

Republic of Namibia
Ministry of Agriculture, Water and Forestry

DATA COLLECTION SURVEY
ON
PROMOTION
OF
MARKET-ORIENTED
AGRICULTURE AND ANIMAL HUSBANDRY

FINAL REPORT

May 2018

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.
A & M Consultant, Inc.

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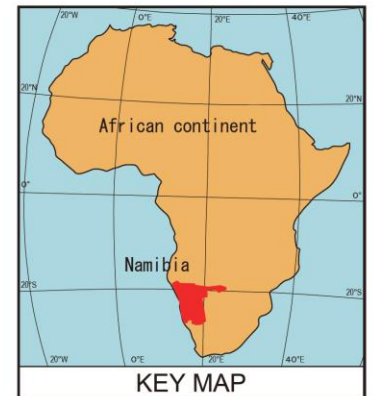
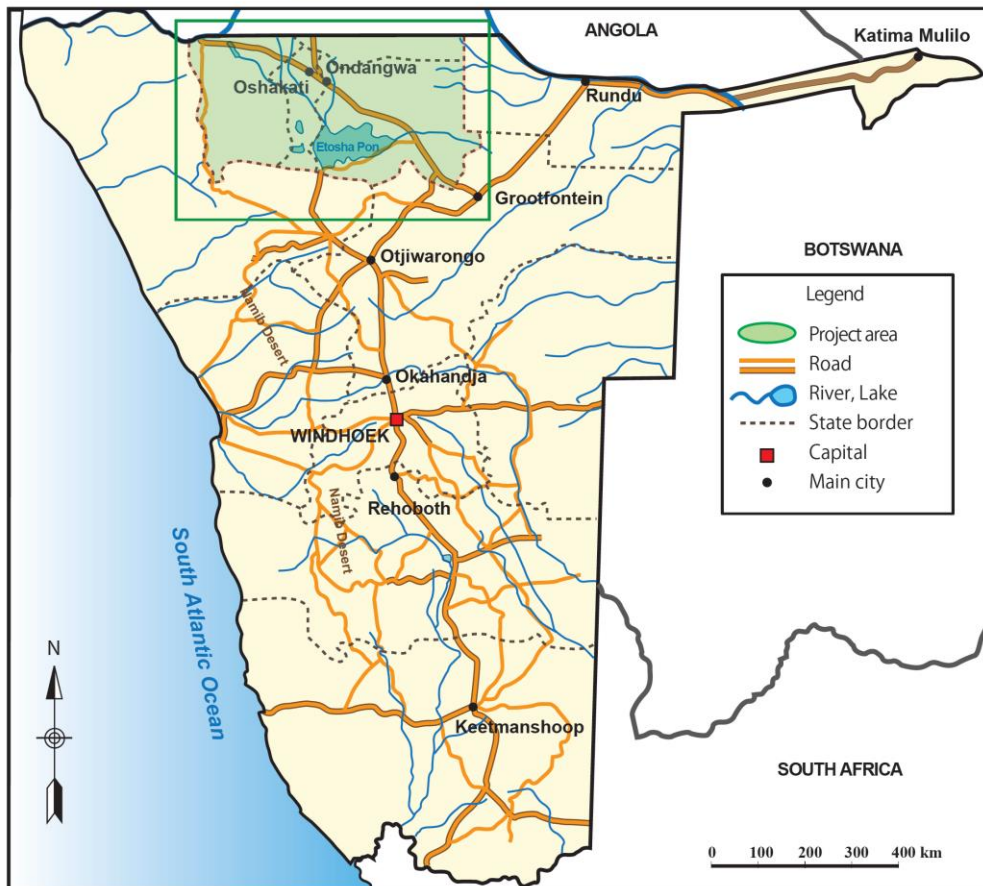
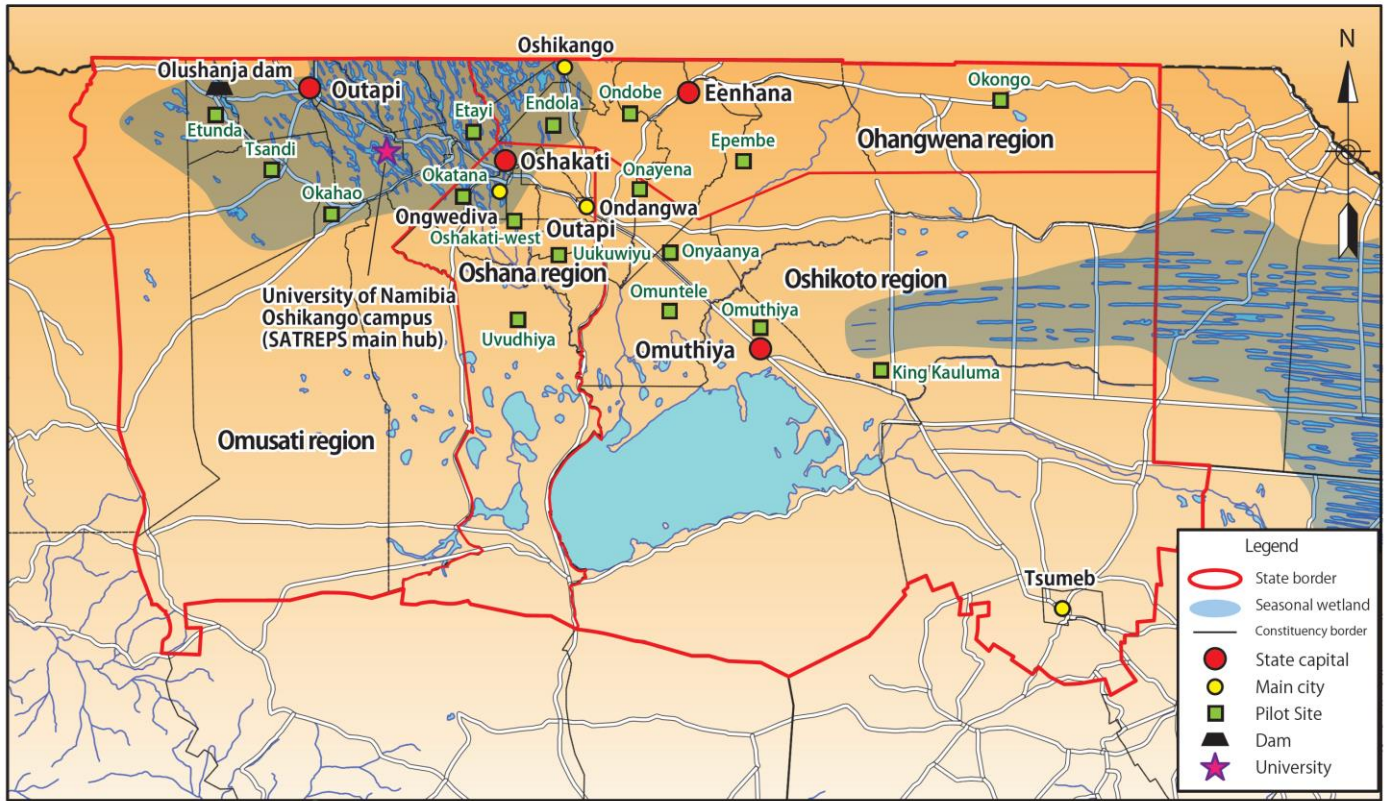
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Source: Final Report, Northern Crop and Livestock Development Master Plan Study in the Republic of Namibia, 2017

Location Map

Data Collection Survey on Promotion of Market-oriented Agriculture and Animal Husbandry

DATA COLLECTION SURVEY
ON
PROMOTION OF MARKET-ORIENTED AGRICULTURE AND ANIMAL HUSBANDRY

Final Report

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CHAPTER 1 INTRODUCTION

1.1 General

This is the Final Report of the “Data Collection Survey on Promotion of Market-oriented Agriculture and Animal Husbandry” in Northern Namibia in accordance with the terms of reference and technical specification given by JICA. The main purpose of the work was to monitor the implementation of Mater Plan formulated under N-CLIMP (Northern Crop and Livestock Development Master Plan Study), conducted during the period from August 2014 to June 2017.

1.2 Background

(1) Background of Agriculture in Namibia

The Republic of Namibia is located in the southern Africa with the area of 820,000 km² bordered by South Africa, Botswana, Angola and Zambia. The population was approximately 2.3 million in 2016.

The main economic activity of Namibia is mining particularly uranium, diamonds and natural gas. Namibia is one of the semi-developed countries with GDP of US\$12.6 billion and GNI per capita of US\$5,670. Annual economic growth has remained at more than 4.5% since 2001. The disparity in distribution of wealth, however, is still large, one of the highest countries in the world, with Gini coefficient of 0.636 (as of 2012). Therefore, rural livelihood improvement is a priority in the country.

The Government of Republic of Namibia (GRN) has formulated the long term national development policy, “Vision 2030”, a basis of a series of 5-year national development plans. In Vision 2030, maintenance and improvement of land productivity is the main target for agriculture sector in order to increase rural household income and to ensure food security of the country. In particular, in consideration of severe climatic conditions and land environment vulnerability, GRN has been promoting sustainable livelihood improvement and poverty alleviation by environment-friendly agriculture. In addition, the Fourth National Development Plan (NDP4: 2012/13 – 2016/17) made enhancement of crop and livestock farming, forestry and fishery as one of the four most important challenges for economic growth of the country.

(2) Present Situation of Agriculture and Rural Area in Northern Namibia

Most of the farmers in the northern area have been engaged in subsistent agriculture on communal land. The area is extensively covered by sandy soil with the annual rainfall of only 200 to 600 mm. Therefore, such grains as millet and beans that are tolerant to dry conditions are planted as the major crops. Farmers generally practice mixed agriculture by grains farming for subsistence and feeding cows and goats. Vegetable and fruit cultivation is carried out only at water-accessible areas such as irrigation systems developed under the green scheme. In such areas, market-oriented crops including maize and vegetables are cultivated.

Northern region of Namibia is prone to climate change where drought due to limited rainfall and flood from Angora plain repeatedly occurs causing serious damages to small-scale farmers. Flood damages have been severely serious such as the northern river flood in 2008 and Zambezi river flood in 2010.

Therefore, population migration is observed from the northern region to capital and other major cities for finding job opportunities.

