Republic of Mozambique
Institute of Agricultural Research of Mozambique

Republic of Mozambique Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development, Mozambique

Final Report

November 2017

Japan International Cooperation Agency (JICA)

NTC International Co., Ltd.
Japan International Research Center for Agricultural Sciences (JIRCAS)

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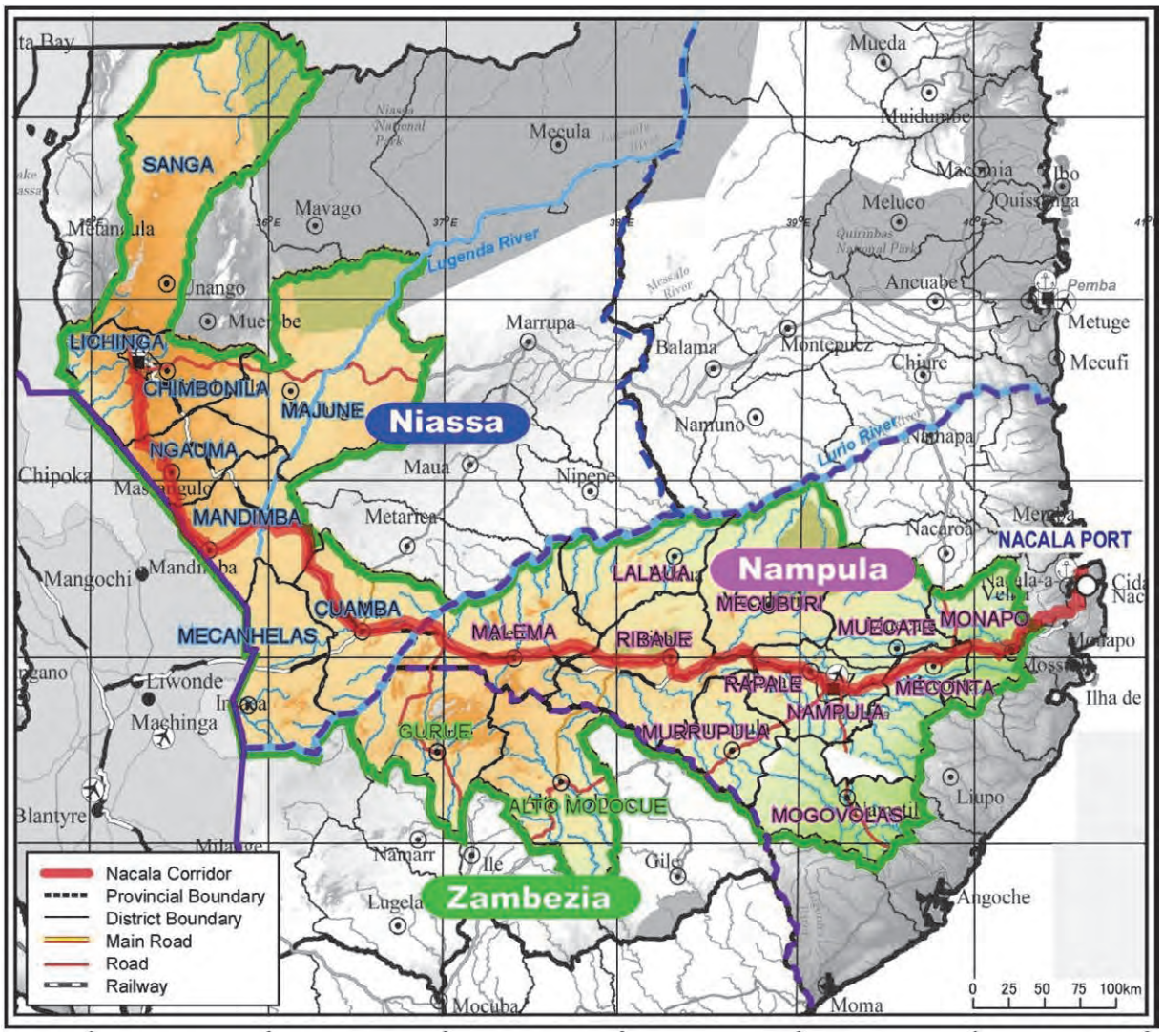

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Soil improvement manual
Crop manual (Ground nut, Sorghum, Potato, Soy bean)

ABBREVIATION

Abbreviation	English	Portuguese	Japanese
ABC	Brazilian Cooperation Agency	Agência Brasileira de Cooperação	ブラジル協力庁
C/P	Counterpart	Contrapartida	カウンターパート
DPASA	Provincial Directorate of Agriculture and Food Security	Direcção Provincial da Agricultura e Segurança Alimentar	州農業・食糧安全保障局
DSS	Decision support system	Sistema de Apoio à Tomada de Decisões	意思決定支援システム
EAL	Lichinga Agricultural Station	Estação agrária de Lichinga	Lichinga 農業試験場
Embrapa	Brazilian Agricultural Research Corporation	Empresa Brasileira de Pesquisa Agropecuária	ブラジル農牧研究公社
Embrapa/SRI	Brazilian Agricultural Research Corporation/ Secretariat of International Relations	Empresa Brasileira de Pesquisa Agropecuária /Secretaria de Relações Internacionais	ブラジル農牧研究公社 国際局
FAO	Food and Agriculture Organization	Organização das Nações Unidas para Agricultura e Alimentação	国際連合食糧農業機関
IIAM	Institute of Agricultural Research of Mozambique	Instituto de Investigação Agrária de Moçambique	モザンビーク農業研究所
IIAM CZnd	Institute of Agricultural Research of Mozambique Northeast Zonal Center	Instituto de Investigação Agrária de Moçambique Centro Zonal Nordeste	モザンビーク農業研究所 北東地域センター
IIAM CZnd PAN	Institute of Agricultural Research of Mozambique Northeast Zonal Center Nampula Agricultural Station	Instituto de Investigação Agrária de Moçambique Centro Zonal Nordeste Posto agronômico de Nampula	モザンビーク農業研究所 北東地域センターナンプラ農業試験場
IIAM CZno	Institute of Agricultural Research of Mozambique Northwest Zonal Center	Instituto de Investigação Agrária de Moçambique Centro Zonal Noroeste	モザンビーク農業研究所 北西地域センター
IIAM CZno EAL	Institute of Agricultural Research of Mozambique Northwest Zonal Center Lichinga Agricultural Station	Instituto de Investigação Agrária de Moçambique Centro Zonal Noroeste Estação agrária de Lichinga	モザンビーク農業研究所 北東地域センターリシンガ農業試験場
IITA	International Institute of Tropical Agriculture	Instituto Internacional de Agricultura Tropical	国際熱帯農業研究所
JCC	Joint Coordinating Committee	Comissão de Coordenação Conjunta	合同調整委員会
JTC	Joint Technical Committee	Comissão Técnica Conjunta	合同技術委員会
JICA	Japan International Cooperation Agency	Agência de Cooperação Internacional do Japão	(独)国際協力機構
JIRCAS	Japan International Research Center for Agricultural Sciences	Centro Japonês de Pesquisas Internacionais para Ciências Agrícolas	国際農林水産業研究センター
MASA	Ministry of Agriculture and Food Security	Ministerio da Agricultura e Segurança Alimentar	モザンビーク農業・食糧安全保障省
OJT	On the Job Training	Treinamento no Trabalho	職場内訓練
PDM	Project Design Matrix		プロジェクト概要表
PIAIT	Platform for Agricultural Research and Technological Innovation	Plataforma para Investigação Agrária e Inovação Tecnológica em	モザンビーク農業研究プラットフォーム

Abbreviation	English	Portuguese	Japanese
	in Mozambique	Moçambique	
ProSAVANA-PI	Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development, Mozambique	Projecto de Melhoria da Capacidade de Pesquisa e de Transferência de Tecnologia para o Desenvolvimento da Agricultura no Corredor de Nacala, Moçambique	モザンビーク国 ナカラ回廊農業開発 研究・技術移転能力向上 プロジェクト
ProSAVANA-PD	Support of the Agriculture Development Master Plan for the Nacala Corridor, in Mozambique	Apoio ao Plano Director com vista ao Desenvolvimento Agrícola no Corredor de Nacala, em Moçambique	モザンビーク国 ナカラ回廊農業開発 マスタープラン策定支援 プロジェクト
ProSAVANA-PEM	Project for Establishment of Development Model at Communities' Level with Improvement of Rural Extension Service under Nacala Corridor Agricultural Development in Mozambique	Projecto de Criação de Modelos de Desenvolvimento Agrícola Comunitários com Melhoria do Serviço de Extensão Agrária com vista ao Desenvolvimento da Agricultura no Corredor de Nacala, em Moçambique	モザンビーク国 ナカラ回廊農業開発におけるコミュニティレベル開発モデル策定 プロジェクト
R/D	Record of Discussions	Registro de Discussões	討議議事録
SDAE	District Services of Economic Activities	Serviços Nacional de Aprendizagem Rural	郡経済活動サービス
TCM	Technical Coordination Meeting	Reunião Técnica de Coordenação	対面式調整会議
USAID	United States Agency for International Development	Agência dos Estados Unidos para o Desenvolvimento Internacional	アメリカ合衆国 国際開発庁

Chapter 1 Outline of the Project

1.1 Objectives

The objectives of this project are to get the expected results by the implementation of the activities described in the Record of Discussions (R/D) for the "Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development, Mozambique "and achieve the project purpose.

1.2 Project Purpose

Appropriate agricultural technology is developed and transferred in Nacala Corridor.

1.3 Outputs

The prospective results of this project are as follows,

Output 1: Capacity of IIAM research centers in Northeast and Northwest is strengthened.
Output 2: Natural resources and socio-economic conditions in Nacala Corridor are evaluated.
Output 3: Soil improvement technology for Nacala Corridor is developed.
Output 4: Appropriate cultivation technology for Nacala Corridor is developed.
Output 5: New agricultural technology developed/validated is implemented in the demonstration units.

1.4 Target Area

The target area comprehends farmlands located in the 21 districts (Sanga, Lichinga, Chimbonila, Majune, Mandimba, Mechanhelas, Ngoma, Cuamba, Gurue, Alto Molocue, Malema, Murrupula, Lalaua, Ribaué, Mogovolas, Muecate, Meconta, Mecuburi, Monapo, Nampula Rapale) in the provinces of Niassa, Nampula and Zambezia.

1.5 Implementation Term of Project

Although the Project was at first planned for 5 years from May 2011 to May 2016, it was recommended to extend its cooperation period through the Final Evaluation which was conducted from November to December in 2015 for the evaluation of the progress and the proposal for improvements of the Project. Based on the result of the evaluation, the mission of 3 countries agreed to extend the project period by 1.5 years to continue soil and plant analysis training of Output 1 and to enhance the Decision Support System (DSS) of Output 5. The R/D has been revised to extend the Project until November 2017 with a total implementation term for 6.5 years.

1.6 Structure of Project Implementation

The following organizations from each country are involved in the implementation of the present Project:

Japan:	JICA,	NTCI-JIRCAS consortium
Brazil:	ABC,	Embrapa
Mozambique:	MASA,	IIAM

A Joint Coordinating Committee (JCC) was established as an entity for decision making and coordination related to ProSAVANA which includes the present Project. Details on the functions and membership are as follows:

The parties will establish JCC to provide and overall policy for the Programme and projects. JCC will be set up for effective and efficient implementation of the program and projects under the chair of MASA. JCC will decide on important matters to promote the output of the program and projects, including major decisions related to the interests of the Programme. JCC shall be held at least twice a year and additionally on the occasions whenever it deems necessary. JCC shall be integrated by the Brazilian, Japanese and Mozambican members designated hereunder. The technical and implementing institutions shall provide technical support for the decision making at JCC level. Its functions are:

(1) To approve the work plans of the projects
(2) To follow the progress of the implementation of the Programme and projects' activities
(3) To coordinate activities and schedules among projects
(4) To resolve issues regarding to the implementation of projects under the Programme
(5) To discuss any matter related to the Programme and projects aiming at the effective and efficient implementation

Its members are:

Mozambican side

(1) Chair: MASA
The person assigned by MASA
(2) Head of Department of International Cooperation
(3) Director of National Directorate of Agricultural Extension
(4) Director of Center for Promotion of Agriculture
(5) Representative of the Governor of the Nampula Province
(6) Representative of the Governor of the Niassa Province
(7) Representative of the Governor of the Zambezia Province

Japanese side

(1) Resident Representative of JICA Mozambique Office, as Head
(2) Representative of JICA HDQ
(3) Representative of JICA Brazil
(4) Programme Coordinator

Brazilian side

(1) Representative of ABC in Mozambique or any person appointed by ABC Brazil
(2) Coordinator of CGRB/ABC - Brasilia

Observers

Officials from the Embassy of Japan and the Embassy of Brazil in Mozambique shall participate in the meetings as observers and MASA, ABC and JICA can nominate the persons who attend JCC as observer.

Secretariat

In order to provide general coordination of the JCC meetings, MASA is assigned as Secretariat for the JCC arrangements. If necessary, Japanese and Brazilian parties shall assist the JCC secretariat.

A Joint Technical Committee (JTC) was established as an entity for decision making and coordination related to technical matters of the present Project. Details on the functions and membership are as follows:

The parties will establish a JTC if an individual project needs a coordination body for technical matters of the project. JTC will compile technical information and advice JCC for decision making based on its technical perspective. JCC will present guidelines and strategies to JTC. JTC will be held at least once a year and whenever the necessity arises. Its functions are:

(1) To discuss and draft Annual Work Plans of the Project
(2) To discuss the progress of activities of the Project
(3) To coordinate roles of three parties
(4) To discuss and propose plans for future activities
(5) To share information

Its members are:

Mozambican side

(1) General Director of IIAM (Chairperson)
(2) Director of IIAM Northeast Zonal Center
(3) Director of IIAM Northwest Zonal Center
(4) Provincial Director of Agriculture and Food Security, Nampula

(5) Provincial Director of Agriculture and Food Security , Niassa
(6) Provincial Director of Agriculture, and Food Security Zambezia
Japanese side
(1) Chief Representative of JICA Mozambique Office
(2) Members of the Japanese Expert Team
Brazilian side
(1) Chief Representative of Embrapa Mozambique Office (staying in Mozambique till December 2013)
(2) Brazilian Experts (staying in Mozambique till November 2015)
Observers
Officials of the Embassy of Japan and Brazil may attend the JTC meetings as observers. Persons who are invited by the Chairperson may attend the JTC meetings.
Secretariat
In order to provide general coordination of the JCC meetings, IIAM is assigned as Secretariat for the JTC arrangements. If necessary, Japanese and Brazilian parties shall assist the JTC secretariat.

The ProSAVANA-Headquarter was established at MASA in Maputo as a central mechanism for coordination and promotion of the program.

At the project level, Embrapa assigned a technical coordinator at IIAM CZnd in Nampula and a resident national engineer at IIAM CZno in Lichinga for 2011 to 2015. A long-term Japanese coordinator dispatched by JICA also worked at IIAM CZnd in Nampula between May 2011 and April 2016. The Mozambican side appointed one agricultural officer in each province as the focal point of ProSAVANA for smooth coordination.

To facilitate mutual communication and to share information among related parties such as Japanese experts team (chief advisor, sub-chief advisor and coordinator), Embrapa (resident representative and technical coordinator) and IIAM (directors of CZnd and CZno), a “Technical Coordination Meeting (TCM)” through face-to-face discussion were held regularly from December 2012 at monthly or bi-monthly basis. After the technical coordinator of Embrapa returned to his country, the TCM was constantly held by Japanese and Mozambican sides.

The “Output Leaders Meeting (OLM)” was initiated from 2013. Under OLM, experts from tripartite parties, who were in charge of the Project (so-called “Output Leader” assigned for each of the outputs No.1 to No.5, and related researchers and technicians at operational level), held intensive face-to-face discussions for several days, in order to harmonize the action plans and promote their implementations.

The following Figure 1-1 shows the overall structure of project implementation described above.

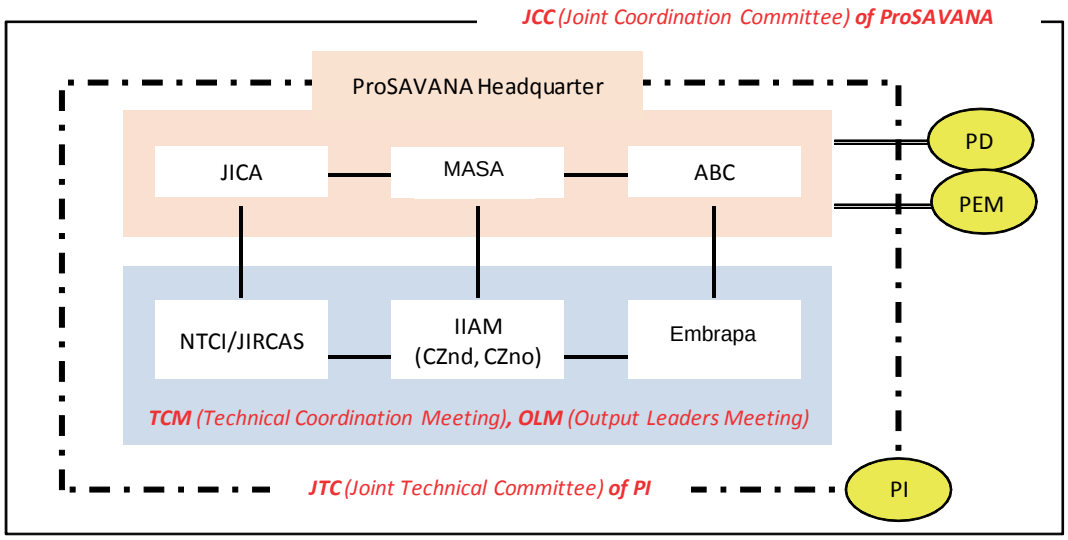


Figure 1-1 Structure of Implementation of ProSAVANA (program level) and PI (project level)

Chapter 2 Contents of activity

2.1 Activities related to Output 1: Capacity of IIAM research centers in Northeast and Northwest is strengthened

2.1.1 To make installation/equipment inventory（Activity 1-1）

The Inventory survey of existing machines and equipment of IIAM CZnd and IIAM CZno were carried out, and the lists of them were prepared afterward. The Project carried out the activities of "To repair existent installation / equipment (Activity 1-2)" and "To provide new research equipment (Activity 1-3)", according to the results of the inventory survey. The result of the inventory survey also contributed to the plan of soil and plant analysis laboratory in Nampula.

2.1.2 Repair of existing facilities and equipment (Activity 1-2)

In this activity, existing facilities and equipment were repaired mainly between the first year and the third year from the results of activity 1-1: To make installation/equipment inventory.

Specifically, from the first year to the third year, in order to improve the minimum required working environment for the research work in the IIAM CZnd PAN, the electricity distribution and the repair work on crime prevention in the office provided by IIAM were implemented. The improvement of internet and the installation of water supply system for improvement of water environment were also implemented. In IIAM CZno EAL, the repair work such as electric distribution and floor of the office room were implemented in the second year. In the third year, the wiring work in a room for dryer to secure power supply was implemented according to the installation of research equipment (such as large dryer and Wiley mill).

Through these activities, the office room for the project and the laboratory facilities, where it was previously difficult to operate, were improved. This led to the promotion of the project activities and enabled to introduce new research equipment in the laboratories.

2.1.3 Procurement of new research equipment (Activity 1-3)

In this project, weather observation equipment, equipment for soil physical and chemical experiments and research equipment necessary for field trials were procured. An inventory list on the procured research equipment has been prepared. The project comprehended and managed the equipment properly.

C/P and researchers in soil and plant analysis laboratory learned about the usage and maintenance of the procured research equipment from experts so they would be able to analyse and experiment using those equipment by them-selves. Furthermore, the agricultural research in Nacala corridor was advanced by utilizing procured equipment in the field trials, weather data observation and soil surveys of Activity2, 3, 4 and 5.

Important research and experimental facilities on handover list were transferred to IIAM in July 2015 and October 2017. IIAM should manage and operate them properly after the project completion.

2.1.4 To construct the laboratories at agricultural research centers in Northeastern area (Activity 1-4)

(1) Soil and Plant Analysis Laboratory in Nampula

1) Construction of Soil and Plant Analysis Laboratory

The construction work was planned to be completed by 24th August 2014 in the contract. However, it was not completed even in the expansion period until 30th November 2014. Although the construction company was charged penalty from 1st December, the works did not progress well. The construction works were finally completed on 2nd July 2015, and the laboratory was later handed over from the JICA Mozambique Office to IIAM CZnd. After warranty period after one year completion date, the construction company repaired some portions requested by the inspection, and the JICA Mozambique Office paid defect guarantee to the construction company on 1st July 2016. The table below shows the information of the construction contract.

Table 2-1 Information of Construction Contract

Item		Description
Contractor		Marcleusa Construction
Contract Amount		18,677,839 MZ
Period	Start	2013, November 28
	End	Initial: 2014, August 24 Extended: 2014, November 30 Actual: 2015, July 2

Size of the Laboratory is 522 m2 (36m*14.5m) and it has the following facilities.

Table 2-2 Laboratory's Facility

Facility	No.	Area (m2)
①Sample Preparation Room	1	33
②Chemical Analysis Room	1	48
③Physical Analysis Room	1	45
④Seminar Room	1	72
⑤Office	5	132
⑥Storage	3	56
⑦Toilet	1	-

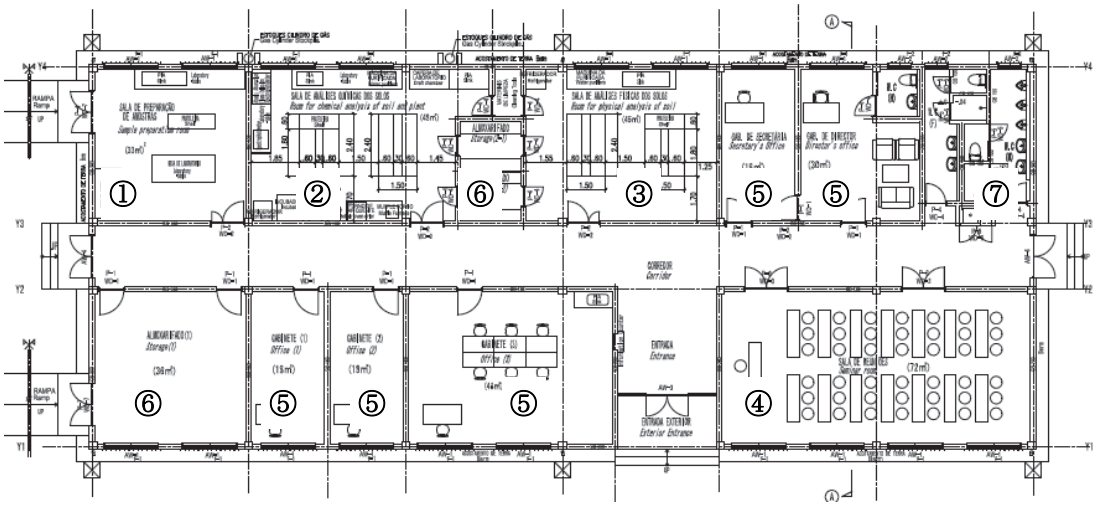


Figure 2-1 Plan of Soil and Plant Analysis Laboratory

Following photos show before and after construction.

