAPP 1B key stakeholders were strongly involved in preparing the project and Bank management gave the operation the necessary attention. WAAPP 1A served as a model for increasing the geographic scope of WAAPP and informed all aspects of project design of WAAPP 1B. CORAF's involvement from the beginning was instrumental to get the project well prepared. Effectiveness delays in Nigeria due to national borrowing regulations cannot be attributed to the project as such.

(b) Quality of Supervision

(including of fiduciary and safeguards policies)

Rating: Satisfactory

86. The quality of implementation support is rated Satisfactory. World Bank implementation support missions played a key role in promoting innovative ideas and concepts such as south – south collaboration for global knowledge sharing; and speeding up the seed multiplication systems in the three countries by attracting private companies and scaling up seed growers' associations. They also continuously looked for new ways to accelerate the spread and adoption of generated technologies by promoting different extension tools such as e-extension, innovation platforms and adopted villages and schools around the NCoS.

87. Especially noteworthy is the projects rating mechanism in the Implementation Status & Results Report (ISR) that was used by World Bank SPN missions. At the end of each implementation support mission, representatives of the three countries were brought together to carry out an open, transparent and public assessment of achievements of project outcomes and intermediate outcome indicators for each country. This benchmarking in performance rating generated a healthy emulation among all the countries, with each country working hard to improve project implementation. However, toward the end of the project, the Bank did not warn the Borrowers and executing agencies in a timely manner of the fact that there would be no second phase of WAAPP-1B, to completed the anticipated 10 APL, and did not explain its decision.

(c) Justification of Rating for Overall Bank Performance

Rating: Satisfactory.

88. The overall Bank performance is rated satisfactory, for effective use of adaptive learning, for the proactivity of the team in addressing issues as they arose, and most of all, for constantly probing for ways of how to accelerate dissemination and adoption of research results within the countries and across national borders given WAAPP-1B's flexible design.

5.2 Borrower Performance

(a) Government Performance

Rating: Moderately Satisfactory

89. The signing of the grant agreements took longer than expected, especially in the case of Nigeria, and led to delayed effectiveness. Thereafter, all three governments played the roles expected of them in a satisfactory manner and set up National Steering Committees under the appropriate Ministry. The three Steering Committees functioned well. They took a keen interest in the project and provided the requisite guidance, reviews, and annual budget approvals in a regular and timely manner. In Nigeria, political infighting over who should be the Project Coordinator after the first office holder retired, led to a period of uncertainty and slower project progress than would have otherwise been the case. Government procurement rules in Burkina Faso led to delays in the construction of a laboratory which only was inaugurated in towards the end of the project. Delays in the release of counterpart funding also at times was a problem.

(b) Implementing Agency or Agencies Performance

Rating: Satisfactory

90. Each of the three countries had a national project coordination unit (PCU) that managed the project. These PCUs were under the authority of (i) Burkina Faso – *Secretariat general* of the Ministry of Agriculture; (ii) Ivory Coast – Inter-professional Fund for Research and Extension (FIRCA) of the Ministry of Agriculture and Rural Development (MINADER); and (iii) Nigeria – the Agricultural Research Council of Nigeria (ARCN) under the Federal Ministry of Agriculture and Rural Development. In addition, the countries' agricultural extension agencies, private contractors (NGOs, producer organizations, and others) participated in project execution. The selected NCoSs were the primary actors in research. All three countries operated competitive research grant systems (the CARGS) as foreseen at appraisal

91. CORAF was responsible for coordinating, monitoring, and evaluating the project's generation and adoption of technologies across the three countries. It assisted the PCUs and NCoS in the development of their work programs and in networking with regional and international centers of excellence, particularly for developing the visiting scientist program. CORAF also built up sound fiduciary capacity which it used to assist the participating countries.

92. In each country, the PCUs needed time to adapt and master Bank procedures for procurement, financial management, M&E, and environmental and social safeguards. But their performance improved steadily and was fully satisfactory by the time of the mid-term review.

(c) Justification of Rating for Overall Borrower Performance

Rating: Moderately Satisfactory

93. Because WAAPP-1B used demand driven Competitive Agricultural Research Grant Schemes (CARGS) at the national and regional level, it required national research systems together with CORAF to develop a significant degree of coordination. Similarly, putting in place the enabling conditions for sub-regional exchange of technologies and agricultural inputs (seeds, fertilizers and pesticides) required close concertation.

Governments and individual researchers in the executing agencies, including CORAF, needed time to assimilate these new concept, but when the project ended, they had clearly internalized them and assumed ownership. Given these positive developments, the overall performance of the Borrowers is rated as Moderately Satisfactory.

6. Lessons Learned

94. **Benefits of regional projects.** Regional projects that (i) are supported by ECOWAS, and (ii) address similar constraints and have the same PDO can have more benefits and a much higher impact on the participating countries than projects limited to individual small countries. By stimulating interactions between professionals in different countries, their world view changes and they become more open to innovations and change. Such regional projects to succeed require a strong regional project coordination unit, and strong and regular supervision and implementation support missions from the Bank. To show their full benefits such regional projects need to be conceived as Adaptable Program Loans (APL) with at least a 10-year time frame.

95. **Need for multidisciplinary research teams.** As a value chain approach is increasingly adopted in agricultural projects and agricultural technology no longer focuses primarily on production aspects, the degree of complexity increases and the inclusion of additional scientific disciplines becomes necessary. A new balance needs to be struck between natural scientists, social scientists, engineers and *agricultural policy makers*. The task of accelerating adoption of released technologies requires added attention to and strengthening of the national extension systems, including the training of key extension staff to the MSc and PhD level and the creation of extension departments at university level. CORAF should take up this challenge. *Also, the capacity to formulate agricultural policy in support of agricultural innovations needs to be strengthened by training of policy makers.*

96. **Need to connect agricultural technology with entrepreneurship and employment creation, especially youth.** As started under WAAPP 1B, the link between agricultural technology and artisanal and agro-industrial entrepreneurship for youth and women has to become a focal point in future projects. This requires institutional changes at the level of different ministries (Agriculture, Industry, Employment, etc.) as in most countries funds for entrepreneurship and job creation exist, but no coordination mechanisms that link them to the agricultural and rural sector.

97. **Strengthening producer organizations must be one key element of agricultural TGD programs.** WAAPP 1B has shown that a higher degree of organization of producers (associations, federations, cooperatives) is critical to enable the use of new technologies and technical innovations that require economies of scale. Building social capital, including strong producer organizations, should be a major focus of national extension systems and extension agents should be trained accordingly in how to work with farmer groups, communication theory, sociology, adult pedagogy and psychology, but also agricultural planning, business administration and market analysis.

98. **Technology packages are more important than single innovations.** While isolated technologies can make significant contributions to improving agricultural productivity, in many cases even larger impacts can be achieved by bundling several innovations into a single technology package. For some potentially game changing technologies such as the use of composite flour (wheat with millet, maize, cassava), a threshold of adoption needs to be attained before the innovation becomes self-sustaining. In such cases, agricultural research results need to be backed up by agricultural policy making (review of import policies) at the national level.