(3) Formulation of Master Plan: N-CLIMP

In order to ensure social stability as well as to stabilize agriculture production in the northern region, a strategic and consistent agriculture development master plan is required in environment-friendly manner. Therefore, Ministry of Agriculture, Water and Forestry (MAWF) of GRN conducted the “Northern Crop and Livestock Development Master Plan Study (N-CLIMP)”, under technical support by JICA during the period from 2014 September to 2017 June, and formulated the Master Plan. A notable feature in the formulation process was to employ SHEP (smallholder horticulture empowerment project) Approach to promote market-oriented agriculture as well as ownership building of stakeholders. Outline of the Master Plan is shown below:

Outline of Master Plan for Northern Crop and Livestock Development

Subject	Contents		
Development Target	Establishment of sustainable crop and livestock production integrated system based on conservation agriculture		
Phase	Three phases as follows: <ul style="list-style-type: none"> ◆ Short-term: Until 2016/2017 (during the implementation of JICA Technical Cooperation) ◆ Medium-term: 2017/18 to 2022/23 ◆ Long-term: 2023/24 to 2029/2030 		
Phase-wise Development Scenario	Through the implementation of the master plan, crop and livestock production integrated system is established based on the concept of conservation agriculture. Phase-wise development scenario is as follows based on the current conditions surrounding agriculture where the population is steadily increasing while farm household is decreasing.:		
	Phase	Crop production	Livestock production
	Short-term	<ul style="list-style-type: none"> ◆ Development and verification of technical measures for stabilization of cereal production ◆ Promotion of horticulture crops for health improvement and cash income increase at potential areas particularly peri-urban areas 	<ul style="list-style-type: none"> ◆ Improvement of animal health and enhancement of livestock productivity particularly using current techniques
	Medium-term	<ul style="list-style-type: none"> ◆ Increase of semi-commercial farmers through farm integration ◆ Dissemination of improved production system of cereal production to both medium and small-scale farmers ◆ Promotion of horticulture crops through medium scale irrigation development by Green Scheme and dissemination of appropriate technology for drip irrigation system 	<ul style="list-style-type: none"> ◆ Continuation of animal health improvement and production enhancement programs ◆ Dissemination of both indigenous and exotic breeds to meet market needs through trial basis
	Long-term	<ul style="list-style-type: none"> ◆ Establishment of medium and small-scale farming system ◆ Contribution of food self-sufficiency by semi-commercial farmers (medium-scale farmers) ◆ Livelihood improvement for small-scale farmers 	<ul style="list-style-type: none"> ◆ Continuous technical and institutional development for improving and expanding communal meat industry
Focal Technical measures	Proposed basic, intermediate and advanced technical measures for crop and livestock production and farm management are adopted and disseminated stepwise based on the categorization.		

Subject	Contents
Implementation Structure	<ul style="list-style-type: none"> ◆ Technical measures are disseminated by crating key model farmers in each village. ◆ Technical measures are disseminated through continuous improvement of dissemination system based on periodical monitoring by NCD and regional offices and ATs of MAWF.
Measurable Outputs of the Development Target	Development target is established for crop and livestock production-related indicators such as number of farmers and/or agriculture production.

Source: Prepared by the JICA Team

1.3 Outline of the Survey

Data Collection Survey is outlined below.

Outline of the Survey

Item	Content
Objectives of the Survey	<ul style="list-style-type: none"> ✓ MAWF's implementation process of the Master Plan is to be monitored, in the 1st year after formulation of N-CLIMP. ✓ Through the above monitoring, issues and challenges are to be identified regarding the agricultural extension system in the northern Namibia as well as the practices of technical measures proposed in the Mater Plan. ✓ Data and information is to be analyzed and compiled for preparation of a cooperation scenario to the agriculture sector taking the issues and challenges into account.
Target Area	<ul style="list-style-type: none"> ✓ Four regions under the North Central Division (NCD) of DAPEES: namely, Oshikoto, Oshana, Ohangwena and Omusati.
Relevant Organizations	<ul style="list-style-type: none"> ✓ Central Level: Ministry of Agriculture, Water and Forestry (MAWF) 3 Directorates under MAWF: Directorate of Agricultural Production, Extension and Engineering Services (DAPEES), Directorate of Agricultural Research and Development (DARD) and Directorate of Veterinary Services (DVS) ✓ Relevant division and department: Division Extension & Development of Northern Regions, Agricultural Development Centers, veterinary services offices of subdivisions and agricultural research stations, Meat Board of Namibia, Meat Corporation of Namibia (Meat Co.), Namibia Agronomic Board, AgriBusDeve, Conservation Agriculture of Namibia (CAN), Livestock Marketing Cooperative (LMC)
Survey Team	<ul style="list-style-type: none"> ✓ 2 consultants provided by JICA
Monitoring Period and Activities	<p>9 months from October 2017 to June 2018, including the following survey activities:</p> <ul style="list-style-type: none"> ✓ Preparatory work in Japan in earl October 2017 (preparation of work plan, draft monitoring forms) ✓ 1st Field Work in Namibia during the period of 2 weeks from October 15 to 29, 2017 (1st steering committee meeting, interview and distribution of monitoring form in each region, joint stakeholder meeting (workshop) in Ongwediva, sharing workshop at MAWF) ✓ 1st Home Work from November 2017 to April 2018 (collection of monitoring forms filled by MAWF) ✓ 2nd Field Work in Namibia during the period of 2 weeks from April 6 to 20, 2018 (interview on the progress in each region including visits of some pilot sites, preparation of draft final report, 2nd steering committee meeting) ✓ 2nd Home Work from April - May 2018 (preparation of the final report)

Source: Prepared by the Study Team

CHAPTER 2 MONITORING RESULT

2.1 Monitoring Results

In the N-CLIMP study, total 35 technical measures for crop, livestock and farm management were proposed and 21 were applied to disseminate in the target area of 4 regions through applying the SHEP approach. Basically, the technical measures were studied based on the existing technical experience of MAWF staff, utilizing the information source of “Spotlight on Agriculture” accumulated in DARD, reports and technical guidelines prepared by the projects and programs, information from the research stations, etc. Technical measures are listed in the table below.

List of Technical Measures

Crop production (8 applied from total 9)	Livestock production (8 applied from total 16)	Farm management (5 applied from total 10)
<u>Grains</u> ◆ Fertilizer application (CR-1) ◆ Cropping pattern and crop management (CR-2) ◆ Conservation agriculture (CR-3) ◆ Flood- and drought-adaptive cropping system (CR-4) <u>Horticulture crops</u> ◆ Water source / water harvesting (CR-5) ◆ Water saving cultivation (CR-6) ◆ Crop selection and marketing (CR-7) ◆ Cropping plan and horticulture crop management (CR-8) <u>Management</u> ◆ Establishment of crop production and marketing cooperatives (CR-9)	<u>Feed supply</u> ◆ Fodder production (LS-1) ◆ Range management (LS-2) ◆ Water harvesting and/or construction of water resource facilities for animals (LS-3) ◆ Nutritious feed supply particularly for pig and chicken (LS-4) <u>Production</u> ◆ Disease control (LS-5) ◆ Large and small stock fattening (LS-6) ◆ Periodical production (LS-7) ◆ Expansion of quality meat (LS-8) ◆ Bull scheme (LS-9) ◆ Multiplication of Sanga bull (LS-10) ◆ Goat production (LS-11) ◆ Pig production (LS-12) ◆ Chicken production (LS-13) <u>Marketing</u> ◆ Promotion and strengthening of auction for both large and small stocks (LS-14) ◆ Development of formal market for small stock (LS-15) <u>Management</u> ◆ Establishment and strengthening livestock cooperatives (LS-16)	<u>Individual household financial imprpvement</u> ◆ Household accounting management (FM-1) ◆ Record keeping (farm record) (FM-2) ◆ Business plan (FM-4) <u>Group production improvement</u> ◆ Group formation / group strengthening (FM-5) ◆ Group accounting management (FM-6) ◆ Collective selling / purchasing (FM-8) ◆ Rural finance accessibility improvement (FM-9) ◆ Market information access improvement (FM-10) <u>Group efficient water use</u> ◆ Formulation of water users association (FM-7) <u>Individual and group</u> ◆ Post harvest (FM-3)

Note: Technical measures with “underline” were applied in the pilot sites.

Source: Final Report, Northern Crop and Livestock Development Master Plan Study, quoted by the Study Team,

During the implementation of Master Plan by MAWF, the above technical measures were applied at the sites as shown below.

Selected Constituency (ADC) for Pilot Site Activities

Region	Crop Production (Cereal/Grains)	Crop Production (Horticulture)	Livestock (Cattle)	Livestock (Small Stocks)
Omusati	Etayi	Etunda	Okahao	Tsandi
Oshana	Oshakati-west	Okatana	Uuvudhiya	Uukuwiyu
Oshikoto	Omuthiya	Onayena	Omuntele	Onyaanya King Kauluma*
Ohangwena	Ondobe	Epembe	Okongo	Endola

Note *1: King Kauluma is selected in the Phase-3. Source: Prepared by the Study Team

Since the implementation of Master Plan in 2017/18 is the most expericnve for MAWF without support by JICA, the MAWF Regional Offices selected the same pilot sites as the trial conducted during the N-CLIMP study, particularly for consolidation of the methods and procedure for implementation of Master Plan. The monitoring result of Master Plan implementation is described below.

2.1.1 Crop Production and Related Farm Management

During the implementation of the Master Plan, technical measures were selected according the conditions of the pilot sites and applied in the site activities for increase of production. Based on the information collected in this survey and the experience obtained during the N-CLIMP study, activities both achievements and failures are compiled in Table 2.1 for each technical measure.

All the technical measures for crops were applied in the pilot site activities, except CR-9 since CR-9 is "Establishment of crop production and marketing cooperative" and this is the Category 3 (technical measures to be applied in the long-term period).

In grain crop production (pearl millet / mahangu), ripper furrowing shows the effect to utilize limited rainfall, and farmers understood the effect during the N-CLIMP activities. In this survey, the JICA Team visited two grain sites (Okau kamasheshe in Oshana), and the effects of ripper furrowing were confirmed.

Horticulture essentially requires irrigation and the most popular water source is piped water supply for most farmers in the NCD (except the Etunda Green Scheme as well as the area surrounding the Olshandja dam lake and the Etaka canal). Therefore, drip irrigation is the most efficient and suitable in the NCD. Under N-CLIMP, drip irrigation sets were distributed and effects were observed for some demonstration farmers; however, key farmers has difficulty to install and maintain the drip irrigation sets. Therefore, frequent and intensive trainings might be required to expand horticulture using drip irrigation.

It is commonly observed that farmers require more proper knowledge on the plant growth stages, so that they can modify their crop management by utilizing the farm record under the unstable rainfall condition, for both grains and horticulture crops.

2.1.2 Livestock Production and Related Farm Management

Out of the 16 technical measures proposed by N-CLIMP, 8 measures were applied for the pilot site activities and are expected to bear positive outcomes in a short time of period except "range management (LS-2)". In terms of the remaining 8 technical measures, "promotion and strengthening of auction (LS-14)" and "development of functional market (LS-15)" needs a large investment and strong support by the government, and the activities related to bulls (LS-9 & 10) and improvement of the meat quality (LS-8) take a certain amount of time till actual outputs come out.

