

Nutritious Maize for Ethiopia (NuME)

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CONTENTS

Contents	i
Abbreviations.....	ii
Executive Summary	i
Narrative Section	1
Introduction.....	1
<i>General Issues Affecting AWP Implementation</i>	<i>1</i>
Key Milestones and Expected Outputs.....	1
Immediate Outcome 1110: Increased demand ... for QPM seed through greater awareness	1
<i>Output 1111: Field plot demonstrations and associated field days... ..</i>	<i>1</i>
<i>Output 1112: QPM media materials and radio broadcasts... ..</i>	<i>3</i>
<i>Output 1113: Gender-sensitive ... training and informational materials featuring QPM... ..</i>	<i>3</i>
Immediate Outcome 1120: Enhanced knowledge and skills of women and men in targeted communities in preparation of traditional food and new food products using QPM.....	3
<i>Output 1121: Traditional and new food products based on QPM... ..</i>	<i>3</i>
<i>Output 1122: Gender-sensitive ... training materials featuring processing and utilization of QPM... ..</i>	<i>4</i>
<i>Output 1123: ...knowledge of how to incorporate QPM in ... food preparations.....</i>	<i>4</i>
Immediate Outcome 1210: Superior, highly productive QPM hybrids and open pollinated varieties (OPVs) adapted to different agro-ecologies.....	4
<i>Output 1211: Late, intermediate and early maturing QPM lines.....</i>	<i>4</i>
<i>Output 1212: Superior hybrids and OPVs identified for different AEZs.....</i>	<i>4</i>
<i>Output 1213: Best hybrids and OPVs released.....</i>	<i>4</i>
Immediate Outcome 1220: Agronomic recommendations and best management practices for QPM varieties in different agro-ecologies.....	4
<i>Output 1221: Recommendations for plant densities, fertilizer rates and... ..</i>	<i>4</i>
<i>Output 1222: Training materials ... on best QPM technology packages.....</i>	<i>5</i>
<i>Output 1223: Enhance understanding of QPM varieties and management practices.....</i>	<i>5</i>
Immediate Outcome 1310: Strengthened institutional capacity of the public and private seed supply sector to produce and distribute high quality QPM seed on a sustainable basis.....	5
<i>Output 1311: A strategy to rapidly increase production of ... QPM seed.....</i>	<i>5</i>
<i>Output 1312: A pilot seed distribution system... ..</i>	<i>6</i>
<i>Output 1313: ...seed company managers ... with enhanced skills in seed business... ..</i>	<i>6</i>
Immediate Outcome 1320: Improved capacity of regulatory system to assure quality of QPM seed and grain	6
<i>Output 1321: Quality standards ... to assure quality QPM seed and grain... ..</i>	<i>6</i>
<i>Output 1322: ... agronomists and inspectors with enhanced skills in ... QPM seed production</i>	<i>6</i>
<i>Output 1323: Economic analysis of regulatory systems.....</i>	<i>7</i>
Baseline, Project Performance and Impact Assessment	7
Gender strategy:.....	7
Communications Strategy:	7
Capacity Building:	8
Annex 1. Performance Reporting Framework.....	10
Annex 2. List of Publications based on NuME Project Studies	19

ABBREVIATIONS

3WC	3-way cross hybrid
AAW	American army worms
AEZ	Agro-ecological zone
AQRL	Agricultural Quality Research Laboratory
ASE	Amhara Seed Enterprise
ATVET	Agricultural, Technical, Vocational, and Education Training
AWP	Annual Work Plan
CIMMYT	Centro Internacional De Mejoramiento De Maíz Y Trigo (International Maize and Wheat Improvement Center)
DA	Development Agent (Agricultural Extension)
DUS	Distinctness, uniformity and stability
EABC	Ethiopian Agricultural Business Corporation (formerly, ESE, Ethiopian Seed Enterprise)
EIAR	Ethiopian Institute of Agricultural Research
EOP	End of project
EPHI	Ethiopian Public Health Institute
ESS	Ethiopian Seed Supply
FRI	Farm Radio International
FTC	Farmers' Training Centre
GAC	Global Affairs Canada
GE	Gender equality
IITA	International Institute of Tropical Agriculture (Ibadan, Nigeria)
IVR	Interactive Voice Response
LM	(Project) Logic Model
MBCU	Meki Batu Cooperative Union
MoANR	Ministry of Agriculture and Natural Resources (formerly, MoA)
NGO	Non-governmental organization
NIRS	Near infrared spectroscopy
NPT	National Performance Trial
OPV	Open pollinated variety
OSE	Oromia Seed Enterprise
PIP	Project Implementation Plan
PRA	Participatory Rural Appraisal
PRC	Participatory radio campaign
PRP	Participatory radio program
PSC	Project Steering Committee
QPM	Quality protein maize
RC	Research Centre
RCT	Randomized Control Trial
SAPR	Semi-annual Progress Report
SC	Single cross hybrid
SG2000	Sasakawa Global 2000 (Program) of Sasakawa Africa Association
SMS	Subject matter specialist (MoA extension)
SNNPR	Southern Nations, Nationalities and Peoples Region
TARI	Tigray Agricultural Research Institute
TLB	Turicum leaf blight
VCU	Value for cultivation
WBS	Work Breakdown Structure
WV-Ethiopia	World Vision-Ethiopia

EXECUTIVE SUMMARY

This semi-annual progress report (SAPR) presents the status of planned activities implemented during the first semester from 1st April to 30th September, 2018, of the 7th and final Annual Work Plan of the extended NuME Project. Most activities in the project have been completed and Outputs delivered while the remaining activities are being executed with a reduced budget carried forward from the initial years of the project when budget was underutilized as well as a supplementary grant from GAC to compensate for the devaluation of the Canadian dollar during the project. The 18-month extension of the project allowed to additional seasons to consolidate progress in the project to date and, hopefully, put QPM variety development and adoption on a more sustainable footing by closure of the project in 2019.

With the exception of excessive rainfall and flooding early in the season and moisture stress late in the season in some project areas, weather conditions were generally favourable this year, and disease and pest incidence were generally low as well. This generally resulted in good performance of QPM variety field demonstrations as well as breeding trials in all agro-ecological zones. Field-based dissemination activities included 233 QPM variety field plot demonstrations (87% success rate) and, as of this reporting, 46 field days organized around them attended by almost 27,500 farmers (25% women). The remaining field days will be conducted in the second semester. Performance of QPM varieties and their reception by farmers followed a pattern observed in previous seasons based on observations gathered at field days.

On-going QPM breeding activities continued in (i) QPM and pro-Vitamin A rich QPM line development, (ii) formation and evaluation of QPM hybrids and open pollinated varieties (OPVs), and (iii) release of best hybrids and OPVs for seed production and farmer adoption. Financial support for these activities has largely been assumed by EIAR with continued backstopping from CIMMYT breeders.

Certified seed production in 2017 has been beset with even greater challenges than in previous years. Risk averse seed companies continue to prioritize production of known conventional varieties despite demand voiced by farmers at field days. Companies have also been unable to meet their QPM seed production commitments due to adverse weather conditions early in the season, loss of production sites and civil unrest which saw seed plots vandalized or threatened by hostilities in neighboring kebeles.

FRI-led participatory radio programming was implemented in only Amhara region this season due to budget limitations. Several on-going or pending communications and educational materials were finalized or completed during the semester. Finally, capacity building activities especially in human resources continued with short term training of farmers, agriculture and health subject matter specialists, developmental agents and health extensionists, and long-term support of graduate studies of staff in partner institutions. Details will be found in the body of this progress report.

NARRATIVE SECTION

INTRODUCTION

This semi-annual report covers the period from 1st April to 30th September 2018 in the execution of the 7th and final Annual Work Plan (AWP) implemented under an 18-month extension of the Contribution Agreement of the original NuME Project from 30th September 2017 to 31st March 2019 approved by Global Affairs Canada (GAC) in 2016. The 7th AWP comprises a reduced set of activities and focuses on consolidating the results of previous work plans and winding up the Project before the completion date of 31st March 2019.