99. **Need to initiate impact evaluation studies early to enable testing of methodologies and address analytical and inferential challenges, which has been a bottleneck in the preparation of this ICR.** The impact of technology diffusion projects is inherently difficult to measure. It is fraught with methodological issues. Adoption rates and yields need to be measured over time (on an annual basis) and other contributing factors need to be sorted out. The most important one of these is "weather" which means that any good technology might not be performing well in a given year. Going forward impact should be initiated as early as possibly, based on: clear terms of reference (specifying exactly what is to be measures; definition of the methodology to be used, etc.

100. Lessons learnt from the design and implementation of WAAPP 1-B as well as the other WAAPP series are greatly influencing the design of the proposed follow-on West Agriculture Transformation Program.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

(b) Cofinanciers

(c) Other partners and stakeholders

(e.g. NGOs/private sector/civil society)

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
1. Enabling Conditions for sub-regional Cooperation in Generation, Dissemination, and Adoption of Agricultural Technologies	8.3	6.08	73.25
2. National Centers of Specialization	28.52	31.19	109.36
3. Funding of Demand Driven Technology Generation and Adoption	67.53	55.75	82.56
4. Project Coordination, Management, Monitoring and Evaluation	16.35	19.01	116.27
Total Baseline Cost	120.71	112.03	92.81
Physical Contingencies	0.14	0.00	0.00
Price Contingencies	0.34	0.00	0.00
Total Project Costs	0.00	0.00	
Front-end fee PPF	0.00	0.00	.00
Front-end fee IBRD	0.00	0.00	.00
Total Financing Required	121.19	112.03	92.44

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower + Beneficiaries		13.19	3.97	30.01
Global Food Crisis Response Program		18.00	17.630	97.94
International Development Association (IDA)		45.00	45.13	100.29
IDA Grant		45.00	45.30.00	100.67
Total		121.19	112.03	92.44

Annex 2: Outputs by Component

Component 1: Enabling Conditions for sub-Regional Cooperation in the Generation, Dissemination, and Adoption of Agricultural Technologies.

1. Common regulations for registering genetic materials and pesticides have been put in place in all three WAAPP-1B countries, along with functional national registration systems for genetic materials and pesticides. Each country has the necessary regulatory and control bodies, and they are performing satisfactorily, although it will take time until border agents are familiar with the regional regulations. The mechanisms for exchanging technologies and researchers have progressed considerably with strong support from CORAF. Technologies have moved across the region under WAAPP-1B and 90,000 producers are using technologies that were developed in other countries. By facilitating these exchanges of technology and research skills, the NCOSs have become part of an emerging regional network of researchers. Gender action plans have been developed and mainstreamed into project implementation. 49 percent of project beneficiaries are female versus an initial target of 40 percent. Also, as mentioned under the intermediate results indicators below, a regional and country specific actions plans for dealing with climate change were developed. For its part, CORAF considerably strengthened its web-based information system and consolidated the information available from various other databases. With the support of CORAF, each country has implemented its own national information strategy. These information measures contribute to strengthening regional integration of the agricultural research community. Especially noteworthy is the progress made by CORAF by putting all available information on the web, and the large number of PhD and MSc trained.

2. A summary of the output indicators of Component 1 is shown in Table A2.1 and Table A2.2.1.

Table A2.1: Output Indicators—Component 1

COMPONENT 1: Enabling conditions for sub-regional cooperation in the generation, dissemination and adoption of agricultural technologies					
Indicator	Country	Baseline	Target	Actual	Status/Percent
Indicator 1: National regulations per countries on genetic materials, fertilizer and pesticides adopted and aligned to regional (ECOWAS) regulations and adopted	TOTAL	0	9	9	100%
	B. Faso	0	3	3	100%
	C. d'Ivoire	0	3	3	100%
	Nigeria	0	3	3	100%
Indicator 2: Common framework for e.g. IPR, farmers' rights and /or Geographic indicator developed (Yes/Non).	B. Faso	N	Y	Y	Achieved
	C. d'Ivoire	N	Y	N	Not
	Nigeria	N	Y	N	Not
Regulations for fertilizer at ECOWAS developed and adopted--	CORAF	N	Y	Y	Achieved
Indicator 3: A system for data collection, analysis and reporting on ag technologies,	B. Faso	N	Y	Y	Achieved
	C. d'Ivoire	N	Y	Y	Achieved
	Nigeria	N	Y	Y	Achieved

research skills, and agriculture productivity is established.	CORAF	N	Y	Y	Achieved
Indicator 5: Hits for the regional/national Web-site -	TOTAL	0	157,000	297,207	189%
	B. Faso	0	2,000	550	28%
	C. d'Ivoire	0	5,000	7,259	145%
	Nigeria	0	30,000	54,898	183%
	CORAF	0	120,000	234,500	195%
Indicator 6: National/regional action plan on Gender, Communication and Climate Change developed.	TOTAL	0	12	12	100%
	B. Faso	0	3	3	100%
	C. d'Ivoire	0	3	3	100%
	Nigeria	0	3	3	100%
	CORAF	0	3	3	100%

Table A2.1.1: Technology Exchange Among WAAPP Countries involving WAAPP1-B

Country	No. of technologies in imported from other WAAPP countries	No. of technologies exported to other WAAPP countries
Burkina Faso	10	15
Cote d'Ivoire	30	5
Nigeria	7	7

Component 2: National Centers of Specialization (NCOS).

3. This component included two activities: a) strengthening the capacity to plan for and manage centers of specialization within their National Agricultural Research Systems (NARS), and b) establishing capacity building programs for researchers. The intermediate outcome indicators for Component 2 were as follows:

Table A2.2: Intermediate Outcome Indicators—Component 2

COMPONENT 2: Centers of Specialization					
Indicator	Country	Baseline	Target	Actual	% Achieved
Indicator 1: Number of technologies generated by NCOS and demonstrated by the project in the project areas	TOTAL	0	36	52	144%
	B. Faso	0	12	20	167%
	C. d'Ivoire	0	12	20	167%
	Nigeria	0	12	12	100%
Indicator 2: Number of technologies generated by NCOS and demonstrated in at least 3 ECOWAS countries outside the country of origin.	TOTAL	0	12	14	117%
	B. Faso	0	4	4	100%
	C. d'Ivoire	0	4	3	75%
	Nigeria	0	4	7	175%
Indicator 3: Number of client days of training provided (includes scientists, extension agents, agro-dealers, farmers, community members, etc.).	TOTAL	0	30,000	107,038	357%
	B. Faso	0	7,500	4,111	55%
	C. d'Ivoire	0	7,500	92,700	1227%
	Nigeria	0	15,000	10,227	68%