Based on the presentations and monitoring reports of the ATs, the major activities in the PILOT SITES are summarized in Table 2.1. The all sites that selected the activities on cattle raising included fodder

production (LS-1), range management (LS-2), disease control (LS-5) and reproduction (LS-7) but no site carried out any actual activity for range management and reproduction. For fodder production fodder seeds were sown in several experimental plots; however, no germination was observed mainly due to water shortage. In addition, vaccination and deworming were applied as disease control measures. The activities such as dehorning, supply of information on nutrition and supplements, and participation in auction are regarded as related to production and castration is more like an activity for quality meat (LS-8) that was not included in the technical measure list of the PILOT SITE.

In the sites applying chicken production (LS-13), vaccination has been carried out for disease control as group activity besides preparation of henhouse, hatchery and mixed feed. In addition, the activities on farm management benefited the chicken marketing, which contributed to income generation for the farmers.

Only one site applied goat production (LS-11) and it hasn't borne certain results as the goat reproduction cycle is much longer than chicken's. Nevertheless, the activities are expected to produce fruitful outcomes in the near future and actually the number of the group members is increasing in Ohangwena.

2.2 Issues Identified in the Master Plan Implementation

2.2.1 Issues on Technical Measures for Crop Production and Related Farm Management

The greatest challenges are “water shortage” and “poor soil fertility” common to crop production for grains and horticulture.

Other challenges on crop protection like diseases, pests and birds are sometimes significant; however, proper countermeasures are not available instantly. These requires coordination among the relevant agencies like crop research stations, Plant Health Division, and agro-chemical suppliers.

Various challenges are being collected: some are from framers and others are from the Agricultural Technicians. Then, some challenges are technical, and others are managerial. Furthermore, these issues have corelated issues with each other, and the measures are not comprehensive to cover all situations.

Taking these situation into account, factor analysis was made to organize the challenges and issues to connect their relations as a trial. The challenges are compiled into the “co-relation diagram” leading to the immediate countermeasures, as shown in Figure 2.1. This is made on the trial basis, and different results could be obtained if similar analysis would be conducted under different situations.

The results show that many challenges are categorized into “limited knowledge / experience on the particular technical items”, and for these challenges, the trainings and experience sharing with diligent farmers are the countermeasures for farmers as illustrated in Table 2.2.

2.2.2 Issues on Technical Measures for Livestock Production and Related Farm Management

The challenges identified through the pilot site activities were summarized in Table 2.2. The challenges were raised by the ATs and do not necessarily correspond to the challenges that farmers are

struggling with in the field. In addition, the issues for the technical measures are separately grouped as "challenges related to implementation management" in the last rows of the table. Those issues are expected to be addressed by the Namibian side, a part of which can be settled by discussion during the course of activities (e.g. "difficulty in training-time management between farmers" and "the demonstration farm is far from the houses of the group members.").

Moreover, even a part of challenges related to the technical measures is not considered in fact as a technical issue. In terms of fodder production (LS-1), sowing fodder seeds is not actually a production technique. A kind of technique that enables growth into fodder in the dry area is needed. In terms of disease control (LS-5), the availability of vaccines is not related to any technique at all. It is doubtful if the ATs have ever had appropriate basic knowledge on animal diseases and preventive measures at all.

Furthermore, the challenge that "the farmers are reluctant to sell cattle", which had been pointed out earlier even before the N-CLIMP commenced, is certainly an issue for the government side and not regarded as the problem of the farmers. Through the interviews with a number of farmers during the detailed planning survey for N-CLIMP in 2013, none of the farmers mentioned that particular challenge. Namely, the countermeasures have to be developed from the point of what motivates the farmers to sell cattle rather than how to force them to sell. Perhaps, a sort of measures like an increase in the number of cattle per farm by improvement of reproductive performance, and improvement of the cattle grading at auctions through improvement of nutritional condition can be preferred. On top of that, it is speculated that the farmers may come to sell the surplus animals (over the number they want to keep) periodically provided they have information on auctions and markets.

2.2.3 Issues on Namibian SHEP Approach and Management of Agricultural Extension

In the N-CLIMP Master Plan implementation, the SHEP approach was incorporated into the project approach to apply the technical measures into the farmer activities by promoting farmer awareness. Namibia has different socio-economic situation and natural condition from Kenya, the original country where SHEP approach was developed. Under this situation, the "Namibian SHEP approach" was devised through modification of the original one, as compared below with steps of the original.

"How to realize it in SHEP?"

Essential 4 steps	Activities in Kenya
1. Selection of targets and sharing vision/goal	Sensitization Workshop Selection of Target District Selection of Target Beneficiaries
2. Farmers' awareness of current situation and new information	Participatory Baseline Survey FABLIST Forum Market Survey
3. Decision making	Crop Selection Action Plan Making
4. Provision of technical solutions	Training for Extension staff Demand driven In-field trainings for farmers

Step & Process	Agricultural Technicians	Demo-Farmers (Representatives)	Key Farmers
1. Selection of targets and sharing goal	• Selection criteria • Selection of ADC	-	-
2. Awareness of current situation	• Technical Measures Option (preparatory training for farmers)	• Challenges and opportunities	-
3. Facilitation of making plan	• AT's support plan: selection of technical measures	• Action plan	-
4. Provision of technical solutions	• Training of trainers (TOT)	• In-field training by ATs	• In-field training by ATs

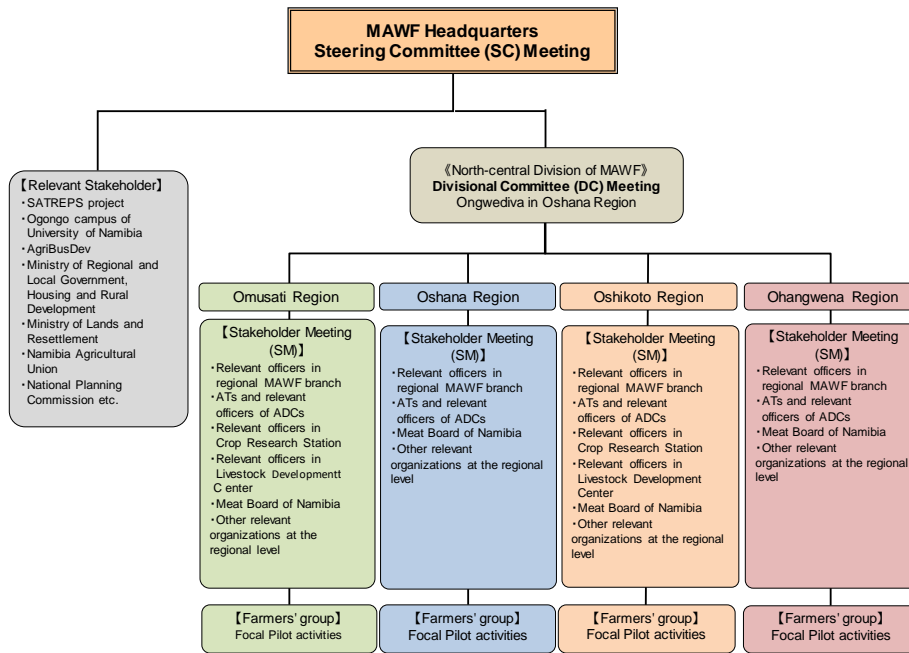
Original SHEP Approach

Namibian SHEP Approach under N-CLIMP

Source: The original SHEP approach is quoted from the SHEP textbook, and the modified Namibian SHEP approach is prepared by JICA Team with the advice from the SHEP expert.

In the modified Namibian SHEP approach, farmers are recommended to be involved in the steps 1 to 3, particularly to raise the farmers awareness as well as prepare their own action plans. In this regard, the Namibian SHEP approach needs to separate the steps for the Agricultural Technicians to prepare and execute their extension plan and other steps for farmers.

Since the implementation process of the Master Plan is involved in the agricultural extension services by Agricultural Technicians, the management of services like monitoring and improvement are important. The organization for implementation of the Master Plan is illustrated in the following figure.



Mater Plan Implementation Organization

Source: Final Report of the Northern Crop and Livestock Development Master Plan (N-CLIMP), 2017, JICA, and modified by the JICA Team.

CHAPTER 3 COUNTERMEASURES TO THE ISSUES IDENTIFIED

MAWF will continue to implement the N-CLIMP Master Plan in 2018/19 and onward, and expand the pilot site activities to the other ADCs and constituencies in the North Central Division. In the process of implementation, MAWF is expected to consider the following countermeasures identified from the survey.

3.1 Countermeasures for Crop Production and Related Farm Management

Technical challenges to implement the Master Plan are listed in the Table 2.2 based on the analysis of the present situation. In order to solve the challenges, each level of stakeholder is advised to carry out the countermeasures indicated in Table 3.1.

The main countermeasure include trainings during field visits to diligent farmers in order for farmers to obtain more knowledge and share experience on market survey, crop management and business for grain production. For horticulture, farmers are recommended to get knowledge and experience on drip irrigation and water sources.

For this purpose, the Agricultural Technicians need to conduct these trainings, field visits to diligent farms (to spread the list of good practices shown in Table 3.2). In conducting these countermeasures, the Agricultural Technicians are recommended to promote farmer awareness of the information and to apply it to their own plots. Then, the regional office and NCD are recommended to support the Agricultural Technicians to provide the information on training, field visits and lists of diligent farmers.

Countermeasures to limited supply of fertilizers and agro-chemicals require budget arrangement of Dryland Crop Production Program or regulation measures in the marketing of agro-chemicals. In these cases, farmers need proper knowledge of how to use fertilizers and agro-chemicals at the field level including ripper furrowing services, tractors, etc.

3.2 Countermeasures for Livestock Production and Related Farm Management

Further to the technical measures listed in the Master Plan, the prospects for future activities are summarized in Table 3.3. The potentials of the technical measures LS-11 to LS-13 are considered highly effective based on the results from the PS activities. Nevertheless, it is recommended to include the measures related to cattle raising since beef production is one of the major industries in the region.

The basics to generate livestock income are to improve the productivity of livestock. The countermeasures in the Master Plan under SHEP approach are listed in Table 3.1. It is necessary to improve the 3 components of the production, (namely, animal health, feeding and reproduction) in order to improve the productivity of livestock. Farm management functions as an interactive technique

over the 3 components.