As with previous semi-annual NuME Project progress reports (SAPRs), this SAPR is primarily a status report on progress made in the implementation of the AWP during the first semester of the fiscal year. Field-based activities will only be completed during the second semester; some of these, in particular, QPM germplasm development activities are on-going and will continue beyond the life of the project supported by the national agricultural research system (EIAR). Other non-field activities reported in this SAPR are largely concerned with wrapping up on-going activities from previous AWP or are activities specific to the wind-up of the project, that is, end-of-project (EOP) surveys, data collection, etc. Only Outputs realized to date as well as the status of activity sets underway within the current AWP are reported here. The Performance Reporting Framework (based on the Project Logic Model (LM) and Work Breakdown Structure (WBS)) in Annex 1 summarizes actual results or progress towards results for the AWP in the column “Actual Results for AWP” against AWP targets/milestones presented in the adjacent column to the left. Activities “in progress” will be completed during the current (October—March) semester and consolidated into the Final Project Report due for submission in March, 2019. A narrative description of progress by Output is provided in the following sub-sections. Very little is said about results at the Outcome level in this report. Project Outcomes are being assessed by means of household and other surveys that are in progress at this writing and which will be reported in the Final Report.

GENERAL ISSUES AFFECTING AWP IMPLEMENTATION

In general, growing conditions in 2018 have been good. The amount of rainfall in most parts of the country was high at the beginning of the season, causing flooding on some farms, including seed production farms, in the big river basins. In some areas the rainfall intensity has also hampered land preparation and planting, specifically on farms where machinery are used for farm operations, for example, seed producing farms such as Ethioveg-Fru. In contrast, some areas in the Central Rift Valley (especially, SNNPR) experienced severe moisture stress at and after planting. Most maize growing areas have suffered from moisture stress during grain filling stage. A few demos were also damaged by hail during the season. On the other hand, infestation of fall armyworm has been relatively minor on most project activities. Despite the foregoing constraints, however, both QPM variety breeding trials and QPM variety demonstration plots have performed reasonably well in all agro-ecological zones. Most of these trials and demos remain in the field at this reporting as the season matures.

Variable levels of civil unrest in Oromia, Amhara and SNPPR caused security concerns and restrictions on travel to the troubled zones. This affected monitoring of trials particularly on farmers’ fields. However, it appears that these concerns have abated and implementation of field days is proceeding according to plan. Associated with this unrest, incidents of vandalism have resulted in the destruction of some QPM seed production fields in north eastern SNPP. More detail as well as other issues as they affected specific activities is provided in the following sections.

KEY MILESTONES AND EXPECTED OUTPUTS

IMMEDIATE OUTCOME 1110: INCREASED DEMAND ... FOR QPM SEED THROUGH GREATER AWARENESS ...

OUTPUT 1111: FIELD PLOT DEMONSTRATIONS AND ASSOCIATED FIELD DAYS...

A total of 233 field plot demonstrations of the QPM varieties, AMH760Q (in 12 demos), AMH852Q (127), BHQPY545 (218), MH138Q (217), Melkasa-6Q (25) and BHQP548 (206), were successfully conducted in target zones of Oromia, Amhara, SNNPR and Tigray. This represents a success rate of about 87% (of 267 planned demos). Most of the variance occurred within the large number of demos managed directly by MoARD/SG2000 (81% success rate) as compared with other partners (95% success rate). Although all demos were planted and established as planned, some were not rated as successful for various reasons such as lack of road access to demos for visitors, poor demo performance due to soil fertility, and poor management where kebeles were too remote.

TABLE 1. QPM FIELD PLOT DEMONSTRATIONS, FIELD DAYS AND PARTICIPATION (GENDER DISSAGGREGATED) IN 2018

Region	Zone	No. of demos		Woreda level field days	Kebele level field days	No. of participants (farmers & others) at woreda and kebele field days			
		Total	women			men	women	others	total
Tigray	NW Tigray	26	0	12	0	1,271	224	60	1,555
Amhara	West Gojjam	19	5	2	24	3,274	817	35	4,126
	Awi	6	0	0	7	763	391	0	1,154
Oromia	East Wollega	21	6	0	10	860	337	0	1197
	West Shoa	41	7	6	10	2035	647	118	2800
	East Shoa	30	1	4	1	702	242	0	944
	West Arsi	7	3	2	2	819	340	0	1,159
	Jimma	29	5	0	18	1,684	534	0	2,218
SNNPR	Gurage	18	7	1	16	2,426	631	0	3,057
	Silti	9	3	0	9	1,535	522	0	2,057
	Hadiya	15	5	4	19	2,452	895	24	3,371
	Sidama	12	4	1	12	2,526	1,311	31	3,868
TOTAL	TOTAL	233	46	32	128	20,347	6,891	268	27,506

About 55% (127) of the successful demonstrations were conducted by SG2000 and their partners in the Regional Bureaus of Agriculture, 12% (29) by seed companies, and 30% (69) by EIAR and TARI extension staff in their mandate areas; WV-Ethiopia conducted the remainder. About 22% (46 in number) of the demonstrations were hosted by women farmers, some from female-headed households.

As in previous years, extension staff (DAs and SMSs) and host farmers were trained on establishment and management of the demos, improved maize production technologies (planting time, spacing, fertilizer application, pest control, etc.) and on characteristics, nutritional value and benefits of QPM. Training sessions were supported with audio-visual training materials developed earlier in the project and extension staff were provided with printed reference materials (QPM manual and guide). Technical support was provided during planting and periodic monitoring and evaluation visits.

Six QPM varieties are being demonstrated during the 2018 season, two in each of the three target agro-ecological zones (AEZs) against the current varieties known and used by farmers in those AEZs. Generally, AMH760Q and AMH852Q were compared with BH660 or BH661 in the highland AEZ, BHQPY545 and BHQP548 with BH540 in moist mid-altitude AEZ, and Melkasa-6Q and MH138Q with Melkasa-2 in moisture-stressed zones. Individual variety performance is similar to that of previous seasons based on early observations by field staff and farmers at the field days that have been conducted to date.

A total of 141 woreda-level field days have been planned for the 2018 season; to date, 32 have been conducted as well as an additional 128 at the kebele level. Total participation at both levels was about 27,500 farmers of which 25% were women.

In addition to the project sponsored field demos, MoA also carried out 229 field demos in five regions of the country. The details will be given in the annual report.

OUTPUT 1112: QPM MEDIA MATERIALS AND RADIO BROADCASTS...

Activity 1112.1: factsheets, brochures, posters, newsletters, etc.:

As summarized in Annex 1, one project newsletter was produced and two articles for the CIMMYT newsletter, *Informa*, were published during the first semester. Leaflets on QPM varieties and utilization were produced in local languages (7,300 copies in Amharic, Oromiffaa and Tigrigna) and distributed as needed by partners to participants at most field days. Regional radio and TV covered five major field days in the Central Rift Valley, SNNPR and Tigray; coverage is expected at other events in the other regions where the crops mature and field days are organized at later dates in the second semester.

Activities 1112.2, .3 and .4 (Participatory Radio Programs (PRPs)):

Participatory radio programs linked with the Interactive Voice Response (IVR) system were broadcasted in the Amhara region during the semester. A refresher training activity was undertaken in the first Quarter in preparation for the programming. A total of 12 episodes were aired on QPM awareness including seed availability and fall army worm control. A total of 481 callers participated in the IVR poll on seed availability.

Interactive Voice Response (IVR) system was used to support farmer participation in the radio programs including collecting feedback, answers for weekly questions and experiences of listeners. A total of 2,121 IVR calls were received by the system.

Activity 1112.5 (NuME Project website (<http://nume.cimmyt.org/>)): Uploading of new materials on the NuME website continues as they become available.

OUTPUT 1113: GENDER-SENSITIVE ... TRAINING AND INFORMATIONAL MATERIALS FEATURING QPM...

Activity completed in previous AWP.

IMMEDIATE OUTCOME 1120: ENHANCED KNOWLEDGE AND SKILLS OF WOMEN AND MEN IN TARGETED COMMUNITIES IN PREPARATION OF TRADITIONAL FOOD AND NEW FOOD PRODUCTS USING QPM

OUTPUT 1121: TRADITIONAL AND NEW FOOD PRODUCTS BASED ON QPM...

The inventory and review of previous work on use of maize and QPM in the preparation of traditional and new food products (Activity 1121.1) has been finalized.

A paper reporting the results of the EPHI study on the effects of processing and processing conditions on the nutritional quality of QPM and conventional maize in the preparation of three traditional foods (*injera*, *dabo* (bread) and *genfo* (porridge)) prepared for submission to the *Journal of Agriculture and Food Chemistry* is under revision.

Two papers based on the consumer acceptance study of QPM-based food products (Activity 1121.2) conducted in Jimma zone in 2016 and previously presented at the Conference of the African Association of Agricultural Economists in September 2016 were submitted, without CIMMYT's knowledge by the senior author to a predatory journal where they remain in limbo CIMMYT has requested the University to withdraw the papers but it is unknown what their fate will be.