Indicator 4: Number of scientific Exchange visits.	TOTAL	0	45	44	98%
	B. Faso	0	15	15	100%
	C. d'Ivoire	0	15	17	113%
	Nigeria	0	15	12	80%
Indicator 5: Scholarships (disaggregated by MSc and PHD).	Agg. Scholarship	0	198	217	110%
	TOT. MSc	0	133	158	119%
	TOT. PHD	0	65	59	91%
	B.F.: MSc	0	80	90	113%
	B.F.: PhD	0	25	18	72%
	<i>Sub-total</i>	<i>0</i>	<i>105</i>	<i>108</i>	<i>103%</i>
	C.I: MSc.	0	33	51	155%
	C.I. PhD	0	22	27	123%
	<i>Sub-total</i>	<i>0</i>	<i>55</i>	<i>78</i>	<i>142%</i>
	Nig: MSc.	0	20	17	85%
	Nig. PhD	0	18	14	93%
	<i>Sub-total</i>	<i>0</i>	<i>38</i>	<i>27</i>	<i>77%</i>

4. The centers in Burkina Faso, Ivory Coast and Nigeria are fully functional and have added skills that support a more professional level of performance. The planned investments in laboratory buildings and equipment in all three countries were carried out. In Burkina Faso, the administrative building at the research station of Banfora and the central laboratory in Fardako-Ba have been finished, although with delay and have been equipped. In Ivory Coast, the laboratories of the two institutes were rehabilitated and equipped. Also, experimental plots and the infrastructure for research, training and housing of researchers and visitors were upgraded. In Nigeria, the project established a DNA analysis laboratory with fully functional molecular biology equipment.

Concerning the training of researchers, summary achievements were as follows:

5. Altogether, 217 scientists were trained to the MSc and PhD level: Burkina Faso:108, Ivory Coast 78; and Nigeria: 31. In addition, some 44 scientific exchange visits took place. Through this training, the project greatly enhanced the human capital base for agricultural research in the three countries. Building the scientific capacity of young researchers through academic and on-the-job training is a vital step in developing functional centers of specialization. It also allowed the three participating NCOS to replace scientists who have retired. The exchange program has gained momentum as CORAF has defined practical modalities for such exchanges among researchers and other stakeholders. CORAF has also conducted several studies that have helped to develop the strategic options for a better regional approach to increasing agricultural productivity, including a study of exchange mechanisms for value chain actors, options to strengthen NCOSs, strategies to develop synergy among sub-regional actors, and mechanisms to develop technology transfer capacity at the regional level. These studies have benefited all participating countries.

6. By generating 52 new technologies—20 in Burkina Faso, 20 in Ivory Coast, and 12 in Nigeria—they have exceeded the target (36) by 44 percent. Of those technologies, 10 are being adapted or disseminated in the region. Several exchange visits have been

organized at the original NCoSs, and the heads of the centers in Burkina Faso, Ivory Coast and Nigeria and their key staff have been regularly invited to the other countries during joint regional implementation review missions.

7. The project's emphasis on funding of biotechnology and seed laboratories is especially noteworthy. That support enabled the countries and the region to benefit from the latest technologies. Investments in biotechnology can considerably reduce the time needed to develop new varieties, and adequately equipped seed laboratories are indispensable for proper seed certification as well as the phytosanitary controls required to move and trade seed internationally.

Other institutional effects of the project were as follows:

8. In Burkina Faso, the National Center of Specialization for fruits and legumes (CNS-FL) was converted into a scientific department of INERA. This is to facilitate its evolution into a Regional Center of Excellence (RCoE) and should improve its sustainability. In the Ivory Coast, WAAPP 1B has greatly stimulated the emergence of smallholder seed entrepreneurs and nursery producers that supply quality planting material for the market. It introduced E-extension on a pilot basis with a call center and automated messages in local languages. This system goes beyond delivery of simple text messages and allows for feedback from the users. The country's extension agency (ANADER) is managing the system. In Nigeria, the project provided support to the Agricultural Research Technology Transfer Centers (ARTTC) so that they can carry out on farm trials, through which all proven technologies from Agricultural Research Council of Nigeria, state and federal institutions as well as other partners are evaluated, with ARTTC scientists acting as facilitators and knowledge-back stoppers in the field. The project also promoted the transformation of the Agricultural Research Council of Nigeria (ARCN) from a consultative into a more executive body. It organized study tours to Brazil and China to study models of reforming agricultural research systems. To speed up technology adoption, the project worked with the National Agricultural Research System (NARS); Agricultural Development Programs (ADPs); the Federal Institute for Industrial Research (FIRO); IITA; ICRISAT; the private sector and NGOs. Several technology dissemination tools such as adopted villages and schools, innovation platforms, extension publications, radio programs, and training workshops were used, which allowed to reach 2.3 million direct beneficiaries out of which 49 percent were female farmers. Entrepreneurship training was given by the NCoS.

Component 3: Funding of Demand-driven Technology Generation and Adoption.

9. Under this component, three activities were funded: a) the establishment of competitive funding mechanisms for adaptive agricultural R&D; b) development of communication and dissemination methods and approaches; and c) establishment of networks to produce planting/breeding material. The intermediate outcome indicators were as follows: (i) national demand-driven research proposals financed by the national Competitive Agricultural Research Grant System (CARGS); (ii) multi-country research proposals financed by the regional CARGS; (iii) number of publications released in

regional/national magazines, and (iv) foundation seeds and breeder stock produced with project support. Results under the intermediate outcome indicators were as follows:

Table A2.3: Intermediate Outcome Indicators—Component 3

COMPONENT 3: Funding of Demand-Driven Technologies' Generation and Dissemination					
Indicator	Country	Baseline	Target	Actual	Percent
Number of multi-country research proposals financed by the Regional Ag Research Grant system	CORAF		10	7	70%
Number of research proposals financed by the national competitive grant system	TOTAL		95	92	74%
	B. Faso	0	25	37	148%
	C. d'Ivoire		40	36	90%
	Nigeria		30	19	63%
Number of technologies generated under the competitive grant system and demonstrated by the project in the project areas.	TOTAL	0	36	90	250%
	B. Faso		8	43	538%
	C. d'Ivoire		14	45	321%
	Nigeria		12	0	0%
	CORAF		2	2	100%
Number of publications released in regional/national magazines.	TOTAL	0	46	213	463%
	B. Faso	0	8	28	350%
	C. d'Ivoire	0	14	19	238%
	Nigeria	0	30	166	553%
Foundation seeds and breed stock produced with the project support.	Burkina Faso				
	Vegetable (KG) (Onion)	0	150	800	533%
	Cereals (t)	0	2,000	3,922	196%
	C. d'Ivoire				
	Plantain (ha)	0	5,000	30,685	614%
	Cereals - maize (t)	0	800	4,619	577%
	Yam (t)	0	150	13	9%
	Cassava (x1000 plants)	0	15,000	31,200	208%
	Nigeria				
	Fingerlings	0	10,000,000	16,159,502	162%
	Cereals (t)	0	250,000	214,394	88%
	Cassava (x1000 plants)	0	30,000	18,000	60%
	Total				
	Cereals	0	252,800	223,800	89%
	Fingerlings	0	10,000,000	16,159,502	162%
	Cassava	0	45,000	49,200	109%