To implement the technical measures in the field, it is recommended to combine the approaches/activities in the following table. Probably the reproduction activities will be most difficult to carry out among them. This is because artificial insemination is not available in the region and a large budget is necessary for introduction of superior bulls. The causes of the low reproduction rates in the region are still unclear but are suspected to be due to either irregular heat or infertility of cows. The former is thought to result from malnutrition and the latter from infectious diseases. There are some other possible causes such as scarce low opportunity of mating. Accordingly, study to identify the cause unfolding is strongly recommended.

List of possible countermeasures to improve animal productivity

	Challenges	Approaches/Activities	Prospects
Improvement of livestock productivity			
Animal Health	Vaccination (LS-5)	<ul style="list-style-type: none"> ✓ Collection and provision of information on vaccines ✓ Formulation of an appropriate vaccination program ✓ Provision of the information on the diseases that can be prevented by vaccines 	High High High
	Deworming (LS-5)	<ul style="list-style-type: none"> ✓ Provision of information on internal parasites ✓ Collection and provision of information on deworming drugs ✓ Formulation of an appropriate deworming program 	High High High
	Preventive medicine (LS-5)	<ul style="list-style-type: none"> ✓ Provision of information on the prevalent diseases in the north central region ✓ Identification of major remarks and control measures on disease prevention (importance of colostrum feeding, etc.) ✓ Introduction of all-in all-out system (chicken raising) 	High High High
	Treatment (LS-5)	<ul style="list-style-type: none"> ✓ Training on clinical symptoms of sick animals (temperature, pulse, anemia, etc.) ✓ Collection and provision of information on curatives 	High High
Feeding	Range management (LS-2)	<ul style="list-style-type: none"> ✓ Collaboration of the other projects ✓ Identification of good practice (search for diligent farmers) ✓ Range land management in participation with several farmers 	High High Fair
	Fodder Production (LS-1, 6)	<ul style="list-style-type: none"> ✓ Identification of good practice (search for diligent farmers) ✓ Collaboration with the related institutions ✓ Production of fodder (based on the information from the related institutions) 	High High High
	Mixed feed (LS-1, 6)	<ul style="list-style-type: none"> ✓ Identification of good practice (search for diligent farmers) ✓ Collaboration with the related institutions ✓ Lessons learned from good practice (especially chicken production) 	High High High
	Utilization of silage (LS-1, 6)	<ul style="list-style-type: none"> ✓ Identification of good practice (search for diligent farmers) ✓ Collaboration with the related institutions ✓ Search for the materials that can be utilized as feed (fruits, residuals of crops and vegetables, etc.) 	High High High Fair

	Challenges	Approaches/Activities	Prospects
		✓ Silage Production	
Reproduction	Improvement of reproduction rate (LS-7)	✓ Study on the current conditions (reproductive performance, nutrition, etc.) ✓ Heat induction using hormone drugs ✓ Prevention of abortions ✓ Improvement of nutrition (as a result of feeding improvement) ✓ Supplement of micro-minerals	High Fair Fair High Fair
	Breed improvement (LS-9, 10)	✓ Introduction of superior bulls ✓ Utilization of artificial insemination	Fair Low
Livestock Production			
	Goat, pig & chicken production (LS-11, 12 & 13)	✓ Identification of good practice (search for diligent farmers) ✓ Provision of information on animal shed ✓ Provision of information on goat raising	High High High

Source: Prepared by the JICA Team

Probably, the most effective and efficient approach is to spot the diligent farmers with good practice (examples listed in Table 3.2 Good Practices) and disseminate the skills to other farmers. For feeding, it is recommended to collect the information on the feedstuffs appropriate for the local conditions from the domestic institutions and follow their instructions. The resource persons on the approaches listed in the above table can be found domestically, however, they are unlikely able to support the field application of the approaches due to time limitation and transport cost. The development partners do not necessarily need to handle "the challenges related to implementation management" listed in Table 3.4; nevertheless, the partners are expected to support the technical part of the countermeasures effective for achievement of the MP Goal. Once the skills become popular in the region through the MP activities under SHEP approaches, they will extend to the other regions.

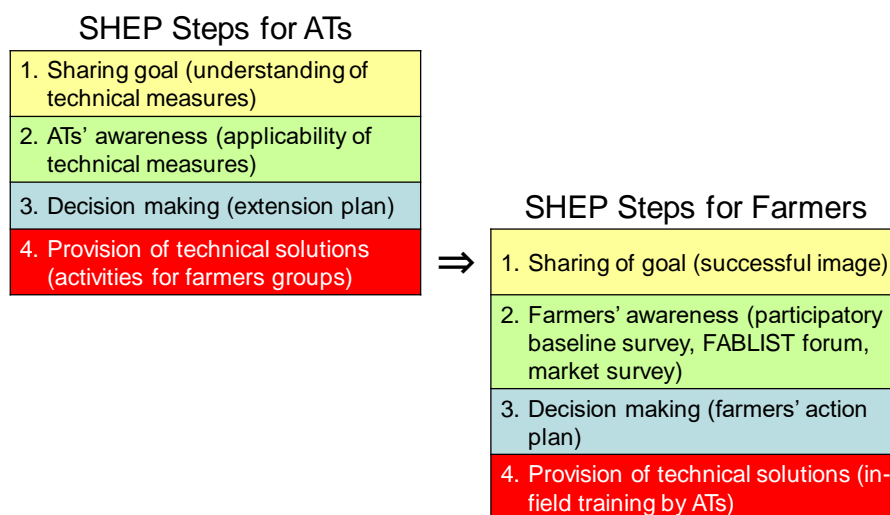
3.3 Namibian SHEP Approach and Management of Agricultural Extension

Modification of the SHEP Approach

As mentioned in the previous section "2.2.2 Issues on Namibian SHEP Approach", the Agricultural Technicians take all the 4 steps but farmers do not take some essential steps under N-CLIMP. Referring the original SHEP Approach, it is necessary to modify the steps in the Namibian SHEP Approach taking into account the following points:

- Farmers are the main actor in the SHEP approach and they need to take all the 4 steps.
- In the present approach, steps are mixed for Agricultural Technicians and farmers, and need to divide the steps separately.
- In the original approach which involves no steps are for the agricultural extension staff, and in the Namibian approach the steps for the Agricultural Technicians are contribute to their extension work. In this regard, steps for the Agricultural Technicians may require more clear definitions.

Tanking the above into account, the steps in the Namibian SHEP Approach are modified, as an example, by diving the steps for the Agricultural Technicians (ATs) and Farmers separately, as shown below.



Example of Modified Steps in the Namibian SHEP Approach

Source: Modified steps of the Namibian SHEP approach is prepared by JICA Team based on the advice from the SHEP expert.

MAWF may modify the present steps based on the above examples according to the situation surrounding them, and may also request JICA to provide advice on the modification.

MAWF SHEP Team

The following is the member list of the MAWF SHEP Team consisting of: 4 members in MAWF Windhoek, 1 in North Central Division, and 5 at regional offices.

Name	Position	Training Course attended
MAWF Windhoek		
Ms. Johanna F. N. Andowa	Director, DARD	Japan and Kenya (2015)
Mrs. Paulina Shilunga	ASO DAPEES	Japan and Kenya (2014)
Dr. Albertina Shilongo	Deputy Chief Veterinary Officer, DVS	Japan and Kenya (2016)
Ms. Margaret Matengu	Deputy Director, Plant Health, DAPEES	Japan and Kenya (2017)
MAWF Regions		
Mr. Martin Embundile	CASO Omusati Region DAPEES	Japan and Kenya (2014)
Ms. Vicky Ipinge	Acting CASO, Oshana Region DAPEES	Japan and Kenya (2015)
Mr. Oswald Manyuangapo	CASO Oshikoto Region DAPEES	South Africa (2017)
Ms. Loide P. Endjala	CAT Oshana Region DAPEES	Japan and Kenya (2016)
Mrs. Lucia NAUNYANGO	AT Omusati Region DAPEES	South Africa (2016)
Ms. Enny Namalambo	Deputy Director, NCD, DAPEES	Japan and Kenya (2017)

Namibian SHEP Team

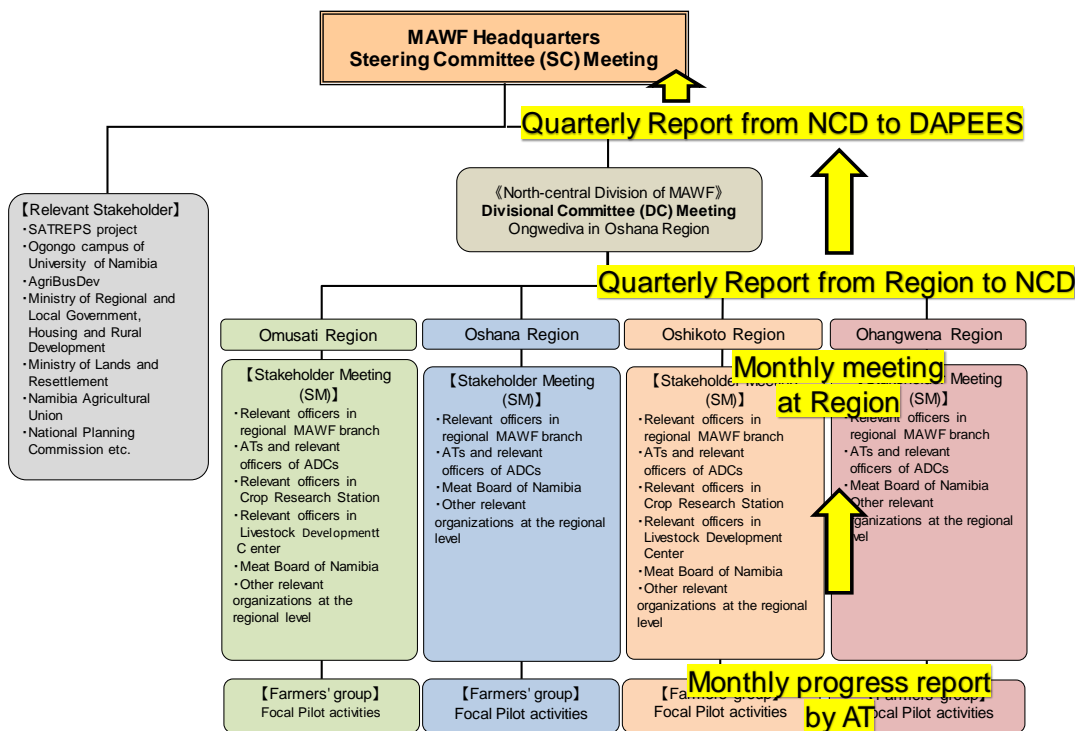
Source: prepared by JICA Team.

Since the SHEP Approach is the new concept of agricultural extension procedure in Namibia, the Agricultural Technicians are recommended to be support the obtaining knowledge and experience on the SHEP Approach. In this regard, the MAWF SHEP Team plays quite important role and, their activities are expected to expand.