Approximately 50 students from each of two primary schools, one in Amhara (Arbisi, Bure Woreda) and one in SNNPR (Mehal Korga, E. Badawachu), evaluated *kinche* prepared from two QPM and two conventional maize varieties (one white and one yellow grained of each) according to appearance, aroma, texture and taste as well as overall characteristics. Results indicated that *kinche* made from QPM, particularly the yellow BHQPY545, was

more appreciated for aroma, taste and overall characteristics than made from conventional varieties. A paper has been prepared of the results and submitted for publication in the journal *Development in Practice*.

OUTPUT 1122: GENDER-SENSITIVE ... TRAINING MATERIALS FEATURING PROCESSING AND UTILIZATION OF QPM...

A “Training Manual on Traditional Food Preparations from QPM” for use by health extension workers and based on the compilation of recipes of 10 QPM-based food products was printed and distributed. The manual was translated to Amharic and Oromiffa and printed for distribution.

In the on-going 16-week radio program series in Amhara, three episodes are dedicated to food preparation of which one radio episode was broadcast in the completed quarter (Activity 1122.2).

OUTPUT 1123: ...KNOWLEDGE OF HOW TO INCORPORATE QPM IN ... FOOD PREPARATIONS.

Demonstrations of QPM-based food products (Activity 1123.1) have been conducted at six field days thus far; most field days by SG2000 and partners will be conducted in October and November and will be reported in the Final Report.

IMMEDIATE OUTCOME 1210: SUPERIOR, HIGHLY PRODUCTIVE QPM HYBRIDS AND OPEN POLLINATED VARIETIES (OPVs) ADAPTED TO DIFFERENT AGRO-ECOLOGIES

OUTPUT 1211: LATE, INTERMEDIATE AND EARLY MATURING QPM LINES...

The planned introduction of 110 advanced QPM inbred lines from CIMMYT-Zimbabwe for evaluation and maintenance at Ambo RC, Bako RC and Melkasa RC did not occur due to delayed harvesting of the inbred lines at CIMMYT-Zimbabwe. After the harvesting, the time window was not sufficient to process the shipment to catch the planting time in Ethiopia. Other breeding activities were implemented as planned.

OUTPUT 1212: SUPERIOR HYBRIDS AND OPVs IDENTIFIED FOR DIFFERENT AEZs

Five activities were planned under Output 1212 during the 7th AWP, one involving formation of test-crosses with the parental lines (CML161 and CML165) of BHQP545 to 48 single crosses made in 2017 to generate 3WC version of BHQP545 (Activity 1212.1), and four activities to evaluate test-cross hybrids formed in 2017. These activities are progressing according to plan. Additionally, two sets of 45 and 64 entries, respectively, of QPM 3WC hybrid trials were introduced from CIMMYT Harare and planted for evaluation under both optimum and low N conditions at Ambo. Specific details on progress of each of these activities is summarized in Annex 1.

OUTPUT 1213: BEST HYBRIDS AND OPVs RELEASED...

No activity was planned under Output 1213 in 2018. The candidate hybrid evaluated in the National Maize Variety Trials in 2017 for release was rejected by the variety release committee mainly due to undesirable performance of one of the parental lines.

IMMEDIATE OUTCOME 1220: AGRONOMIC RECOMMENDATIONS AND BEST MANAGEMENT PRACTICES FOR QPM VARIETIES IN DIFFERENT AGRO-ECOLOGIES

OUTPUT 1221: RECOMMENDATIONS FOR PLANT DENSITIES, FERTILIZER RATES AND...

The results and conclusions of four years of agronomic trials to determine if revised recommendations of plant density and N-fertilizer management were needed for new QPM varieties were summarized in last year’s Annual Progress Report. Those results indicated that modification of current MOANR maize agronomy recommendations for QPM varieties would not be necessary or justified. Progress in the preparation of a comprehensive report on the NuME agronomic research has been delayed due to difficulties in retrieving the

agronomic data both from the former project agronomist and the principal investigator from EIAR side. The PL has recently secured the data from the collaborating EIAR agronomists and is engaging one to synthesize the results.

OUTPUT 1222: TRAINING MATERIALS ... ON BEST QPM TECHNOLOGY PACKAGES...

This activity has been completed. No further activity was undertaken in 2018.

OUTPUT 1223: ENHANCE UNDERSTANDING OF QPM VARIETIES AND MANAGEMENT PRACTICES...

This activity has been completed. No further activity was undertaken in 2018.

IMMEDIATE OUTCOME 1310: STRENGTHENED INSTITUTIONAL CAPACITY OF THE PUBLIC AND PRIVATE SEED SUPPLY SECTOR TO PRODUCE AND DISTRIBUTE HIGH QUALITY QPM SEED ON A SUSTAINABLE BASIS

OUTPUT 1311: A STRATEGY TO RAPIDLY INCREASE PRODUCTION OF ... QPM SEED...

The following table presents the status of breeders, pre-basic and basic seed production in relation to AWP targets. Seed has not yet been harvested but, in general, production is expected to reach or exceed targets.

Variety	Parent	Institution	Breeders' & pre-basic seed (kg)		Basic seed (kg)	
			Target	Actual‡	Target	Actual‡
AMH852Q	FS1705Q	Ambo RC	600	100		
	SRSYN20Q		200	150		
	EC34Q		100	50	250	150
	FS170Q/SRSYN20Q				595	200
BHQPY545	CML161	Bako RC	100	100		3,000
	CML165		300‡			2,000
BHQPY548	CML144	Bako RC	-			
	CML159		-			
	KuleniQ		200	200	40	40
	CML144/CML159				240‡	
MH138Q	CML144	Melkasa RC	300‡			
	CML159		300‡			
	Pool15Q		100	30†	500	500†
	CML144/159					
Melkasa-6Q	--	Melkasa RC	300	75		
TOTAL			2,500	705	1,625	5,890

‡ not produced due to the availability of enough stock e.g. 1 ton basic seed of CML144/CML159 was carried over from last year since companies promised to produce BHQ548 retreated.

† being produced under irrigation

The estimated, as yet not harvested, production of certified seed in relation to targets based on AWP commitments by seed companies is summarized in the following table.

Producer	AMH852Q		BHQPY545		BHQPY548		MH138Q		Melkasa-6Q		TOTAL	
	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual	Target	Actual
	----- (tonnes) -----											
EIAR	2	4	-		-		0.5	-	-		2.5	4
TARI			-		-		-		12.5	-	12.5	-
ASE			75	-	-		-		125	42.0	200	42.0
OSE			75	-	90	-	-		75	-	240	-
Zi-Andeta*			34	-	-		-		-		34	-
MBCU			22	9.0	-		240	15.0	250	47.5	512	71.5
Ethio-veg Fru			90	22.4	-		-		-		90	22.4
Yimana Farm			15	-	-		-		-		15	-
TOTAL	2	4	311	31.4	90	0	240.5	15.0	462.5		1,106	139.9

Although seed production commitments by seed companies were as usual quite high when the AWP was developed in March, seed production performance this year has been poor due to the various external and internal constraints detailed below. In particular, resource limitations, social unrest and political instability as well as non-conducive weather factors contributed to much of the poor seed production performance in addition to the usual problems surrounding the seed sector in Ethiopia described in previous reports. In face of these challenges, all seed companies have prioritized production of seed of conventional maize varieties which have an established market and higher productivity rather than favouring QPM seed production with the nutritional benefit it offers to the rural community.

Specific challenges experienced by seed companies included the loss of two of seed farms (Kunzela in Amhara and Shalla in Southern Oromia) of ESS to be used for other purpose or passed to other organizations. While Zi-Andeta planted about 22.5 ha for BHQPY545 seed production on its farm in Marko woreda, SNPPR, the farm was abandoned around detasseling time due to the hostility of youths from the surrounding kebeles. OSE planted 50.0 ha for BHQPY545 seed production but it suffered severe bird damage and miss mangment. Ethioveg-Fru farm failed in its commitment because of the heavy rainfall during June and July that prohibited machine operations. ASE was also unable to produce BHQPY545 seed as promised because the contractual farmers were not willing to produce BHQPY545 on their farm. Seed production performance of MBCU declined from previous years due to limitations of land, lack of a competent seed expert, and continuing leadership issues happening since late 2017. The union is prohibited by the board to produce seed on non-member farmers association. The long serving seed production expert also left the company. Yimam farm also faced limitations of land for seed production. Faced with these challenges, the project leader approached a few seed companies to undertake offseason production to partly offset the poor seed production performance. Unfortunately, with the project ending and financial limitations he was unable to secure any new commitments.