	Vegetables	0	150	800	533%
	Plantain	0	500	30,685	614%
Demonstration plots established.	TOTAL	0	2,000	3,146	157%
	B. Faso	0	1,000	1,046	105%
	C. d'Ivoire	0	500	1,000	200%
	Nigeria	0	500	1,100	220%

The following key technologies were developed under WAAPP-1B:

Table A2.4: Key technologies developed—Component 2 and 3

<p>Burkina Faso Integrated pest management against the fruit fly that attacks mangoes, causes heavy losses and impedes exports Development and release of new rainy season tomato varieties that were introduced from Brazil, Cape Verde and Japan Development and release of new onion varieties that have good storage performance, are tolerant to hot and humid season, and are resistant to bolting and pest and diseases Two natural pesticides against tomato pests Broyeur/trieur Chemical treatment against la fonte des semis d'oignon et</p>	<p>Ivory Coast Development of agro-processing techniques that allow to mix corn, cassava, and plantain flour with wheat flour for bakery products New improved banana plantain varieties Development of interplanting techniques between plantain and short-cycle crops Determination of fertilizer recommendations for vegetable growing in the off-season Frequency of irrigation for high value crops in the off-season Development of plantain flour for the preparation of local dishes (foutou and fofou). Development of in-vitro seedling multiplication techniques for banana plantain. This technology has already been transferred to Mali.</p>	<p>Nigeria Improved catfish breeding and management techniques (production of all-male tilapia) that increase the survival rate of fingerlings from the present 60% to over 80%, and reduces the growth rate/culture period for fingerlings by 33% Detachable Fish Smoking Kiln designed to address the many problems of traditional smoking method (lack of control over the drying process, exposure to dirt and dust, insect infestation, exposure to contaminants and low capacity which often lead to production of unstable and unsafe smoked products) Fish feed production (fish meal processed from Lantern fish Briquette machine Fish solar tent dryer that is dismantlable and thus very portable and with a higher batch capacity than earlier wooden models Multi-crop solar dryer Fish retail tables that will reduce post-harvest losses, improve quality and hygiene, enhance marketability and increase availability of fresh fish Fish cooling boxes (plastic and aluminum) for better preservation, distribution and marketing of fish Technique to produce all year-round fingerlings – clarias species</p>
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contre la pourriture de bulbes au champ		
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Component 4: Project Coordination, Management, Monitoring, and Evaluation.

10. Under this component, the project helped establish a well-functioning M&E system that is harmonized across all participating countries. Project reports as well as procurement and financial management activities were regularly completed as anticipated. A summary of the intermediate outcome indicators of Component 4 is shown in Table A2.5.

Table A2.5: Intermediate Outcome Indicators—Component 4

COMPONENT 4: Project Coordination, Management, Monitoring and Evaluation					
Indicator	Country	Baseline	Target	Actual	Status/percent
Procurement and FM activities executed in conformity with the procurement plan.	B. Faso	0	100%	100%	100%
	C. d'Ivoire	0	100%	33%	33%
	Nigeria	0	100%	100%	100%
Project reports presented within 45 days of the end of the relevant period.	BURKINA	0	100%	100%	100%
	C. d'Ivoire	0	100%	100%	100%
	NIGERIA	0	100%	100%	100%
A harmonized M&E system is established and operational in each country for data collection, analysis and reporting.	BURKINA	N	Y	Y	
	C. d'Ivoire	N	Y	y	
	NIGERIA	N	Y	Y	
Subproject granted with environmental management plan have implemented effectively	B. Faso	N	Yes	Yes	
	C. d'Ivoire	N	Yes	Yes	
	Nigeria	N	Yes	Yes	
Disbursement rate of funds.	TOTAL	0	100%	98.24	98.24%
	B. Faso - IDA	0	100%	84%	84%
	C.I - IDA	0	100%	97%	97%
	Nig. - IDA	0	100%	100%	100%

Annex 3. Economic and Financial Analysis

Impact evaluation studies and beneficiary assessments

1. Ex-post impact evaluation studies were carried out in December 2016 in Burkina Faso, Nigeria and Ivory Coast. CORAF assisted in the drafting of the terms of reference. The quality of the studies varies from one country to the other. Despite their limitations, it is possible to draw some preliminary conclusions about the initial impacts of the project, at least at the level of intermediate outcomes. In all three countries the evaluators did not only analyze the impact of the project on the focus agricultural commodities, but also on other commodities that benefitted from the project's efforts to improve technology generation, diffusion and adoption. This needs to be kept in mind, since the economic benefits of the project went far beyond the focus commodities in the three countries, in the maintenance of the regional focus of the project.

Burkina Faso: Impact Study of WAAPP-1B prepared by *Société d'Etudes, de Conseils et d'Assistance Multisectorielle (SECAM), December 2016.*

2. Methodology. The study covered: (i) five villages where WAAPP technologies had been adopted; (ii) the Innovation Platforms; and (iii) the Centres de Promotion Rurale. For each of these villages and platforms a control group was selected that did not benefit from WAAPP interventions. Households, enterprises, support organizations (traders and transformers), and farmer organizations were the subject of the study and were interviewed. The people interviewed had to provide estimates on yields, production and income and this over the period 2011 to 2015. Based on sampling techniques 120 villages (60 beneficiary and 60 non-beneficiary villages) and 648 households were included (216 beneficiary households and 432 non-beneficiary households). Unfortunately, WAAPP did not provide in time a list of beneficiary villages and households. Therefore, this selection was done by the interviewers on the ground. The definition of « WAAPP beneficiary » was not clearly defined and given that all information was based on recall data and estimates given by the interviewees the results of this study need to be treated with circumspection.

3. Major findings.

- For all commodities yield increases were observed that went from 3.5 percent for mangoes to 57 percent for maize.
- Revenues, except for onions, increased for all commodities between 16 900 FCFA and 466 800 FCFA per year and household.
- Adoption rates were as follows:
 - Improved varieties – 35%
 - Use of plant protection measures – 29%
 - Drying techniques for fruits and vegetables – 15%
 - Improved storage techniques – 21%

- 77.8 percent of beneficiary households indicated that the WAAPP program improved their living conditions through: (i) productivity increases, (ii) yield increases, and (iii) improved relationships between men and women within families.
- 50 percent of enterprises indicate that they received material support from the program. The support to acquire new technologies benefitted 33 percent of these enterprises. Training on different technologies has benefitted 16.6 to 61 percent of technicians in these enterprises. Over 50 percent are satisfied with the support they received and between 33 and 100 percent depending on the technology are applying the new technologies that they learned.
- WAAPP has had a positive impact on yields. Yield increases were 200 kg per ha for millet; 1.16 tons per ha for sorghum; and 130 kg per ha for cowpeas. Depending on the variety, yield increase for millet varied from 15 – 33 percent; for sorghum from 76 – 130 percent; and for cowpeas they were 60 percent.
- Annual revenues of input distributors of seeds and fertilizers that benefitted from the project are 11 – 24 times higher than that of non-beneficiaries.
- The additional volume of production per year and producer varied between 82 kg for onions to 749kg for tomatoes.