The SHEP Trainings and Seminars are likely to continue on regular basis under JICA. MAWF may get some seats for the opportunity to send the staff, and MAWF will reinforce the activities under the SHEP by increasing the members of the SHEP Team. For sending staff from MAWF, it is important to consider the staffing balance at the regional level, particularly Oshikoto and Ohangwena regions.

Management of Master Plan

The N-CLIMP Master Plan will be implemented though the existing MAWF agricultural extension activities, which consists of 3 tiers: central, division and region. Agricultural Development Centers (ADCs) are mostly located at the constituency level, and the Agricultural Technicians will manage the ADC and carry out the agricultural extension activities. They are working and monitored under the regional office, and the Master Plan. Monitoring mechanism in implementation is illustrated below.



Monitoring Mechanism along the MAWF DAPEES Line

Source: prepared by JICA Team, through modification of the Master Plan Implementation Organization, Final Report of the N-CLIMP Northern Crop and Livestock Development Master Plan Study, June 2017 JICA.

Under the implementation in 2017/18, the monthly monitoring report form was devised and collected under the initiative of the SHEP Team through the region office. In the monthly regular meeting at the region office, activities are monitored. However, it was discussed that the monthly regular meeting (1 day) is not enough to monitor the implementation since many topics are discussed

in the meeting. This matter will be attended by the MAWF SHEP Team and the region offices to seek a suitable solution to the situation.

Challenges to manage the Master Plan implementation are mostly administrative matters like transportation, number of Agricultural Technicians, budget, etc. and these are within the arrangement by MAWF. Such new project like NAMSIP (Namibia Agricultural Mechanization and Seed Improvement Project by the support from African Development Bank) will contribute to transportation at the region and ADC level. Under such situation, MAWF may continue to implement the N-CLIMP Master Plan linking with the programs to extend its effects to farmers.

Tables

Table 2.1 Operational Situation of the Master Plan (1/2)

Technical Measures	Activities Achieved	Activities not Performed
Crop (grains)		
CR-1 Fertilizer application	<ul style="list-style-type: none"> • Basal manure application • Top dressing of fertilizer supplied by DCPD 	<ul style="list-style-type: none"> • Short supply of manure • Top dressing according to the rainfall situation
CR-2 Cropping pattern and crop management	<ul style="list-style-type: none"> • Preparation of cropping plan (some farmers) • Thinning at initial growth stages • Sales of surplus to open markets and AMTA 	<ul style="list-style-type: none"> • Excessively high planting density against the rainfall situation • Crop management according to the growing stage (thinning, top dressing, weeding) • Pest and disease control • Market survey on mahangu
CR-3 Conservation agriculture	<ul style="list-style-type: none"> • Application of ripper furrowing • Inter-cropping with legumes 	<ul style="list-style-type: none"> • Arrangement of ripper furrowing services (sometime) • Crop rotation with fallowing • Mulching
CR-4 Rice mahangu mixed cropping system	<ul style="list-style-type: none"> • Application of ripper furrowing • Transplanting of rice seedling (some farmers) 	<ul style="list-style-type: none"> • Procurement of rice seeds by farmers • Selection of suitable seasonal wetland • Market survey on rice
Crop (horticulture)		
CR-5 Water source / water harvesting	<ul style="list-style-type: none"> • Supply of materials to repair roof catchment • Operation of rainwater catchment 	<ul style="list-style-type: none"> • Complete repairing of roof catchment • Maintenance of roof catchment
CR-6 Water saving cultivation	<ul style="list-style-type: none"> • Supply of drip irrigation sets/kits and their installation • Replacement of existing drip irrigation sets 	<ul style="list-style-type: none"> • Installation of drip irrigation sets/kits • Operation and maintenance of drip irrigation • Procurement of drip irrigation sets by farmers
CR-7 Crop selection and marketing	<ul style="list-style-type: none"> • Crop selection according to market survey • Sales at markets 	<ul style="list-style-type: none"> • Regular market survey
CR-8 Cropping plan and horticulture crop management	<ul style="list-style-type: none"> • Preparation of cropping plan based on the market survey • Field preparation 	<ul style="list-style-type: none"> • Crop management according to crop growing stage • Plant protection, pest and disease management • Mulching due to lack of materials
Farm management (crop)		
FM-2 Record keeping	<ul style="list-style-type: none"> • Farming records on crop management on the notebooks distributed under N-CLIMP 	<ul style="list-style-type: none"> • Modification of cropping plan based on the records • Recording of cost, and calculation of income balance
FM-5 Group formation / group strengthening (3 sites only)	<ul style="list-style-type: none"> • Group management (2 sites) • Increase of members (1 site) 	<ul style="list-style-type: none"> • Increase of absenteeism (1 site) • Low activity (1 site)
FM-6 Group accounting management (3 sites only)	<ul style="list-style-type: none"> • Accounting record of the group 	<ul style="list-style-type: none"> • Payment of water charge
FM-7 Collective sales / collective purchasing	<ul style="list-style-type: none"> • No application to crop production 	<ul style="list-style-type: none"> • No application to crop production

Table 2.1 Operational Situation of the Master Plan (2/2)

Technical Measures	Activities Achieved	Activities not Performed
FM-10 Market information access improvement	<ul style="list-style-type: none"> Market survey at the horticulture sites, then selection of crops and preparation of cropping calendar 	<ul style="list-style-type: none"> Regular market survey
Livestock Production		
LS-1 Fodder production	<ul style="list-style-type: none"> No success though production was experimented. 	<ul style="list-style-type: none"> Collection of information on feedstuffs besides grass and hay, and its application
LS-2 Range management	<ul style="list-style-type: none"> No application (only discussion was made) 	<ul style="list-style-type: none"> Difficult without a leadership of the government
LS-4 Nutritious feed supply	<ul style="list-style-type: none"> Applied at a part of the farms 	<ul style="list-style-type: none"> Nothing particular (need to purchase)
LS-5 Disease control	<ul style="list-style-type: none"> Vaccination Application of deworming drugs 	<ul style="list-style-type: none"> Extension of basic information on diseases, disease prevention and treatment Formulation and implementation of vaccination program
LS-6 Large and small stock fattening	<ul style="list-style-type: none"> Any activity specific to fattening was not applied. 	<ul style="list-style-type: none"> Formulation and implementation of deworming program Fattening program combined with fodder production
LS-7 Periodical production	<ul style="list-style-type: none"> No application in cattle 	<ul style="list-style-type: none"> Improvement of reproductive performance through improvement of nutrition and health
LS-11 Goat production	<ul style="list-style-type: none"> Vaccination Application of deworming drugs 	<ul style="list-style-type: none"> Improvement of reproductive performance
LS13 Chicken production	<ul style="list-style-type: none"> Launch of chicken raising Preparation of henhouse Preparation of hatchery Vaccination Production of mixed feed 	<ul style="list-style-type: none"> Introduction of all-in all-out system Identification of challenges and study on countermeasures Implementation of the countermeasures .
Farm Management (Livestock Production)		
FM-2 Record keeping	<ul style="list-style-type: none"> Implementation of trainings on record keeping 	<ul style="list-style-type: none"> Formulation of farm management programs utilizing the records
FM-5 Group formation	<ul style="list-style-type: none"> Applied for chicken raising farmers 	<ul style="list-style-type: none"> Necessary for cattle raising farmers as well
FM-6 Group accounting management	<ul style="list-style-type: none"> Applied for chicken raising farmers Open an group account 	<ul style="list-style-type: none"> Further extension and strengthening are necessary.
FM-8 Collective selling / purchasing	<ul style="list-style-type: none"> Collective purchasing of vaccines for chicken Collective selling of chicken and chicks 	<ul style="list-style-type: none"> Collective purchasing can be applied for deworming drugs, concentrates, etc. Further extension and strengthening are necessary.
FM-10 Market information access improvement	<ul style="list-style-type: none"> Implementation of market survey 	<ul style="list-style-type: none"> Collect information on curatives, vaccines, fodder seeds, feedstuffs as well Strengthening of information gathering especially on small animals as there's no formal market.

Table 2.2 Challenges through Factor Analysis (1)

Technical Measures	Current Conditions	Factor Analysis	Challenges
Crop: Grain			
CR-1 Fertilizer application	✓ Poor soil fertility	✓ Application manure and fertilizer	✓ Limited supply of manure and fertilizer
CR-2 Cropping pattern and crop management			✓ Limited knowledge / experience on crop management (fertilizer application)
CR-3 Conservation agriculture	✓ Water shortage	✓ Application of ripper furrowing for efficient use of limited rainfall	✓ Proper use of ripper furrowing
CR-4 Rice-mahangu mixed cropping system			✓ Short of tractor services (broken not repaired)
FM-1 Household account management			✓ Late arrangement of services
FM-2 Record keeping	✓ Damages by diseases, insects, rats and snakes	✓ Proper knowledge required for crop protection	✓ Limited knowledge / experience on crop management
FM-3 Post harvest			✓ Limited supply of agro-chemicals
FM-4 Business plan	✓ Shortage of rice seedlings	✓ Limited supply from UNAM	✓ Limited coordination with UNAN
FM-5 Group formation / strengthening			
FM-9 Rural finance access	✓ No funds to purchase fertilizer / Lack of land preparation tools / Shortage of fencing materials / Shortage of grain storage	✓ Limited fund for farming ✓ Expectation from the government	✓ Low access to rural finance
FM-10 Market information access			✓ Limited knowledge / experience on business
	✓ No transportation to market		
	✓ Lack of market information	✓ -	✓ Limited knowledge / experience on market survey
Agricultural Extension Management	✓ Demo plots far from key farmers ✓ Absenteeism	✓	✓ No / low demonstration effect
Crop: Horticulture			
CR-5 Water source / water harvesting	✓ High cost of drip irrigation ✓ Poor maintenance of drip irrigation system	✓ Cost well compensated by proper operation ✓ Proper maintenance essential for drip irrigation ✓ Proper knowledge required	✓ Limited knowledge / experience on drip irrigation (procurement, maintenance)
CR-6 Water saving cultivation			
CR-7 Crop selection and marketing	✓ Incomplete irrigation kits		
CR-8 Cropping plan and horticulture crop management	✓ Greenhouse damaged	✓ Proper maintenance and periodical renewal essential	✓ Limited knowledge / experience on roof catchment
	✓ Lack of water due to wrong connection of in-let pipe	✓ Arrangement of technician	✓
FM-1 Household account management	✓ No production	✓ -	✓ Limited knowledge / experience on horticulture crop management
FM-2 Record keeping	✓ Water shortage / no access to water (connection to tap) ✓ Inability to buy container, seeds, etc.	✓ Limited fund for farming ✓ Expectation from the government	✓ Low access to rural finance
FM-4 Business plan			✓ Limited knowledge / experience on business
FM-5 Group formation / strengthening	✓ Lack and shortage of fencing materials		
FM-9 Rural finance access			
FM-10 Market information access	✓ Low participation to market survey	✓ -	✓ Limited knowledge / experience on business
Agricultural Extension Management	✓ No AT	✓ Pilot projects to be supported by ATs ✓ Demonstration effects	✓ Pilot project not implemented smoothly ✓ No / low demonstration effect
	✓ No transportation for AT	✓	✓ Limited budget and allocation
Crop production and sales			
CR-9 Crop cooperatives	No application in pilot sites	✓ -	✓ -