OUTPUT 1312: A PILOT SEED DISTRIBUTION SYSTEM...

In 2017, a stockist system was organized in collaboration with two seed companies (ASE and OSE) to offer QPM seed (primarily BHQPY545) through private stockists in both conventional 12.5 kg size bags and small (6.25, 3.125 and 2 kg) packets to make it more attractive to individual farmers. The stockists received orientation on how to collect data from customers and were provided with information (visual posters and leaflets) in the local language on the varieties available. The socio-economics team was unable to monitor satisfaction with the scheme during 2017 due to travel restrictions. The follow-up survey planned for 2018 has not as yet been conducted.

OUTPUT 1313: ...SEED COMPANY MANAGERS ... WITH ENHANCED SKILLS IN SEED BUSINESS...

The seed business management training target set in the PIP has been fulfilled and this activity has been completed.

IMMEDIATE OUTCOME 1320: IMPROVED CAPACITY OF REGULATORY SYSTEM TO ASSURE QUALITY OF QPM SEED AND GRAIN

OUTPUT 1321: QUALITY STANDARDS ... TO ASSURE QUALITY QPM SEED AND GRAIN...

Activity complete. No further activity planned under this Output.

OUTPUT 1322: ... AGRONOMISTS AND INSPECTORS WITH ENHANCED SKILLS IN ... QPM SEED PRODUCTION

Activity complete; no additional courses covering seed production, quality control or agronomic management planned for the AWP.

OUTPUT 1323: ECONOMIC ANALYSIS OF REGULATORY SYSTEMS...

A survey of seed companies was conducted in 2016 and 2017. However, the report on the costs and benefits of QPM quality assurance by various methods including laboratory analysis has not been completed but is expected during the 1st semester of the 2018 AWP.

BASELINE, PROJECT PERFORMANCE AND IMPACT ASSESSMENT

Activity P-3: Conduct food insecurity and food consumption surveys (household level): Baseline data from the RCT study (Activity P-4, below) were used to conduct a detailed analysis of diets among rural Ethiopian infants and young children. These results were presented in a poster at the International Congress of Nutrition (ICN) in October 2017 in Argentina. A paper based on the results was submitted to the journal, *Nutrients*, and recently accepted for publication.

Activity P-4: Use anthropometrics, dietary intake, biochemical tests of target population to assess risk of malnutrition as well as lysine deficiency in target areas: The randomized control trial (RCT), initiated in 2015 to measure the impact of QPM on the nutrition and growth of young children in 12 kebeles in six target woredas in Oromia Region, was completed and all samples, measurements and analyses were completed in 2017. A series of four papers are being prepared of the results of the nutrition component of the study for publication with the PhD student in nutrition. A second PhD student in health economics is preparing the results on the impact of the consumption encouragement treatments on behavioral change, in particular encouragement of ear-marking of QPM for the target child, and the resulting effect on the child's increased QPM consumption and improved nutritional status. Drafts are expected to be completed by the end of the 1st semester of this AWP.

Activity P-5: Calculate potential impact of QPM on target population's health using disability-adjusted life years (DALYs): Protein, vitamin A and micronutrient deficiencies from estimated by the MNS (P-4), and food consumption estimated in household surveys (P-3 and P-4) will be used to calculate DALYs lost due to protein deficiencies. NuME provided support to EPHI's National Micro-nutrient Survey, the data of which are now being analysed. The results of the analysis will be used to develop a manuscript and submitted for publication.

Activity P-6: Conduct adoption studies to measure performance indicators and progress to achieving project results, including seed availability and farmer evaluation (gender disaggregated): A consultant was contracted during the first semester to conduct the adoption studies. The EOP questionnaire, essentially augmented versions of the baseline and mid-term questionnaires, was developed and the surveys commenced in October. It is expected they will be completed in November after which data cleaning and analysis will promptly begin.

GENDER STRATEGY:

The document "Gender mainstreaming under NuME project", which describes the project's efforts to address gender inequality was finalized and printed during the last semester.

COMMUNICATIONS STRATEGY:

The table below summarizes several activities pertaining to the Project communications strategy described elsewhere in this report. In general, communications activities and outputs are on target to be completed according to plan.

Output (abbreviated)	Institution	AWP Activity with target output	Status of activity
1111 Field plot demonstrations & associated field day events to promote QPM varieties, nutritional benefits & utilization...	SG2000 FRI EIAR CIMMYT	▪ Organize and facilitate media (radio, TV, newspaper) coverage of field days and other important Project events	▪ Field day events broadcast in Amharic, Oromiffa or Tigrigna on: TV (STV, LTV, EBC, Addis TV, OBN TV, Tigray TV) and radio (FM100.9, FM103.4)
1112 QPM media materials and radio broadcasts featuring	CIMMYT	▪ Produce two articles in <i>informa</i>	▪ Two <i>Informa</i> articles produced: (i) "Farmers in

Output (abbreviated)	Institution	AWP Activity with target output	Status of activity
QPM and its nutritional benefits targeting farmers, food processors and consumers as well as an active website to provide this information to the general public and interested parties		<ul style="list-style-type: none"> Distribute leaflet on production and utilization of QPM 	<p>Ethiopia willing to pay more for quality protein maize”, April 18, 2018; and (ii) “Seed companies are responsible for creating demand for quality protein maize”, June 12, 2018</p> <ul style="list-style-type: none"> 7,300 leaflets in Amharic, Oromiffa and Tigrigna distributed.
	FRI	<ul style="list-style-type: none"> Continue the participatory radio campaign (PRC) on QPM in two target areas 	<ul style="list-style-type: none"> PRC conducted only in Amhara Region due to limited budget
	CIMMYT	<ul style="list-style-type: none"> Upload public project documents and photos of project activities to the project website as they become available Produce and distribute one issue of NuME Newsletter/Bulletin and contribute to the CIMMYT <i>Informa</i> newsletter 	<ul style="list-style-type: none"> Recently published documents uploaded 8th issue of NuME Newsletter published and distributed; layout and design of the 9th issue completed.
1122 Gender-sensitive ... training materials featuring processing and utilization of QPM	SG2000 CIMMYT	<ul style="list-style-type: none"> Publish Amharic and Oromiffa versions of the training manual on the preparation of QPM-based foods 	<ul style="list-style-type: none"> Published

CAPACITY BUILDING:

Human resource capacity: Human resource capacity building activities in progress during this AWP are summarized in the table below together with their current status at this reporting. Most are tied to specific activities in the Project LM which are described in greater detail elsewhere in the report.

Type of training	Training event	Organizer	Timeframe	Status
Short courses and short term training	QPM technology, and establishment and management of QPM field plot demonstrations for DAs, agric. experts and model farmers	SG2000 (Abraham)	Feb – Apr 2018 Aug – Sep 2018 Nov – Dec 2018	3,142 people trained (255 women & 715 men farmers, 87 DAs and experts by conventional methods; 431 women & 1520 men farmers, 26 DAs & experts using AV based materials)
	Training on QPM-based food preparation	SG2000 (Senayit, etc)	Nov – Dec 2018	Not yet given
Graduate and Post-graduate research	Ph.D. thesis research – nutrition (Masresha Tessema): “The effect of growing Quality Protein Maize on nutritional, health and economic status of women and their children in maize growing areas of Ethiopia”, Wageningen University	CIMMYT, HSPH (Hugo, Nilupa)	Analysis & write up: 2018/19	Thesis writing in progress; two papers from thesis (“methods” and “baseline”) published or accepted
	Ph.D. thesis research – health policy (Katherine Donato): Essays in Maternal and Child Health Economics”, Harvard T.H. Chan School of Public Health, Harvard University	HSPH, CIMMYT (Nilupa, Hugo)	Completed in May2018	Thesis finished and candidate graduated; paper from thesis in preparation

Type of training	Training event	Organizer	Timeframe	Status
	M.Sc. thesis research – agronomy (Haji Kumbi):	CIMMYT (Hae Koo)	Graduation: May 2018	Thesis evaluated and is under revision based on examiners feedback
	M.Sc. thesis research – breeding (Goshime)	CIMMYT	Graduation: Sept. 2018	Writing thesis
	Ph.D. thesis research topic – breeding (Gudeta Napier): Combining ability of highland quality protein maize inbred lines for formation of best hybrids	CIMMYT (Dagne & Adefris)	Graduation: May 2018	Completed
	Ph.D. thesis research topic – breeding (Addis Alem Mebratu): Genetic Analysis and GXE Interaction in Quality Protein maize	CIMMYT (Dagne, Amsal & Adefris)	Graduation: Sept. 2018	Writing thesis
	M.Sc. thesis research – Human nutrition (Ali Bianco) ⁵ : Risk Factors for Anemia in Young Ethiopian Children	CIMMYT, EPHI and HSPH (Nilupa, Hugo and Masresha)	Thesis research work: Feb, 2018 to June 2018	Thesis writing completed and under review by advisors
	M.Sc. thesis research – Human nutrition (Anastasia Karakitsou) ⁵ : The relationship between, protein status, serum IGF, serum mycotoxin and linear growth of children in Ethiopia	CIMMYT CIMMYT, EPHI and HSPH (Nilupa, Hugo and Masresha)	Thesis research work: Feb, 2018 to June 2018	Thesis writing completed and under review by advisors

⁵M.Sc. students writing their thesis on part of the collected by Masresha, the Ph.D student from EPHI who is enrolled in Jimma and Wageningen Universities.