Before Construction
Taken from East, 2nd December 2013

After Completion
Taken from East, 2nd July 2015

Before Construction
Taken from West, 2nd December 2013

After Completion
Taken from West, 2nd July 2015

Before Construction
Taken from North, 2nd December 2013

Before Construction
Taken from South, 2nd December 2013

After Completion
Taken from North, 2nd July 2015

After Completion
Taken from South, 2nd July 2015

2) Borehole for Laboratory

Construction plans of the laboratory construction plan did not include consrruction of water resources. A borehole was constructed near the laboratory due to necessity of a new water resoruces. Information of the borehole is summarized below.

Table 2-3 Summary of Borehole

Item		Description
Location		IIAM CZnd
Contractor		Babaji S.U, Lda
Contract Amount		1,253,437 MZN
Period	Start	2014, August 26
	End	Initial: 2014, September 29 Actual: 2014, October 3
Quantity		4.5m^3/hr~5.0m^3/hr (against 2.5m^3/hr of planned quantity)
Depth		65m

Completed Pump House

3) Generator

The Construction plan did not discuss the establishment of generators as well as the borehole. Therefore, generators and genrator house were installed nearby the laboratory by sub-contractor. The summary of the generator is shown below.

Table 2-4 Summary of Generator

Item		Description
Contractor		Mariamo Juma AbooBacar
Contract amount		114,374.29 MZN
Period	Start	2016, July 25
	End	2016, September 19
Scale		Length3m × Wide4m × Hight2m

4) Major repairing works of soil and plant analysis laboratory

New machines and equipment were installed into the soil and plant analysis laboratory. The table 2-5 shows the major repairing works that have been done during the Project period.

Table 2-5 Major repairing works of soil and plant analysis laboratory

Machines and equipment	Trouble	Repairing
MP-AES	The temperature of waveguide unit of MP-AES increased abnormally caused by lack of capacity of ventilation.	・Exchanged sirrocco fan from normal fan, Exhaust efficiency of analytical equipment was improved. ・Exchanged heat resistant waveguide unit from the normal one, The analytical equipment could be withstood the temperature fear of being high before.
Pumping machine to water tank	Three water pumps required too much electricity and the distribution board was broken.	It was changed that the electricity to three water pump was connected to the line of external light. Then, three water pumps works correctly. The connection line was buried in the ground.
Electric taps on the floor of chemical and physical analysis laboratory.	Electric taps on the floor were shorted out because the taps were covered with water while cleaning the floor.	The electric taps were removed from the floor and hung down from the ceiling boards.

2.1.5 To train research center staff for usage and maintenance of facilities and equipment (Activity 1-5)

(1) Maintenance of facility equipment

C/Ps were instructed in OJT formats, regarding that they can maintene and managefacilities and equipment..

In addition, the project created a list of suppliers and manufacturers and instructed C/Ps to take consult with suppliers and manufacturers when a problem occurs.

(2) Soil and plant analysis training and examination

Soil and plant analysis training was conducted in OJT format to enable C/Ps to properly use the experimental equipment that was introduced in the soil and crop laboratory.

After the training, the project carried out certificate examinations whether C/Ps can operate and analysze the equipment properly. In the examinations, C/Ps analyzed samples already analyzed by Japanese experts. C/Ps were evaluated whether they can analyze the samples by following the manual. Examination was required to match result by Japanese experts and C/Ps. In total, eight C/Ps took the training. The project had a target objective to train at least two researchers who understand each analysis item, therefore the training and examination was focused on Ms. Anabela, Ms. Clarinda and Mr. Lourenço. In cases where the researchers could not receive trainings by JICA experts for several analysis items, they were to receive the training of them from the researchers who have passed. Mr. Lourenço was a newly employed staff and he was allocated to the laboratory of IIAM CZnd from May 2017. Therefore, he did not receive the training of soil physical analysis.

Table 2-6 Acceptance status of the analysis examinations

Analysis items			Anabela	Clarinda	Lourenço
Soil analysis	Soil physical analysis	Moisture factor	Pass	Pass	-
		Organic matter	Pass	Pass	-
		Bulk density	Pass	Pass	-
		Three-phase distribution	Pass	Pass	-
		Saturated hydraulic conductivity	Pass	Pass	-
		Particle size composition	Pass	Pass	-
	Soil chemical analysis	pH	Pass	Pass	-
		EC	Pass	Pass	-
		Total nitrogen	Pass	Pass	Pass
		Nitrate nitrogen	Pass	Pass	Pass
		Ammonia nitrogen	Pass	Pass	Pass
		Soluble phosphate	Pass	Pass	Pass
		Exchangeable base	Almost mastered	Pass	Pass
		Exchange acidity	Pass	Pass	Pass

Analysis items		Anabela	Clarinda	Lourenço
Plant analysis	Organic matter	Pass	Pass	-
	Total nitrogen	Pass	Pass	Pass
	Nitrate nitrogen	Almost mastered	Pass	Pass
	P, K, Ca, Mg, Na, Fe, Mn, Zn, Cu and B	Almost mastered	Pass	Pass

Examination on soil physical analysis

Examination on soil chemical analysis

(3) Usage of facilities

Trainings on laboratory safety management was held for CPs and all researchers of IIAM CZnd on February 2017, using manuals formulated by the project. The contents of the training included how to use hazardous reagents, processing of hazardous liquid waste and dangers such as fire, burns, and electric shock. The management manual were submitted to IIAM headquarters, and finally approved by IIAM at Wrap up meeting in March 2016.

Fire extinguishing training

2.1.6 Advice on the method of managing the agricultural testing site (Activity 1-6)

(1) Management Guidelines of IIAM CZnd and CZno

The Project developed 'Management Guidelines of IIAM CZnd and CZno'. The guideline was announced by the director of IIAM CZnd at a Wrap-up meeting in March 2016, and approved by IIAM at the same meeting. The composition of the guideline is shown in the table below. This guideline also includes the operational management of the soil plant analysis laboratory constructed in Activity 1-4.

Table 2-7 Composition of 'Management Guideline of IIAM CZnd

No	Code	Document
Management Guideline of IIAM CZnd		
01	N 1	Outline of ARM
02	N 2	Implementation Guideline of IAMRAP
03	N 3	Sample ATD
04	N 4	Manuals for growth observation and plant sampling
05	N 5	Guideline of Soil and Plant Analysis Laboratory
06	N 5.1	Soil Analysis Manual)
07	N 5.2	Safety Use Manual of Soil and Plant Analysis Laboratory
08	N 5.3	Reading and Application of Soil Analysis Results
09	N 5.4	Recording Sheet for Equipment
10	N 5.5	Building Maintenance Manual
11	N 5.6	Technical Report on the Borehole
12	N 5.7	Water Pump Manual

(2) Revising the price list of soil analysis

Since the laboratory had been constructed, the Project had continuously made discussions with IIAM HQ and IIAM CZnd PAN on revising the price list of soil analysis by IIAM and establishing a budget system to ensure operation and maintenance cost of the laboratory. Consequently, a new price list was announced at the final Wrap-up meeting. The number of measurement items in the new list increased to 22 and the price became 3,000MZN (≒50US$) in total, compared to the previous list with 11 measurement items and a total of US$50. The price of the new list is almost the same as previous one though the number of measurement items increased. The reason is that the Project installed analytical instrument and analysis method, which required low measurement cost. In addition, the new list shows the price set for each item. In other words, the new list enabled the requesters to purchase of selected necessary and minimum items according to their demand and budget.

Table 2-8 New list of soil analysis

No	Item	Unit (MZN)	Special set price (MZN)
1	pH	110	200
2	Electric conductivity	110	
3	Organic matters	150	150
4	T-N	250	250
5	NH_4-T	160	300
6	NO_3-N	160	
7	P	150	1,300
8	K	150	
9	Ca	150	
10	Mg	150	
11	Na	150	
12	Fe	150	
13	Mn	150	
14	Zn	150	
15	Cu	150	

16	B	150	
17	Exchangeable acidity	150	150
18	Soil texture	250	250
19	Saturated hydraulic conductivity	110	300
20	three-phase distribution	110	
21	Bulk density	110	
22	Specific Density	100	100
Total (MZN)			**3,000**

2.1.7 Capacity Building of C/Ps (Activity 1-7)

(1) Internal Annual Meeting for Research Achievements and Planning (IAMRAP)

Considering the importance of progress control of experiment and research, IAMRAP (Internal Annual Meeting on Research Achievements and Planning) has been conducted for planning, execution, summarizing and presenting of the results of the experiments with C/Ps and improving capacity of C/Ps. IAMRAPs held in the past are listed in the table below.

Table 2-9 IAMRAPs in the past

Time	Date	Place	Number of participants
First	2011, December 1	IIAM CZnd	32
Second	2012, August 17	IIAM CZno	38
Third	2013, August 29 ~ 30	Nampula	50
Forth	2014, December 11	Nampula	10
Fifth	2014, April 22	IIAM CZno	32
Sixth	2014, May 5	IIAM CZnd	40
Seventh	2014, October 1	IIAM CZno	21
Eighth	2014, October 13	IIAM CZnd	17
Ninth	2016, November 4	IIAM CZnd	49
Tenth	2016, November 7	IIAM CZno	49
Eleventh	2017, August 9	IIAM CZno	58
Twelfth	2017, August 17	IIAM CZnd	69

While IAMRAP had been implemented mainly by experts in the beginning, the effectiveness of the meeting has been gradually recognized by C/Ps. As a result, both IIAM CZnd and CZno showed their strong willingness to continue to implement the meeting after completion of the project. The limited number of IIAM staff participated at working group meeting first,, although from October 2015, each research center had tried to take opinions from the people in field by inviting local extension workers. The Project contributed to capacity building of stakeholders through the presentations of the progress and results of proposal based research conducted during the extension period (2016 and 2017).

(2) Agricultural Research Meeting in Nacala Corridor (ARM)

Agricultural Research Meeting in Nacala Corridor (ARM), a seminar to present research results to the public, has been conducted to improve capacity, exchange information and strengthen linkage among stakeholders. The 1st ARM was held on 2014 April 22 and 23 at Hotel Milenio in Nampula, where there was a little confusion among some of the participants as they did not understand the Project purpose properly. The 2nd ARM was held on 2015 August 25 and 26 at Girassol Hotel in Lichinga. Questions and

comments were given from a technical point of view generally. The 3rd ARM was held on 2017 October 16 at Copa Cabana conference hall in Nampula. Participants were mainly from IIAM, DPASA, IITA, Lurio University, Agricultural technical schools and other research institutes. UNAC and Solidariedade Moçambique participated as well. Total number of participants was 84. The outline of the 3rd ARM is shown in (4) 3rd ARM and the Final Wrap up meeting.

(3)Wrap up meetings

The Wrap-up meeting was held on 10th and 11th March 2016 to summarize the results of the five-year cooperation. The Project made a presentation according to the Outputs on the 10th and participants visited the trial fields including the field of the Project and facilities of IIAM as a field day on the 11th. The details of the program is shown below

Table 2-10 Program of Wrap-up Meeting

< March 10, Copacabana conference hall in Nampula >

	Presentation
Address	
	Overview of ProSAVANA-PI
	ProSAVANA and Japanese support
	ProSAVANA and MASA’ activity
	ProSAVANA and MASA’s activity in Nampula Province
	Photo session
Output 2 and 3	
	Output 2 and 3: Research results on natural condition in Nacala Corridor and soil conservation
	Q & A
Output 1	
	Output 1: Capacity development of IIAM
	Q & A
Output 4	
	Output 4: Research results on crop production
	Q & A
Output 5	
	Output 5: Socio economic survey and Decision Support System
	Output 5: Results of technical transfer activities
	Q & A
Lessons learned from 5 years cooperation of ProSAVANA-PI	
Review	
Lunch, Finish	

On the 1st day, there were about 110 participants composed of mainly IIAM, MASA and other stakeholders related to agriculture. The meeting was meaningful, since there were active technical questions and comments to each presentation. As for Output 1 of “Capacity of IIAM research center”, the participant that the method of making land use plan of both research centers was proposed to be applied to other research centers. As for Output 3, the comments on the importance of protecting soil erosion technique were raised. In addition, questions were raised regarding the changes of yield without cultivation method and ways to protect from damage by termite. For the former question, the Project answered that the yield of cassava may decrease without cultivation method. For the latter question, planting vetivers were suggested as having effect to protect crops from termite. As for Output 4 of crop production, it was recommended that adaptability of crop cultivars to the Project area should be shown simply and practically. As for Output 5 of social economy, participants asked for the reasons of selecting soy bean for profitability analysis and the cause of difference in sales price depending on the production scale. For the former question, the Project

answered that soy bean has high profitability in the Project area. For the latter one, the difference of sales price was caused by the gap of bargaining power on price. In the end, the decision support system in Output 5 attracted participants' interests and the Project received comments on its importance from the participants.

Presentation on 1st Day

Site visit on 2nd day

The Embassy of Japan in Mozambique organized the press tour, which reported part of activities of ProSAVANA-PI, the Wrap-up meeting. The press visited a village in Muriaze on March 11 afternoon. The association members explained the agriculture technique and the method they learned and been transferred by the Project.

The article was published on newspaper, and TV program was broadcasted, which delivered messages how important ProSAVANA was fighting against food insecurity in Mozambique, how MASA and JICA was participating for farmers' expectations for their receiving benefit..

Interviewing a member on 2nd day

(4) The 3rd ARM and the Final Wrap Up Meeting

The 3rd ARM and the Final Wrap Up Meeting were held on 16th and 17th October 2017. The meetings were held at the Copa Cabana Conference Hall on 16th, and at the soil and plant analysis laboratory of IIAM CZnd on 17th. The programs are shown below

Table 2-11 Program of 3rd ARM (including Wrap Up Meeting)

Agenda
Objectives of ARM and contribution of ProSAVANA-PI
Outline of the scheme of Proposal based Research
Presentation about results of Proposal based Research (1) (Nampula) "Evaluation of the cotton yield intercropped with legumes (soybean, cowpea and holoco bean)"
Presentation about results of Proposal based Research (2) (Nampula) "Parasitological study in Herd of cattle and goats in the Region of Nacala Corridor"
Interval (Cafe)

Presentation about results of Proposal based Research (3) (Lichinga) Research on "Participatory Selection of Promising varieties of common bean"
Presentation about results of Proposal based Research (4) (Lichinga) Research on "Production of sweet potato (Ipomoea potatoes. (L) (Lam) of nutritious orange pulp for communities"
Presentation about research results by IITA "Selection of Indigenous Strains of Bradyrhizobium with Excellent Symbiotic Performance for Increases of Soya Yield in Mozambique" Selecção de Estirpes Indígenas de Bradyrhizobium com Excelente Desempenho Simbiótico para o Aumentos dos Rendimento de Soja em Moçambique
Presentation about research results by CIP "VISTA Project-Challenges, Objectives and Achieved results"
Presentation about research results by Uni Lurio "Agribusiness - An Analysis of the Appropriate Business Organization Model for Sectoral Competitiveness"

Table 2-12 Final Wrap Up Meeting

Agenda
The 1st day in October 16th
Outline of the overall results of ProSAVANA-PI
Explanation of Decision Support System
Explanation about soil and plant analysis laboratory in Nampula
The 2nd day in October 17th
Inspection of soil and plant analysis laboratory
Poster session (overall achievement of PI)

At the 3rd ARM, four members of the proposal based research teams, IITA, and Lurio University presented their achievements. The discussion in 3rd ARM was a little improvement from the former ARMs, in which it included not only about production techniques but also economic matters including outreaching the market of the new cultivars used in the trials. It showed the changes of researchers' interests and mind.

In the final wrap up meeting on 16th, comments were mainly on the dissemination of the decision support system, and on sustainable operation and use of soil and plant analysis laboratory, reflecting participants' interests toward both issues. Dr. Chamuene, the director of IIAM CZnd, had final statementthat the Project has achieved all of the Outputs and made good results.

During the visit of the laboratory on 17th, participants commented that a well-equipped laboratory was constructed in Nampula and the current operation was fine. On the other hand, participants from Lichinga expressed disappointment that a laboratory could not be constructed in Lichinga. In the poster session, seven C/Ps and a JICA expert presented their achievement and active discussion was made. At the closing ceremony, the directors of DPASA Niassa and Zambezia made remarks that ProSAVANA achieved good results.

Presentation on the entire activities of PI on the 1st day

Explanation on DSS on the 1st day

Visit of the laboratory on the 2nd day

Poster session on the 2nd day

(5) Capacity Building of C/Ps

Improving capacity for the research and technology transfer to C/P of IIAM CZnd CZno, evaluation their capacities was held continuously during the Project period. Questionnaires for the baseline survey were distributed and collected from 17 C/Ps.

To measure the level of capacity improvement of IIAM C/Ps through the project implementation, questionnaires were distributed and collected between September and November 2015. The survey results comparing with the baseline survey are explained as following.

Regarding performance of experiments and trials, since target crops such as cowpea, rice, vegetables and amaranthus were increased, the range of researchers' trial and study were expanded.

Regarding demonstration farm, it was evaluated that C/Ps obtained skills to demonstrate interaction among varieties and individual plants through project activities, such as demonstration on cropping type and shape, crop rotation and intercropping, research on sowing date, etc. These skills were developed through experience from the Brazil's demonstration farm for cowpea and upland rice, and from Japan's demonstration farm for crop rotation and inter-cropping.

Regarding the capacity development of C/Ps, the trainings were acclaimed for developing skills of soil conservation, conservation agriculture, planning and coordination of experiments and statistical analysis of data. On the other hand, some negative comments were given such as the capacity development was not

fully achieved since the activities weren't implemented smoothly.

Regarding extension, the result of evaluation was intermediate. Approaches to extension activities should be included in the Project and it seems that the contents of activities were regarded as insufficient.

Although the training by JICA experts achieved good evaluation, additional support such as scholarship for academic degree and equipment or facility for experiments and analysis were requested.

(6) Proposal based research

A proposal based research was conducted in order to build capacity of sequence research from planning to implementation and presentation of the result by the IIAM researchers.

First of all, guidelines for proposal were prepared for all researchers of IIAM CZno and IIAM CZnd. The theme selection criteria shown in the guidelines were (1) relating to the ProSAVANA PI project, (2) the research site is located in the ProSAVANA PI project site, and (3) necessary to contribute to the farmer needs and consider the dissemination. The proposal was reviewed by the committee consisting of the ProSAVANA focal point, a researcher of IIAM (crop production), and DPASA C/P. Four research themes were selected for each IIAM CZno and IIAM CZnd.

Table 2-13 Selected title of the research

	Title	Main researcher	Budget
IIAM CZnd	Evaluation of the cotton yield (Gossypium hirsutum L.) intercropped with legumes [soybean (Glicine max L.), cowpea (Vigna unguiculata L.) and holoco bean (Vigna radiata L.)]	Manuel Pedro Maleia	7,000USD
	Parasitological study in Herd of cattle and goats in the Region of Nacala Corridor - Nampula	Nilda Rosa Francisco Ernesto	7,000USD
	Evaluation of Agronomical Performance and Intensification of production of Alliaceas (ONION Allium cepa L and GARLIC Allium sativun) along the Nacala corridor	Elizeth Regina Raisse	7,000USD
	Evaluate the effect of different levels of phosphorus in the production performance of corn (Zea maize L.) Variety ZM 309 in Nampula and Ribaué.	Boaventura Isac Muacha	6,000USD
IIAM CZno	Participatory selection of promising varieties of common bean (Phaseolus vulgaris L.) in 2016/2017 agricultural season.	John B. Kaunda	7,000USD
	Production of sweet potato (Ipomoea potatoes. (L) (Lam) with nutritious orange pulp for communities in 2016/2017 agricultural season	Guilherme Paulo Damba	7,000USD
	Extension project of maize varieties	Carlos Paulo Horacio	7,000USD
	Control of newcastle disease along the Nacala corridor	Carlos Paulo Horacio	6,000USD

The research was conducted from September 2016 to August 2017. IAMRAP was held at the beginning (September 2016) and at the end (August 2017) of the research, and the research purpose and research results were introduced. During the research implementation, the committee members and the JICA experts supervised them by the monthly report submitted by each research group.

Through the presentation of research results at IAMRAP, one of the major outcomes of this activity was that researchers were able to set target goals based on farmers' needs. This effect was obtained by including extension to farmers in the selection criteria and involving farmers in their research.

As for future challenges, it was pointed out that the presentations were difficult to understand when using technical terms. This may have happened because of the few presentation opportunities in the past, but the skills can be expected to improve through more presentation experience. In addition, it was stated that the research sites were limited compared to the large area of the Nacala corridor area. Regarding this, it is expected that the data accumulation through steady research will lead to the development of a more effective research plan. It was also mentioned that insufficient communication between IIAM and SDAE caused insufficient cooperation between research groups and extension workers. At the same time, insufficient communication among extension workers, SDAE Director and extension supervisor was also specified. As a lesson learned, an implementation structure involving SDAE before starting the research is needed when requesting cooperation between researchers and extension workers.

(7) Development of soil diagnostic report automatic creation program and exposition of the program usage

Before the start of the project, C/Ps did not understand how to read and explain the soil diagnosis report, therefore they could not provide the report that is understandable to extension workers and farmers. Therefore, a program using Excel macro and VBA was created so that the calculation was done for the amount of required fertilizer for the crops by input of data of soil analysis and planned crops. Automatic calculation can minimize the error derived from complicated calculation necessary to provide soil diagnosis report. The project distributed this program and explained how to use to the member of the soil and plant analysis laboratory in February 2017. Very high interests of the benefits of the program were demonstrated.

(8) Seminar on livestock

“Estimation of feeding volume by pastured animals”, which was the case study in Mongolia, was explained to C/Ps (Nampula, Lichinga) and exchanged opinion in November 2016. Many questions including usage of pasture area were raised. It was also mentioned by the participants that the shortage of feed for animals during dry season is one of the biggest issues in Mozambique.

(9) Seminar on financial analysis on agricultural technique

IIAM researchers often focus their interests on increase in agricultural production, but few researchers evaluate financial efficiency of the techniques they developed. Therefore, the Project provided a seminar on financial analysis on agricultural technique at IIAM CZnd PAN and CZno EAL in February 2017.

In this seminar, the Project emphasized the following issues, according to the experience of soil conservation trials and financial analysis on the fertilizer test.

- Increment of agricultural production does not always generate increment of profit
- Profit decreases if the production cost exceeds the rise in income
- Reduction of cost generates can contribute to the increment of the profit, whether the yield increases or decreases
- Profit also increases if the increment of the income is larger than the increment of the cost.