Table 2.2 Challenges through Factor Analysis (2)

Technical Measures	Current Conditions	Factor Analysis	Challenges
Livestock: Feed supply			
LS-1 Fodder production	<ul style="list-style-type: none"> ✓ Insufficient water ✓ No germination ✓ Difficult to procure grass seeds 	<ul style="list-style-type: none"> ✓ The rainy season came late. ✓ Seed supply is scarce. 	<ul style="list-style-type: none"> ✓ The information on fodder production is not sufficient. ✓ The information on feedstuffs such as residues of agriculture products is little.
LS-2 Range management	<ul style="list-style-type: none"> ✓ Water in the range land is not sufficient ✓ Deterioration of the range land due to over grazing ✓ Range land management is difficult 	<ul style="list-style-type: none"> ✓ Strong intervention and leadership by the government is necessary. 	<ul style="list-style-type: none"> ✓ Formulation of the regulations on rangeland management ✓ Allocation of caretakers
LS-3 Water resource facilities	No application in pilot sites	<ul style="list-style-type: none"> ✓ Strong intervention and leadership by the government is necessary. 	<ul style="list-style-type: none"> ✓ Infrastructure for harvesting water and water resources has to be provided.
LS-4 Nutritious feed supply	No application in pilot sites	<ul style="list-style-type: none"> ✓ Supply of concentrates is not regarded as technical measure 	<ul style="list-style-type: none"> ✓ Supply of concentrates is a farmer's personal matter
Livestock: Production			
LS-5 Disease Control	<ul style="list-style-type: none"> ✓ A lot of disease especially parasites ✓ Available vaccines are few 	<ul style="list-style-type: none"> ✓ Poor collaboration with DVS ✓ Insufficient basic knowledge of the ATs ✓ Preventive measures were belittled. 	<ul style="list-style-type: none"> ✓ ATs' and farmers' knowledge on animal health is not sufficient (disease, treatment and prevention) ✓ Difficult to collaborate with DVS due to under staffing
LS-6 Stock fattening	(No particular report)	<ul style="list-style-type: none"> ✓ Closely related with feed and health 	<ul style="list-style-type: none"> ✓ Improvement of nutrition and health is necessary.
LS-7 Periodical production	<ul style="list-style-type: none"> ✓ The reproduction rates are low. ✓ Farmers are reluctant to sell cattle. ✓ Buyers are few. 	<ul style="list-style-type: none"> ✓ The cause of the low rates is unknown. (Nutrition or disease?) ✓ The cause of the farmers' attitude is not studied. 	<ul style="list-style-type: none"> ✓ The number of rearing cattle does not increase due to poor reproductive performance. ✓ Milk yield is low due to scarce calving
LS-8 Quality meat	No application in pilot sites	<ul style="list-style-type: none"> ✓ Closely related with feed and health 	<ul style="list-style-type: none"> ✓ The grading at auctions is low.
LS-9 Bull scheme	No application in pilot sites	<ul style="list-style-type: none"> ✓ The scheme is unknown. 	<ul style="list-style-type: none"> ✓
LS-10 Sanga bull	No application in pilot sites	<ul style="list-style-type: none"> ✓ The scheme is unknown. 	<ul style="list-style-type: none"> ✓
LS-11 Goat Production	<ul style="list-style-type: none"> ✓ Abortion is frequent 	<ul style="list-style-type: none"> ✓ Closely related with feed and health 	<ul style="list-style-type: none"> ✓ Reproduction programs are necessary (Heat induction by hormone drugs, etc.).
LS-12 Pig Production	No application in pilot sites	<ul style="list-style-type: none"> ✓ Is there any need? 	<ul style="list-style-type: none"> ✓ Is pig raising needed?
LS-13 Chicken Production	<ul style="list-style-type: none"> ✓ Damage caused by rats and snakes ✓ The design of henhouse was not appropriate. ✓ The market price is low. 	<ul style="list-style-type: none"> ✓ Study (information) was not sufficient. 	<ul style="list-style-type: none"> ✓ Collection of optimal information on chicken raising ✓ Introduction of preventive measures for losses
Livestock: Marketing			
LS-14 Auction for stocks	<ul style="list-style-type: none"> ✓ Only auction is held (There's no market) 	<ul style="list-style-type: none"> ✓ Strong intervention and leadership by the government is necessary. 	<ul style="list-style-type: none"> ✓ Infrastructure has to be improved
LS-15 Formal market	<ul style="list-style-type: none"> ✓ Paucity of formal market 		
Livestock: Management			
LS-16 Livestock cooperatives	No application in pilot sites	<ul style="list-style-type: none"> Strong leadership by the government is necessary. 	<ul style="list-style-type: none"> ✓ Regulations and policy support are necessary.

Table 3.1 Level-wise countermeasures to the challenges identified (1)

CR-1: Fertilizer application

Challenges	• Limited supply of fertilizer
MAWF	• Budget arrangement for DCPD
NCD Office	• (not applicable)
Regional Office	• (not applicable)
AT in charge	• (not applicable)
Target Farmers	• (not applicable)

CR-2: Cropping pattern and management

Challenges	• Limited supply of agro-chemicals
MAWF	• Acceleration of private supply
NCD Office	• (not applicable)
Regional Office	• (not applicable)
AT in charge	• (not applicable)
Target Farmers	• (not applicable)

CR-1: Fertilizer application, CR-2: Cropping pattern and management, CR-3: Conservation agriculture, CR-4: Rice-mahangu mixed cropping system, CR-5: Water source / harvest, CR-6: Water saving cultivation, CR-7: Crop selection and marketing, CR-8: Cropping plan and horticultural crop management
 FM-1: Household accounting management, FM-2: Record keeping, FM-4: Business plan, FM-5: Group formation / strengthening, FM-6 Group accounting management, FM-9: Rural finance access improvement, FM-10: Market information access improvement

Challenges	• Limited knowledge / experience on crop management (fertilizer application, proper use of ripper furrowing, damages by disease/pest/birds/snakes, business, market survey, low access to rural finance, drip irrigation, roof catchment, horticulture crop management)
MAWF	• Coordination with stakeholders like DARD, AGRIBUSDEVE, NAB, AMTA, etc.
NCD Office	• Coordination with stakeholders like DARD, AGRIBUSDEVE, NAB, AMTA, etc.
Regional Office	• Support of ATs
AT in charge	• Carrying out of trainings / field days to invite farmers • Listing of diligent farmers
Target Farmers	• Participation of trainings and field days, visits to diligent farmers

CR-3: Conservation agriculture

Challenges	• Short of tractor services for ripper furrowing
MAWF	• Arrangement of budget to increase and repair equipment
NCD Office	• (not applicable)
Regional Office	• Searching for private service provider
AT in charge	• (not applicable)
Target Farmers	• (not applicable)

CR-3 (grains): Conservation Agriculture, CR-4: Rice-mahangu mixed cropping system

Challenges	• Late arrangement of ripper furrowing services • Limited coordination with UNAM for rice seedlings
MAWF	• (not applicable)
NCD Office	• (not applicable)
Regional Office	• Monitoring of ATs action
AT in charge	• Early arrangement of tractor services • Contact with UNAM
Target Farmers	• Preparation of cropping plan, and request for services (DCPD)

Table 3.1 Level-wise countermeasures to the challenges identified (2)

[Livestock Production]

LS-1 (Feed supply): Fodder production

Challenges	<ul style="list-style-type: none"> ✓ The information on fodder production in Namibia is not sufficient. ✓ The information on feedstuffs such as residues of agriculture products is little.
MAWF	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
NCD Office	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
Regional Office	<ul style="list-style-type: none"> • Collaboration with the related institutions • Capacity development of ATs on animal feed
AT in charge	<ul style="list-style-type: none"> • Identification of good practice, Collection and extension of the information on feedstuffs
Target Farmers	<ul style="list-style-type: none"> • Feed production

LS-2 (Feed supply): Range management

Challenges	<ul style="list-style-type: none"> ✓ Formulation of the regulations on rangeland management ✓ Allocation of caretakers
MAWF	<ul style="list-style-type: none"> • Formulation of the regulations on rangeland management
NCD Office	<ul style="list-style-type: none"> • Allocation of caretakers
Regional Office	<ul style="list-style-type: none"> • Extension of the regulations on rangeland management
AT in charge	<ul style="list-style-type: none"> • Extension and guidance of the regulations on rangeland use
Target Farmers	<ul style="list-style-type: none"> • Compliance with the regulations

LS-4 (Feed supply): Nutritious feed supply particularly for pig and chicken

Challenges	<ul style="list-style-type: none"> ✓ Supply of concentrates is a farmer's personal matter
MAWF	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
NCD Office	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
Regional Office	<ul style="list-style-type: none"> • Collection of the information on concentrates and other feedstuffs
AT in charge	<ul style="list-style-type: none"> • Extension of the information on concentrates and other feedstuffs
Target Farmers	<ul style="list-style-type: none"> • Improvement of the feed for fattening

LS-5 (Production): Disease control

Challenges	<ul style="list-style-type: none"> ✓ ATs' and farmers' knowledge on animal health is not sufficient (disease, treatment and prevention) ✓ Difficult to collaborate with DVS due to under staffing
MAWF	<ul style="list-style-type: none"> • Improvement of disease control program, Strengthening of DVS function
NCD Office	<ul style="list-style-type: none"> • Implementation of disease control program, Strengthening of collaboration with DVS • Formulation of countermeasures to the issues in the field
Regional Office	<ul style="list-style-type: none"> • Collection of information (vaccines, medicines, preventive measures, farmers' issues, etc.) • Capacity development of the ATs (basic techniques and knowledge on animal health)
AT in charge	<ul style="list-style-type: none"> • Study on the farmers' issues and identification of good practice • Dissemination of the countermeasures to the issues
Target Farmers	<ul style="list-style-type: none"> • Application of disease preventive measures and good practice • Application of deworming and vaccination programs