4. While the adoption rate for cereals only progressed moderately, the adoption rates for new varieties of cowpeas and forage maize were impressive. For these two crops, the area under improved varieties doubled.

Ivory Coast: Impact Study of WAAPP-1B on Banana/Plantain and other agricultural products prepared by *Ecole Nationale Supérieure de Statistique et économie Appliquée, Novembre 2016.*

5. **Methodology.** The survey not only covered farm households but also transformers (processors), traders, representatives of cooperatives and representatives of research and extension organizations that participated in the project. Also, the survey covered not only banana-plantain, but also cassava, yams, rice, and maize. In all, 195 districts were selected (105 without project impact and 90 with project impact). A total of 2,321 farmer families were selected based on a stratified sampling technique. Data collection covered the agricultural season from April 2015 to March 2016.

6. **Major findings.** The adoption rate for seeds and seedlings sponsored by WAAPP-1B are still relatively low, particularly for vegetative propagated crops. Farmers who have been exposed to the improved materials have declared their intention but have limited access to planting materials. Their bulkiness limit mass propagation techniques these planting materials. For example, for banana -plantain the proportion of farmers that use improved planting material is about 20 percent. The same is the case for cassava. Nevertheless, these limited successes within the first phase of the project is commendable from the backdrop of the anticipated gradual effect of the project on adoption, (as the process of technology generation, dissemination and adoption take a bit of time). However, in the case of rice (the seeds of which is relatively simple propagate), more than 70 percent

of farmers have adopted varieties promoted by WAAPP. Concerning yields, at the national level, yields for all crops covered by WAAPP increased between 2011 and 2016, with wide differences according to the various agroecological zones. A comparison of living standards between project beneficiaries and non-project beneficiaries shows that the poverty rate for project beneficiaries declined from 67.5 percent to 63.25 percent while for non-project beneficiaries the poverty rate further deteriorated.

Nigeria: Impact Study of WAAPP-1B prepared by Prof. G.A. Abu, Institute of Food Security, Federal University of Agriculture Makurdi, Nigeria.

7. **Methodology.** The surveyed households were sampled across twenty-eight (28) States in Nigeria. Beneficiary and non-beneficiary villages were identified and in each of the 31 beneficiary villages identified, 40 respondents were selected leading to a total sample size of 1,240. The study used questionnaires, focus group discussions, case studies, key informant interviews, and in-depth interviews. The scope of the study was very wide as it not only covered the impact of new fishery technologies (fingerlings, feeds and processing) but also technologies related to rice, maize, sorghum, cassava and poultry.

Major findings:

- 96 percent of beneficiary fish farmers estimate their productivity increase to be 60 percent
- Factors positively influencing beneficiaries' level of adoption of technologies promoted by WAAPP1-B are primarily: household size, farm income, off-farm work and membership in cooperatives
- The percentage of poor fish farmers decreased from 88.2 percent in 2011 to 11.9% in 2015
- Factors militating against technology diffusion and adoption were problems of transportation, high costs of production inputs, storage and marketing
- Income from fish farming between 20011 and 1015 increased by Neira 119,000

8. **Nigeria: Financial and economic analysis of WAAPP-NIGERIA**, prepared by the Agricultural Economics, Policy and Resource Management Programme, National Agricultural Extension and Research Liaison Services (NAERLS), Ahmadu Bello University (ABU) Zaria.

9. **Methodology.** A multi-stage sampling technique was used with 22 WAAPP beneficiary villages and 22 without WAAPP project villages selected across the country. In each village 35 respondents were randomly selected to form the survey respondents. Thus, a total of 1540 respondents were used for the study. Information related to WAAPP-1B project participation, access to WAAPP productivity enhancing technologies, adoption level, production, processing and marketing and general background data such as socio-

economic and demographic characteristics of the respondents were gathered. An adoption index was calculated and a financial and economic analysis was conducted to determine the net incremental impact on the incomes of the farmers as well as the financial viability and sustainability of the WAAPP-1B project from the main beneficiary's perspective. The adoption index used was defined as the given area put under adoption of the extended technology as a percentage of the total land area owned and grown to the crop. The technologies were improved crop varieties that were developed by some private seed companies in Nigeria and disseminated to farmers in WAAPP-1B beneficiary villages. The improved technologies (mostly improved seed varieties) covered: rice, maize, cassava, yam, and aquaculture.

10. **Major findings.** The adoption index for the improved varieties among farmer beneficiaries of WAAPP-1B was as follows:

Table : Adoption Index for the improved varieties among WAAPP farmers

Commodity	Average land area (ha)	WAAPP mean land area adopted (ha)	Adoption Index (%)
Rice (n=138)	2.91	2.91	100
Maize (n=156)	2.07	1.07	51.69
Cassava (n=152)	4.13	3.00	72.64
Yam (n=133)	3.21	1.72	53.58

Table : Mean commodity yields (kg/ha)

Commodity	With Project	Without Project	% Increase
Rice	2681	2031	32
Maize	3167	2145	48
Cassava	26200	21800	20
Yam	14600	11580	26
Aquaculture	1664kg/10m2 per cycle	1356kg/10m2 per cycle	23

Table : Benefit-Cost Analysis (Benefit/Cost Ratio – BCR in financial (FBCR) and economic prices (EBCR))

Commodity	Benefit/Cost Ratio (BCR)
Rice	FBCR – 10.42 EBCR – 8.81
Cassava	FBCR – 11.00 EBCR – 11.09
Maize	FBCR – 50.75 EBCR – 46.44
Yam	FBCR – 142 EBCR – 132.8
Aquaculture	FBCR – 1.70 EBCR – 1.29

11. Sensitivity analysis was carried out on all commodity models by decreasing revenues by 10 percent and by increasing production costs by 10 percent. These changes had little impact on the overall profitability of the various technologies used.

12. A review of the above figures on area adoption, incremental yields, and benefit/cost ratios for the different commodities shows that these technologies are greatly appreciated by farmers and are very profitable. Farmers seem to be willing to completely change their existing rice varieties for the ones promoted by the project and even for maize, cassava and yam they are using new technologies on more than half of their land holdings. Yield increases due to the new technologies are very high (48 percent for maize, and 32 percent for rice) and even for cassava, yam, and aquaculture are they above 20 percent. The benefit/cost ratios (BCR) in financial and economic terms are extremely attractive. Except for aquaculture where they are 1.70 and 1.29 for the FBCR and EBCR respectively, they vary from EBCR 8.81 (rice) to 132.8 (yam) and FBCR 10.42 (rice) to 142 (yam). The BCR are unusually high. This is most likely due to the fact, that beneficiaries were selected from villages that received very intensive and special attention from WAAPP-1B.