Although the seminar contents were very simple and basic, researchers, who considered that the highest yield creates the highest profit, were surprised at the analysis by the Project. The analysis results stated that

profit decreased when large volume of fertilizer was applied in order to get the highest yield, understood from the fertilizer trial by Embrapa.

The materials of the seminar were kept in the desktop computers at IIAM CZnd PAN and CZno EAL and shared among C/Ps.

The numbers of participants were 26 in Nampula and 9 in Lichinga. Among the participants of Nampula, approximately 10 participants were new researchers appointed from March 2017.

(10) Seminar on cassava production to the researchers at IIAM CZnd PAN

Seminar on cassava production, named "Current situation of cassava production in southern east asia" has been held twice at IIAM CZnd PAN in April 2017. Thirty seven participants including Director Constantino, an expert of cassava breeding, participated the seminars. Wide range of questions such as physiological peculiarity, cultivation technique and processing were raised.

(11) Seminar on potato production to the researchers at IIAM CZno EAL

The seminar on potato production, named "Potato production in Japan", has been held at IIAM CZno EAL in April 2017. Thirty five researchers, including Director Carolino, an expert of Potato, participated the seminar. Many questions, including irrigation method in Japan during winter, the reason of processing dried potato, and the country providing the seed potatoes to Japan, were raised.

(12) Seminar on the way of view on soil diagnostic report

The lecturer of Federal University of Viçosa (UFV) in Brazil provided the seminar on the way of view on soil diagnostic report. The number of the participants was 30 members, including 22 of IIAM CZnd, 5 of IIAM CZno, and 3 of IIAM HQ. The participants were satisfied with the contents of the training, since the lecturer had reflected the demands of both Mozambican and Japanese side to the lecturer through E-mail and SNS.

Although the chief of the laboratory was negative to apply the Mehlich 3 method, he came to understand the advantages of the method through the explanations given by the Brazilian lecturer. This was considered as one of the greatest achievements in this training, since it significantly affects the application of the soil analysis method training which had been provided by the Japanese side to the Mozambican side.

Practical work for fertilizer application volume, based on the soil analysis results

Soil sampling training

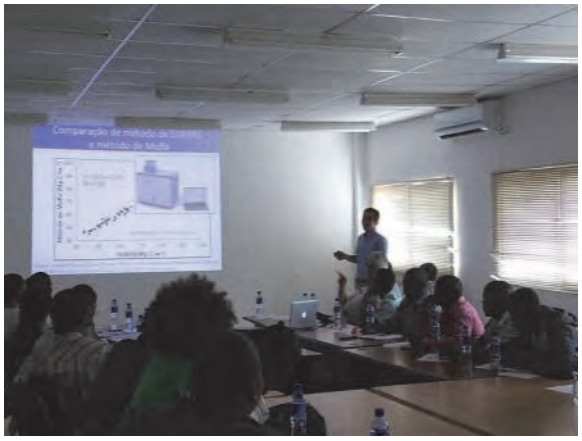
(13) Meeting of standardizing soil analysis method in Mozambique

Different soil analysis method shall produce different results, and inconsistent methods disturb simple comparison of the results. Unless there is a standard of the soil analysis method, results which is difficult to compare would accumulate, and evaluation on soil fertility and development of agricultural techniques would be interfered. Therefore, the Project provided an opportunity to open a discussion toward standardization of soil analysis method at the soil and plant analysis laboratory in PAN on 29th September 2017, with related participants of soil analysis laboratory from IIAM HQ, IIAM CZnd, Eduardo Mondlane University, Agricultural college in Lichinga, industrial training school in Manica, and the expert from Brazil. The minutes with signature of participants were made and shared among participants.

The most important outputs of the meeting was the movement toward creating a committee that manages the soil analysis method and quality standard. Another significant outcome is that the Mehlich 3 and ignition loss methods were acknowledged as a unified method among participants. The Project have trained these methods from the beginning of the Project, since the Project concluded those methods were the most suitable ones to the soil in Mozambique, according to the soil analysis results in the target area. It is expected that the committee is established by IIAM-HQ initiative and those methods are taken root in as the officially fixed method in Mozambique.

In addition, since there was a request to create a database so that analytical results of each analysis room could be shared at the plenary session, the cloud system was launched. By this system, it is expected that sharing of data between each analysis room and cooperation of work are promoted.

Depending on the budget, next meeting will be implemented next year by IIAM-HQ applying for next year's budget.



The explanation of significance to unification of soil analysis method and the analysis method recommended by Japanese side (by JICA expert)

The explanation about trend of introduction of Mehlich 3 method in Brazil (by Brazilian expert)

(14) Seminar on soil and water conservation

The seminar on soil and water conservation was held by the Brazilian lecturer at PAN between 2nd and 6th October 2017. The seminar complemented contents which were not covered by the Japanese side, including soil profile survey, soil productivity classification, model on estimating soil erosion rate, etc. On the last day of the seminar, TV Mozambique covered the seminar and Dr. Chamuene, the director of IIAM CZnd, and Eng. Fabiao, the training coordinator from IIAM HQ, received interviews.

Soil profile survey

Shooting of training by TV Mozambique

(15) Training on AquaCrop to the IIAM researchers

A five-day course of FAO-AquaCrop model (crop yield prediction model) training was held during 9-13 October 2017 at IIAM-PAN to increase the knowledge on the calibration and validation of the model for IIAM researchers from PAN, EAL, Namialo, Namapa, Nametil, Ribaue, Mapupulo, Gurue, and Mutuali. The number of trainee who finished this training course was 26. This training course consisted of introduction to outline of Decision Support System (DSS), validation and simulation of major indicators of AquaCrop such as climate, soil profile, crop and field management. Furthermore, learning how to use the model via on-line AquaCrop learning modules published by FAO was assigned to trainees in order to fulfill the knowledge on AquaCrop model. At the last day of training, the ability of each trainee to create a climate file by using a direct import of meteorological data set instead of a manually input method was tested. As a result, the performance of 21 trainees was excellent.

(16) Training on BFMmz to the IIAM researchers

The trainings on BFMmz for IIAM researchers were held at Lichinga on 19th September, at Nampula on 22nd September 2017. The C/Ps in charge (IIAM researchers) were explained how to use the software of BFMmz in advance, and those C/Ps explained the software to the other IIAM researchers in the trainings. The trainees learned how to use the software and simulate the optimum cropping plan for gaining the maximum income.

2.1.8 To develop laboratory construction plan for IIAM CZno (Activity 1-8)

Although the Brazilian side had expressed support for the construction of a multi-functional laboratory in EAL, the contribution of construction costs was postponed due to financial difficulties, and thus it remained in the provision of a basic drawing.

2.2 Activities related to Output 2: Natural resources and socio-economic conditions in Nacala Corridor are evaluated

2.2.1 To evaluate soil and vegetation (Activity 2-1) and To collect and analyze meteorological data (Activity 2-2)

In this activity, we have classified the agricultural environments along the Nacala corridor into four zones based on the historic weather data and soil analysis, i.e., *Zone1*:The interior Highlands near the Lake Niassa (c.a. 1,000-1,500 m asl.) with relatively fertile soils and cool and humid climate conditions; *Zone2*: Hilly regions connecting the highlands to the eastern plateau (c.a. 500-1,000 m asl.) with fertile soils and high solar radiation and diurnal ranges; *Zone3*: Central Plateau (200-500 m asl.) with poor soil physic-chemical properties and high temperature; *Zone4*: The Coastal Region (<200 m asl.) with some alkaline soils and hot and dry climatic conditions. Then, we have pointed out that potential of crop production would be particularly high in the Zone1 and Zone 2.

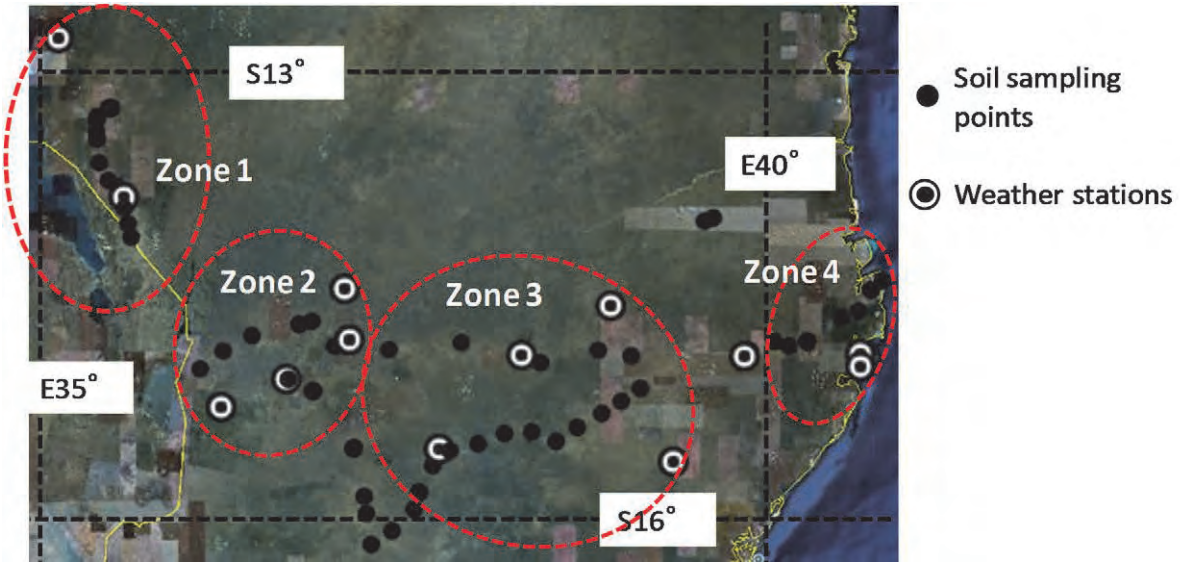


Figure 2-2 Data collection points of weather data and soil properties in the four agro-ecological zones along the Nacala corridor (cited from Tsujimoto et al., 2011).

The results were presented at the 10th African Crop Science Conference (held in Maputo in Sep, 2011), and that proceeding was published as follows.
Tsujimoto et al. (2011). Characterization of Agro-Environments for optimizing cropping systems upon locality along the Nacala Corridor, Mozambique. African Crop Science Conference Proceedings, Vol. 10, 279-282.

The Project installed new weather stations and provided technical transfers for its sustainable utilization. In the 3rd year, weather stations were newly installed at three on-farm trial sites in addition to the regular monitoring at IIAM-Nampula, IIAM-Lichinga, IIAM-Mutuali, and IIAM-Namialo. It contributed to strengthen the monitoring of daily weather along the Nacala corridor (Refer to the Investigation report for detailed methodologies and results).

Furthermore, the project has reinforced technical transfer and currently the daily operation of the weather stations and data monitoring can be operated by the counterparts at each site. On the other hand, remaining issues were raised on how the counterparts could continuously manage any breakdown or stolen cases of

the weather stations by themselves that may happen after the completion of the project. In addition, database development was recognized to be ideal to enable a wide-range of usage of the accumulated weather data not only by the projects but also by the outside personnel and institutes.

The survey results on soil characteristics made clear that a wide range of pH soils were distributed in the Project area. Past reports showed this situation was applicable to the whole country. The soil analysis method common in Japan and Brazil were suitable to analyze acidic soil. The Project proposed the Mehlich 3 method, which was applicable to a wide range of pH from acidic to alkaline soil, and confirmed its adaptability to the soils in Mozambique. Therefore, the Project decided to train this method to the C/Ps in the soil analysis training.

The methodology of soil analysis was presented at the 7th International Conference of the African Soil Science Society in Ouagadougou, Burkina Faso in May 2016. The followings were published.

Fukuda et al. (2016) Evaluation of Mehlich 3 reagent as cation and available phosphorus extractant for soils in Mozambique.7th International Conference of the Africa Soil Science Society (held in Ouagadougou, May 2016)

Fukuda et al. (2017) Evaluation of the Mehlich 3 Reagent as an Extractant for Cations and Available Phosphorus for Soils in Mozambique.Communications in Soil Science and Plant Analysis (DOI)

2.2.2 Collection and analysis of water resource data (Activity 2-3)

Regarding the collection and analysis of water resource data, the Brazilian side was responsible for this activity, but this activity was not implemented due to shortage of the budget for this activity. The water resource data collected by ProSAVANA-PI was stored on shared computer of soil plant analysis laboratory of IIAM CZnd PAN and these data were able to be browsed and utilized by C/P and researchers.

2.2.3 Collecting and analyzing terrain data (Activity 2-4)

Regarding the collection and analysis of terrain data, the Brazilian side was responsible for this activity, but this activity was not implemented due to reasons such as Brazilian side could not secure the budget for this activity. The terrain data such as the tectonic map of the entire Nacala corridor collected by ProSAVANA-PI was stored on a shared computer of soil plant analysis laboratory of IIAM CZnd PAN and these data were able to be browsed and utilized by C/P and researchers.

2.2.4 Proposal of land use plan for agriculture purpose (Activity 2-5)

Initially, the objective of this activity was to propose the land use plan for agriculture purpose at Nacala corridor. Since it come out that several land use plans of Nacala corridor scale had already been developed, the activity shifted its aim to compile the existing land use plan of Nacala corridor and the results of zoning to a comprehensive plan. Therefore, the contents of the deliverables were changed to a dataset of existing terrain map, vegetation map, soil map, land use map and proposal of land use plans of IIAM CZnd PAN and CZno EAL.

The land use plans of IIAM CZnd PAN and CZno EAL which were developed by this activity, were presented on the seminars in October 2015 for Lichinga and in July 2016 for Nampula, and opinions were exchanged with researchers from each research center. In addition, the outline of these plans was reported

at the Wrap-up meeting held in March 2017. Researchers had a high interest in this activity and referring to this case, they were eager to develop similar land use plans for branch centers without the plan [For this output, see the reports on technical cooperation 'Land Use Plan of Nacala Corridor and IIAM CZnd and CZno'].

2.2.5 To survey socio-economic conditions (Activity 2-6)

In order to analyze the profitability of soybean, Ruace village, Gurue district in Zambezia province was selected as the area where soybean production is very popular. The farm investigation was conducted in the village from 2012 to 2015. (Refer to the Investigation report 1.2 for detailed methodologies and results of the investigation).

Results are published as reports in Japanese journals. The reports have been translated from Japanese into English and published as a book entitled "Farm management in northern Mozambique" in August 2017.

2.3 Soil improvement technology for Nacala Corridor is developed (Output 3)

2.3.1 To develop the soil improvement technology (Activity 3-1)

The soil improvement techniques shown in the Table below were developed against the issues of soil in the target area, such as low content of organic matters in sandy soil widely spread in the target area, narrow layer of effective soil, and hard soil from 2012 to 2015. Maize and soy bean were selected as the target crops of the experiment, because maize was a major food crops and soy bean was a major commercial crop in the target area. (The method and the results of the experiment were shown in detail in 2-1 of Investigation report.)

Table 2-14 The developed technologies on soil improvement

Technology	Effect	Remarks
Crop residue incorporation and mulching	Increase Maize and Soy bean production twice (quantificar). Maize in PAN: 2.4t/ha→4.5t/ha Maize in Muriaze: 1t/ha→1.7t/ha Soy bean in PAN: 0.6t/ha→0.8t/ha Soybean in Muriaze: 0.3t/ha→0.45t/ha	The trials were continued at the same location for 3 years at PAN and for 2 years at Muriaze. During the period, crop residues were mixed into the soil, and rotation of maize and soy bean was formulated. As for chemical properties, organic and nitrogen contents increased. As for physical properties, it was partially observed, but it was not concluded as a clear effect.
Improvement of soil physical properties by deep root crops	Improvement of soil physical properties by deep root crops of sun flower and pigeon pea	

2.3.2 To develop fertilization schemes/recommendation by crops (Activity 3-2)

Field experiments were conducted from 2012 to 2015 at IIAM CZnd PAN, IIAM CZno EAL, and IIAM-Mutuali to develop fertilization schemes/recommendation by crops as shown in the table below (Refer to the Investigation report 2.2 for detailed methodologies and results of the experiments).

Table 2-15 The Developed fertilization technology

Technology	Effect	Explanation
Fertilization for Maize, Rice, Wheat, Cowpea, Common bean, Soybean, Potato, Cotton	Optimal N,P,K application for each crop was determined.	Optimal N application for Wheat and Maize are 100, 178kgN/ha, respectively. Optimal P application for Rice, Wheat, Common bean, Soybean are 35, 180, 140, 140kg/ha of P2O5, respectively. Yield of Maize and Cowpea will not saturate up to 280kg/ha of P2O5 application. For Maize, each 1kg of P2O5 will increase yield by 1.45kg. Cotton will not respond to P application. Optimal K application for Rice, Wheat, Common bean, Cotton are 100, 50, 100, 200kg/ha of K2O, respectively. Yield of Maize and Soybean will not saturate up to 200kg/ha of K2O application. For maize, each 1kg of K2O will increase yield by 2.15kg. Cowpea will not respond to K application.
Lime application for Maize and Wheat	Optimal Lime application for each crop was determined.	Optimal lime application for wheat is 4.2t/ha. For Maize, each 1kg of lime will increase yield by 0.44kg up to 5t/ha of lime application.
Chicken manure application for Maize and Soybean.	Increase P, K, Ca in soil. However, to increase crop production, it is necessary to combine N application.	Chicken manure will increase Soybean yield in most case (1-2 t/ha). For Maize, yield increase will be maximized when NPK fertilizer is applied at the same time (0.5-2.5 t/ha).

Part of the results was presented at the 7th International Conference of the Africa Soil Science Society (held in Ouagadougou, May 2016) and at annual meetings of the Crop Science Society of Japan. One of the counterpart researchers made an oral presentation at that international conference.

Chichongue et al. (2016) Effects of applying different levels of P fertilizer on growth and yield of soybean (Glycine max L. Merrill) varieties (TGX-1835-10E and Serenata) in Lichinga, Nampula, and Mutuali.7th International Conference of the Africa Soil Science Society (held in Ouagadougou, May 2016)

Oya et al. (2016) Effects of NPK fertilizers and chicken manure on maize and soybean yield in a rotation system in northern Mozambique.7th International Conference of the Africa Soil Science Society (held in Ouagadougou, May 2016)

Oya et al. (2017) Effects of nutrient omission treatments on the yield and nutrient status of soybean seeds grown in northern Mozambique. Abstracts of the 243rd Meeting of the Crop Science Society of Japan.

Oya et al. (2016) Effect of soybean cultivation on yield improvement of succeeding maize in northern Mozambique. Abstracts of the 241st Meeting of the Crop Science Society of Japan.

Oya et al. (2015) Effects of NPK and chicken manure application on maize and soybean cultivation in the northern Mozambique. Abstracts of the 239th Meeting of the Crop Science Society of Japan.

2.3.3 To develop soil conservation technology (Activity 3-3)

Field experiments were conducted from 2012 to 2015 at IIAM CZnd PAN and IIAM CZno EAL to develop

technical soil erosion control measures during rainy season as shown in the table below (Refer to the Investigation report 2.3 for detailed methodologies and results of the experiments).

Table 2-16 Developed technical soil erosion control measures during rainy season

Technology	Effect	Explanation
Minimum tillage	Decrease 40-91% of soil erosion Reduce production cost Increase net income 500-3000MT/ha	Minimum tillage (Zero tillage) showed same level of yield on Pigeon pea, Maize, Cassava production compared with conventional tillage. Minimum tillage (Zero tillage) can reduce production cost and increase net income because tillage is not necessary.
Mulching with crop residue	Decrease 50-95 % of soil erosion Mitigate drought effect Increase net income 1500-4000MT/ha	Sorghum (3t/ha), Pigeon pea (2t/ha), Maize (4t/ha), Sunflower (4t/ha) residue mulching decreased soil erosion. Soy bean (4t/ha) residue mulching could not decrease soil erosion because it was fine and easy to incorporate in soil through weeding. However, incorporated soy bean residue increased pigeon pea production twice (0.8t/ha→1.7t/ha)
Vetiver grass hedgerow	Decrease 78-91 % of soil erosion Increase net income 0-800MT/ha	Vetiver grass is planted on contour-line. Pruned Vetiver leaf can be used as mulching material. This system will not increase termites because they do not eat the vetiver leaf.
Alley cropping with Pigeon pea	Decrease 86 % of soil erosion	Yield of perennial Pigeon pea reaches the maximum level in the second year and decreases from the third year. The Pigeon pea is cut a height of 50 cm and intercropped with Maize at the start of third year. The pruned brunch and leaf are used as mulching material. The Pigeon pea can continue to provide mulching material because it reproduces brunch and leaf.

Part of the results was published at the poster presentation of the National Assembly of the Agricultural Rural Engineering Society in 2014 and the contents are also described in abstracts.

Kazuhiro Naruo (2014), Effect of mulching with Sorghum residue and minimum tillage on Pigeon pea production and soil erosion control, The Japanese Society of Irrigation, Drainage and Rural Engineering annual meeting abstract, pp.512-513

2.4 Appropriate cultivation technology for Nacala Corridor is developed（Output 4）

2.4.1 To select appropriate crops/cultivars (Activity 4-1)

(1) To select cultivars and cultivation method of Maize and Soy bean

The maize-soy intercropping systems with the on-station trials have been evaluated between 2011 and 2015. Since the maize-soy intercropping system is particularly advantageous against the monocropping systems in the drought-prone and low N-input field environments, the system can be concluded as a suitable technique to the rainfed upland fields in the northern region of Mozambique where those field conditions are widely extended. The method and results of the trials are shown in detail in 3.1 of the Investigation report.

Table 2-17 Developed technology on maize-soy intercropping system

Technology	Effect	Remarks
Intercropping technique with maize and soy bean	Vigorous growth of maize by intercropping with soy bean Drought avoidance effect	Intercropping (simultaneous planting of 2 maize: 3soybean strip allocation) a locally recommended and early maturity cultivar of maize, cv. Matuba, and a medium maturity cultivar of soybean (TGX-1937-1F or the locally registered name, Olima) can provide advantageous productivity over the respective monocropping systems in terms of the land equivalent ratio (LER) across wide-range of agro-environments in the Nacala Corridor. The LER values are particularly large in the drought-prone and low-N input environments

Part of the results from this activity was published by a counterpart (Mr. Boina, G.) at the 11th African Crop Science Society Conference held in Entebbe during the period of 14-17Oct, 2013. Such experience is important for capacity building of the counterparts and further opportunities are recommended. In addition to this presentation, the following publications have been put out from this activity in the 3rd year term.

Tsujimoto et al. (2015) Performance of Maize-Soybean Intercropping systems under various N application rates and soil moisture conditions in Northern Mozambique, Plant Production Science Vol. 18(3), 365-376.