Institutional capacity: provided in the form of germplasm and training and reference materials:

- i) EIAR breeding program at Ambo received two sets of 45 and 64 entries, respectively, of QPM 3WC hybrid trials from CIMMYT-Zimbabwe for evaluation under both optimum and low N conditions and selection of superior adapted materials for use in their breeding activities. The expected 110 advanced QPM inbred lines to be introduced from CIMMYT-Zimbabwe were not received in time for planting this season;
- ii) The Amharic and Oromiffa versions of the training manual on QPM-based food preparations (“Training Manual: QPM-Based Ethiopian Traditional Food Preparation Manual”) have been published.

Physical capacity: Planned physical capacity activities were completed in previous AWP.

ANNEX 1. PERFORMANCE REPORTING FRAMEWORK¹

#	LM LEVEL	STATEMENTS	OUTCOME & OUTPUT RESULTS BY END-OF-PROJECT / ACTIVITY RESULTS PLANNED FOR CURRENT AWP	ACTUAL RESULTS FOR AWP	VARIANCE OF ACTUAL TO PLANNED RESULTS AND EXPLANATION
1100	Intermediate Outcome	Increased utilization of QPM seed and grain, particularly by vulnerable groups with emphasis on young children and women in maize producing areas	<ul style="list-style-type: none"> 20% of target population, including women and girls, using QPM based products 20% of target population (10% of men) knowledgeable in QPM based food product processing At least one school in each target area using QPM based food 		
1110	Immediate Outcome	Increased demand by male and female farmers for QPM seed through greater awareness of QPM and its nutritional benefits	<ul style="list-style-type: none"> 50% of target population, including women, aware of QPM and nutritional benefits 25% of target population, including women, participated 30% of target population, including women, with QPM information 		
1111	Output	Field plot demonstrations and associated field day events to promote QPM varieties, nutritional benefits and utilization involving men and women farmers, Development Agents (DAs), government officials, seed companies, NGOs (including women's groups), the food Industry, home economists and health extension officers	<ul style="list-style-type: none"> 1,500 field demonstrations during life of Project (10% managed by women farmers) 200 field days conducted 20,000 participants attend field days with minimum 40% women 		
1111.1	Activity	Establish side-by-side field plot demonstrations of QPM and non-QPM maize genotypes under best management practices at FTCs and roadside farmers' fields including female farmers in the establishment and demonstration of QPM varieties	<ul style="list-style-type: none"> 267 field demonstrations (>20% women hosted) of AMH852Q, BHQP545, BHQP548, MH138Q and Melkasa-6Q 	<ul style="list-style-type: none"> 233 field demonstrations (46 or 22 % by women) successfully conducted 	
1111.2	Activity	Conduct field days at best demo plots targeting female and male community members to (a) show agronomic performance of QPM varieties cf non-QPM versions and (b) convey health messages	<ul style="list-style-type: none"> 141 field days conducted with an estimated participation of ~43,400 men and women farmers and other stakeholders (~40% women participants) 	<ul style="list-style-type: none"> 32 woreda level & 128 kebele level field days conducted thus far with participation of about 27,500 farmers (~25% women) and about 268 others (researchers, DAs, VIPs, etc) 	
1112	Output	QPM media materials and radio broadcasts featuring QPM and its nutritional benefits targeting women and men farmers, food processors and consumers as well as an active website to provide this information and project results to the general public and interested parties	<ul style="list-style-type: none"> Radio campaign with 13-24 weeks of nutrition information targeted to rural families focusing on children and women in local target area languages in year 1. Full programs aired at least twice per week with promos and messages broadcast at least 8 times/week Participatory radio campaign of at least 13 ½-hour programs on QPM and relevant crop information, with participation of both men and women (at least 30%) aired at least 2 times/week before and during planting season from year 2 in relevant languages. 		

¹ Cumulative progress toward EOP results not shown; results shown in Annual Report 2016-17 will be updated in the Annual Report for 2017-18 due to the preliminary nature of many results at this point during the current AWP.

#	LM LEVEL	STATEMENTS	OUTCOME & OUTPUT RESULTS BY END-OF-PROJECT / ACTIVITY RESULTS PLANNED FOR CURRENT AWP	ACTUAL RESULTS FOR AWP	VARIANCE OF ACTUAL TO PLANNED RESULTS AND EXPLANATION
			<ul style="list-style-type: none"> Radio air QPM messages in different languages at least 3X daily for 8 weeks prior to planting season each year from Year 2 followed by on-going messaging through harvest and post-harvest At least 25% of messages broadcast by female presenters All documents produced by Project present on website Website is current At least 5,000 websites hits by EOP 		
1112.1	Activity	Produce communications materials of QPM varieties and their nutritional and health benefits responsive accessible to both women and men farmers	<ul style="list-style-type: none"> 2 editions of project newsletter and 2 feature articles for CIMMYT <i>Informa</i> published One news releases on QPM technology and events prepared for and promoted among local journalists 	<ul style="list-style-type: none"> Two newsletter produced Two feature articles submitted for CIMMYT <i>Informa</i> 	<ul style="list-style-type: none"> A planned news release announcing the release of a new QPM variety was not possible since the variety was rejected
1112.2	Activity	Select partner radio stations and provide training and capacity development to produce an effective participatory and gender responsive radio program	<ul style="list-style-type: none"> Conduct content advisory panel (CAP) meetings to discuss and follow up on PRP content Monitor radio broadcasts and send feedback to broadcasters Provide seed information through IVR in Tigray, ANNPR, Oromiya & Amhara regions 	<ul style="list-style-type: none"> CAP meeting convened and agrees to focus PRPs in Amhara region to provide information on QPM seed availability and fall army worm control in addition to QPM awareness PRP episodes logged and monitored by FRI staff QPM seed supplier information provided to farmers through IVR in 1 regions 	
1112.3	Activity	Design a radio communication strategy on nutrition, health and protein awareness (NHPA), and QPM and other protein-rich crops (QPM-Plus) that is responsive to the needs of all family members, especially women and children	<ul style="list-style-type: none"> Conduct in-station refresher training on QPM Participatory Radio Programming in two regional radio stations (Amhara and Oromia) 	<ul style="list-style-type: none"> Refresher training conducted in Amhara only 	<ul style="list-style-type: none"> Budgetary constraints limit radio broadcasting to one region
1112.4	Activity	Launch and broadcast NHPA and QPM-Plus strategies targeting women and men farmers as well as food processors and consumers	<ul style="list-style-type: none"> Run PRP on QPM awareness focusing on input/seed provision and nutrition and food preparation for 16 weeks aired twice weekly in 2 regions Use beep-to-vote polls and Interactive Voice Response (IVR) techniques to assess QPM awareness and demand for seed and inform farmers and seed companies of where there is seed demand and seed supply Provide input to EOP household surveys for PRP outcome evaluation in the four regions 	<ul style="list-style-type: none"> 12 30-minute episodes broadcast twice a week in Amhara region IVR used to provide information on QPM seed availability and suppliers and fall army worm control 	
1112.5	Activity	Develop and maintain a website to provide information on the QPM technology and project results	<ul style="list-style-type: none"> NuME project documents, etc. uploaded to website as produced 	<ul style="list-style-type: none"> Uploading of new material in progress 	
1113	Output	Gender-sensitive audio-visual (including audio visual facilities provided to selected farmer training centres-FTCs) and other training and informational materials featuring QPM and its nutritional value for distribution to FTCs, DAs, home economists and health extension officers	<ul style="list-style-type: none"> At least 5 different QPM brochures produced for each category of user Brochures distributed to all participants at field days and demonstration events At least 3 different posters produced in local languages for each category of user 		