13. The report concludes, that WAAPP-Nigeria has had a positive impact on the financial and economic viability of farmers in the whole country. This was achieved through substantial productivity increases in the prioritized commodities. The report then makes a series of recommendations:

- Improved levels of adoption could be achieved by leveraging farmers' financial capability
- Added attention should be given to formally educate farmers since the analysis of factors influencing adoption of new technologies indicated that farming experience and years of schooling were significant variables for influencing farmers' adoption decision
- The number of extension visits is a key variable for influencing adoption decisions. Consequently, strengthening of extension services is crucial
- Farmers should be encouraged to form cooperatives or groups through which they can be reached more easily and which would allow group lending and group marketing
- Credit facilities should be made accessible and farmers should be linked to input and output markets.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

a) Task Team members

Names	Title	Unit	Responsibility/ Specialty
Lending			
Rose Abena Ampadu	Senior Program Assistant	AFCW1	
Charles Annor-Frempong	Senior Agricultural Spec.	GFA13	
Victoria Ahlonkoba Bruce-Goga	Program Assistant	GSU03	
Soulemane Fofana	Senior Rural Development Specialist	GFA01	
Kadir Osman Gyasi	Senior Agriculture Economist	GFA01	
Gwladys Nadine Isabelle Kinda	Program Assistant	AFMBF	
Elisabeth Mekonnen	Program Assistant	LCC3C	
Ibrahim B. Nebie	Consultant	GFADR	
Kofi Nouve	Senior Agriculture Economist	GFA02	
F. Alain Onibon	Agric. Economist	AFTA1 - HIS	
Sossena Tassew	Operations Analyst	GFA01	
Abdoulaye Toure	Lead Agriculture Economist	GFA01	Team Leader
Supervision/ICR			
Abdoulaye Toure	Lead Agriculture Economist	GFA01	Team Leader
Sossena Tessaw	Operations Analyst	GFA01	Team Member
Sheu Salau	Senior Agriculture Economist	GFA01	Co-TTL
Salam Hailou	Program Assistant	GFA01	Team member
Olukemi Roseline Akinsola	Program Assistant	AFCW2	Team member
Mariame Bamba	Program Assistant	AFCF2	Team member
Kadir Osman Gyasi	Senior Agriculture Economist	GFA01	Team member
Haccandy Yao Alexis	Consultant		Team member
Elisee Ouedraogo	Senior Agriculture Economist	GFA01	Team member
Cheikh A.T. Sagna	Senior Social Safeguards Specialist	GSU01	Safeguards Specialist
Amadou Konare	Senior Environment Specialist	LCSEN	Safeguards Specialist
Abiodun Elufioge	Program Assistant	AFCW2	Team member
Akinrinmola Oyenuga Akinyele	Senior Financial Management Specialist	GG025	Financial management specialist

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY10	75.62	509.26
FY11	21.56	106.19
Total:	97.18	615.45

Supervision/ICR		
FY11	18.9	80.66
FY12	46.66	168.19
FY13	38.02	177.96
FY14	27.47	125.47
FY15	21.80	80.86
FY16	26.15	151.28
FY17	19.27	117.38
Total:	198.27	901.80

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Annex 5. Beneficiary Survey Results

See key recommendations from the stakeholder's consultation in Nigeria (page VIII)

1. For Burkina Faso and Ivory Coast, no specific beneficiary assessments as such were carried out. What was done in these two countries were impact evaluation studies. The results of these impact evaluation studies are shown in Annex 3 and not repeated here.

2. Nigeria. A specific beneficiary assessment of WAAPP1-B Nigeria was carried out by Dr. A. Muhammad-Lawal and his report was issued on December 2016.

Methodology. Sampling techniques were used to generate the data and information was collected from 32 institutions (6 Universities, 4 Federal Colleges of Agriculture, 4 private farms/firms, 5 ministerial departments, and 7 National Agricultural Research Institutes). Also, WAAPP beneficiaries (adopted schools, adopted villages, and innovation platforms were sampled in the various selected areas. Data were obtained from both primary and secondary resources. Instruments used were conversational interviewing among representative groups of key stakeholders/beneficiaries; focus group discussions; participant observation; and institutional assessment. The instrument for data collection was a basic interview guide which was modified to fit different stakeholder groups. The guide covered investigations on the interviewees' exposure to WAAPP, participation, technology dissemination, partnerships and collaborations, satisfaction levels with WAAPP activities and recommendations for improvement. Data collected for the study were analyzed and presented using descriptive statistics.

Summary Results.

3. Eighty (80) percent of farmers reported to have benefitted from improved knowledge and technical know-how. The beneficiary farmers were satisfied with the relevance, affordability and appropriateness of the technologies disseminated to them. However, less than half were satisfied with the sufficiency and timeliness of the technologies. In addition, 88% of the farmers were satisfied with the method of dissemination of information. On the aggregate, 70% of collaborating agencies were satisfied with the appropriateness of the technologies generated under the project, 50% on timeliness as well as on sufficiency. Majority (82%) were satisfied with the availability of the technologies. While 62% were satisfied with the timeliness of supply of funds, 60% were satisfied with its sufficiency. Only 33% were satisfied with the financial management procedures under WAAPP. Another area in which poor level of satisfaction was revealed was the area of procurement in which only 23% of the collaborating agencies were satisfied.

4. The beneficiaries were unanimous in suggesting that the project needs to improve on the sufficiency and timeliness in the release of funds. Another suggestion which was strongly opined is the need for more involvement of end users of technologies and the various other stakeholders in all aspects of decision-making. Beneficiaries of the project also recommended an increase in the level of supervision accorded to the project. Other suggestions made were in the areas of increasing the technical know-how of end users through more training and effective co-ordination of activities between linked stakeholders.

Suggestions were also made on how to enhance the coverage of the project through diversification of extension strategies.

Annex 6. Stakeholder Workshop Report and Results
(if any)

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

Project Implementation Completion Report—Burkina Faso

1. According to the government of Burkina Faso's ICR of March 2017, the levels of attainment of the six PDO indicators were as follows:

- Indicator 1: 288 000 direct beneficiaries (144% of original target) with 43% women farmers against an original target of 40%.
- Indicator 2: 2 700 beneficiaries that used technologies transferred from neighboring countries against the original target of 2 500.
- Indicator 3: 20 technologies generated by the project that increase yields by at least 15% against the original target of 10 technologies.
- Indicator 4: 78 800 producers are aware of the technologies generated and diffused by the project against an initial target of 50 000 producers.
- Indicator 5: 274 000 hectares covered by project recommended technologies versus 250 000 hectares as originally envisioned.
- 191 000 producers/ago-processors that have adopted technologies promoted by the project versus the original target of 150 000.

2. Concerning **efficiency**, the report notes that despite the initial delays in project execution, by the end all PDO indicators were achieved or overachieved and the degree of physical execution was 96%.

3. ***Overall rating for PDO. Satisfactory.***

4. **Other results and impacts.** The ICR point out that according to the impact evaluation study, 77% of households benefitting from WAAPP have improved their living conditions through agricultural production and yield increases. Also, the project has improved the seed sector by organizing meetings of the National Seed Committee and the certification of 30 000 tons of seeds.