Boina et al. (2013) Effect of maturity types and planting dates of soybean on the performance of maize/soybean intercropping systems in the northwestern region of Mozambique. 11th African Crop Science Conference (held in Entebbe, Oct2013)

Tsujimoto et al. (2013) Development of maize/soybean intercropping system in the northern Mozambique. 1. Drought mitigation for the soybean growth as intercropped with maize. Abstracts of the 236th Meeting of the Crop Science Society of Japan, pp66-67.

Ito et al. (2013) Development of maize/soybean intercropping system in the northern Mozambique. 2. Effect of intercropping system on the soybean nodulation. Abstracts of the 236th Meeting of the Crop Science Society of Japan, pp68-69.

(2) Crop manual (Ground nut, Sorghum, Potato, Soy bean)

Crop manual covering ground nut, sorghum, potato, and soy bean was made by IIAM researchers. The crop manual was finalized and accepted after being reviewed by CPs in October 2017. The crop manual will be distributed to extension workers for their extension activities and farmers for their capacity development on crop production. (Refer to four Crop manuals in the Reports on technical cooperation)

2.4.2 To develop appropriate seed production system (Activity 4-2)

This activity corresponds to “Local materials are recovered and seed banks are organized” in the Technical Plan of Embrapa. Establishment of seed banks and demonstrations of seeds (with products) in fairs were planned. However, these activities were not implemented, since Brazilian side could not secure the budget for them.

Using the fund of PIAIT funded by USAID, Embrapa invited IIAM staff to Brazil and provided a training

course in Embrapa-Soja and Embrapa-Trigo to study about the institute-responsible basic seeds and the establishment of the seed system, in August 2013. Other technical trainings for the treatment of seeds of potato, soybean, rice and common bean were also provided.

2.4.3 To select appropriate microorganisms for leguminous and other crops (Activity 4-3)

Field experiments were conducted from 2012 to 2015 at IIAM CZnd PAN and IIAM CZno EAL to select appropriate microorganisms for leguminous and other crops as shown in the table below. A pot experiment was conducted at IIAM CZnd PAN to evaluate the effect of inoculation of rhizobium and arbuscular mycorrhizal fungi (AMF). Nodule separation, image capture of the arranged nodules and DNA sampling for the analysis of nucleotide sequence of the *nifD* gene were made by the methodologies established in these seasons. (Please refer to the Investigation report 3.2 for detailed methodologies and results of the experiments).

Table 2-18 Developed technologies on selecting appropriate microorganisms

Developed technology	Effect	Explanation
Rhizobium Inoculation	Rhizobium (SEMIA 5079) significantly increased 40-50 % of soybean production.	Rhizobium (SEMIA 5079, 5080, and 5019) will increase soybean yield. Rhizobium (SEMIA 6462 and 6463) will be effective to get more than 1.5t/ha of cowpea yield without fertilizer.
Genetic diversity of nodule bacteria in soybean plants	As estimated with the similarity of nucleotide sequence in *nifD* gene and ITS region, most of the nodule bacteria on soybean plants in the Nacala Corridor were genetically very close to *Bradyrhizobium elkani*.	It is possible to optimize symbiotic bacteria in soybean root nodules by inoculation of exogenous bacteria strains, such as those from neighboring countries or Brazil. This would lead to the improvement of the soybean productivity through the enhancement of biological nitrogen fixation (BNF) and yield.
Inoculation of Arbuscular mycorrhizal fungi (AMF)	Inoculation of AMF (TwinGuard, Idemitsu Kosan, Japan) significantly increased soybean yield by 160%.	Soil was taken from a field of PAN under fallow at least for 5 years, and put in a 10-L plastic pot. Rhizobiumu（Biofix, Nairobi Univ. Kenya） also increased soybean yield by 40%.

Part of the results from this activity was published by a counterpart (Mr. Colial) at 7th International Conference of the Africa Soil Science Society held in Ouagadougou, May 2016. Apart from this presentation, the following publications have been put out from this activity.

Colial et al. (2016) Effect of inoculation with arbuscular mycorrhizal fungi (AMF) and Rhizobia for improved soybean production in North of Mozambique (Nampula province).7th International Conference of the Africa Soil Science Society (held in Ouagadougou, May 2016)

Ando et al. (2014) Phylogenetic analysis of soybean bradyrhizobia in Mozambique. Annual Meeting of the Japan Society for Bioscience, Biotechnology, and Agrochemistry, 2014: 2A09a16

Ando et al. (2013) Distribution of soybean bradyrhizobia in Mozambique. Abstracts of the Annual Meeting, Japan Society of Soil Science and Plant Nutrition Vol. 59, p.40 (P3-1-3), 2013

Ando et al. (2013) Diversity of *nifD* gene in soybean bradyrhizobia in Mozambique. Annual Meeting of the Japan Society for Bioscience, Biotechnology, and Agrochemistry, 2013: 2B11p11

2.4.4 To develop appropriate methods to enhance the access to water resource for agricultural purpose (Activity 4-4)

Vegetable production plot with low pressure drip irrigation system, consisting of local materials, was installed in 2013 and trials were carried out until 2015. (Refer to 3.3 in Investigation report)

Table 2-19 Model irrigation system for enforcement of accessing water

Technology	Effect	Remarks
Low pressure drip irrigation with a tank established at a height of 1m	The system can supply uniform amount of water to around of 0.1 ha.	This system was introduced for vegetable production in PAN. Through the trial by this system, it was confirmed that fruit vegetable is suitable for this system, on the view point of profitability. In order to avoid the replant failure by fruit vegetables, rotation of leaf vegetables and root vegetables are recommended to include cropping system.

2.4.5 To develop appropriate cropping systems (Activity 4-5)

Field experiments were conducted from 2012 to 2015 at IIAM CZnd PAN, IIAM CZno EAL, IIAM-Gurue, and IIAM-Mutuali to develop appropriate cropping systems as shown in the table below (Refer to the Investigation report 3.4 for detailed methodologies and results of the experiments).

Table 2-20 Developed cropping systems technology

Technology	Effect	Explanation
Maize- Soybean Intercropping	Mitigate drought effect Increase 20-50 % of land equivalent ratio. As a demonstration of this cropping system, farmer's participated trials were implemented. Total 75 farmers of 3 villages in two seasons participated.	Maize-soybean intercropping system increase productivity by 15-49% as indicated by Land Equivalent Ratio. Advantage of this intercropping system was more highlighted under drought prone and low fertility conditions.
Maize-Soybean crop rotation	Maize-Soybean crop rotation increased 54-59 % of crop production.	Yield of maize cultivated after soybean will be higher than that of maize continuously cultivated. This enhancement will not be observed when soil and fertilizer P are limited, for example, without P fertilizer in Nampula.

2.5 New agricultural technology developed / validated is implemented in the demonstration units. (Output 5)

2.5.1 To organize technology transfer activities (seminars, field days, etc.) (Activity 5-1) and To support ProSAVANA-PEM to organize training courses for extension workers (Activity 5-2)

Technical transfer activities implemented for extension workers are summarized in the table below.

Table 2-21 List of technology transfer activities implemented for extension workers

No.	Activities	Date	Location	Participants	
				Extension workers	Farmers
Technical transfer on Output 1 to 4					
1	1st ARM	23 Apr 2014	Nampula	19	-
2	2nd ARM	25-26 Aug 2015	Lichinga	5	
3	Soil improvement technology seminar	14 Dec 2014	Nampula	29	-
4	Technology seminar of crop cultivation and soil improvement	24 Nov 2015	Nampula	39	-
5		27 Nov 2015	Lichinga	23	-
6	1st IAMRAP	22 Apr 2015	Lichinga	9	-
7	2nd IAMRAP	5 May 2015	Nampula	11	-
8	3rd IAMRAP	1 Oct 2015	Lichinga	7	-
9	4th IAMRAP	13 Oct 2015	Nampula	7	-
10	Field day in Muriaze and Namuatho B	14 Apr 2015	Nampula	13	17
Co-activities with PEM					
11	Field day in UFF	16 Apr 2015	Meconta	4	50
12	Field day in Lussanhando	21 Apr 2015	Lichinga	3	40
Technical transfer in the proposal based research					
13	Field day of field trial about comparison of sweet potato varieties	3 May 2017	Majune	4	97
14		4 May 2017	Ngauma	3	93
15	Field day of field trial about comparison of sweet potato varieties (Cooking training of sweet potato)	24 May 2017	Majune	3	142
16		26 May 2017	Ngauma	3	155
17	Field day of field trial about comparison of kidney bean	4 Apr 2017	Sanga	6	250
18		10 Apr 2017	Chimbunila		
19		3 May 2017	Ngauma	6	21
20	Field day of field trial about comparison of maize	25 Apr 2017	Mandimba	3	49
21		26 Apr 2017	Ngauma	3	39
22	Field day of field trial about intercropping of cotton and leguminous crop	17 May 2017	Namialo	2	7
23	Field day of farmer's field trial about Newcastle disease of livestock	22 Jun 2017	Cuamba	2	39
24	11th IAMRAP	9 Aug 2017	Lichinga	26	-
25	12th IAMRAP	17 Aug 2017	Nampula	31	-
26	3rd ARM	16-17 Oct 2017	Nampula	24	1
Technical transfer on DSS					
27	Training of decision support system (DSS) in Lichinga	20 Sep 2017	Lichinga	20	-
28	Training of decision support system (DSS) in Nampula	26 Sep 2017	Nampula	28	-
Technical transfer in Wrap up meeting and Final Wrap up meeting					
29	Wrap Up Meeting	10-11 Mar 2016	Nampula	20	3
30	Final Wrap Up Meeting	16-17 Oct 2017	Nampula	40	1
Total				393	1,004

The total number of participants to technology transfer activities reached 393 extension workers well over 100 participants which were indicated in the PDM. In addition, the total number of participants reached 1,004 farmers.

< Technical transfer on Output 2 to 4>

In activities from No.1 to No.10 of the above table, socio-economic survey, technologies of soil improvement, fertilization, soil conservation, adequate variety selection, adequate microorganism identification and the result of intercropping of cotton and leguminous crop were shared with extension workers. Especially, a series of these technology transfer activities were implemented many times; therefore it is considered that the understanding of extension workers to these technologies has been deepened.

< Co-activities with PEM >

In activities of No.11 and No.12, in response to the request from ProSAVANA-PEM, intercropping of good varieties of cassava and peanut in UFF and compared demonstration of good varieties of leguminous crop in Lussanhando were implemented. The superior varieties produced in each demonstration field were distributed to farmers who related to the management of demonstration field after harvest.

< Technical transfer in the proposal based research >

In activities from No.13 to No.26, the results of proposal based research were shared with extension workers and farmers (for details, refer to activity 1-6.). Since many themes of proposal based research were implemented by researchers collaborated with some extension workers, it was observed that it was good opportunity of technology transfer for extension workers who implemented the activity with researchers. In addition, many farmers who participated in field trials requested for similar trials in the future.

< Technical transfer on DSS >

In activities of No.27 and No.28, intensive training on usage of decision support system (DSS) was implemented (for details, refer to activity 5-3).

< Technical transfer in Wrap Up Meeting and Final Wrap Up Meeting >

In the Wrap Up Meeting and Final Wrap Up Meeting, which are the activities of No.29 and No.30, summarized achievements of the entire activities of ProSAVANA-PI were reported (details were referred to the activity 1-6.).

<Yield trials for Maize, Cow pea, and Soy bean under no fertilizer condition>

Currently, the ProSAVANA PEM Project needs information on cultivars of major crops with the highest yield under no fertilizer condition. In addition, this trial was expected to provide a kind of standard of yield under no fertilizer condition. Therefore, ProSAVANA PI conducted some trials to provide information on yield of several cultivars of maize, cowpea, and soybean under no fertilizer condition at Nampula, Gurue, and Lichinga.

As the result of the trials, the yield of ZM523 of maize was as high as 1,800 to 1,900 kg/ha at both of Nampula and Lichinga. The yield of cowpea was 200 to 500 kg/ha. The yield of Zambonae of soybean was as high as 1,400 to 1,500 kg/ha at both Nampula and Lichinga (For details, refer to 4.2 of the Investigation report).

A farmer interviewed by a local reporter on field day of field trial about comparison of sweet potato varieties

Cooking training of sweet potato on field day of field trial about comparing different varieties of sweet potato

Field day of field trial about comparison of maize

The eating quality of cooked kidney bean in field day of field trial about comparison of kidney bean varieties

2.5.2 To develop a Decision Support Model for farmers to select appropriate cropping system （Activity 5-3）

(1) Preparation of Decision Support System

From September 2009 to August 2010, the preparatory survey on Triangular Cooperation Program for Agricultural Development of the African Tropical Savannah among Japan, Brazil and Mozambique (ProSAVANA) was taken place to collect local information and also to prospect the future cooperation. The knowledge of the Cerrado development project in Brazil was assumed that it could be applied to the agricultural development in the Savannah area in Mozambique. However, considering the large difference in the socioeconomic situation between Mozambique and Brazil, the preparatory survey concluded that it is necessary to establish a decision-making support model for agricultural development of the Nacala corridor and its surrounding area that allows farmers to select suitable cropping patterns and agricultural techniques. In order to establish the model, analysis and accumulation of research results and implementations of demonstrative projects are necessary.

The Decision Support System (DSS) is a combined program of AquaCrop (Crop yield prediction model) and BFMmz (Linear programming model). Using this computer program, it gives farmers advice on the optimum planted area and cropping pattern of the selected crops based on the information on location, farm acreage, labor force of the farmer and the crop to cultivate.

During the extended period of one year and a half, a wider survey on socio-economic condition of the farmers in the target areas, update of AquaCrop model, and validation of DSS were conducted (for details, refer to 4.1 of the Investigation report).

Tsujimoto et al. (2017) An application of digital imagery analysis to understand the effect of N application on light interception, radiation use efficiency, and grain yield of maize under various agro-environments in Northern Mozambique. Plant Production Science 20(1): 12-23.

Tsujimoto et al. (2015) Estimate of intercepted radiation with digital images and light-based analysis of yield variations in maize grown under rainfed conditions of Mozambique. Abstracts of the 240th Meeting of the Crop Science Society of Japan, p59.

(2) Improving the prediction accuracy of AquaCrop

Based on the results of each monocrop yield of maize and soybean obtained through Activity 4, the Project developed a formula that could be used to estimate the yields of maize-soy intercropping system under the same field environment.

Then, the monocrop yields of soybean and maize were estimated using the AquaCrop model which had been developed by the Food and Agriculture Organization (FAO) as a universal crop production model. As a result, it was identified that a highly accurate yield production is possible by setting the soil fertility parameter based on observed canopy coverage data. The soil fertility parameter is one of the main model parameters of AquaCrop. The canopy coverage was quantitatively evaluated using a digital camera and ImageJ, which is a free image analysis software, without using any expensive instruments. This measurement procedure has already been transferred to C/Ps in each IIAM branch.

A certain level of technique and efforts would be necessary to set the soil fertility parameter through this procedure. Thus, it was considered that an easily-accessed and widely-available dataset would be required to enhance its versatility. SoilGrid, which is a broad-scale soil dataset managed by ISRIC, was one of the potential sources. Therefore, the prediction accuracy on soil properties of SoilGrid was evaluated. The data of SoilGrid was evaluated by comparing with the results of the soil profile survey conducted in the target area.

According to the analysis, it became clear that AquaCrop model could be used to make accurate predictions on yields of soybean and maize among different field environments, by estimating the soil fertility using the canopy coverage data. In addition, challenges were found in applying broad-scale data set (the SoilGrid data and monthly weather data) to enhance versatility. AquaCrop has overestimated crop yield in Lichinga and Nampula, compared with observed dataset application.

For further investigation, changes in canopy coverage were measured throughout the cultivation period for cowpea, cassava and pigeon pea in Nampula, for haricot beans and cowpea in Lichinga, and for haricot beans, cowpea and pigeon pea in Gurue. As a result, it was clarified that AquaCrop could be used to make accurate predictions on monocrop yields of soybean and cowpea by applying the soil fertility parameter set based on the observed changes in canopy coverage of soybean. To improve the prediction accuracy, it is necessary to carry on the adjustments of the parameter suitable for each area (for details, refer to 4.1 of the Investigation report).

(3) Linear programming model for Decision Support System (DSS)

To make DSS applicable on the field, we first conducted an extensive household survey to about 650 farm households in 3 zones (Nampula, Gurue, and Lichinga) from June to August 2016 and created a database on farm economy and crop production in each zone. Based on this database, improvements were made on the linear programming model used to create the optimal farming plan as the main output of DSS. The linear programming model was also used to clarify model cases of farming in each zone as well as to develop a program called BFMmz that can readily compute the optimal farming plan based on farmer's land size, labor availability and crop preference. This program is to be transferred to local users (for further details on the methods and results, refer to 4.1 of the Investigation report).

(4) Validation study on Decision Support System (DSS)

To evaluate the applicability of DSS, a randomized-controlled trial (on-farm trials) was carried out targeting the rainy-season cropping in 2016/2017 in Nampula and Lichinga. As a result, many farmers acknowledged the positive effects of the optimal farming plan suggested by DSS. Especially, those who referred to the farming plan were more likely to derive benefits of increased income compared to those who did not refer to the farming plan (for further details on the methods and results, refer to 4.1 of the Investigation report).

Table 2-22 Decision Support System (DSS)

Developed technology	Effect	Explanation
The prediction of crop yield by AquaCrop	The yield prediction accuracy turned out to be high for soybean, maize and cowpea.	It was clarified that by estimating the soil fertility parameter from the canopy coverage using AquaCrop, it is possible to predict the difference in yield affected by field interval and manure. It is necessary to constantly gather and calibrate local parameters to enhance the prediction accuracy.
The development and verification for local applicability of BFMmz	Based on the on-farm trials, 81% of the farmers who voluntarily referred to the farming plan by the VFMmz program have increased their income (whereas only 31% for those who didn't refer to the farming plan have increased their income).	Based on the database of farmers in each area (production volume, sales price, cost, labor time, size of land etc.), a linear programming model was developed. This system for local users could instantly provide them an optimal farming plan by simple input of data on the farmers' conditions.

(5) Training on BFMmz to extension workers

The trainings on BFMmz for extension workers were held at Lichinga on 20th September, at Nampula on 26th September 2017. The trainees learned how to use the software and received role-play training. The role-play training was carried out by one person playing the role of an extension worker and the other playing as a farmer, and creating a cropping plan considering the size of farm area, number of labor and other necessary factors. The extension worker received the training seriously in order to make a plan for their PITTA field, since they actually cultivated crops in their PITTA field. The training on Aqua Crop was held for only IIAM researchers.

Chapter 3 Project Management

3.1 Purpose of the Project

3.1.1 General purpose of the Project

The Project started as a triangular cooperation amongst Japan, Brazil and Mozambique from 2011 May. The Project had repeatedly confirmed the contents of PDM and discussed about numerical targets in JTCs, and finally PDM (version 2) was confirmed at JTC in 2012 August. In 2013 October, the contents of PDM were revised and PDM (version 3) was made according to the results of Mid-term review. After that, however, it was clarified that the Brazilian side will not make inputs along the plan, and draft PDM (version 4) was made to deal with the actual situation at that time. The Project discussed the contents of PDM (version 4) at the 6th JCC in 2014 December and it was officially approved by three countries (Japan, Brazil and Mozambique) at JTC in 2015 August. PDM (version 4) is shown in the table below. It shows the revised points from Version 3. After the approval of PDM (version 4), it was decided that the project period would be extended for another one and a half years (thus 6.5 years in total) according to the results of the Terminal Evaluation in the end of 2015. Terminal monitoring mission was carried out in 2017 August and the Project was judged that its results had reached the expected level and the purpose of the Project had been achieved. Therefore, it was decided that the Project is to complete in 2017 November.

Table 3-1 Project Design Matrix (PDM) Version 4

Project Title:	Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development, Mozambique	**Version**: 4
Target Area:	Nacala Corridor, Northern Area in Mozambique	**Date** : 2015/8
Target Group:	The staff of Northeast and Northwest IIAM Zonal Research Centers and Farmers from pilot units and its surroundings	
Duration:	2011.5- 2017.11 (6.5 years)	

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Appropriate agricultural technology is adopted in Nacala Corridor.	- Appropriate agricultural technologies validated by IIAM are practiced by more than 10 % of farmers in the target areas.	Survey	
Project Purpose Appropriate agricultural technology is developed and transferred in Nacala Corridor.	- Appropriate agricultural technologies are validated by IIAM and ~~practiced in more than 10 demonstration units~~ transferred to more than 100 extension workers	Final Report of the Project	Relevant projects in Nacala Corridor are implemented and managed on schedule.
Outputs 1. Capacity of IIAM research centers in Northeast and Northwest is strengthened.	- Experimental laboratory and research equipment are repaired, constructed and installed at IIAM CZnd (soil and plant analysis laboratory) ~~and IIAM CZno (multi-functional laboratory)~~. - Laboratory construction plan for IIAM CZno is developed. - Record of use and maintenance of research facilities and equipment are kept by IIAM. - Meetings to evaluate experimental plans and results are taken place annually at IIAM. - C/Ps' self-evaluation survey on research and transfer abilities shows advance as compared to baseline survey results. - Guidelines of research center management are accepted by IIAM. - C/Ps present on their research work regarding soil improvement technology and cultivation technology more than a total of ~~XXX~~ 8 times	- Constructed or repaired laboratory and equipment (and its list) - Progress Reports of the Project - Progress Reports of the Project - Progress Reports of the Project and C/Ps' self-evaluation survey results - Guidelines of research center management - Presentation, records of meetings, seminars, workshops, IAMRAP, Agriculture Research Meeting – Nacala, symposium between	* Equipment conditions of the research centers do not get worse. * Large-scale weather disaster or abnormal climate does not occur.