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			<ul style="list-style-type: none"> At least 80% of FTCs in Project focal areas receive posters and brochures At least 4 training materials produced 80% of FTCs in Project focal areas receive training materials 50 of TVs, DVD players and small generators purchased and distributed to FTCs 		
1113.1	Activity	Produce and distribute gender responsive educational materials including bulletins and manuals, DVDs on QPM varieties, germplasm development, agronomic management, nutritional and health benefits, addressing gender issues in trainings and social mobilization to FTCs, DAs and health extension officers	<ul style="list-style-type: none"> Activity completed 	<ul style="list-style-type: none"> Not applicable 	
1113.2	Activity	Provide audio-visual training equipment (TV, DVD player, small generator) to selected FTCs	<ul style="list-style-type: none"> Activity completed 	<ul style="list-style-type: none"> Not applicable 	
1113.3	Activity	Conduct gender analysis in the target community to inform all strategies and activities designed by the project	<ul style="list-style-type: none"> Activity completed 	<ul style="list-style-type: none"> Not applicable 	
1113.4	Activity	Identify and use traditional institutions (religious, social and economic) to reach out to different women's groups	<ul style="list-style-type: none"> No further activity 	<ul style="list-style-type: none"> Not applicable 	
1120	Immediate Outcome	Enhanced knowledge and skills of women and men in targeted communities in preparation of traditional food and new food products using QPM	<ul style="list-style-type: none"> 100 ToT (10 men) and 2,000 people (200 men) participate in training events 25% of target population with QPM information 		
1121	Output	Traditional and new food products based on QPM with high acceptability by female and male consumers	<ul style="list-style-type: none"> 10 types of traditional foods accepted by consumers 5 new improved recipes with high acceptance by male and female consumers 		
1121.1	Activity	Develop recipes for traditional foods and new products to achieve male and female consumer preferred characteristics	<ul style="list-style-type: none"> Paper on study on effects of processing and processing conditions of traditional food preparation with QPM and conventional maize on their absolute and relative tryptophan and lysine contents published Inventory and review of previous work on use of maize including QPM in Ethiopian food preparations published as a project working paper on the NuME website 	<ul style="list-style-type: none"> Paper on processing effects on preparation of <i>injera</i>, <i>dabo</i>, and <i>genfo</i> on tryptophan and lysine contents completed drafted and under revision The working paper on inventory and review of previous work on use of maize including QPM in Ethiopian food preparations finalized. 	
1121.2	Activity	Conduct sensory evaluations of QPM-based food products by rural consumers (women and men) in focal areas to ensure their acceptability, including that of children (as observed by their mothers)	<ul style="list-style-type: none"> Paper on results of Jimma consumer acceptance (sensory evaluations and willingness to pay) studies of traditional foods prepared with QPM or conventional maize published 	<ul style="list-style-type: none"> Results analyzed and presented at Conf. African Assoc. Agric. Economics in Sept 2016 in Addis Ababa. Two papers based on the study submitted for publication by the senior author to predatory journals and without CIMMYT's knowledge are in limbo 	
1121.3	Activity	Promote use of QPM grain by school feeding programs	<ul style="list-style-type: none"> Paper on consumer acceptance of yellow QPM vs. yellow and white CM by students, teachers and kitchen staff in school feeding program published 	<ul style="list-style-type: none"> paper prepared of the results and submitted for publication in the journal, <i>Development in Practice</i> 	

#	LM LEVEL	STATEMENTS	OUTCOME & OUTPUT RESULTS BY END-OF-PROJECT / ACTIVITY RESULTS PLANNED FOR CURRENT AWP	ACTUAL RESULTS FOR AWP	VARIANCE OF ACTUAL TO PLANNED RESULTS AND EXPLANATION
1122	Output	Gender-sensitive audio-visual and other training materials featuring processing and utilization of QPM in traditional and newly developed food products for distribution to FTCs, DAs, home economists and health extension workers and use in radio broadcasts	<ul style="list-style-type: none"> At least one manual in each language At least 80% of FTCs in target areas receive materials At least 2 radio programs transmitted on QPM and its nutritive value 		
1122.1	Activity	Develop training materials (pamphlets, manuals, DVDs) featuring women and men illustrating uses and preparation methods of traditional and new food products using QPM and distribute to FTCs, DAs and health extension officers	<ul style="list-style-type: none"> Training manual on QPM-based food preparations (Amharic and Oromiffa versions) published 	<ul style="list-style-type: none"> Amharic and Oromiffa versions of training manual on QPM-based food preparations published 	
1122.2	Activity	Incorporate content on the use of QPM in food preparation in the radio communication strategy for NHPA and QPM-Plus	<ul style="list-style-type: none"> PRP episodes include aspects on QPM utilization and food preparation 	<ul style="list-style-type: none"> Food preparation with QPM highlighted in one PRP during 1st semester 	<ul style="list-style-type: none"> Two additional episodes to be aired in 2nd semester
1123	Output	Increased knowledge of how to incorporate QPM in new and traditional food preparations	<ul style="list-style-type: none"> Demonstrations performed during at least 50% of field days Training sessions conducted in at least 80% of FTCs in target districts each year commencing in Year 2 20-25 participants (>10% men) participate in each training session 		
1123.1	Activity	Demonstrate and conduct trainings on use of QPM in new and traditional foods to male and female DAs, health extension workers and community members, including demonstrations at field days	<ul style="list-style-type: none"> Use of QPM in traditional food preparations demonstrated in at least 12 field days 	<ul style="list-style-type: none"> food demos conducted at 6 woreda level field days 	<ul style="list-style-type: none"> Additional food demos will be conducted during field days in 2nd semester
1200	Intermediate Outcome	Increased QPM grain from drought-prone to highland agro-ecologies	<ul style="list-style-type: none"> 2,500 t per annum at EOP 400,000 t of QPM grain produced by 2014 20% of maize seed sold is QPM by EOP 20% of farmers, including FFHs³, use agronomic recommendations 		
1210	Immediate Outcome	Superior, highly productive QPM hybrids and open pollinated varieties (OPVs) adapted to different agro-ecologies	<ul style="list-style-type: none"> 4 hybrids and OPVs 15 kg of seed of parents of each released cultivar available during life of project 		
1211	Output	Late, intermediate and early maturing QPM inbred lines (including pro-vitamin A rich lines) adapted to different Agro-Ecological Zones (AEZs) with information on diversity and heterotic groups developed and available to public and private sector breeders	<ul style="list-style-type: none"> 30 QPM inbred lines developed; fingerprinted and classified into heterotic groups 		
1211.1	Activity	Establish QPM breeding nurseries to introduce, develop and evaluate late, intermediate and early maturity QPM inbred lines	<ul style="list-style-type: none"> 5-10 adapted QPM inbred lines selected in each agro-ecology (highland, moist mid-altitude and moisture stressed) from CIMMYT-Harare introduction for further hybrid and synthetic formation On-going activities to be continued by EIAR scientists with EIAR budgetary support and CIMMYT back-stopping 	<ul style="list-style-type: none"> No selections made 	<ul style="list-style-type: none"> Nurseries from CIMMYT-Harare no received in time for planting