LS-6 (Production): Large and small stock fattening

Challenges	<ul style="list-style-type: none"> ✓ Improvement of nutrition and health is necessary.
MAWF	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)
NCD Office	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)
Regional Office	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)
AT in charge	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)
Target Farmers	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)

Table 3.1 Level-wise countermeasures to the challenges identified (3)

LS-7 (Production): Periodical production

Challenges	<ul style="list-style-type: none"> ✓ The number of rearing cattle does not increase due to poor reproductive performance ✓ Milk yield is low due to scarce calving
MAWF	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
NCD Office	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
Regional Office	<ul style="list-style-type: none"> • Study on the current conditions (the causes that farmers are unwilling to sell cattle, reproductive performances, nutritious conditions, etc.) • Study on the countermeasures to the above causes
AT in charge	<ul style="list-style-type: none"> • Extension of the countermeasures to the causes, low reproduction rates and poor nutrition
Target Farmers	<ul style="list-style-type: none"> • Implementation of the above countermeasures

LS-8 (Production): Expansion of quality meat

Challenges	<ul style="list-style-type: none"> ✓ The grading at the auctions is low.
MAWF	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
NCD Office	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
Regional Office	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)
AT in charge	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)
Target Farmers	<ul style="list-style-type: none"> • (Following the countermeasures for LS-1 and LS-5)

LS-11 (Production): Goat production

Challenges	<ul style="list-style-type: none"> ✓ Reproduction programs are necessary (e.g. Heat induction utilizing hormone drugs)
MAWF	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
NCD Office	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
Regional Office	<ul style="list-style-type: none"> • Identification of good practice, formulation of reproduction programs based on market needs • Capacity development of ATs (basic techniques and knowledge on goat raising)
AT in charge	<ul style="list-style-type: none"> • Extension of techniques and knowledge on goat raising (referring to the information of LS-1 and LS-5)
Target Farmers	<ul style="list-style-type: none"> • Initiate goat-raising or improve the relevant techniques

LS-13 (Production): Chicken production

Challenges	<ul style="list-style-type: none"> ✓ The appropriate information on chicken raising is needed. ✓ Introduction of preventive measures to losses
MAWF	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
NCD Office	<ul style="list-style-type: none"> • (Unnecessary to be concerned)
Regional Office	<ul style="list-style-type: none"> • Identification of good practice • Capacity development of ATs (basic techniques and knowledge on chicken raising)
AT in charge	<ul style="list-style-type: none"> • Extension of techniques and knowledge on chicken raising (referring to the information of LS-1 and LS-5)
Target Farmers	<ul style="list-style-type: none"> • Application of preventive measures on health (e.g. All-in all-out method, supplement of anticoccidial drugs to feed) • Initiate chicken-raising or improve the relevant techniques (including henhouses)

LS-16 (Management): Establishment and strengthening of livestock cooperatives

Challenges	<ul style="list-style-type: none"> ✓ Legislation and support by the government are necessary
MAWF	<ul style="list-style-type: none"> • Policy making on livestock cooperatives
NCD Office	<ul style="list-style-type: none"> • Take Supporting measures based on the policy
Regional Office	<ul style="list-style-type: none"> • Take Supporting measures based on the policy
AT in charge	<ul style="list-style-type: none"> • Facilitate farmers to form groups
Target Farmers	<ul style="list-style-type: none"> • Initiate farmers' group formation followed by cooperative establishment

Table 3.2 Good Practice

Technical Measure	Place	Good Practice
CR-1 Fertilizer application	<ul style="list-style-type: none"> Okashana, Oshikoto Okau kamasheshe, Oshana 	<ul style="list-style-type: none"> Top dressing of compound fertilizer
CR-2 Cropping pattern and crop management	<ul style="list-style-type: none"> Okashana, Oshikoto Okau kamasheshe, Oshana 	<ul style="list-style-type: none"> Crop management like thinning
CR-3 Conservation Agriculture (Ripper Furrowing)	<ul style="list-style-type: none"> Etayi Omusati Okashana, Oshikoto Okau kamasheshe, Oshana 	<ul style="list-style-type: none"> Ripper Furrowing の実践
CR-4 Rice mahangu mixed cropping system	<ul style="list-style-type: none"> Omusati 	<ul style="list-style-type: none"> Using water from canal, and applying better crop management
CR-5 Water source / water harvesting	<ul style="list-style-type: none"> Etunda, Omusati 	<ul style="list-style-type: none"> Operation under green scheme
CR-6 Water saving cultivation	<ul style="list-style-type: none"> Onayena, Oshikoto Etunda & Olushadja, Omusati 	<ul style="list-style-type: none"> Drip irrigation
CR-7 Crop selection and marketing FM-10 Market information access	<ul style="list-style-type: none"> Onayena, Oshikoto Etunda, Omusati 	<ul style="list-style-type: none"> Market survey, crop selection and cropping calendar
CR-8 Cropping plan and horticulture crop management	<ul style="list-style-type: none"> Onayena, Oshikoto Etunda, Omusati (service provider) 	<ul style="list-style-type: none"> Better management
FM-2 Record keeping (crop)	<ul style="list-style-type: none"> Onayena, Oshikoto Okashana, Oshikoto Okashana, Oshikoto Ondone Ohangwena 	<ul style="list-style-type: none"> Hort. crop management, inputs, water expense, and sales records Grain crop management
FM-5 Group formation / strengthening	<ul style="list-style-type: none"> Ondobe, Ohangwena 	<ul style="list-style-type: none"> Good leadership and collaboration of members
LS-7 Periodical production	<ul style="list-style-type: none"> Omusati, Oshikoto 	<ul style="list-style-type: none"> A farmer became to sell cattle at the age of 3-4 years old based on the information that the price of 3-4 year-old cattle is high.
LS-15 Chicken production	<ul style="list-style-type: none"> Uukuwiyu Uushona, Oshana Onankali, Oshikoto 	<ul style="list-style-type: none"> The group became able to produce chicks by establishing a hatchery.
LS-15 Chicken production LS-5 Disease control FM-5 Group formation FM-8 Collective purchasing	<ul style="list-style-type: none"> Uukuwiyu Uushona, Oshana Tsandi, Omusati 	<ul style="list-style-type: none"> ND Vaccine was purchased through the group as it has large doses and vaccination carried out.
LS-15 Chicken production LS-1 Fodder production	<ul style="list-style-type: none"> Onankali, Oshikoto, 	<ul style="list-style-type: none"> Chicken feed was prepared by mixing locally available feedstuffs.
LS-15 Chicken production FM-2 Book keeping	<ul style="list-style-type: none"> Tsandi, Omusati Onankali, Oshikoto 	<ul style="list-style-type: none"> A recording system was introduced based on the farm management seminar.
LS-15 Chicken production FM-6 Group accounting Management	<ul style="list-style-type: none"> Onankali, Oshikoto 	<ul style="list-style-type: none"> A group account was opened.

Source prepared by the JICA Team

Table 3.3 Prospects of the Technical Measures for Future Activities

No.	Technical Measure	N-CLIMP Category	Verification by N-CLIMP	Perspective		Note
				Fitness	Government Involvement	
CR-1	Fertilizer Application	1, 2 - 3	High	(High)	Yes	MAWF support like DCP, CA
CR-2	Cropping pattern & crop manage.	1, 2 - 3	High	(High)	Yes	MAWF support like DCP, CA
CR-3	Conservation agriculture	1, 2 - 3	High	(High)	Yes	MAWF support like CA
CR-4	Rice mahangu mixed cropping	1, 2 - 3	Low	Low	Yes	Support by UNAM 援
CR-5	Water source / water harvesting	1, 2 - 3	Fair	Fair	Yes	Relatively large investment
CR-6	Water saving cultivation	1, 2 - 3	High	(High)	Yes	Farm level activity
CR-7	Crop selection and marketing	1, 2 - 3	Fair	(High)	No	Farm level activity
CR-8	Cropping plan and horticultural crop management	1, 2 - 3	Fair	(High)	Yes	Support by MAWF program
CR-9	Crop cooperatives	3	-	(Low)	Yes	Support by policy needed
LS-1	Fodder production	1	Low	High	No	Information necessary
LS-2	Range management	1, 2 - 3	-	Low	Yes	MAWF leadership needed
LS-3	Water resource facilities	2	-	Fair	Yes	MAWF leadership needed
LS-4	Nutritious feed supply	1	Fair	Fair	No	Farm level activity
LS-5	Disease control	1	Fair	High	Yes	Support Farmer's activity
LS-6	Large and small stock fattening	1	Fair	High	No	Farm level activity
LS-7	Periodical production	1	Low	High	No	Improve reproduction rate
LS-8	Expansion of quality meat	2-3	-	Fair	No	Farm level activity
LS-9	Bull scheme	2-3	-	Low	Yes	MAWF leadership needed
LS-10	Multiplication of Sanga bull	2-3	-	Low	Yes	MAWF leadership needed
LS-11	Goat production	1	Fair	High	No	Farm level activity
LS-12	Pig production	2	-	High	No	Farm level activity
LS-13	Chicken production	1	High	High	No	Farm level activity
LS-14	Auction for large & small stocks	2	-	Low	Yes	MAWF leadership needed
LS-15	Development of formal market	2	-	Low	Yes	MAWF leadership needed
LS-16	Livestock cooperatives	2-3	-	Low	Yes	Support by policy needed
FM-1	Household account management	2	-	(High)	No	Farm level activity
FM-2	Record keeping	1	(High)	(High)	No	Farm level activity
FM-3	Post harvest	2-3	-	Fair	Yes	Different support by stakeholders
FM-4	Business plan	2	-	(High)	No	Farm level activity
FM-5	Group formation / strengthening	1	(Fair)	Fair	Yes	Support by AT required
FM-6	Group accounting management	1	(Fair)	Fair	Yes	Support by AT required
FM-7	Water users' association	2	-	Low	Yes	Collective use of water
FM-8	Collective selling / purchasing	1-2	(Fair)	Fair	Yes	Support by AT required
FM-9	Rural finance access improv.	2	-	Low	Yes	Support by rural finance scheme
FM-10	Market information access improv.	1	(High)	High	Yes	Farm level activity

Note: Category 1-2 to be adopted urgently as fundamental basic items for crop and livestock production. Also, they will require longer time of period for verification.

Category 2-3 to be disseminated after basic technical measures are extended.

Category 1,2-3 to be introduced urgently, however, their dissemination would take longer period than Category 1-2.

Verification result of verification of technical measures (for crops, high / fair / low identified in requirement of application by Agricultural Technicians

“- “ indicates that the technical measure was not applied in the pilot site under N-CLIMP.

Prospect Fitness for activities in technical cooperation project.