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
	in meetings, seminars, workshops, Annual Meeting on Research Achievements and Planning (IAMRAP), Agriculture Research Meeting – Nacala, symposium between IIAM and university, conference, etc.	IIAM and university, conference, etc.	
2. Natural resources and socio-economic conditions in Nacala Corridor are evaluated.	- Reports and databases on natural resources evaluation in Nacala corridor (soil, vegetation, land use, meteorology, water resources and landscape) are accepted by IIAM. ~~- Draft land use plan for agricultural purpose in Nacala corridor is approved by JTC.~~ ~~- A report on potentiality of crop / livestock production in Nacala Corridor is accepted by IIAM.~~ - Reports of socio-economic ~~and environmental impact~~ assessment are accepted by IIAM.	- Reports and databases on natural resources evaluation ~~- Draft land use plan for agricultural purpose~~ ~~- Report on potentiality of crop/livestock production~~ - Report of socio-economic ~~and environmental impact~~	
3. Soil improvement technology for Nacala Corridor is developed.	- A soil improvement manual (including fertilization and soil conservation) is accepted by IIAM.	- Soil improvement manual	
4. Appropriate cultivation technology for Nacala Corridor is developed.	- A cultivation manual (including crops, varieties, seed production, microorganism, access to water and cropping system) ~~is and a decision support model are~~ accepted by IIAM.	- Cultivation manual ~~- Decision support model (first version)~~	
~~5. New agricultural technology developed / validated is implemented in the demonstration units.~~ 5. Technology transfer activities for extension workers are implemented on newly developed/validated agricultural technologies	~~- More than 10 demonstration units are established.~~ - Technology transfer activities (seminars, field days, training courses, etc.) are held over 15 times. - A decision support model is accepted by IIAM. - Training for extension workers to use the decision support model is taken place.	- Progress Reports of the Project - Progress Reports of the Project - Decision support model (first version) - Final Report of the Project	

Activities	Inputs	
1-1. To make installation / equipment inventory. 1-2. To repair existent installation / equipment. 1-3. To provide new research equipment. 1-4. To construct experimental laboratory in Nampula ~~and Lichinga~~ 1-5. To train research center staff for usage and maintenance of facilities and equipment. 1-6. To advise IIAM Research Centers on management. 1-7.To Increase research capacity of CPs and relevant researchers 1-8. To develop laboratory construction plan for IIAM CZno	<u>Japanese party</u> * Long-term experts - Chief Advisor of Japanese Team - Liaison Officer * Short-term experts as necessary * Tropical agricultural technologies developed in Japan * Vehicles * Construction of experimental laboratory * Installation irrigation facility in the Research Centers * Provision of equipment * Cost of seminars / workshops * Trainings in Japan <u>Brazilian party</u> * Brazilian research experts * Technical experts for the infrastructures needed * Tropical agricultural technologies developed in Brazil * Provision of materials for management, monitoring and evaluation assessments * Provision of technical publications and other editions related to tropical agriculture * ~~Provision of Brazilian made machinery for small scale farmers, seedlings and seeds~~ * Running expenses related to Brazilian experts * Trainings of Mozambican personnel in Brazil and Mozambique. <u>Mozambican party</u> * Assignment of counterpart personnel (IIAM research centers in Northeast and Northwest) * Provision of office space for experts * Provision of demonstration units * Additional personnel in IIAM research	* Trained staff of the research centers remains working at the centers.
2-1. To evaluate soil and vegetation. 2-2. To collect and analyze meteorological data. 2-3. To collect and analyze water resources data. 2-4. To collect and analyze landscape data. ~~2-5. To assess the potentiality of crop / livestock production~~ ~~2-6.~~ 2-5. To suggest appropriate land use plan for agricultural purpose. ~~2-7.~~ 2-6. To survey socio-economic conditions.		
3-1. To develop soil improvement technology. 3-2. To develop fertilization schemes / recommendation by crops. 3-3. To develop soil conservation technology.		
4-1. To select appropriate crops / varieties. 4-2. To implement training course to develop appropriate seed production systems. 4-3. To select appropriate microorganism for leguminous and other crops. 4-4. To develop appropriate methods to enhance the access to water resources for agriculture purposes. 4-5. To develop appropriate cropping systems.		
~~5-1. To select pilot farms and to establish demonstration units for crop / livestock.~~ ~~5-2.~~ 5-1. To organize technology transfer activities (seminars, field days, etc.) ~~on the demonstration units for farmers~~ for extension workers.		**Pre-conditions** * Farmers nearby agree on cooperation.

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
~~5-3.~~ 5-2. To support ProSAVANA-PEM to organize training courses for extension workers. ~~5-4.~~ 5-3.To develop a Decision Support Model for farmers to select appropriate cropping system.		centers * Running expenses for the Project	

3.1.2 Major events in the extension phase

The major events in the extension phase are listed in the table below.

Table 3-2 Major events in the extension phase

Date		Event	Summary
2016	July 19	Conclusion of second contract modification	Second contract modification was concluded after the first contract modification in the end of April. It was decided that the project period would be extended until the end of November 2017.
	Aug. 2	7th JTC	The 7th JTC was held in collaboration with the Mid-term Evaluation of PEM. Accomplishments of the last year and the work plan for the following year were approved. Activities of Brazilian side during extension period were discussed.
2017	Aug. 28 ~ Aug. 31	Final evaluation of the extension period	JICA mission confirmed progress and achievemnet of the Project, and issues to be done in the remaining period. JICA mission visited IIAM CZnd and IIAM CZno and discussed with C/Ps. Also, the mission also made site inspections and conducted interviews to farmers who were related to the Proposal based Research and Decision Support System.
	Sep. 4	8th JTC	The Project presented the progress and achievements of activities in the extension period. In addition, JICA mission team presented the results of the final evaluation, and discussed with participants the further cooperation after completion of the Project.
	Oct. 16 and 17	ARM, Final wrap-up seminar	Four C/P presented their outcome and X C/P made poster presentation at ARM. In the Final Wrap up meeting, the Project presented the achievement from the beginning to the end including the expansion phase.

3.1.3 JTC and TCM

Outline of JTC (Joint Technical Committee) and TCM (Technical Coordination Meeting) are shown in the table below.

Table 3-3 Summary of JTC and TCM

Item	Time	Summary
JTC	7th	It was held in collaboration with the Mid-term Evaluation of PEM. Accomplishments of the last year and the work plan for the following year were approved. Activities of Brazilian side during extension period were discussed (supposedly shared in the 2nd week of October). The report including the research results of Japan and Brazil were proposed to be compiled.
	8th	It was held in 4th September 2017 in Maputo. The JTC members discussed the contents of activities in the remaining period. The directors of Nampula, Niassa and Zambezia provinces mentioned the dissemination of the techniques developed by the Project.
TCM	22th	It was held on 10th June 2016 as a Skype meeting. Agenda was set for preparation of JTC (planned on 2nd August) and schedules of events (IAMRAP; November, ARM; April, Wrap-up Meeting; September).
	23th	The Project held a Skype meeting on 9th June 2017. Participants mainly discussed following: 1. Schedule of upcoming events such as IAMRAP, JTC, ARM and Wrap-up Seminar; 2. Training by Brazilian side; 3. Progress about approval for new price of soil analysis; 4. Process of revision of soil and plant manual etc.

3.1.4 Activities by the Brazilian Side

As previously mentioned, PDM was changed according to the limitation of the inputs from Brazil, caused by the limitation of ABC's budget which is affected by the economic situation of Brazil. Embrapa's technical coordinator left the Project in November 2015. On the occasion of terminal evaluation in

November 2015, the Brazilian side proposed to dispatch the lecturers for trainings. The Brazilian side was supposed to dispatch a mission in October 2016 to plan the activities during the extension period and formulate a plan in November. However, the Brazilian side did not dispatch a mission. After several discussions between Japanese side and Brazilian side, the training by Brazilian lecturer was held at the end of September 2017 under the logistical and financial support by Japan.

Chapter 4 Status of Achievement of Project Purpose

4.1 Status of Achievement of Indicators in PDM

The indicators, accomplishments, and future challenges are shown in Table 4-1.

Table 4-1 Achievement of indicators in PDM

Item / Indicator		Accomplishment
Project Purpose	Appropriate agricultural technology is developed and transferred in Nacala Corridor.	
Indicator	Appropriate agricultural technologies are validated by IIAM and transferred to more than 100 extension workers	The project purpose has been already achieved. 393 extension workers participated in technology transfer activities.
Output 1	Capacity of IIAM research centers in Northeast and Northwest is strengthened.	Most inputs were provided and activities of capacity building of C/Ps were conducted. Equipment management system has been established. The management guideline of research centers has been developed.
Indicator 1-1	Experimental laboratories and research equipment are repaired, constructed and installed at IIAM CZnd (soil and plant analysis laboratory).	The Laboratory was completed on 2 July 2015 formally and the President attended the completion ceremony. The laboratory is has been effectively utilized. Warranty inspection has been conducted on July 2016. The ownership of the laboratory has been handed over from JICA to IIAM.
Indicator 1-2	Laboratory construction plan for IIAM CZno is developed.	It was designed by the Brazilian side but not constructed.
Indicator 1-3	Record of use and maintenance of research facilities and equipment are kept by IIAM.	All planned facilities and most equipment has been procured. Recording system has been established.
Indicator 1-4	Meetings to evaluate experimental plans and results are taken place annually at IIAM.	"Annual Meeting on Achievement and Planning of Research in IIAM Zonal Centers (IAMRAP)" was held at Lichinga in 2012 and at Nampula in 2013. The meetings were held at each zonal center between 2014 and 2017 with attendance of extension workers.
Indicator 1-5	C/Ps' self-evaluation on research and transfer abilities shows advance as compared to baseline survey results.	The baseline survey was conducted in 2013and the reinvestigation was conducted in September 2015. Diversification of the contents of the trials and capacity development through trainings were confirmed.
Indicator 1-6	Guidelines of research center management are accepted by IIAM.	Guidelines of research center management were developed and accepted by IIAM.
Indicator 1-7	CPs present on their research works regarding soil improvement technology and cultivation technology more than a total 8 times in meeting, workshop, IAMRAP, ARM, symposium between IIAM and university, conference, etc.	C/Ps presented soil improvement and cultivation technologies at following occasions; No. / Occasion 12 IAMRAP 3 ARM 2 PIAIT 1 Soil improvement seminar 2 Crop cultivation and Soil improvement technology seminar 1 Academic conference in Kenya 1 Academic conference in Burkina Faso 2 Wrap Up Seminar 24 (Total)
Output 2	Natural resources and socio-economic conditions in Nacala Corridor are evaluated.	This activity has been completed.
Indicator 2-1	Reports and databases on natural resources evaluation in Nacala corridor (soil, vegetation, land use, meteorology, water resources and landscape) are accepted by IIAM.	Data collection and analysis on natural resources in Nacala corridor have been completed and the reports have been prepared.
Indicator 2-2	Reports of socio-economic are accepted by IIAM.	Investigation and reporting for socio-economic have been completed.
Output 3	Soil improvement technology for Nacala Corridor is developed.	This activity has been completed.
Indicator 3-1	A soil improvement manual (including fertilization and soil conservation) is accepted by IIAM.	All experiments on fertilization, soil improvement and soil conservation are finished. The Soil Improvement Manual was developed. Review of the manual by the committee established by IIAM is finished.
Output 4	Appropriate cultivation technology for Nacala Corridor is developed.	This activity has been completed.
Indicator 4-1	A cultivation manual (including crops, varieties, seed production, microorganism, access to water and cropping system) is accepted by IIAM.	All experiments on crop cultivation are finished. The Crop Cultivation manuals were developed. Review of the manual by the committee established by IIAM was finished.
Output 5	Technology transfer activities for extension workers are implemented on newly developed/validated agricultural technologies	Technology transfer activities were conducted after the prototype of the Decision Support System was developed. Seminars/Trainings of utilization of the model for researchers were held.

Item / Indicator		Accomplishment
Indicator 5-1	Technology transfer activities (seminars and field days for farmers, training courses for extension workers, etc.) are held over 15 times.	3ARMs, 6 IAMRAPs with extension workers, 14 Field Days for extension workers and farmers, 3 Seminars for soil improvement and crop cultivation for extension workers were conducted as technology transfer activities. Seminars on DSS were conducted once in both Nampula and Lichinga, once each for Wrap Up Seminar and Final Wrap Up Seminar. So far, the total number of activities is 30.
Indicator 5-2	A decision support model is accepted by IIAM.	On-farm trials for evaluation of effect of DSS were conducted. DSS (Ver.1) was revised based on the results of the on-farm trials and its explanation was provided at ARM.
Indicator 5-3	Training for extension workers to use the decision support model is taken place.	48 extension workers and 58 IIAM researchers received the training.

4.2 Outline of the terminal monitoring mission

JICA conducted the terminal monitoring mission between 27th August and 4th September in order to see the progress and achievements of the Project activities. It also aimed to propose the course of activities in the remaining period and to discuss further cooperation by JICA in the research field after the Project completion. It was decided that the Project would be finished at the end of November 2017 as scheduled, since the Project carried out the activities as planned and the Project purpose was projected to be achieved.

During the remaining period of the Project, the Project have continued the training for IIAM researchers on soil and plant analysis techniques, held the ARM, the Final Wrap Up Meeting, and presentation on the researches under proposal based research scheme, and prepared the final report. IIAM has been requested to assign responsible staff for each Project activity (Assigned C/Ps are shown in the Plan of Operation of the Project in the Annex 2), to review the price list soil and plant analysis, to improve the financial system to secure sufficient budget for the operation and maintenance cost for the soil and plant analysis laboratory and to endorse the manuals concerned.

After the completion of the Project, IIAM are requested to continue the activities of the Project, to disseminate the technique developed by the Project and IIAM, to develop human resources of IIAM researchers, and to secure necessary budget.

As for further cooperation, IIAM requested to JICA to continuously support the activities done in the Project, to work on new research fields such as entomology, post harvesting, agro processing, climate change, livestock and seed supply system, to strengthen human resources & institutional capacity, and to improve facilities and equipment. JICA mission is to consider possible further cooperation considering the requests from IIAM.

Chapter 5 Recommendation to achieve the overall goal in PDM

5.1 Strengthening of communication mechanism between research and agricultural extension

The Project developed and verified the technique of soil improvement and conservation, crop cultivation for several crops. These techniques contribute to the increment of agricultural production only after these techniques are used by farmers in the target area. The manuals on the techniques developed by the Project are recommended to be updated and to be used for technical support on site by extension workers and farmers.

The Project provided the opportunity for the linkage between research and agricultural extension by inviting extension workers and farmers to IAMRAP. In order to develop useful agricultural techniques on site, it is recommended that IIAM collects the demands of extension workers and farmers and to proceed with the research that meet their demand.

The Project provided training of these techniques to extension workers and held field days to show these techniques to them.

However, it is difficult to disseminate the outputs of the Project to farmers through only demonstration farms and manual distributions. It is necessary to continue the research with the participation of farmers so as to make revisions on techniques suitable for them. DSS is pointed to as a technology that requires continuous research in particular. Regarding AquaCrop which is one of the component of DSS, in order to deal with various farmer's cropping system, DSS also accumulate data and needs to correct the model, increasing crop varieties. With respect to DFMmz which is the other component technology, both of researchers and extension workers require to master DFMmz through on-site practice.

The "proposal based research" scheme is recommended to be used to put that kind of research into practice. Under the scheme of the "proposal based research" in the final project year of the extension phase, the studies were carried out through cooperation between extension workers and farmers, since the conditions were set out that farmers would benefit directly from the development of the technique. In the 11th and the 12th IAMRAP, active discussions between extension workers and researchers were held at the presentation of the outputs of the proposal based research. Moreover, many farmers showed high interests in studies which had potentials to provide direct benefits to farmers, such as the comparative study of cultivars of haricot beans. On the other hand, since the proposal based research doesn't set the budget scale per theme so high, it is more meaning as a training place for young researchers than as a place to make achievements for senior researchers. Particularly, the proposal based research is suitable for the continuous research of DSS in which research methods are established and active utilization of proposal based research is desired.

In addition, the Project referred to the guideline provided by the FRG approach of Ethiopia in order to prepare the guideline of the proposal based research. The Project expects that the guideline of the proposal based research and the lessons learned be accumulated in JICA as well as the FRG approach of Ethiopia.

It is recommended that IIAM strengthens the linkage between research and agricultural extension and continues trainings and field days, so as to disseminate useful techniques on site including the techniques developed through the Project to subject matter specialists, SDAE Director and extension supervisor and extension workers.

5.2 Operation and maintenance of soil and plant analysis laboratory

The soil and plant analysis laboratory in PAN was constructed by the Japanese budget and the cost of its operation and maintenance was borne by the Japanese side. After the completion of the Project, IIAM would have to bear the cost of operation and maintenance of this facility. The Project estimated that the annual cost would be 2.9 million MZN. IIAM is expected to keep the budget covering the cost. Under the current financial system, the income of soil and plant analysis flows to the national government revenue and the northeast zonal center cannot use that income directly for the cost of the laboratory. Currently, IIAM is changing the financial system in order to make available to keep the income of each zonal center for their activities. IIAM is strongly recommended to accelerate the process of changing the system and find a way to keep the budget for the cost of the laboratory.

The unstable power supply in Nampula caused damage of the analytical instruments and other equipment and machines. After the completion of the Project for Reinforcement of Transmission Network in Nacala Corridor, IIAM should prepare the system to receive stable power supply from EDM, which is the C/P institute of the above project.

It is also essential to secure human resources for the laboratory. The Project trained several researchers and technicians. They are required to provide proper service for soil and plant analysis to the outside customers according to their request. They are also required to manage the machines and equipment properly and maintain the function of the laboratory.

5.3 Continuous capacity development of researchers

The Project provided various training including soil and plant analysis to IIAM researchers. However, few IIAM researchers achieved the international level and almost all of them are expected to make continuous efforts to develop their capacity. It is essential that IIAM continues the IAMRAP and internal training to develop researchers' capacity.

5.4 Expanding the field of agricultural research

On the occasion of the terminal monitoring mission of the Project, IIAM proposed the enforcement of the research of crops and animal husbandry, which were not covered by the Project, and the research for the crops considering marketability. At the discussion with farmers, many farmers requested support for selling soybeans. IIAM is also required to strengthen the field of marketing support and agricultural processing for increasing farmers' income.

5.5 Information sharing among donors

Although IIAM has the projects supported by donors including Agricultural Productivity Program for Southern Africa (APPSA) supported by World Bank and the seed production and vegetable production supported by USAID, IIAM is required the attitude to coordinate support and achievement from donors actively. In sense of above, it is also urgent to arrange and develop research plans and project priority by IIAM (including research funds and cooperation from external organizations).

Annex

1. PDM (the latest version and chronological changes)

1.1 The latest version of PDM

Project Design Matrix (PDM) Version 4

Project Title: Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development, Mozambique
Version: 4
Target Area: Nacala Corridor, Northern Area in Mozambique
Date : 2015/08/24
Target Group: The staff of Northeast and Northwest IIAM Zonal Research Centers and Farmers from pilot units and its surroundings
Duration: 2011.4 – 2017 .11

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Appropriate agricultural technology is adopted in Nacala Corridor.	- Appropriate agricultural technologies validated by IIAM are practiced by more than XX% of farmers in the target areas.	Survey	
Project Purpose Appropriate agricultural technology is developed and transferred in Nacala Corridor.	- Appropriate agricultural technologies are validated by IIAM and transferred to more than 100 extension workers	Final Report of the Project	Relevant projects in Nacala Corridor are implemented and managed on schedule.
Outputs 1. Capacity of IIAM research centers in Northeast and Northwest is strengthened.	- Experimental laboratory and research equipment are repaired, constructed and installed at IIAM CZnd (soil and plant analysis laboratory). - Laboratory construction plan for IIAM CZno is developed. - Record of use and maintenance of research facilities and equipment are kept by IIAM. - Meetings to evaluate experimental plans and results are taken place annually at IIAM. - C/Ps' self-evaluation survey on research and transfer abilities shows advance as compared to baseline survey results. - Guidelines of research center management are accepted by IIAM. - C/Ps present on their research work regarding soil improvement technology and cultivation technology more than a total of 8 times in meetings, seminars, workshops, Annual Meeting on Research Achievements and Planning (IAMRAP), Agriculture Research Meeting – Nacala, symposium between IIAM and university, conference, etc.	- Constructed or repaired laboratory and equipment (and its list) - Progress Reports of the Project - Progress Reports of the Project - Progress Reports of the Project and C/Ps' self-evaluation survey results - Guidelines of research center management - Presentation, records of meetings, seminars, workshops, IAMRAP, Agriculture Research Meeting – Nacala, symposium between IIAM and university, conference, etc.	* Equipment conditions of the research centers do not get worse. * Large-scale weather disaster or abnormal climate does not occur.
2. Natural resources and socio-economic conditions in Nacala Corridor are evaluated.	- Reports and databases on natural resources evaluation in Nacala corridor (soil, vegetation, land use, meteorology, water resources and landscape) are accepted by IIAM. - Reports of socio-economic assessment are accepted by IIAM.	- Reports and databases on natural resources evaluation - Report of socio-economic	
3. Soil improvement technology for Nacala Corridor is developed.	- A soil improvement manual (including fertilization and soil conservation) is accepted by IIAM.	- Soil improvement manual	

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
4. Appropriate cultivation technology for Nacala Corridor is developed.	- A cultivation manual (including crops, varieties, seed production, microorganism, access to water and cropping system) ~~is and a decision support model are~~ accepted by IIAM.	- Cultivation manual	
5. Technology transfer activities for extension workers are implemented on newly developed/validated agricultural technologies	- Technology transfer activities (seminars, field days, training courses, etc.) are held over 15 times. - A decision support model is accepted by IIAM. - Training for extension workers to use the decision support model is taken place.	- Progress Reports of the Project - Progress Reports of the Project - Decision support model (first version) - Final Report of the Project	

Activities	Inputs	
1-1. To make installation / equipment inventory. 1-2. To repair existent installation / equipment. 1-3. To provide new research equipment. 1-4. To construct experimental laboratory in Nampula 1-5. To train research center staff for usage and maintenance of facilities and equipment. 1-6. To advise IIAM Research Centers on management. 1-7.To Increase research capacity of CPs and relevant researchers 1-8. To develop laboratory construction plan for IIAM CZno 2-1. To evaluate soil and vegetation. 2-2. To collect and analyze meteorological data. 2-3. To collect and analyze water resources data. 2-4. To collect and analyze landscape data. 2-5. To suggest appropriate land use plan for agricultural purpose. 2-6. To survey socio-economic conditions. 3-1. To develop soil improvement technology. 3-2. To develop fertilization schemes / recommendation by crops. 3-3. To develop soil conservation technology. 4-1. To select appropriate crops / varieties. 4-2. To implement training course to develop appropriate seed production systems. 4-3. To select appropriate microorganism for leguminous and other crops. 4-4. To develop appropriate methods to enhance the access to water resources for agriculture purposes. 4-5. To develop appropriate cropping systems. 5-1. To organize technology transfer activities (seminars, field days, etc.) for extension workers. 5-2. To support ProSAVANA-PEM to organize training courses for extension workers. 5-3.To develop a Decision Support Model for farmers to select appropriate cropping system.	<u>Japanese party</u> * Long-term experts - Chief Advisor of Japanese Team - Liaison Officer * Short-term experts as necessary * Tropical agricultural technologies developed in Japan * Vehicles * Construction of experimental laboratory * Installation irrigation facility in the Research Centers * Provision of equipment * Cost of seminars / workshops * Trainings in Japan <u>Brazilian party</u> * Brazilian research experts * Technical experts for the infrastructures needed * Tropical agricultural technologies developed in Brazil * Provision of materials for management, monitoring and evaluation assessments * Provision of technical publications and other editions related to tropical agriculture * Running expenses related to Brazilian experts * Trainings of Mozambican personnel in Brazil and Mozambique. <u>Mozambican party</u> * Assignment of counterpart personnel (IIAM research centers in Northeast and Northwest) * Provision of office space for experts * Provision of demonstration units * Additional personnel in IIAM research centers * Running expenses for the Project	* Trained staff of the research centers remain working at the centers. **Pre-conditions** * Farmers nearby agree on cooperation.