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1211.2	Activity	Develop pro-vitamin A rich QPM inbred lines	<ul style="list-style-type: none"> 10-20 adapted QPM inbred lines selected from CIMMYT-Harare introduction in each of the 3 agroecology for further hybrid and synthetic formation 	<ul style="list-style-type: none"> No selections made 	
1212	Output	Superior hybrids and OPVs identified for different AEZs	<ul style="list-style-type: none"> At least 6 OPVs at final stages of release 20 experimental hybrids/OPVs under NVT in different AEZs 		
1212.1	Activity	Cross selected QPM inbred lines to testers	<p>For the moist mid-altitude agro-ecology:</p> <ul style="list-style-type: none"> 48 3WC generated from crosses of CML161 and CML165 each to 24 yellow QPM SC hybrids formed in 2017 	<ul style="list-style-type: none"> The three way crosses have been formed but selections are pending harvest 	
1212.3	Activity	Conduct multi-location testing in different AEZs of newly developed OPVs and hybrids	<p>For the highland agro-ecology:</p> <ul style="list-style-type: none"> 1-2 QPM 3WC hybrids identified for VVT in 2019 	<ul style="list-style-type: none"> NMVT trials in progress 2 sets of 3WC trials introduced from CIMMYT-Zimbabwe in progress 	
			<p>For the moist mid-altitude agro-ecology:</p> <ul style="list-style-type: none"> 5-6 best single cross (involving BHQPY545 parents) selected to convert to 3WC hybrids 2-3 QPM 3WC hybrids identified for VVT in 2019; 1-2 hybrids identified from... and promoted to VVT for possible release 	<ul style="list-style-type: none"> Trials in progress 	
			<p>For moisture stressed agro-ecologies:</p> <ul style="list-style-type: none"> 1-2 QPM 3WC hybrids identified for VVT in 2019 	<ul style="list-style-type: none"> Trials in progress; some sites affected by severe moisture stress 	
1213	Output	Best hybrids and OPVs released by public sector and private seed companies for commercial seed production through efficient 'Value for Cultivation' (VCU) tests and distinctness, uniformity, stability (DUS) procedures for release and registration of new varieties	<ul style="list-style-type: none"> At least 4 hybrids and OPVs released by EOP VCU and DUS document published 		
1213.1	Activity	Increase seed of pre-release and newly released OPVs and hybrids for farmer-participatory field evaluation and agronomic trials	<ul style="list-style-type: none"> No activity planned for this season; On-going activities to be continued by EIAR scientists with EIAR budgetary support and CIMMYT back-stopping 	<ul style="list-style-type: none"> Not applicable 	
1213.3	Activity	Carry out variety characterization (DUS) and statutory pre-release 'National Maize Verification Trials' of best hybrids and OPVs for release by public sector and private seed companies	<ul style="list-style-type: none"> No activity planned for this season; On-going activities to be continued by EIAR scientists with EIAR budgetary support and CIMMYT back-stopping 	<ul style="list-style-type: none"> Not applicable 	
1220	Immediate Outcome	Agronomic recommendations and best management practices for QPM varieties in different agro-ecologies	<ul style="list-style-type: none"> 3-4 agronomic recommendation packages available 		
1221	Output	Recommendations for plant densities (spacing), fertilizer rates and soil-water management practices for new QPM varieties on different soil types and agro-ecologies	<ul style="list-style-type: none"> recommendations for grain and green cob production for 2 new cultivars 4 agronomic recommendations (N and P with and without lime; drainage and tie ridge) 		
1221.1	Activity	Conduct plant density trials at multiple sites and seasons using new QPM varieties to determine optimal spacing for both grain and green cob production in different agro-ecologies	<ul style="list-style-type: none"> A report on the results of NuME agronomic research on optimal plant densities (spacing) for QPM varieties in different agro-ecologies and recommendations for future work 	<ul style="list-style-type: none"> Agronomic data secured from EIAR agronomists; report to be prepared 	<ul style="list-style-type: none"> Delays in acquiring data may delay report further

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			<ul style="list-style-type: none"> A report on the effects of plant spacing and increased stand density on BHQP545 seed production 		
1221.2	Activity	Develop an <i>in situ</i> methodology to determine economically optimal fertilizer nitrogen rates for new QPM varieties on different soil types and agro-ecologies	<ul style="list-style-type: none"> No addition activity planned. 	<ul style="list-style-type: none"> Not applicable 	
1222	Output	Training materials (manuals, guides, bulletins, audio-visual materials) on best QPM technology packages for DAs and FTCs	<ul style="list-style-type: none"> 1 each of manual, guide or bulletin and DVD on QPM technology produced Copies distributed to Ag-TVETS and >80% of FTCs in target areas 		
1222.1	Activity	Develop and distribute training materials (pamphlets, bulletins, manuals, guides, DVDs) on best bet QPM technology packages for DAs and FTCs	<ul style="list-style-type: none"> Activity complete 	<ul style="list-style-type: none"> Not applicable 	
1223	Output	Enhanced understanding of QPM varieties and management practices by male and female DAs	<ul style="list-style-type: none"> DAs of at least 80% of FTCs receive training in QPM technologies and management 		
1223.1	Activity	Conduct training on QPM varieties and management at ATVETS for male and female DAs	<ul style="list-style-type: none"> Activity complete 	<ul style="list-style-type: none"> Not applicable 	
1300	Intermediate Outcome	Strengthened institutional capacity of the public and private seed supply sector to produce and distribute high quality QPM seed on a sustainable basis	<ul style="list-style-type: none"> 2,500 t per annum of QPM seed distributed by EOP 30 t per annum of basic seed produced by seed companies by EOP 10 seed company managers (of which at least one is a woman) trained 30 agronomists and seed inspectors (of which 2 are women³) trained 		
1310	Immediate Outcome	Increased quantities of high quality QPM breeders', pre-basic, basic and certified seed available to male and female seed producers and farmers	<ul style="list-style-type: none"> 100 t certified seed of BH660-type QPM and 200 t of others released QPM cultivars produced by 2012 20% of improved maize seed sales are QPM by EOP Seed produced is high quality based on QPM standards 		
1311	Output	A strategy to rapidly increase production of breeders, pre-basic, basic and certified QPM seed that minimizes risk to seed producers but meets increasing demand by farmers	<ul style="list-style-type: none"> Strategic document available in the first year of Project Seed production meets targets 		
1311.1	Activity	Produce breeders' and pre-basic seed of released OPVs and parents of hybrids to meet seed company's needs	<ul style="list-style-type: none"> Approximately 2,500 kg of breeder's and pre-basic seed of AMH852Q, BHQP545, BHQP548, MH138Q and Melkasa-6Q produced 	<ul style="list-style-type: none"> 705 kg produced 	<ul style="list-style-type: none"> Enough stock is available for some of the parental lines
1311.2	Activity	Develop production schedules for scaling up breeders, pre-basic, basic and certified QPM seed production based on source seed available at project inception	<ul style="list-style-type: none"> No further activity 	<ul style="list-style-type: none"> Not applicable 	
1311.3	Activity	Contract seed companies to produce quantities of basic seed of QPM varieties on an escalating scale until demand is sustainable	<ul style="list-style-type: none"> Total of approximately 2.825 tonnes of basic seed of AMH852Q, BHQP545, BHQP548, MH138Q and Melkasa-6Q produced 	<ul style="list-style-type: none"> 5.9 tonnes 	<ul style="list-style-type: none"> To sustain BHQP545 future seed production basic seed of the two parents was multiplied out f the plan

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1311.4	Activity	Contract public and private seed companies to produce quantities of certified seed of QPM varieties on an escalating scale until demand is sustainable	<ul style="list-style-type: none"> At least 1,080 tonnes of certified seed of AMH852Q, BHQP545, BHQP548, MH138Q and Melkasa-6Q produced 	<ul style="list-style-type: none"> 139.9 	<ul style="list-style-type: none"> Seed companies constrained by land, social unrest, staff and leadership
1312	Output	A pilot seed distribution system based on private stockist concept tested to estimate market demand for, and improved delivery of QPM seed	<ul style="list-style-type: none"> 6 stockists established and provided with quantities of seed of QPM and older varieties based on estimated demand Seed supply exceeds demand by no more than 10% Farmers (both men and women) highly satisfied with availability of desired variety and seed when required 		
1312.1	Activity	Establish a pilot network of private seed stockists in a project focal area to market QPM and maize seed directly to farmers	<ul style="list-style-type: none"> Seed companies supported to offer QPM seed in conventional and small packets messages on seed sources broadcast on PRPs and informed DAs and SG2000 site coordinators 	<ul style="list-style-type: none"> not yet done 	<ul style="list-style-type: none"> Seed produced this season will be sold later in April and March after the project ended
1312.2	Activity	Monitor male and female farmer and stockist satisfaction of stockist system vs. classic systems for QPM and maize seed delivery through farmer surveys	<ul style="list-style-type: none"> informal surveys/feedback solicited at woreda level FDs in pilot stockist woredas 	<ul style="list-style-type: none"> not yet done 	
1313	Output	Emerging public and private seed company managers, including women, with enhanced skills in seed business principles	<ul style="list-style-type: none"> 10 seed managers trained by the EOP At least one seed company managed by women producing QPM seed Seed manager (both men and women) are highly satisfied with training received 25% of farmers producing QPM seed are women At least 2 of the 6 stockists established by the project are women 		
1313.1	Activity	Provide short course training on seed business to seed company managers	<ul style="list-style-type: none"> No additional courses to be offered; Activity complete 	<ul style="list-style-type: none"> Not applicable 	
1313.2	Activity	Identify, encourage and facilitate participation of women in seed production, marketing and seed company entrepreneurship	<ul style="list-style-type: none"> No additional activity. 	<ul style="list-style-type: none"> Not applicable 	
1320	Immediate Outcome	A quality assurance system for QPM seed and grain	<ul style="list-style-type: none"> QPM certified seed guidelines published EIAR QPM laboratory staffed and operational QPM laboratory analyzing 2,000 samples per year by EOP EIAR QPM lab results agree within 10% with CIMMYT and other QPM labs 		
1321	Output	Quality standards established and a system for monitoring developed to assure quality QPM seed and grain for producers and consumers	<ul style="list-style-type: none"> Quality standards officially established Official manual published QPM lab offering routine QPM analytical services Breeders and seed companies satisfied with QPM lab services 		
1321.1	Activity	Develop, in collaboration with MoA, regulatory definitions and standards for QPM seed and grain for commercial use	<ul style="list-style-type: none"> No additional activity; Ethiopian Standards Authority to publish approved quality standards for QPM seed and grain 	<ul style="list-style-type: none"> Not applicable 	