5. **Evaluation of Bank and Government performance.** **Bank performance** is judged globally as **satisfactory**. The Bank carried out regular project implementation support missions and was willing to increase the procurement thresholds. Nevertheless, notifications of required non-objections by the Bank have at times slowed down project execution. Performance of the **Government/PCU** is judged as **satisfactory** even while national procurement procedures are cumbersome and slow down project implementation. The Government showed flexibility when it came to the procurement of seeds and allowed the use of the procurement procedures of the United Nations Office for Project Services for the purchase of laboratory equipment.

6. **Lessons learned:**

- The adoption of rules and regulations of CEDEAO concerning the national legislation for seeds, pesticides and fertilizers were a key factor in facilitating trans-border trade.

- The channels for the diffusion and adoption of innovations (innovation platforms, adoption villages and Rural Promotion Centers (CPRs) are appropriate.
- Information concerning the economic and financial profitability of newly developed technologies is a determining factor for their adoption by farmers and private operators.
- Regular meetings of the fiduciary staff of different agencies allows to create a climate of cooperation and collaboration and improves disbursement performance.
- Capacity building of all project related staff, especially financial and accounting staff, allows for a better understanding of the procedures of the donor.
- Procurement plans need to be prepared in advance and updated regularly to avoid delays.\
- Concerted programming of activities with other ongoing projects is necessary to better use all available resources.

Project Implementation Completion Report – Cote d’Ivoire

What follows is a summary translation of key parts of the *Rapport d’Achèvement du WAAPPI-B, Cote d’Ivoire du Fevrier 2017*.

7. **The** ICR of Cote d’Ivoire describes the history, objectives, components, financing and institutional organization of the project. In its evaluation, the report comes to the following conclusions:

8. **The** results achieved (increases in production, yields and revenues) demonstrated that the proposed technologies were of interest and useful to farmers, agro-entrepreneurs, and other stakeholders. WAAPP concentrated on improvements of value chains, from production all the way to marketing. The rate of physical execution was 95%. A comparison between the rate of physical execution (95%) and financial execution (98% shows that resource use was optimal. Results from the impact evaluation carried out by ENSA showed: (i) an increase of 28% in the volume of agricultural production in commodities supported by WAAPP; (ii) a 20% increase in the revenues of producers; and (iii) an improvement in household food security. The utilization of technologies generated by WAAPP has allowed the creation of employment in small and medium-sized enterprises (nurseries, agro-processors, etc.). Women farmers and youth have benefitted from project activities as planned. Project sustainability has been enhanced through the innovation platforms that bring together farmer groups, cooperatives, and private and public operators. This has created dynamic partnerships and has attracted other donors such as GIZ, FIDA.

Evaluation of IDA’s performance. The support provided by IDA was helpful but at times insufficient. Positive factors during project implementation were: (i) intelligent use of knowledge of researchers and other participants in agricultural technology generation and diffusion; (ii) joint implementation review missions at regional level; (iii) creation of a regional technology market on the Internet; and (iv) IDA project implementation support missions were regular and of good quality and made useful recommendations. A negative factor influencing project execution were delays in obtaining non-objection notifications.

9. **Evaluation of the Government’s performance.** The Government helped WAAPP greatly by designating the Inter-professional Fund for Research and Agricultural Extension (FIRCA) as project executing agency. This allowed for efficient management of procurement and disbursements, and FIRCA’s good relationship with the different commodity organizations facilitated the diffusion and adoption on new technologies. The PCU and the Ministry’s Directorate of Project Evaluation regularly supervised the project, including review of the annual budget and work plans and field visits. Negative factors were: (i) delays in making available counterpart funds; (ii) delays concerning certain key decisions (creation of a seed fund); and (iii) inadequate institutional support to strengthen the seed sector.

10. **Lessons learned:**

- WAAPP has led to the generation and adoption of technologies that are of interest and use to farmers within Cote d’Ivoire and in neighboring countries
- WAAPP has developed a new spirit of agricultural entrepreneurship and allowed the creation of small and medium-sized agricultural enterprises
- WAAPP has greatly improved the quality and quantity of agricultural research with regard to banana plantain (higher trained researchers and laboratories)
- The coordinated development of research programs has allowed to reduce or avoid duplications
- The competitive agricultural research grant system is a powerful tool to stimulate competition between R&D groups
- WAAPP has demonstrated that in order to increase agricultural productivity a well-functioning continuum: research – R&D – and extension with a strong involvement of farmers is the key
- Innovation platforms are an efficient extension approach
- Where access to agricultural credit is a limiting factor, matching grants are useful to speed up technology adoption
- WAAPP has permitted to integrate hitherto marginalized groups (women and youth)
- To consolidate the achievements of WAAPP, it is necessary to put in place a “seed fund” and to continue financing a second phase of the program.

Project Implementation Completion Report – Nigeria.

11. What follows is a summary of key parts of the Borrower’s Implementation Completion and Results Report for WAAPP-1B Nigeria of December 16, 2016.

12. The ICR of Nigeria is comprehensive and describes: (i) the project context, development objectives and design; and (ii) key factors affecting implementation and outcomes. It then assesses the outcomes of the project.

The project’s objectives are judged to be consistent and relevant to Government’s Agricultural Transformation Agenda (ATA) and the Agricultural Promotion Policy (APP). It also responded to ECOWAS regional agricultural policy that is consistent with the Africa-wide Comprehensive Africa Agricultural Development Program (CADDP) and the African Union’s New Partnership for Africa’s Development (NEPAD). The project’s design was also judged to remain relevant, and this in view of the project development

objective (PDO), key performance indicators (KPI) and components. The design of the project as a 2-phase program over 10 years was considered especially appropriate.

13. The report then goes on to review the results framework, analyzing each PDO indicator and each Intermediate Outcome Indicator (these figures are contained in the main body of the ICR and are therefore not repeated here). As a result of this review, **the report rates the achievement of PDO as satisfactory. The overall rating is also satisfactory.** The satisfactory rating reflects: (i) the relevance of the project's design and investments made; (ii) the positive impact on the project beneficiaries through the adoption of improved technologies; and (iii) enhanced capacity and effective structures that are in place to provide continuity in integrating and undertaking technology generation, acquisition, and scaled-up dissemination activities.

14. Under poverty impacts, gender aspects, and social development, the report states that the project benefitted the rural poor and vulnerable through farmer empowerment and development of farmer-driven agricultural systems. The project provided targeted support for scaled-up applications of technology, dissemination and adoption through establishment of farmers' networks in the form of innovation platforms and adopted schools for building capacity of farmers' associations and commodity organizations and as well as developing the interest of youths in agriculture. Furthermore, some of the participating farmer groups were given an opportunity to venture into value addition activities thereby capturing higher shares of market value of their produce. Women participated as equal partners with men based on the Results Framework. The project also made significant contributions toward capacity building, ICT and infrastructure development of national agricultural research institutes (NARIs) and Universities. Human resource development capacity was enhanced through support of researchers for degrees in PhDs, MScs, as well as other short-term training.