1.2 The chronological changes of PDM

<table>
<tr><th>Ver. No.</th><th>Major Changes</th></tr>
<tr><td>Ver.0</td><td>PDM Version 1 was the same as the PDM of R/D and it was approved at 1st JTC on 29 August 2011.</td></tr>
<tr><td>Ver.1</td><td>Version 1 was approved at 2nd JCC on 26 February 2012. All indicators were revised to concrete and appropriate expressions considering real situations of the Project but figures (X %, X times, etc.) of some indicators were not agreed. Some changes of important indicators are listed below.
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Indicator</th></tr>
<tr><th>Before</th><th>After</th></tr>
<tr><td>Overall Goal</td><td>- Productivity of technology transferred farms increases X
- Total production of technology transferred farms increase X</td><td>- Annual growth of agriculture sector in Nacala corridor becomes over X %.</td></tr>
<tr><td>Project Purpose</td><td>- No. of farmers practicing developed technology increases X
- No. of extension workers transferring developed technology increases X</td><td>- Appropriate agricultural technologies are validated by IIAM and practiced in more than X demonstration units.</td></tr>
<tr><td>Output 1</td><td>- (Describe concrete facility or equipment here: ex. Soil Analysis Laboratory in Nampula) is renovated.</td><td>- Experimental laboratories and research equipment are repaired、constructed and installed at IIAM CZnd (soil and plant analysis laboratory) and IIAM CZno (X).</td></tr>
<tr><td>Output 5</td><td>- No. of participants in seminars of demonstration is X by gender
- No. of participants showing interests in technology demonstrated in seminars is X by gender
- No. of training courses for extension workers is X by gender
- No. of participants in training course for extension is X by gender</td><td>- More than X demonstration units are established.
- Technology transfer activities (seminars and field days for farmers、training courses for extension workers、etc.) are held X times.</td></tr>
</table></td></tr>
<tr><td>Ver.2</td><td>Version 2 was approved at 3rd JCC on 16 August 2012. Figures of indicators of Overall Goal, Project Purpose and Output 5 were defined. Function of Lichinga Laboratory was also defined. The minutes of meeting designated Japanese responsibility of Nampula laboratory and Brazilian responsibility of Lichinga laboratory.
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Indicator</th></tr>
<tr><th>Before</th><th>After</th></tr>
<tr><td>Overall Goal</td><td>- Annual growth of agriculture sector in Nacala corridor becomes over X %.</td><td>- Annual growth of agriculture sector in Nacala corridor becomes <u>more than the target value of the Mozambican national strategy (PEDSA)</u>. (= 7%)</td></tr>
<tr><td>Project Purpose</td><td>- Appropriate agricultural technologies are validated by IIAM and practiced in more than X demonstration units.</td><td>- Appropriate agricultural technologies are validated by IIAM and practiced in more than <u>10</u> demonstration units.</td></tr>
<tr><td>Output 1</td><td>- Experimental laboratories and research equipment are repaired、constructed and installed at IIAM CZnd (soil and plant analysis laboratory) and IIAM CZno (X).</td><td>- Experimental laboratories and research equipment are repaired、constructed and installed at IIAM CZnd (soil and plant analysis laboratory) and IIAM CZno (<u>multi-functional laboratory</u>).</td></tr>
<tr><td>Output 5</td><td>- More than X demonstration units are established.
- Technology transfer activities (seminars and field days for farmers、training courses for extension workers、etc.) are held X times.</td><td>- More than <u>10</u> demonstration units are established.
- Technology transfer activities (seminars and field days for farmers、training courses for extension workers、etc.) are held <u>15</u> times.</td></tr>
</table></td></tr>
<tr><td>Ver.3</td><td>Version 3 was approved at the meeting for PDM review in the Mid-term Evaluation on 23 October 2013. Some indicators were corrected to more directly linked expressions to outcomes of the Project (Overall Goal, Output 1) and an expression to clearly explain the linkage with PEM was added in one of activities of Output 5. Although one of Japanese evaluators proposed to omit Brazilian activities with no progress from the PDM, decision was postponed.
<table>
<tr><th rowspan="2">Item</th><th colspan="2">Indicator</th></tr>
<tr><th>Before</th><th>After</th></tr>
<tr><td>Overall Goal</td><td>- Annual growth of agriculture sector in Nacala corridor becomes more than the target value of the Mozambican national strategy (PEDSA).</td><td>- Appropriate agricultural technologies validated by IIAM are practiced by more than XX% of farmers in the target areas.</td></tr>
<tr><td rowspan="2">Output 1</td><td>- A manual of research center management is accepted by IIAM.</td><td>- <u>Guidelines</u> of research center management are accepted by IIAM.</td></tr>
<tr><td>None</td><td>- CPs present on their research work regarding soil improvement technology and cultivation technology more than a total of XXX times in meetings, seminars, workshops, Annual Meeting on Research Achievements and Planning (IAMRAP),</td></tr>
</table></td></tr>
</table>

Ver. No.	Major Changes

		Agriculture Research Meeting – Nacala, symposium between IIAM and university, conference, etc.
Item	Activity	
Output 5	- 5-3 To organize training courses for extension workers.	- 5-3 **To support ProSAVANA-PEM** to organize training courses for extension workers.

Ver.4

Version 4 was approved at 6th JCC on 24 August 2015. Since the initial stage of the Project, inputs from the Brazilian side were not provided as planned or scheduled, so some activities under responsibilities of Brazil have not been implemented. At the 1st Monitoring Meeting of ProSAVANA on 16 May 2014 at Brasilia, ABC explained budgetary constrains that unable the total finance for Lichinga laboratory and change activities of Output 5, and 3 parties agreed to modify PDM. Therefore corrections of PDM to omit Brazilian activities with no progress or to revise some others according to real situations were proposed at 6th JCC on 4 December 2014, but the agreement was not made on the spot. Japanese and Brazilian sides agreed corrected version (Version 4) on 28 January 2015 through E-mail communications, so that it was discussed at 6th JTC and approved at last.

Based on the result of final evaluation, the mission of 3 countries agreed to extend project period in 1.5 years especially to continue soil and plant analysis training of Output 1 and to enhance the Decision Support System (DSS) of Output 5.

Item		Before	After
Project Purpose	Indicator	Appropriate agricultural technologies are validated by IIAM and practiced in more than 10 demonstration units.	Appropriate agricultural technologies are validated by IIAM and **transferred to more than 100 extension workers.**
Output 1	Indicator	- Experimental laboratory and research equipment are repaired, constructed and installed at IIAM CZnd (soil and plant analysis laboratory) and IIAM CZno (multi- functional laboratory).	- Experimental laboratory and research equipment are repaired, constructed and installed at IIAM CZnd (soil and plant analysis laboratory). - **Laboratory construction plan for IIAM CZno is developed.**
	Activity	- 1-4. To construct experimental laboratory in Nampula and Lichinga	- 1-4. To construct experimental laboratory in Nampula - **1-8. To develop laboratory construction plan for IIAM CZno**
Output 2	Indicator	- Draft land use plan for agricultural purpose in Nacala corridor is approved by JTC. - A report on potentiality of crop / livestock production in Nacala Corridor is accepted by IIAM - Reports of socio-economic and environmental impact assessment are accepted by IIAM.	-Delete (This is because the land use plan of Nacala corridor was changed to the plan of research stations) - Delete - Reports of socio-economic assessment are accepted by IIAM.
	Activity	- 2-5. To assess the potentiality of crop / livestock production	- Delete
Output 4	Activity	- 4-2. To develop appropriate seed production systems.	- 4-2. **To implement training course** to develop appropriate seed production systems.
Output 5		5. New agricultural technology developed / validated is implemented in the demonstration units.	5. Technology transfer activities for extension workers are implemented on newly developed/validated agricultural technologies
	Indicator	- More than 10 demonstration units are established.	- Delete
	Activity	- 5-1. To select pilot farms and to establish demonstration units for crop / livestock. - 5-2. To organize technology transfer activities (seminars, field days, etc.) on the demonstration units for farmers.	- Delete - 5-1. To organize technology transfer activities (seminars, field days, etc.) **for extension workers**.
Input	Brazilian party	- Provision of Brazilian made machinery for small scale farmers, seedlings and seeds	- Delete

2. Plan of Operation

Activities as per PDM Ver.4		Expected results		2011	2012	2013	2014	2015	2016	2017	Persons in charge		
											NTCI/JIRCAS	EMBRAPA	IIAM
Output 1. Capacity of IIAM research centers in Northeast and Northwest is strengthened.													
1-1.	To make installation / equipment inventory.	Inventory of CZnd, CZno prepared	Plan								Anyoji	Alex Silva	Albino Silva
			Actual								Tobita		Lodovico
1-2.	To repair existent installation / equipment.	Repairs done according to the inventory results	Plan								Narumi	Alex Silva	Albino Silva
			Actual								Tobita		
1-3.	To provide new research equipment.	Equipment provided according to the inventory results	Plan								Narumi	Alex Silva	Albino Silva
			Actual								Naruo		
1-4.	To construct experimental laboratory in Nampula												
	1-4-1. To agree upon function, basic design and cost sharing of new laboratories among 3 parties.	Basic design and cost sharing agreed upon by 3 parties	Plan								Anyoji	Alessandro Silva	Constantino
			Actual								Nishikawa		Carolino
	1-4-2. To prepare detailed design and cost estimate.	Detailed design and cost estimate prepared	Plan								Kondo	-	Constantino
			Actual								Shemsu		Carolino
	1-4-3. To select contractor based on approved tender document.	Tender document approved; Contractor selected	Plan								Kawabata	-	Constantino
			Actual								Shemsu		Carolino
	1-4-4. To supervise the construction and hand over the completed laboratory.	Soil and plant analysis laboratory handed over	Plan								Ishihara	-	Constantino
			Actual										Carolino
1-5.	To train research center staff for usage and maintenance of facilities and equipment.												
	1-5-1. To train CZnd staff for usage and maintenance of fixed equipment	Record of usage and maintenance of equipment kept	Plan								Naruo	Alessandro Silva	Constantino
			Actual								Nakamura		Carolino
1-6.	To advise IIAM Research Centers on management.												
	1-6-1. To identify weak points of current management systems of CZnd and CZno.	Weak points identified and described in progress reports	Plan								Anyoji	Cesar Miranda	Constantino
			Actual										Carolino
	1-6-2. To implement a management training course with agricultural research institutes of Brazil	Reports by participants submitted	Plan								-	Cesar Miranda	Constantino
			Actual										Carolino
	1-6-3. To implement soil diagnosis training course in Japan	Reports by participants submitted	Plan								Narumi	-	Constantino
			Actual										Carolino
	1-6-4. To prepare a guideline of research center management.	Guidelinel of research center management accepted by IIAM	Plan								Kuwahara	Cesar Miranda	Constantino Cuambe
			Actual								Naruo		Carolino Martinho
1-7.	To Increase research capacity of CPs and relevant researchers												
	1-7-1. To organize research planning and evaluation meetings	Materials and records of meetings shared by all relevant actors	Plan								Kuwahara	Cesar Miranda	Constantino
			Actual								Tobita		Carolino
	1-7-2. To conduct baseline survey and annual self-evaluation of C/P staff's research capacity.	Advance of C/P staff's research capacity monitored annually	Plan								Kuwahara	Cesar Miranda	Constantino
			Actual								Tobita		Carolino
	1-7-3. To conduct research activities proposed from IIAM	Report of the resech activities prepared	Plan								Uehara		Constantino
			Actual								Kobayashi		Carolino
	1-7-4. To conduct information sharing between researcher and extension worker for better research activity planning.	Research plan reflected needs from extension side	Plan								Uehara		Constantino
			Actual								Kobayashi		Carolino
1-8.	To develop laboratory construction plan for IIAM CZno												
			Plan								-	Alessandro Silva	Carolino Martinho
			Actual										

Activities as per PDM Ver.4		Expected results		2011	2012	2013	2014	2015	2016	2017	Persons in charge		
											NTCI/JIRCAS	EMBRAPA	IIAM
Output 2. Natural resources and socio-economic conditions in Nacala Corridor are evaluated.													
2-1.	To evaluate soil and vegetation.												
	2-1-1. To collect existent soil information and conduct additional survey, sampling and analysis.	Soil database and reports elaborated	Plan								Oya	Skorupa	Momade
			Actual								Naruo		
	2-1-2. To collect existent vegetation information and conduct additional survey.	Vegetation database and reports elaborated	Plan								Oya	Skorupa	Alistidis
			Actual								Mori		
2-2.	To collect and analyze meteorological data.												
	2-2-1. To install weather stations at field trial sites, provide training, and keep observation.	Weather stations installed and operational	Plan								Tsujimoto	Skorupa	Joao
			Actual								Tobita		
	2-2-2. To collect and analyze existent meteorological information	Meteorology database and reports elaborated	Plan								-	Skorupa	Joao
			Actual										
2-3.	To collect and analyze water resources data.	Water resources database and reports elaborated	Plan								-	Skorupa	Ragu
			Actual										
2-4.	To collect and analyze landscape data.	Landscape database and reports elaborated	Plan								-	Skorupa	Momade
			Actual										
2-5.	To develop a land use plan for agricultural purpose.												
	2-5-1. To integrate existing land-use plans or zoning results around the Nacala Corridor	Existing land-use plans or zoning results integrated	Plan								Mori	Skorupa	Ragu
			Actual									Coelho	Chichongue
	2-5-2. To develop land-use plans of PAN and EAL	Land-use plans of PAN and EAL developed	Plan								Egami	-	Ragu
			Actual										Chichongue
2-6.	To survey socio-economic conditions.												
	2-6-1. To survey basic characteristics of farm households.	Types of farm households classified	Plan								Yamada	Skorupa	Salegua / Amancio
			Actual										Cassamo
	2-6-2. To survey socio-economic conditions of soybean production areas.	Factors of soybean introduction and development clarified	Plan								Yamada	Skorupa	Salegua / Amancio
			Actual										Cassamo
	2-6-3. To evaluate farm economy of cash crop growers' households.	Cost and profit of cash crops evaluated	Plan								Yamada	Skorupa	Salegua / Amancio
			Actual										Cassamo
Output 3. Soil improvement technology for Nacala Corridor is developed.													
3-1.	To develop soil improvement technology.												
	3-1-1. To identify main problems on soil improvement	Plan of activity made based on identified main problems	Plan								Kobayashi	Coelho	Baltazar
			Actual										
	3-1-2. To implement field trial of soil improvement by subsoiler and/or deep-rooted crops	Results reported and soil improvement manual drafted	Plan								Kobayashi	Coelho	Baltazar
			Actual										
	3-1-3. To implement field trial of soil improvement by crop residue application.	Results reported and soil improvement manual drafted	Plan								Kobayashi	Coelho	Baltazar
			Actual										
3-2.	To develop fertilization schemes / recommendation by crops.												
	3-2-1. To implement long term trial on essential elements necessity in different agro-environments.	Results reported and soil improvement manual drafted	Plan								Oya	Araujo Filho	Momade/Clarinda
			Actual								Naruo	Denardim	Chichongue/Seninho
	3-2-2. To implement experiment on optimal fertilizer dose for several crops.	Results reported and soil improvement manual drafted	Plan								Oya	Araujo Filho	Momade/Clarinda
			Actual								Naruo	Denardim	Chichongue/Seninho
3-3.	To develop soil conservation technology.												
	3-3-1. To indentify main problems on soil conservation.	Plan of activity made based on identified main problems	Plan								Naruo	-	Uatemua/Chichonge/
			Actual										Sualei
	3-3-2. To implement field trial of soil conservation technologies using water and sediment trap	Results reported and soil improvement manual drafted	Plan								Naruo	-	Uatemua/Chichonge/
			Actual										Sualei
	3-3-3. To establish demonstration farm for agroforestry with *Feidherbia Albida*	Demonstration farm for agroforestry with *Feidherbia*	Plan								Naruo	-	Ivete/Sualei
			Actual										

	Activities as per PDM Ver.4	Expected results		2011	2012	2013	2014	2015	2016	2017	Persons in charge NTCI/JIRCAS	EMBRAPA	IIAM
Output 4. Appropriate cultivation technology for Nacala Corridor is developed.													
4-1.	To select appropriate crops / varieties.												
	4-1-1. To implement multi-location trial of important crops / varieties.	Results reported and crop measurement manual drafted	Plan								Tsujimoto	Didonet	Colial
			Actual								Tobita	Machado	Boina
	4-1-2. To prepare and revise crop cultivation manuals	Crop cultivation manuals elaborated	Plan								Oya	Denardin/Cesar	Colial
			Actual								Tobita	Miranda	
	4-1-3. To determine recommendable crops and varieties for Nacala Corridor.	Selected crops and varieties described in cultivation manual	Plan									Denardin/Cesar	
			Actual									Miranda	
	4-1-4. To implement field trial to evaluate adaptability of edible soybean cultivars.	Results reported and fed back into decision-support model	Plan								Naruo	-	Colial
			Actual										
4-2.	To implement training course to develop appropriate seed production systems.	Training course to develop appropriateSeed production systems implemented	Plan								-	Cesar Miranda	
			Actual										
4-3.	To select appropriate microorganism for leguminous and other crops.												
	4-3-1. To collect soybean nodules in fields and analyze molecular biological diversity.	Results reported and nodule observation manual drafted	Plan								Tobita	Denardim	Colial
			Actual									Didonet	Boina
	4-3-2. To analyze the effect of intercropping on nodulation in soybean plants.	Results reported and nodule observation manual drafted	Plan								Tobita	Denardim	Colial
			Actual								Ito	Didonet	Boina
	4-3-3. To analyze the presence and infection of mycorrizal fungi in field crops.	Results reported and research plan / protocols prepared	Plan								Tobita	Denardim	Colial
			Actual								Ito	Didonet	Boina
	4-3-4. To implement field trials of introduction and inoculation of useful microorganisms.	Results reported and fed back into cultivation manual	Plan								Tobita	Cesar Miranda	Colial
			Actual										Boina
4-4.	To develop appropriate methods to enhance the access to water resources for agriculture purposes.												
	4-4-1. To investigate available water potential for agricultural activity in the project area.	Water potential reported	Plan								Shemsu	-	Ragu
			Actual										
	4-4-2. To make planning and design of model irrigation system in CZnd	Model irrigation system planned and designed	Plan								Shemsu	-	Ragu
			Actual										
	4-4-3. To implement model irrigation system in CZnd.	Model irrigation system implemented	Plan								Shemsu	-	Ragu
			Actual								Kobayashi		
4-5.	To develop appropriate cropping systems.												
	4-5-1. To implement 1st multi-location trial.	Results reported and crop measurement manual drafted	Plan								Tsujimoto	Didonet	Colial
			Actual								Tobita	Machado	
	4-5-2. To implement 2nd multi-location trial.	Results reported and "estimation of N use / fixation manual" drafted	Plan								Tsujimoto	Didonet	Colial
			Actual								Tobita	Machado	Boina
	4-5-3. To implement 3rd multi-location trial.	Results reported and "soil respiration and organic matter	Plan								Tsujimoto	Didonet	Colial
			Actual								Tobita	Machado	Boina
	4-5-4. To implement 4th multi-location trial.	Results reported	Plan								Tsujimoto	Didonet	Colial
			Actual								Tobita	Machado	Boina
	4-5-5 To summarize the multi-location trials along years	Results reported and dataset fed back into decision-support model	Plan								Tsujimoto	Didonet	Colial
			Actual								Tobita	Machado	Boina

Activities as per PDM Ver.4	Expected results		2011	2012	2013	2014	2015	2016	2017	Persons in charge		
										NTCI/JIRCAS	EMBRAPA	IIAM
Output 5. Technology transfer activities for extension workers are implemented on newly developed/validated agricultural technologies												
5-1. To organize technology transfer activities (seminars, field days, etc.) for extension workers												
5-1-1. Seminars to explain crop/soil technologies developed and validated by PI will be held in pilot sites of PEM.	More than 5 seminars held	Plan								Kobayashi	-	Victor
		Actual								Naruo		Ivete
5-1-2. The technologies will be explained in field day of IIAM.		Plan								Kobayashi	-	Victor
		Actual								Naruo		Ivete
5-1-3. To invite extension workers to IAMRAP and field days to share technologies developed by ProSAVANA-PI .	More than 50 extension workers	Plan								Naruo	-	Victor
		Actual								Kobayashi		Ivete
5-2. To support ProSAVANA-PEM to organize training courses for extension workers												
5-2-1. To hold training course on crop cultivation technologies in Nampula, Mutuali and Lichinga.		Plan								Oya	-	Victor
		Actual								Kobayashi		Ivete
5-2-2. To hold training course on soil improvement technologies in Nampula, Mutuali and Lichinga.		Plan								Naruo	-	Victor
		Actual								Kobayashi		Ivete
5-2-3. To hold training course on utilization of decision support model in Nampula, Mutuali and Lichinga.		Plan								Nakamura / Koide	-	Victor
		Actual								/ Tsujimoto		Ivete
5-3. To develop a Decision Support Model for farmers to select appropriate cropping system.												
5-3-1. To summarize agricultural environments (soil, weather, socio-economics, etc.) around Nacala Corridor	Agricultural environments around Nacala Corridor summarized	Plan								Tsujimoto	-	Colial/Salegua/
		Actual								Yamada		Cassamo
5-3-2. To run sub-models on crop growth/yield and light resources with data collected from multi-location trial		Plan								Nakamura	-	Colial
		Actual								Tsujimoto		Boina
5-3-3. To try run-models on crop growth/yield and water and nutrients with data collected from multi-location trial		Plan								Nakamura	-	Colial
		Actual								Tsujimoto		Boina
5-3-4. To try run-models on linear programming with data collected from multi-location trial		Plan								Yamada	-	Colial
		Actual								Koide		Boina
5-3-5. To develop a decision-support model ver.0	Decision-support model ver.0 developed	Plan								Nakamura	-	Colial/Salegua/
		Actual								Koide		Cassamo
5-3-6. To conduct cultivation test for common beans, cowpea, pigeon peas and cassava, in particular examine the correlation between vegetation cover rate and yield.	Enhancement of Decision Support Model	Plan								Nakamura	-	Colial/Salegua/
		Actual								Koide		Cassamo
5-3-7. To conduct additional survey on rural socio-economy	Enhancement of Decision Support Model	Plan								Nakamura	-	Colial/Salegua/
		Actual								Koide		Cassamo
5-3-8. To develop a decision-support model ver.1	Decision-support model ver.1 developed	Plan								Nakamura	-	Colial/Salegua/
		Actual								Koide		Cassamo
5-3-9. To conduct breed adaptability test of various crops without fertilizer	Breed adaptability of the crops without fertilizer evaluated	Plan								Nakamura	-	Colial/Salegua/
		Actual								Koide		Cassamo