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1321.2	Activity	Develop protocols and procedures for seed sampling, analysis and reporting for QPM certification	<ul style="list-style-type: none"> Activity completed 	<ul style="list-style-type: none"> Not applicable 	
1321.3	Activity	Develop a system to offer QPM analytical services to seed producers and commercial grain millers on a full cost recovery basis using the EIAR QPM laboratory	<ul style="list-style-type: none"> Activity completed 	<ul style="list-style-type: none"> Not applicable 	
1321.4	Activity	Upgrade the existing EIAR QPM laboratory to carry out QPM quality tests for large numbers of seed samples	<ul style="list-style-type: none"> Upgrade complete and lab operating; activity complete 	<ul style="list-style-type: none"> Not applicable 	
1322	Output	Public and private seed company agronomists and inspectors with enhanced skills in high quality QPM hybrid and OPV seed production	<ul style="list-style-type: none"> 30 seed agronomists and inspectors (20% female) trained by the EOP 		
1322.1	Activity	Conduct short training courses targeting both women and men on QPM hybrid and OPV seed production including seed crop inspection and monitoring	<ul style="list-style-type: none"> No additional courses to be offered; Activity complete 	<ul style="list-style-type: none"> Not applicable 	
1323	Output	Economic analysis of regulatory systems, comparing benefits and costs	<ul style="list-style-type: none"> Publication of study results 		
1323.1	Activity	Calculate the benefits and costs of different options for quality control and labelling of QPM seed, grain and food products	<ul style="list-style-type: none"> Report on the benefit/cost analysis of methods of QPM seed quality assurance by seed companies completed and shared with partners and stakeholders 	<ul style="list-style-type: none"> Data collected and the report will be ready by the end of the 1st semester or early 2nd semester of the AWP 	
P-1	Activity	Carry out GIS analysis of maize production, consumption, poverty, health and nutritional status in maize growing areas to identify areas with high potential for impact of QPM and project focal areas	<ul style="list-style-type: none"> Activity completed 	<ul style="list-style-type: none"> Not applicable 	
P-2	Activity	Conduct gender-disaggregated studies to obtain baseline data for performance indicators (awareness, adoption, etc.) to monitor progress in achieving project results	<ul style="list-style-type: none"> Activity completed 	<ul style="list-style-type: none"> Not applicable 	
P-3	Activity	Conduct food insecurity and food consumption surveys (household level)	<ul style="list-style-type: none"> Data from surveys analyzed and written up for publication as a report and/ or journal paper 	<ul style="list-style-type: none"> Paper based on results accepted for publication in the journal <i>Nutrients</i> 	
P-4	Activity	Use anthropometrics, dietary intake, clinical and biochemical tests of target population (children and women) to assess risk of malnutrition as well as lysine deficiency in target areas	<ul style="list-style-type: none"> Three papers prepared based on results of micronutrient survey and RCT study: (i) methodology paper; (ii) protein, vitamin A and micronutrient deficiencies from MNS and food consumption estimated in household surveys; and (iii) mid-line and end-line data on anthropometrics and biomarkers (vitamin A, Fe, Zn, protein) One paper prepared on impact of consumption encouragement treatments on behavioural change for ear-marking QPM for target children and effect of children's QPM consumption 	<ul style="list-style-type: none"> One manuscript accepted on the journal "Nutrient" and another one on the RCT is in progress Paper on consumption encouragement study in preparation 	

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P-5	Activity	Calculate potential impact of QPM on target population's health using disability-adjusted life years (DALYs)	<ul style="list-style-type: none"> DALYs lost due to protein deficiencies calculated from P-3 and P-4 data and results used to develop a manuscript and submitted for publication 	<ul style="list-style-type: none"> Progress pending results from Activities P-3 and P-4 	
P-6	Activity	Conduct adoption studies to measure performance indicators and progress to achieving project results, including seed availability and farmer evaluation (gender disaggregated)	<ul style="list-style-type: none"> End-of-project household surveys of project performance indicators conducted to assess QPM awareness and adoption, data analyzed and report prepared for GAC. EOP, mid-term and baseline survey results combined for possible publication in refereed journal 	<ul style="list-style-type: none"> EOP survey questionnaire developed and surveys in progress with expected completion in November. 	
P-7	Activity	Collect and maintain a database on seed production and sales/ distribution by category	<ul style="list-style-type: none"> Database maintained of seed production and sales by category and producer 	<ul style="list-style-type: none"> In progress; data compiled annually at end of season 	
P-8	Activity	Collect data and maintain an inventory of QPM promotional activities including numbers of demonstrations and field days conducted, training events and participation in each, etc. (all gender disaggregated)	<ul style="list-style-type: none"> Inventory of activities maintained 	<ul style="list-style-type: none"> In progress; data compiled annually at end of season 	

ANNEX 2. LIST OF PUBLICATIONS BASED ON NUME PROJECT STUDIES

In addition, the following scientific papers related to QPM development, dissemination and utilization, based on work supported by the NuME Project, were published:

1. Belayene D., Senayit Yetneberk, A. Teklewold, H. De Groot. 2017. Quality Protein Maize for school feeding in Ethiopia: stakeholders consultation, sensory evaluation and potential impact. *African Journal of Food, Agriculture, Nutrition and Development* (submitted and awaiting editorial response).
2. Tesfaye B., H. De Groot, N. S. Gunaratna, M. Tafesse, A. Teklewold. 2017. Nutritional Effects of Traditional Processing on Biofortified Foods: Quality Protein Maize in Ethiopia. Draft under revision for submission to *Journal of Agricultural and Food Chemistry*.
3. Samuel Diro, Wondaferahu Mulugeta, Muhidin Muhammedhussen. 2016. Consumers' Acceptance of Traditional Dishes from Quality Protein Maize in South West Ethiopia: Jimma Zone. *Food Science and Quality Management* 52: 17-28.
4. Samuel Diro, Wondaferahu Mulugeta, Muhidin Muhammedhussen. 2016. Evaluation of Quality Protein Maize Traditional Dish at Home and Consumers' Willingness to Pay for its Grain in Jimma Zone: Omo Nada District. *Journal of Economics and Sustainable Development* 7 (9):38-50.
5. Masresha Tessema, Nilupa S. Gunaratna, Inge D. Brouwer, Katherine Donato, Jessica L. Cohen, Margaret McConnell, Tefera Belachew, Demissie Belayneh, Hugo De Groot. 2018. Associations among High Quality Protein and Energy Intake, Serum Transthyretin, Serum Amino Acids and Linear Growth of Children in Ethiopia. *Nutrients* (accepted).
6. Addisalem Mebratu, Dagne Wegary, Wassu Mohammed, Adefris Teklewold, Amsal Tarekegne. 2018. Combining ability and heterosis in Quality Protein Maize Inbred lines adapted to eastern and southern Africa under drought stress and optimum management. *Journal of Agriculture and Food Security* (submitted).
7. Addisalem Mebratu, Dagne Wegary, Wassu Mohammed, Adefris Teklewold, Amsal Tarekegne. 2018. Genotype-by-environment interaction and grain yield stability of medium to late maturing quality protein maize hybrids under contrasting management conditions in eastern and southern Africa. *Crop Science* (under major revision following editorial review).