15. Overall, **risk to development outcome is evaluated as moderate.**

Assessment of Bank and Government Performance.

16. Bank performance is rated as **satisfactory** for ensuring quality at entry, supervision and overall.

17. Government performance is rated **moderately satisfactory** mainly because of the issue of untimely counterpart funding.

18. Lessons learned:

- Technology generation and dissemination processes (research, extension, training) must be integrated to maximize impact
- A demand-driven system is needed to ensure efficiency and sustainability
- Producers need to be empowered to drive the agenda and progressively share the cost of technology generation and dissemination
- Technology generation and dissemination must be market oriented
- Financial assistance (credit) is needed to induce adoption
- Service delivery system needs to be rationalized, restructured, strengthened with clear definitions (based on comparative advantages) of functions, roles and responsibilities among public and private sector providers, at national and sub-regional level
- Capacity building is needed at all levels

- Soil fertility management is key to sustainable agricultural productivity
- Mechanization is needed to encourage and sustain interest in agriculture
- Climate smart agriculture conserves the environment and is vital for agricultural productivity
- Effective monitoring and evaluation system is crucial to the success of the project.

Project Implementation Completion Report - CORAF

19. **What** follows is a summary of key parts of CORAF’s Implementation Completion and Results Report for WAAPP-1B of March 2017.

20. **Responsibilities of CORAF.** Under WAAPP-1B, CORAF had the following responsibilities: (i) allocating resources under the Regional Agricultural Research Grant Scheme (RCARG) based on a well- developed operational manual; (ii) advising and filtering research national and regional proposals for CARG; (iii) collecting and synthesizing M&E data produced by the national M&E teams; (iv) provide leadership to the activities under Component 1 – Enabling Conditions for sub-Regional Cooperation in the Generation, Dissemination, and Adoption of Agricultural Technologies. Furthermore, according to its overall mission to coordinate and provide direction to WAAPP-1B, CORAF prepared and participated in all project implementation support missions and prepared the necessary documents.

21. **Key factors that influenced project execution.** Lessons learned under WAAPP-1A facilitated implementation of the project. M&E, and more specifically the definition of indicators measuring project development objectives and the intermediate outcome indicators, required adjustments and capacity building for M&E staff within CORAF and in the PCUs of the three countries. The mobilization of counterpart funds at times slowed down project execution and disbursements.

22. **Overall results of CORAF.** The support of CORAF to the project has all allowed the following results:

- Creation of a policy and institutional framework that favors generation of new technologies
- Strengthening research capacity and management of research institutions in the participating countries
- Strengthening of scientific collaboration at national and regional level (joint use of resources for research and exchange and mobility of researchers)
- Improvements in agricultural productivity at the national and regional level
- Commercial use of research results
- Improvements in the communication mechanisms between CORAF, WB, and the participating countries
- A better understanding of stakeholders of the importance of CORAF’s role
- Improvements in the communications systems and a greater visibility of WAAPP.

23. **The** results achieved by the three participating countries under the various project components (see Annex 2 – Outputs by Component) would not have been possible without the support of CORAF. CORAF played a major role in harmonizing procedures for the release of genetic materials and pesticides in the development of common policies for the

production and marketing of fertilizers as well as the establishment of a common intellectual property rights (IPR) framework. Concerning the diffusion of technologies, CORAF introduced the concept of innovation platforms (IP) and supported its application in the different countries. It also created a repository of technologies and a market for agricultural technologies through an electronic information platform on the Internet. Through its communication strategy, CORAF greatly increased the visibility of WAAPP. Regarding the regional sharing of resources, CORAF organized a series of concertation meetings, scientific conferences, capacity building workshops, international research symposia, etc. It also developed in a participatory process the criteria to be used for the transformation of National Centers of Specialization (NCoS) into Regional Centers of Excellence (RCE).

24. **Lessons learned:**

- The improvements in communication between CORAF, IDA, and the countries has allowed to increase the rate of budget execution and the rate of disbursements
- CORAF's mission through the implementation of WAAPP is more and more understood in the countries and among its partners. Its support is so highly valued by the countries that they are willing to contribute more to its financing
- The improvements in the communication systems has led to a higher visibility of WAAPP
- The special emphasis that was put on the diffusion and adoption of technologies and the use of innovation platforms (IP) has turned out to be beneficial for the implementation of the program
- The emphasis that was placed on the regional aspects of programs and the common use of resources, especially the mobility of researchers, has been a determining factor in the development of national centers of specialization (NCoS) into regional centers of excellence (RCE)

25. **The** need to put in place the regional competitive agricultural grant scheme (CARG) is now well understood by the participating countries

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders

Annex 9. List of Supporting Documents

1. Aide-Memoires of Supervision Missions from 2011- 2016
2. *FICHES TECHNIQUES on newly developed technologies*
3. Project Appraisal Document, World Bank, September 3, 2010
4. Etude d'Impact de la Première Phase du Programme de Productivité Agricole en Afrique de l'Ouest (PPAAO/WAAPP) Burkina Faso, SECAM, Mars 2017
5. République de Cote d'Ivoire, Ecole National Supérieur de Statistique et d'Economie Appliquée (ENSA), Evaluation d'Impact du Projet WAAPP-1B sur la Banane Plantain et Autres Produits du WAAPP, Novembre 2016
6. Impact Evaluation of West Africa Agricultural Productivity Programme (WAAPP-Nigeria), Prof. G.A. Abu, Institute of Food Security, Federal University of Agriculture Makurdi, Nigeria, December 2016
7. Financial and Economic Analysis of WAAPP-Nigeria, Sani Usman, Agricultural Economics, Policy and Resource Management Programme, National Agricultural Extension and Research Liaison Services (NAERLS), Ahmadu Bello University (ABU), Zaria
8. Report on Beneficiary Assessment of WAAPP-Nigeria, Dr. A. Muhammad-Lawal, December 2016
9. Rapport d'Achèvement de la 1ere Phase du WAAPP-Burkina Faso, Ministère de l'Agriculture et des Aménagements Hydroagricoles, Mars 2017
10. Cote d'Ivoire, Ministère de l'Agriculture et du Développement Rural, Rapport d'achèvement du PPAAO/WAAPP - Cote d'Ivoire, Février 2017
11. Cote d'Ivoire, Ministère de l'Agriculture et du Développement Rural, Phase additionnelle du PPAAO/WAAPP – Cote d'Ivoire, Analyse économique et financière, Aout 2016
12. Rapport d'achèvement du WAAPP-1B au CORAF/WECARD, Mars 2017
13. Analyse des mécanismes de diffusion des technologies agricoles améliorées et innovations dans l'espace CEDEAO, CORAF, Février 2011
14. CORAF, Plateformes d'Innovation Suivant l'Approche IAR4D, Guide Pratique, 2014

15. <http://www.waapp-ppaao.org/en> (Web site of WAAPP)
16. <http://www.waapp-ppaao.org/en/mita> (CORAF's Marketplace of Agricultural Technologies and Innovations)

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