3. Dispatch of Japanese experts

Name	Assignment	Assignment duration		Affiliation
		FY	MM	
Hisao Anyoji	Chief Advisor	2011	5.63	NTCI
		2012	7.03	
		2013	4.90	
Tsuneo Kuwahara	Chief Advisor	2014	4.60	NTCI
		2015	6.14	
		2016	0.67	
		2017	0.00	
Satoshi Tobita	Sub-Adviser/ Crop Cultivation 1	2011	3.53	JIRCAS
		2012	4.37	
		2013	1.80	
		2014	2.97	
Kiyoko Hitsuda	Crop Cultivation 2	2011	7.00	JIRCAS
Tetsuji Oya	Crop Cultivation 2	2012	4.00	JIRCAS
		2013	5.94	
		2014	5.13	
	Subadvisor 1/Agronomist 1	2015	5.53	
		2016	0.80	
		2017	0.27	
Aritsune Uehara	Subadvisor 2/Training	2015	0.00	NTCI
		2016	1.67	
		2017	0.00	
Keiichiro Kobayashi	Soil Improvement Technology	2011	1.20	NTCI
		2012	1.80	
		2013	4.00	
		2014	3.50	
		2015	4.20	
		2016	3.27	
		2017	0.00	
Mitsunori Oka	Training 2/Research Coordination 2	2015	0.00	NTCI
		2016	0.40	
		2017	0.93	
Tomohito Egami	Land Use Planning	2015	3.80	
	Land Use Plan/Soil and Crops Analysis 1	2015	2.63	NTCI
		2016	5.37	
		2017	2.77	
Satoshi Nakamura	Agronomist 4/Decision Support System 2	2014	1.63	JIRCAS
		2015	2.53	
		2016	0.83	
		2017	0.00	
Monrawee Fukuda	Decision Support System 2	2015	0.00	JIRCAS
		2016	2.57	
		2017	1.00	
Taku Mori	Land Use Planning	2011	1.40	NTCI
		2012	1.00	
		2013	0.50	
Osamu Ito	Soil Microorganism	2011	1.00	JIRCAS

Name	Assignment	Assignment duration		Affiliation
		FY	MM	
		2012	0.60	
		2013	0.77	
Shemsu Kemal Andeta	Water Resource Utilization	2011	0.50	NTCI
		2012	3.80	
		2013	3.50	
Tadaaki Nishikawa	Archtect	2011	0.53	NTCI
Kozo Kondo	Archtect	2012	1.80	NTCI
Yutaka Kawabata	Bidding support	2013	2.70	NTCI
Hiroei Ishihara	Laboratory construction	2013	2.77	NTCI
		2014	3.22	
Ryuichi Yamada	Socioeconomy 1	2012	4.00	JIRCAS
		2013	3.67	
		2014	1.00	
Junji Koide	Socioeconomy 2	2014	0.83	JIRCAS
		2015	4.00	
		2016	4.10	
		2017	1.87	
Yasuhiro Tsujimoto	Fertilization	2011	1.00	JIRCAS
		2012	3.23	
		2013	2.42	
		2014	1.93	
		2015	1.40	
		2016	0.00	
		2017	0.00	
Kazuhiro Naruo	Soil Conservation / Crop Cultivation 3/ Research Coordination	2011	2.30	NTCI
		2012	7.00	
		2013	6.24	
		2014	4.87	
	Soil Conservation/Agronomist3	2015	7.63	
		2016	2.80	
		2017	0.00	
Hisashi Nasukawa	Extension Support/ Research Coordination	2015	2.30	NTCI
	Technology Transfer 1/Soil and Crops Analysis2/Research Coordination	2015	2.83	
		2016	6.87	
		2017	1.67	
Ayaka Sasaki	Coordinator/Technology Transfer 2	2015	0.00	NTCI
		2016	4.83	
		2017	0.13	
Keita Hasebe	Interpreter	2011	1.00	NTCI
Total MM			218.42	

4. Handover list of facility

JAPAN INTERNATIONAL COOPERATION AGENCY Mozambique OFFICE

CERTIFICATE OF HANDOVER

PROJECT TITLE: "The Construction of Soil and Plant Analysis Laboratory on 522 sq., meter area in the Northeastern Zonal Center of IIAM, Nampula Province."

This is to certify that the building of the laboratory and its equipments in the attached list for above-mentioned project have been handed over properly as of 8th July, 2015 to the Northeastern Zonal Center of IIAM.

Mr. Katsuyoshi Sudo
Resident Representative
Japan International Cooperation Agency (JICA) Mozambique Office

Dr. Inácio Calvino Maposse
General Director
Agricultural Research Institute of Mozambique (IIAM)

8th July, 2015

At the Northeastern Zonal Center of IIAM, Nampula Province

List of Facility

No.	Name of Item	Qty.	Place of Delivery	Date of Handover
1	One building of Laboratory with 522 sq. meter, electrical service and hydraulic services	1	The Northeastern Zonal Center of IIAM	June 8th, 2015
2	Elevated water Tank system with 3 water tanks, 2 pumps and required apparatus such as valves	1	ditto	ditto
3	Septic Tank with capacity for 50 persons	1	ditto	ditto
4	Absorption Pit	1	ditto	ditto
5	Air conditioner with 8 kw	5	ditto	ditto
6	Air conditioner with 6.3 kw	2	ditto	ditto
7	Air conditioner with 3.6 kw	3	ditto	ditto
8	Air Fan with capacity of 1000 m^3/hr	2	ditto	ditto
9	Air Fan with capacity of 500 m^3/hr	2	ditto	ditto
10	Digital actual volumenometer	1	ditto	ditto
11	Digital soil hardness meter	1	ditto	ditto
12	Long quantum sensor	1	ditto	ditto
13	Weather station	2	ditto	ditto
14	Muffle furnace	1	ditto	ditto
15	Shaker	1	ditto	ditto
16	Magnetic stirrer	2	ditto	ditto
17	Microwave digestion system	1	ditto	ditto
18	Willey mill	1	ditto	ditto

19	Incubator	1	ditto	ditto
20	Desiccator cabinet	1	ditto	ditto
21	Ultrasonic cleaner	1	ditto	ditto
22	Potable turbidimeter	1	ditto	ditto
23	Soil infiltration meter	1	ditto	ditto
24	Microwave plasma-atomic emission spectrometer	1	ditto	ditto
25	Laboratory bench (center)	3	ditto	ditto
26	Laboratory bench (side)	4	ditto	ditto
27	Desk for the office	13	ditto	ditto
28	Shelf for the office	21	ditto	ditto
29	Meeting table for the office	5	ditto	ditto
30	Chair for the office	30	ditto	ditto
31	Chair for the laboratory	8	ditto	ditto
32	Open Shelf for the storage and laboratory	20	ditto	ditto
33	Chair for the meeting room	53	ditto	ditto
34	Desk for the meeting room	25	ditto	ditto
35	Shelf for the meeting room	2	ditto	ditto
36	Desk top PC for the office and MP-AES	4	ditto	ditto
37	Desk for the reception	1	ditto	ditto
38	Chair for the reception	2	ditto	ditto
39	Refrigerator	2	ditto	ditto
40	Printer	6	ditto	ditto
41	Photocopy machine	1	ditto	ditto

42	blind	21	ditto	ditto
43	Generator	1	ditto	ditto
44	Generator house	1	ditto	ditto
45	Compressor house	1	ditto	ditto
46	Pump house	2	ditto	ditto
47	Borehole with submissive pump, required apparatus such as water meter and valves	1	ditto	ditto
48	Pump house	1	ditto	ditto
49	Delivery pipe from pump to the elevated water tank	1	ditto	ditto
50	Control switch box	1	ditto	ditto
51	Operation and malignance manual	1	ditto	ditto

ProSAVANA PROJECTO DE INVESTIGAÇÃO Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development,Mozambique

CERTIFICATE OF HANDOVER

PROJECT TITLE:"Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development,Mozambique "

This is to certify that the equipments in the attached list for above-mentioned project have been handed over properly as of October 30th, 2017to the Northeastern Zonal Center of IIAM.

30.10.2017

Dr. Antonio Chamuene
Director
Northeastern Zonal Center of IIAM

October 30th,2017

At the IIAM CZnd PAN, Nampula Province

List of Facility

No.	Name of Item	Qty.	Place of Delivery	Date of Handover
1	UV visible spectrophotometer	1	The Northeastern Zonal Center of IIAM	October 29th, 2017
2	Analytical oven	1	Ditto	Ditto
3	Automatic voltage regulator	1	Ditto	Ditto
4	Flame photometer	1	Ditto	Ditto
5	Generator	1	Ditto	Ditto
6	Generator house	1	Ditto	Ditto
7	Volume weight measuring instrument	1	Ditto	Ditto
8	Draft chamber	2	Ditto	Ditto
9	Air condition	2	Ditto	Ditto
10	Water Purification system	1	Ditto	Ditto
11	Kjeldahl distillation system	1	Ditto	Ditto
12	Analytical Balance 0.0001 g	1	Ditto	Ditto
13	Analytical Balance 0.01 g	3	Ditto	Ditto
14	pH meter	1	Ditto	Ditto
15	Drip irrigation kits with water tower and 3 tanks	1	Ditto	Ditto
16	Soil measurement facility	1	Ditto	Ditto

30. 10. 2017

5. Minutes of the JTC meetings

MINUTES OF THE MEETING
ON
TRIANGULAR COOPERATION PROGRAMME FOR TROPICAL SAVANNAH AGRICULTURAL DEVELOPMENT IN MOZAMBIQUE
AMONG
MINISTRY OF AGRICULTURE OF MOZAMBIQUE
BRAZILIAN COOPERATION AGENCY
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. Background

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as ProSAVANA-JBM), implemented under the framework of the Japan Brazil Partnership Programme (hereinafter referred to as "JBPP") the Project for Improving Research and Technology Transfer Capacityfor Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI") was launched in April 2011 in Mozambique. In July 2011, Japan, Brazil and Mozambique agreed on the scope for implementation of the Development Study for Nacala Corridor Agriculture Development, which will start in the Japanese Fiscal Year (JFY) 2011, aiming at the implementation and enhancing development effect of future activities in Nacala Corridor by attaining the purpose of ProSAVANA-JBM. The Project for improvement of Rural Extension is under analysis by the Japanese and Brazilian government, and after the approval of both government, with the common agreement by the Mozambican government, the project will be started.

For the smooth implementation of the Program, the first Joint Coordinating Committee (hereinafter referred as "JCC") was held in Maputo on August 29th, 2011. On that occasion, the three Parties confirmed the following points for effective and efficient implementation of ProSAVANA-JBM.

2. Summary of meeting

2.1 – General Coordination

2.1.1– Definition on the structure and functions of Joint Coordinating Committee and Joint Technical Committee

The Parties confirmed the New Administration of ProSAVANA-JBM, which include structure and functions of Joint Coordinating Committee and Joint Technical Committee are as Annex 1.

2.1.2 – Communication Flow

The Parties confirmed the current communication flow among three Parties as in Annex 2. After the establishment of Programme Coordination Team in Mozambique, the flow will be re-evaluated and modified, if necessary.

2.1.3 – Report of meetings on the activities and important matters

Regarding the official meetings that are to be held in order to discuss important matters related to the Program, the Parties shall keep the others informed about the purposes and the results of the said meetings through appropriate manner to enhance the information sharing among the three Parties.

2.2 – Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique

2.2.1 – Approval of the Triangular Work Plan

The Parties approved the Triangular Work Plan as Annex 3.

2.2.2 –Division of the local cost for implementation

The Parties confirmed major components related to local cost execution for implementation of the project, such as, the Mozambican side makes effort for the local cost execution, and if necessity arises Japanese side will be able to execute the cost for transportation and procurement of material when approved by JICA office. The Brazilian side will be able to support local cost related to eventual technical meetings and joint activities in the field when requested in advance and approved by ABC in Brasilia, except costs related to the provision of food and beverages.

2.2.3 – Acronym of the Project

The Parties agreed the acronym of the Project as "ProSAVANA-PI"

2.3 – Support of Agricultural Development Master Plan for Nacala Corridor in Mozambique

2.3.1 Schedule

The Parties confirmed the schedule to initiate the Development Study as follows;

- By the end of September 2011:signingof the Triangular Agreement, R/D and Supplementary Agreement
- October to December 2011: the internal procedure for the contract with Project implementing institution by ABC and JICA
- December 2011 or January 2012: Launching of the Development Study

2.3.2 Acronym of the Project

The Parties agreed on the acronym of the Project as "ProSAVANA-PD"

2.4 Project for improvement of Agricultural Extension (Previously referred to as "Establishment of Development Model at Communities Level")

2.4.1 Schedule

The Parties confirmed as tentative schedule to initiate the Project as follows;

- January to March 2012: Preliminary study for extension service in Mozambique
- June to July 2012: Detailed planning survey for the Project
- Late half of 2012: Inauguration of the Project

2.4.2 Acronym of the Project

The Parties agreed on the acronym of the Project as "ProSAVANA-PE".

3. Other

With concern to the promotion of the private investment and the eventual participation of private investors in the Nacala Corridor, MINAG, ABC and JICA will discuss and develop procedures to the adequate exchange of information following the communication flow described in annex 2.

Maputo, 29th August 2011

For JICA:

Mr. Masami Shukunobe
Chief Representative
JICA Mozambique Office
Japan International Cooperation Agency – JICA

For ABC/MRE:

Mr. Frederico Dimas de Paiva
Project Analyst
Brazilian Cooperation Agency – ABC
Ministry of External Relations – MRE

For MINAG:

Mr. José Gaspar
Director of Agricultural Extension
Ministry of Agriculture of Mozambique - MINAG

List of Participants

〈MOZAMBIQUE〉

(1) Dr. Minister Jose Pacheco (Minister of Agriculture of Mozambique – MINAG)
(2) Dr. Ventura Macamo (Advisor to the Minister of Agriculture of Mozambique – MINAG)
(3) Dr. Calisto Bias (General Director of the IIAM)
(4) Mr. Jose Gaspar (National Director of Agricultural Extension – MINAG)
(5) Mr. Marcelo Chaquisse (Deputy National Director of Agricultural Services – MINAG)
(6) Mr. Pedro Dzucule (Provincial Directorate of Agriculture of Nampula – DPA-Nampula)
(7) Mr. Ilidio Bande (Provincial Directorate of Agriculture of Zambézia – DPA-Zambézia)
(8) Mrs. Licia Sambo (Centre for Promotion of Agriculture)

〈JAPAN〉

(1) Mr. Masami Shukunobe (Chief Representative, JICA Mozambique Office)
(2) Mr. Akihiro Miyazaki(Representative, JICA Mozambique Office)
(3) Mr. Jun Hirashima (Project Formulation Advisor, JICA Mozambique Office)
(4) Mr. Kota Sakaguchi (Assistant Director – Division Africa 3, Department of Africa, JICA HDQ)
(5) Ms. Jusimeire Mourão (Consultant for Promotion of Japan Brazil Partnership Program – Triangular Cooperation and Social Programmes Division, JICA Brazil Office)

〈BRAZIL〉

(1) Counselor Pedro Escosteguy Cardoso (Representative of the Ambassador of Brazil in Mozambique)
(2) Mr. Frederico Paiva (Project Analyst in charge of ProSAVANA-JBM at ABC)
(3) Dr. Alberto Santana (Coordination of Structuring Projects- Embrapa-SRI)
(9) Dr. Carlos Henrique Canesin (Coordination of Technical Cooperation – Embrapa-SRI)
(10) Dr. José Luiz Bellini Leite (Embrapa Mozambique)

Annex 1 – The New Administration of ProSAVANA-JBM
Annex 2 – Communication Flow
Annex 3– Triangular Work Plan

ANNEX 1

29th August 2011

The New Administration of ProSAVANA-JBM

ProSAVANA-JBM, as a program, consists of projects under the triangular cooperation between Japan, Brazil and Mozambique.

The current administration of ProSAVANA-JBM is composed of (I) Joint Working Group (JWG), based on the Minutes of Meeting signed on 17th September 2009 (II) the Programme Coordination Team for the Programme management, based on the Minutes of Meeting signed on 26th April 2011, (III) the Joint Coordinating Committee (hereinafter referred to as "JCC") for a project management, based on the agreement BRA/04/044 (JBPP/PCJ/008) signed on 10th November 2010, and (IV) the Joint Technical Committee (hereinafter referred to as JTC) for a technical purpose, based on the Minutes of the Consultative Meeting signed on 21st June, 2011.

During the Joint Mission for formulation of the Project "Support of Agriculture Development Master Plan for Nacala Corridor", the three parties agreed to restructure the administration of ProSAVANA-JBM in order to manage more effectively and efficiently the Programme and projects of ProSAVANA-JBM. This restructure is expected to bring in active interactions between activities beyond each project and synergy effects among projects.

The parties agreed on the new administration of ProSAVANA-JBM as follows:

1 Structure

Joint Working Group (JWG)

Joint Coordinating Committee (JCC)

Joint Technical Committee (JTC) Note: if necessary for an individual project JTC can be organized

2 Purpose and functions

2.1 Joint Working Groups (JWG)

The Joint Working Group (JWG) of Brazil, Japan and Mozambique are recognized as a higher level decision making body of the Programme, and the Working Groups (WG) in each country will be in charge of obtaining consensus among the organizations involved and managing the progress of each activity, as mentioned in the item 3 (8) of the MM signed in 17th of September 2009.

2.2 JCC

The parties will establish JCC to provide an overall policy for the Programme and projects. JCC will be set up for effective and efficient implementation of the program and projects under the chair of MINAG. JCC will decide on important matters to promote the output of the program and projects, including major decisions related to the interests of the Programme. JCC shall be held at least twice a year and additionally on the

ANNEX 1

occasions whenever it deems necessary. JCC shall be integrated by the Brazilian, Japanese, and Mozambican members designated in 3.1. The technical and implementing institutions shall provide technical support for the decision making at JCC level.

Its functions are:

(1) To approve the work plans of the projects

(2) To follow the progress of the implementation of the Programme and projects' activities

(3) To coordinate activities and schedules among projects

(4) To resolve issues regarding to the implementation of projects under the Programme

(5) To discuss any matter related to the Programme and projects aiming at the effective and efficient implementation

2.3 JTC

The parties will establish a JTC if an individual project needs a coordination body for technical matters of the project. JTC will compile technical information and advice JCC for decision making based on its technical perspective. JCC will present guidelines and strategies to JTC.

The detailed functions of JTC of the project will be defined by JCC, but a bottom line of its functions may include:

(1) To discuss and draft a work plan of the project

(2) To discuss the progress of activities of the project

(3) To coordinate roles of three parties

(4) To discuss and propose plans for future activities

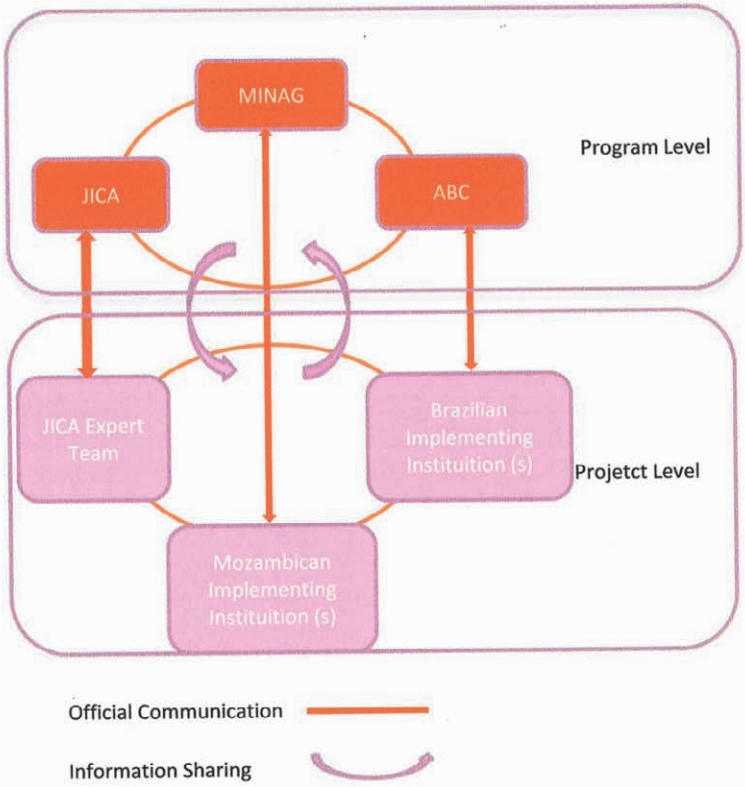
(5) To share information

2.4 JCC and JTC Secretariat

In order to provide general coordination of the JCC and JTC meetings, MINAG and IIAM are assigned as Secretariat for the JCC and JTC arrangements respectively. If necessary, Japanese and Brazilian parties shall assist the JCC and JTC secretariat.

ANNEX II

ProSAVANA-JBM Official Communication Flow



MINUTES OF THE MEETING
ON
THE SECOND JOINT TECHNICAL COMMITTEE MEETING
FOR
PROJECT FOR IMPROVING RESEARH AND TECHNOLOGY TRANSFER CAPACITYFOR NACALA CORRIDOR AGRICULTURE DEVELOPMENT, MOZAMBIQUE
AMONG

MOZAMBIQUE AGRICULTURE RESEARCH INSTITUTE,
BRAZILIAN AGRICULTURE RESEARCH CORPORATION
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. Background

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as "ProSAVANA-JBM"), The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI"),which is implemented under the framework of the Japan-Brazil Partnership Programme (hereinafter referred to as "JBPP"), was launched in April 2011 in Mozambique.

In August 29, 2011, Japan, Brazil and Mozambique (hereinafter referred to as "The Parties") established the Joint Technical Committee (hereinafter referred to as " JTC ") as a coordination body for technical matters of the ProSAVANA-PI project. The work plan of the ProSAVANA-PI project was approved in the first JTC meeting.

The second JTC meeting was held in Nampula on February 26, 2012. By the time, The Parties confirmed the following points for effective and efficient implementation of the ProSAVANA-PI project.

(1) To report the activities in 2011
(2) To approve the activities plan for 2012
(3) To confirm the PDM
(4) To discuss the needs for Project Logo

2. Summary of meeting

2.1 Activities in 2011 and plan for 2012 (Brazil)

The Parties agreed on the activities in 2011and plan for 2012 as detailed in Annex 2.

2.2 Activities in 2011 and plan for 2012 (Japan)

The Parties agreed on the activities in 2011and the plan for 2012 as detailed in Annex 3.

2.3.Activities in 2011 and plan for 2012 (Mozambique)

There was a short oral presentation.

2.4.Confirmation of Project Design Matrix (PDM)

The Parties agreed on the initial general Project Design Matrix (PDM) concept (version 0). The concept of the detailed design of the PDM (version 1, draft) was agreed on. It may be subject to change depending on further discussions between the Parties. PDM is the target and activity plan of the Project, which includes 5 components;

1) Strengthening the Capacity of Northeast (hereinafter referred to as " IIAM CZnd ") and Northwest (hereinafter referred to as " IIAM CZno ")IIAM research centers
2) Evaluation of Natural resources and socio-economic conditions in Nacala Corridor
3) Development of Soil improvement technologies for Nacala Corridor
4) Appropriate cultivation technologies for Nacala Corridor
5) Implementation of demonstration units for New agricultural technologies developed / validated.

The indicators (X values) of the PDM should be proposed to the next Join Coordination Committee (hereinafter referred to as "JCC") by JTC . The Next JCC meeting will be held on A pril 25, 2012.

The Parties agreed involvement of counterpart (C/P) members from IIAM CZnd and IIAM CZno throughout the project period as detailed.

2.5. Needs for Project Logo

The Parties discussed the Needs for Project Logo of ProSAVANA-PI.
The Parties agreed to make a single logo for the three (3) projects (PI, PD and PE) under the ProSAVANA-JBM. The logo should provide an idea about the three lateral agreement among Brazil-Japan-Mozambique and an idea about agricultural development. The logo will be modified for each project by incorporating with a letter for the particular project (PI, PD or PE).

2.6. Security Measures

Security measures were informed by the JICA security advisor representative.

Nampula, 26th February, 2012

For JICA:

Dr. Hisao Anyoji
Chief Advisor
ProSAVANA PI Project
Japan International Cooperation Agency
-JICA

For IIAM:

Dr. Calisto Bias
General Director
Instituto de InvestigaçãoAgrária de Moçambique
-IIAM

For EMBRAPA:

Dr. Jose Luiz Bellini Leite
EMBRAPA Program Coordinator
Brazilian Agricultural Research Corporation
– EMBRAPA

ANNEXES(sended by e-mail)

ANNEX 1. The list of Participants
ANNEX 2. Activities in 2011 and plan for 2012 (Brazil)
ANNEX 3. Activities in 2011 and plan for 2012 (Japan)
ANNEX 4. Activities in 2011 and plan for 2012 (Mozambique) no annexes
ANNEX 5. Confirmation of Project Design Matrix (PDM) version 1
ANNEX 6. Project Design Matrix (PDM) version 1 (draft)

MINUTES OF THE MEETING
ON
THE THIRD JOINT TECHNICAL COMMITTEE MEETING
FOR
PROJECT FOR IMPROVING RESEARH AND TECHNOLOGY TRANSFER CAPACITYFOR NACALA CORRIDOR AGRICULTURE DEVELOPMENT, MOZAMBIQUE
AMONG

MOZAMBIQUE AGRICULTURE RESEARCH INSTITUTE,
BRAZILIAN AGRICULTURE RESARCH CORPORATION
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. **Background**

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as "ProSAVANA-JBM"), The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI"),which is implemented under the framework of the Japan-Brazil Partnership Programme (hereinafter referred to as "JBPP"), was launched in April 2011 in Mozambique.

In August 29, 2011, Japan, Brazil and Mozambique (hereinafter referred to as "The Parties") established the Joint Technical Committee (hereinafter referred to as " JTC ") as a coordination body for technical matters of the ProSAVANA-PI project. The work plan of the ProSAVANA-PI project was approved in the first JTC meeting.

In February 26, 2011, The Parties The second JTC meeting was held in Nampula.
By the time, The Parties confirmed the following points for effective and efficient implementation of the ProSAVANA-PI project.

(1) To report the activities in 2011
(2) To approve the activities plan for 2012
(3) To confirm the PDM
(4) To discuss the needs for Project Logo

In August 16,2012 The Third JTC meeting was held in Lichinga. The Parties approved and discussed the following points;.

(1) To agree Laboratory construction in Lichinga
(2) To approve the Work Plan for 2012
(3) To approve the PDM
(4) To inform Security issues
(5) To discuss Any Other Business(AOB)

2. Summary of meeting

2.1 Agriculture situation in Niassa Province

There were Special Presentation about the agriculture situation in Niassa Province were made by Provincial Direction of Agriculture (DPA) Niassa.

Approval of the Laboratory construction in Lichinga (ABC)

The Parties agreed the Laboratory construction in Lichinga as detailed in Annex 2.

2.2 Approval of the Work Plan for 2012 (ProSAVANA PI)

The Parties approved the Work Plan for 2012 detailed in Annex 3.
It could be improved depending on further discussions between the Parties.

2.3.Approval of the PDM (ProSAVANA PI)

The Parties approved the PDM detailed in Annex 4.

2.4. Security Measures

Security measures were informed by the ProSAVANA PI Research Coordinator, Brazilianside and the Project Coordinator, Japanese side detailed in Annex 5 and 6.

2.5. Any Other Business (AOB)

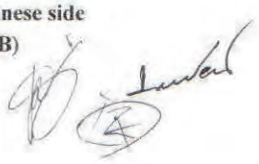
Some important issue related the ProSAVANA PI project was discussed as detailed in Annex 7.

Lichinga, 16th August, 2012

For JICA:	For IIAM:	For EMBRAPA:
Dr.Hisao Anyoji Chief Advisor ProSAVANA PI Project Japan International Cooperation Agency -JICA	Dr. Inacio Maposse General Director Mozambique Agriculture Research Institute -IIAM	Dr. Henoque Ribeiro da Silva Research Coordinator EMBRAPA_ABC ozambique Program Brazilian Agricultural Research Corporation – EMBRAPA

ANNEXES(sended by e-mail)

ANNEX 1. The list of Participants
ANNEX 2. Laboratory Construction in Lichinga
ANNEX 3. Work Plan for 2012 (ProSAVANA PI)
ANNEX 4. Project Design Matrix (PDM)
ANNEX 5. Security Measures, Brazilian side
ANNEX 6. Security Measures, Japanese side
ANNEX7. Any Other Business (AOB)



MINUTES OF THE MEETING
ON
THE FOURTH JOINT TECHNICAL COMMITTEE MEETING
FOR
PROJECT FOR IMPROVING RESEARCH AND TECHNOLOGY TRANSFER CAPACITY FOR NACALA CORRIDOR AGRICULTURE DEVELOPMENT, MOZAMBIQUE
AMONG
MOZAMBIQUE AGRICULTURE RESEARCH INSTITUTE, Brazilian AGRICULTURE RESEARCH CORPORATION
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. Background

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as "ProSAVANA"), The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI"),which is implemented under the framework of the Japan-Brazil Partnership Programme (hereinafter referred to as "JBPP"), was launched in April 2011 in Mozambique.

2. Summary of meeting

2.1 Special Presentation;Agriculture situation in Nampula Province

The chief of SPA in Nampula made a special presentation about the current situation concerning agriculture in Nampula Province detailed in Annex 1.

2.2. Activites for 2012-2013 and process of their implementation

The ProSAVANA PI reported their activities as shown in Annex 2. It was informed that ProSAVANA-PI increases the field experimental sites and on-farm trials.

2.3 Approval of the Triangular Work Plan for 2013/2014

The Parties agreed to approve the Triangular Work Plan should be finalized at the next TCM. It covers the activities from October 2013 to September 2014, including the result of the discussion in the Output 2 Leader Meeting on 2-5 Sep 2013. The agreed Triangular Work Plan as detailed in Annex 3.

ProSAVANA HQ suggested to review the format of the Work Plan. The selected crops for research should consider PEDSA priority, strategic plan of IIAM and the first ProSAVANA agreement.

ProSAVANA HQ also suggested to build capacity on GIS skills in both IIAM Zonal Centers (CZnd and CZno).

2.4. Introduction of the ProSAVANA-PEM activities and suggestions for the technical communication strategy between PI and PEM

ProSAVANA-PEM summarized their work plan to the Parties as shown in Annex 4. The Parties

agreed to establish a communication body with the ProSAVANA-PEM to support effective implementation of the activities.
ProSAVANA-HQ suggested to establish the innovation platform support by the ProSAVANA projects and other stake holders.

2.5. Concept Notes for the Agriculture Research Meeting in Nacala Corridor (ARM Nacala)

The JTC members welcomed the plan for the Agriculture Research Meeting on the Nacala Corridor as shown in Annex5.

The ProSAVANA-PI is in charge of the planning and implementation with other stake holders.
Embrapa nominated Dr. Cesar Miranda as a person who is in charge, Mozambican and Japanese team will nominate eligible personnel and will be informed at the ProSAVANA-PI TCM. Tentatively ARM-Nacala will be organized March 2014.

2.6. Laboratory Construction in Nampula and Lichinga

With regard to laboratory construction in Nampula, the Japanese team reported that bidding was held and closed on 10th September, 2013 as shown in Annex6.

The evaluation committee was established with five (5) members at the north east zonal center of IIAM (IIAM CZnd). The result of the evaluation will be reported to JICA Mozambique office. It was suggested to nominate an officer of the public works.

With regard to laboratory construction in Lichinga, ABC informed the Parties that the arrangements necessary to start with the bidding process is expected to start the first semester of 2014. The construction of the laboratory facilities is expected to be started on the second semester of 2014.

2.7. Mid-term evaluation

JICA presented the project PDCA cycle (Plan, Do, Check and Action) to be used as the mid-term evaluation as shown as annex 7. JICA also informed the Parties that a Mid-term evaluation will be held jointly with MINAG, ABC and JICA from September to October, 2013.
It was suggested from Embrapa. JICA agreed to inform the detailed methodology, objectives and possessors for better preparation including documents and general brief of the mid-term evaluation.

2.8. Next JTC and Agenda

The next JTC will be held at the end of September, 2014 at Lichinga. Agenda will be discussed at the TCM. It is confirmed that JTC will be held once per year. However, in case it is need it will be discussed at the TCM meeting.

END

Nampula, 10th September, 2013

For JICA:	For IIAM:	For Embrapa:
Dr.Hisao Anyoji Chief Advisor -ProSAVANA PI Japanese Team	Dr. Inácio Maposse General Diretor -IIAM	Dr. Jose Luiz Bellini Leite General Coordinator ABC Embrapa Mozambique Programme /Embrapa

ANNEXES

ANNEX 0. The list of Participants
ANNEX 1. Agriculture situation in Nampula Province
ANNEX 2. Result of the Activities
ANNEX 3. Triangular Work Plan (3rd Year) September 2013
ANNEX 4 . ProSAVANA-PEM Project Brief (draft)
ANNEX 5. Concept Notes for the Agriculture Research Meeting on Nacala Corridor
ANNEX 6. Soil and Plant Analysis Laboratory in Nampula
ANNEX 7. Mid-term evaluation

END

MINUTES OF THE MEETING
ON
THE FIFTH JOINT TECHNICAL COMMITTEE MEETING
FOR
PROJECT FOR IMPROVING RESEARCH AND TECHNOLOGY TRANSFER CAPACITY FOR NACALA CORRIDOR AGRICULTURE DEVELOPMENT, MOZAMBIQUE
AMONG
MOZAMBIQUE AGRICULTURE RESEARCH INSTITUTE, BRAZILIAN AGRICULTURE RESARCH CORPORATION
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. Background

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as "ProSAVANA"), The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI"), which is implemented under the framework of the Japan-Brazil Partnership Programme (hereinafter referred to as "JBPP"), was launched in April 2011 in Mozambique.

On August 29, 2011, Japan, Brazil and Mozambique (hereinafter referred to as "The Parties") established the Joint Technical Committee (hereinafter referred to as "JTC ") as a coordination body for technical matters of the ProSAVANA-PI. Since then, JTC meetings were held on yearly bases.

2. Summary of meeting of 5th JTC as below;

2.1. Activites for 2013-2014

The ProSAVANA PI reported their activities as shown in Annex 1. The ProSAVANA PI was requested from the Parties to present the detailed results of research at this JTC, however, the ProSAVANA PI explained that IAMRAP and ARM made role of this point. The Parties also requested to strength of linkage between ProSAVANA-PI with IIAM HQ for better understanding.

2.2 The Triangular Work Plan for 2014/2015

The ProSAVANA-PI presented the overall draft of the Triangular Work Plan which is covering the activities from October 2014 to September 2015. The presented Triangular Work Plan and it presentation document are detailed in Annex 2 and 3. Main points of discussions for each output are summarized below.

Output 1 : ABC mentioned that there is no financial support plan to construct the laboratory in Lichinga. To conclude overall, construction issue will be determined at the next ABC mission which is planned to be dispatched by November 2014.

Output 2-4 : Livestock activity plans were not shared well between IIAM HQ and Embrapa. This

issue will be discussed at the ABC/Embrapa mission by November 2014.

Output 5 : As shown in 2.3.

2.3. Amendment of the PDM (Project Design Matrix)

The Japanese Team Leader of ProSAVANA-PI presented the draft of amendment of the PDM as shown in Annex4. It was agreed that amendment will be finalized among ProSAVANA-PI after ABC's inputs are clarified and the amendment will be proposed at JCC.

2.4. Financial resource for Soil and Plant Analysis Laboratory (SPAL) function and maintenance

The director of IIAM CZnd made oral presentation. The Parties generally agreed the prospect of the use of the Laboratory. It was mentioned that necessary survey and planning start as soon as possible. The Parties agreed to consider financial, legal and administrative aspect to make operational plan then submit to MINAG and Ministry of Finance through IIAM DG. The Parties made tentative schedule as follows;

By December 2015: Operational cost of SPAL supported by ProSAVANA PI
April to May 2015 : Budget plan will be discussed at IIAM CZnd
After January 2016: Running cost of SPAL will be covered by Mozambican side

2.5. Any Other Business

2.5.1 Next JTC

The 6th JTC will be conducted same timing with ARM in Lichinga, April 2014. Agenda will be discussed at the ProSAVANA-PI TCM. (JTC is for internal members and ARM is open meeting.)

2.5.2 Additional member of the JTC

Directors of IIAM CZnd and CZno proposed to add new members of JTC from IIAM HQ Directorates as follows;

Director of Agnoromy natural resources, IIAM HQ
Director of animal science, IIAM HQ
Director of Technology transfer, IIAM HQ

It will be discussed at the next TCM and will be present to the next JCC.

2.5.3 Related meeting schedule

The Parties confirmed the related meeting schedule as follows;

16th TCM, 1st week November 2014, Nampula
5th JCC Middle to end of November, 2014, Zambezia
6th JTC, ARM, April 2015 Lichinga.

END

Maputo, 9th September, 2014

For JICA:	For IIAM:	For Embrapa:
Mr.Tsuneo Kuwahara Chief Advisor ProSAVANA PI Project Japanese Team	Dr. Inacio Maposse General Director Mozambique Agriculture Research Institute -IIAM	Dr. Cesar Mirranda General Coordinator EMBRAPA_ABC Mozambique Program Brazilian Agricultural Research Corporation – Embrapa

ANNEXES

ANNEX 0. The list of Participants
ANNEX 1. Result of the Activities
ANNEX 2. Triangular Work Plan (4th Year) September 2014
ANNEX 3 . Project Design Matrix (draft)
ANNEX 4. Soil and Plant Analysis Laboratory in Nampula
ANNEX6. Activities BR side

END

MINUTES OF THE MEETING
ON
THE SIXTH JOINT TECHNICAL COMMITTEE MEETING
FOR
PROJECT FOR IMPROVING RESEARCH AND TECHNOLOGY TRANSFER CAPACITY FOR NACALA CORRIDOR AGRICULTURE DEVELOPMENT, MOZAMBIQUE
AMONG
AGRICULTURALRESEARCH INSTITUTE OFMOZAMBIQUE, BRAZILIANAGRICULTURALRESARCH CORPORATION
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. Background

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as "ProSAVANA"), The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI"), which is implemented under the framework of the Japan-Brazil Partnership Programme (hereinafter referred to as "JBPP"), was launched in April 2011 in Mozambique.

On August 29, 2011, Japan, Brazil and Mozambique (hereinafter referred to as "The Parties") established the Joint Technical Committee (hereinafter referred to as "JTC ") as a coordination body for technical matters of the ProSAVANA-PI. Since then, JTC meetingswereheld on yearly bases.

2. Summary of meeting of 6thJTC as below;

2.1. Activites for 2014-2015

The ProSAVANA PI reported their activities as shown in Annex 1 and the Parties generally understood the progress of the Project.

2.2 Amendment of the PDM (Project Design Matrix)

The ProSAVANA-PI presented the draft of amendment of the PDM version four (4) as shown in Annex 2. All parties agreed the amendment.
The history of amendmentsof PDM and their reasons should be clarified and evaluated by the final evaluation.

2.3.The Triangular Work Plan for 2015/2016

The ProSAVANA-PI presented the overall draft of the Triangular Work Plan which is covering the activities from September 2015 to March 2016 and the Parties generally agreed its contents.
The presented Triangular Work Plan is detailed in Annex 3.

2.4. Progress of the laboratory construction in Lichinga

*Oral presentation without document.

The general coordinator of Embrapa explained the current situation of the laboratory construction plan in Lichinga and the Parties generally understood the situation.Mozambican side explained the importance of engineering documents which will be useful for future realization of the laboratory.

2.5. Final Evaluation

*Oral presentation without document.

JICA Nampula Field Office explained the general idea and tentative timing of the final evaluation.

It is planned at the beginning of November 2015 by trilateral evaluation team.

All parties understood the explanation and importance of the evaluation. The instruction of the evaluation will be shared in writing.

2.6 Concept of the ProSAVANA PI wrap-up meeting

*Oral presentation without document.

The wrap-up Meeting will be held in March 2016. TOR will be discussed at the ProSAVANA-PI TCM. The detailed concept will be presented at the 7th JCC.

END

Lichinga,24th August, 2015

For JICA:	For IIAM:	For Embrapa:
Mr.TsuneoKuwahara Chief Advisor ProSAVANA PI Project Japanese Team	Dr. Inacio Maposse General Director AgriculturalResearch Institute of Mozambique -IIAM	Dr. Cesar Mirranda General Coordinator EMBRAPA_ABC Mozambique Program Brazilian Agricultural Research Corporation – Embrapa

ANNEXES

ANNEX 0. The list of Participants
ANNEX 1. Result of the Activities
ANNEX 2. Project Design Matrix version 4 (draft)
ANNEX3.Triangular Work Plan (5th Year) August 2015

END

MINUTES OF THE MEETING
ON
THE SEVENTH JOINT TECHNICAL COMMITTEE MEETING
PROJECT FOR IMPROVING RESEARCH AND TECHNOLOGY TRANSFER
CAPACITY FOR NACALA CORRIDOR AGRICULTURE DEVELOPMENT,
MOZAMBIQUE
AMONG
AGRICULTURAL RESEARCH INSTITUTE OF MOZAMBIQUE,
BRAZILIAN COOPERATION AGENCY
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. Background

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as "ProSAVANA"), The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI"), which is implemented under the framework of the Japan-Brazil Partnership Programme (hereinafter referred to as "JBPP"), was launched in April 2011 in Mozambique.

On August 29, 2011, Japan, Brazil and Mozambique (hereinafter referred to as "The Parties") established the Joint Technical Committee (hereinafter referred to as "JTC") as a coordination body for technical matters for the ProSAVANA-PI. Since then, JTC meetings were held on yearly bases. The 7th JTC meeting was held on 2nd August 2016 at IIAM HQ, Maputo.

2. Summary of meeting of 7th JTC as below;

2.1 Activity for 2015-2016

The ProSAVANA-PI reported their activities as shown in Annex 2 and the Parties generally understood the progress of the project.

2.2 The Triangular Work Plan for 2016-2017

The ProSAVANA-PI presented the overall draft of the Triangular Work Plan which is covering the activities from September 2016 to October 2017 and parties generally agreed its contents. The presented Triangular Work Plan is detailed in Annex 3.

2.3 Input from the Brazilian side for the extension phase

Japanese and Mozambican sides proposed the activities which the Brazilian side can contribute during the extension phase (ANNEX 4). Brazilian side agreed to bring a draft plan of activity of Brazilian side in the second week of October 2016, so all parties will discuss for realization of the plan.

2.4 Compilation of research result

Brazilian side is compiling the results of research of ProSAVANA PI as a booklet. Both sides are requested to compile one booklet including results of both sides.

END

Maputo, 2nd August, 2016

For JICA	For IIAM	For ABC
Mr. Tsuneo Kuwahara Chief Advisor ProSAVANA-PI Project Japanese Team	Dra. Olga Faftine General Director Agricultural Research Institute of Mozambique –IIAM	Mr. Wofsi Yuri Guimaraes de Souza General Coordinator CGCB_ABC

ANNEXES

ANNEX 0. The list of Participants
ANNEX 1. Agenda
ANNEX 2. Result of the Activities
ANNEX 3. Triangular Work Plan (6th Year)
ANNEX 4. ProSAVANA-PI Activities on 2015-17 Season

MINUTES OF THE MEETING
ON
THE EIGHTH JOINT TECHNICAL COMMITTEE MEETING
PROJECT FOR IMPROVING RESEARCH AND TECHNOLOGY TRANSFER
CAPACITY FOR NACALA CORRIDOR AGRICULTURE DEVELOPMENT,
MOZAMBIQUE
AMONG
AGRICULTURAL RESEARCH INSTITUTE OF MOZAMBIQUE,
BRAZILIAN COOPERATION AGENCY
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

1. Background

Within the Triangular Cooperation Programme for Tropical Savannah Agricultural Development in Mozambique (hereinafter referred to as "ProSAVANA"), The Project for Improving Research and Technology Transfer Capacity for Nacala Corridor Agriculture Development in Mozambique (hereinafter referred as the "ProSAVANA-PI"), which is implemented under the framework of the Japan-Brazil Partnership Programme (hereinafter referred to as "JBPP"), was launched in April 2011 in Mozambique.

On August 29, 2011, Japan, Brazil and Mozambique (hereinafter referred to as "The Parties") established the Joint Technical Committee (hereinafter referred to as "JTC") as a coordination body for technical matters for the ProSAVANA-PI. Since then, JTC meetings were held on yearly bases.

2. Summary of meeting of 8th JTC as below;

2.1 Activity for 2016-2017(the extension phase)

The ProSAVANA-PI reported their activities as shown in Annex 2 and the Parties generally understood the progress of the project and appreciated the outcomes of the Project.

2.2 Terminal Monitoring Mission for the extension phase

The JICA Mission team presented the results of Terminal Monitoring for the extension phase which is covering the activities from September 2016 to October 2017 and the prospects after the project period, and parties generally agreed its contents. The Minutes of Meeting of Terminal Monitoring Mission is attached in Annex 3.

END

Maputo, 4th September, 2017

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For JICA

桑原恒夫

Mr. Tsuneo Kuwahara
Chief Advisor
ProSAVANA-PI Project
Japanese Team

For IIAM

Dra. Olga Tarfine
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–IIAM

For ABC

Mr. Bruno Neves
First Secretary
Embassy of Brazil in Mozambique

ANNEXES

ANNEX 0. The list of Participants
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ANNEX 3. Minutes of Meeting of Terminal Monitoring Mission