Table 3.4 Challenges and Countermeasures (1)

Technical Measures	Challenges	Countermeasures	Donor
Crop (grain)			
CR-1 Fertilizer application	✓ Limited supply of manure and fertilizer	✓ Increase of supply	
CR-2 Cropping pattern and crop management	✓ Limited knowledge / experience on crop management (fertilizer application)	✓ Training, field days, visits to diligent farmers	
CR-3 Conservation agriculture			
CR-4 Rice–mahangu mixed cropping system	✓ Proper use of ripper furrowing	✓ Training, field days, visits to diligent farmers	
FM-1 Household account management	✓ Short of tractor services (broken not repaired)	✓ Increase of equipment and repairing	
FM-2 Record keeping	✓ Late arrangement of services	✓ Early booking	
FM-3 Post harvest	✓ Limited knowledge / experience on crop management	✓ Training, field days, visits to diligent farmers	
FM-4 Business plan			
FM-5 Group formation / strengthening	✓ Limited supply of agro-chemicals	✓ Increase of supply	
FM-9 Rural finance access	✓ Limited coordination with UNAN	✓ Smooth coordination	
FM-10 Market information access	✓ Low access to rural finance ✓ Limited knowledge / experience on business	✓ Training, field days, visits to diligent farmers	
	✓ Limited knowledge / experience on business	✓ Training, field days, visits to diligent farmers	
Agricultural Extension Management	✓ Low access to rural finance ✓ Limited knowledge / experience on business	✓	
Crop (horticulture)			
CR-5 Water source / water harvesting	✓ Limited knowledge / experience on drip irrigation (procurement, maintenance)	✓ Training, field days, visits to diligent farmers	
CR-6 Water saving cultivation	✓ Limited knowledge / experience on roof catchment	✓ Training, field days, visits to diligent farmers	
CR-7 Crop selection and marketing	✓	✓ Training, field days, visits to diligent farmers	
CR-8 Cropping plan and horticulture crop management	✓ Limited knowledge / experience on horticulture crop management	✓ Training, field days, visits to diligent farmers	
FM-1 Household account management	✓ Low access to rural finance ✓ Limited knowledge / experience on business	✓ Training, field days, visits to diligent farmers	
FM-2 Record keeping			
FM-4 Business plan	✓ Limited knowledge / experience on business	✓ Training, field days, visits to diligent farmers	
FM-5 Group formation / strengthening			
FM-9 Rural finance access			

Table 3.4 Challenges and Countermeasures (2)

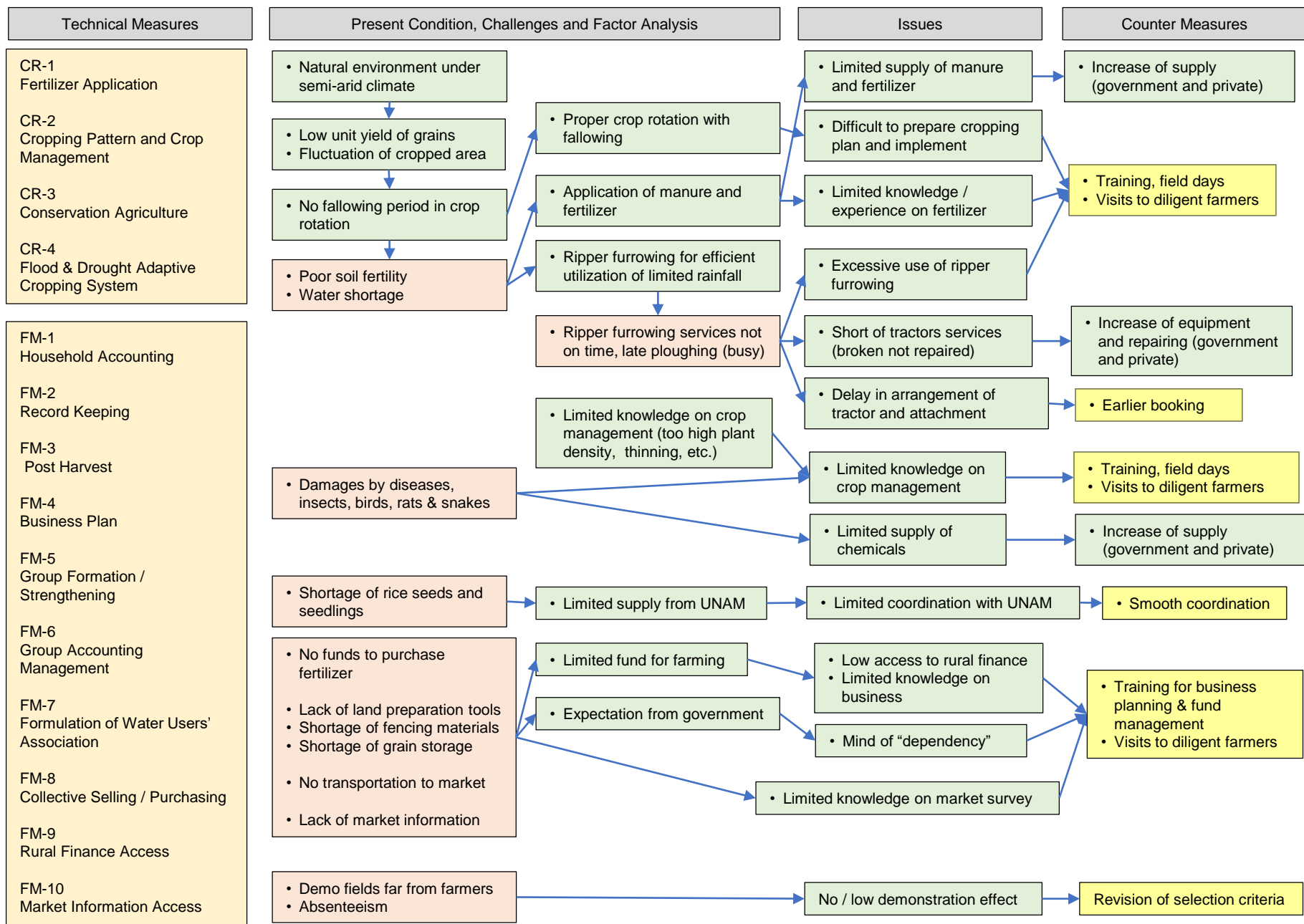
Technical Measures	Challenges	Countermeasures	Donor
FM-10 Market information access			
Agricultural Extension Management	<ul style="list-style-type: none"> ✓ Pilot project not implemented smoothly ✓ No / low demonstration effect 	<ul style="list-style-type: none"> ✓ Revision of selection criteria 	
	<ul style="list-style-type: none"> ✓ Limited budget and allocation 	<ul style="list-style-type: none"> ✓ Sharing of vehicles ✓ Increase of allocation 	
Crop production and sales			
CR-9 Crop cooperatives	✓ -	✓ -	
Feed supply			
LS-1 Fodder production	<ul style="list-style-type: none"> ✓ The information on fodder production is not sufficient. ✓ The information on feedstuffs such as residues of agriculture products is little. 	<ul style="list-style-type: none"> ✓ Collection and extension of the information from related institutions ✓ Identification of good practice 	
LS-2 Range management	<ul style="list-style-type: none"> ✓ Formulation of the regulations on rangeland management ✓ Allocation of caretakers 	<ul style="list-style-type: none"> ✓ JICA's assistance is not suitable. 	EU
LS-3 Water resource facilities	<ul style="list-style-type: none"> ✓ Infrastructure for harvesting water and water resources has to be provided. 	<ul style="list-style-type: none"> ✓ JICA's assistance is not suitable. 	EU
LS-4 Nutritious feed supply	<ul style="list-style-type: none"> ✓ Supply of concentrates is a farmer's personal matter 	<ul style="list-style-type: none"> ✓ Collection and extension of the information on concentrates and other feedstuffs (Related with LS-1) 	
Livestock Production			
LS-5 Disease Control	<ul style="list-style-type: none"> ✓ ATs' and farmers' knowledge on animal health is not sufficient (disease, treatment and prevention) ✓ Difficult to collaborate with DVS due to under staffing 	<ul style="list-style-type: none"> ✓ Study on the farmers' issues ✓ Formulation of countermeasures to the issues ✓ Extension of the information on disease prevention ✓ Identification of good practice 	
LS-6 Stock fattening	<ul style="list-style-type: none"> ✓ Improvement of nutrition and health is necessary. 	<ul style="list-style-type: none"> ✓ Related with LS-1 & 5 	
LS-7 Periodical production	<ul style="list-style-type: none"> ✓ The number of rearing cattle does not increase due to poor reproductive performance. ✓ Milk yield is low due to scarce calving 	<ul style="list-style-type: none"> ✓ Demonstrate the causes → Related with LS-1 & 5 ✓ Study countermeasures to the causes and disseminate them 	
LS-8 Quality meat	<ul style="list-style-type: none"> ✓ The grading at auctions is low. 	<ul style="list-style-type: none"> ✓ Related with LS-1 & 5 	
LS-9 Bull scheme	✓	<ul style="list-style-type: none"> ✓ JICA's assistance is not suitable. 	
LS-10 Sanga bull	✓		
LS-11 Goat Production	<ul style="list-style-type: none"> ✓ Reproduction programs are necessary (Heat induction by 	<ul style="list-style-type: none"> ✓ Formulation of reproduction programs based on market 	

Table 3.4 Challenges and Countermeasures (3)

Technical Measures	Challenges	Countermeasures	Donor
	hormone drugs, etc.).	needs ✓ Identification of good practice ✓ Extension of basic information on goat raising (Related with LS-1 & 5)	
LS-12 Pig Production	✓ Is pig raising needed?		
LS-13 Chicken Production	✓ Collection of optimal information on chicken raising ✓ Introduction of preventive measures for losses	✓ Introduction of all-in all-out system as a health measure ✓ Identification of good practices ✓ Extension of basic information on chicken raising (Related with LS-1 & 5)	
Livestock Marketing			
LS-14 Auction for stocks	✓ Infrastructure has to be improved	✓ JICA's assistance is not suitable.	EU
LS-15 Formal market			EU
Livestock Management			
LS-16 Livestock cooperatives	✓ Regulations and policy support are necessary.	✓	EU
Implementation management			
Agricultural Extension Management	✓ Pilot project not implemented smoothly	✓ Revision of selection criteria	
	✓ No / low demonstration effect		
	✓ Limited budget and allocation	✓ Sharing of vehicles ✓ Increase of allocation	

Figures

Figure 2.1 Issues identified through Factor Analysis of Grains Production (Sample)



Attachment

Attachment 1: Challenges addressed by ATs (1/2)

Region / ADC / Activity	Technical Measure / Progress	Challenges	Comment from JICA Team
Oshana Region Okau Kamasheshe ADC Grains	- Conservation Agriculture (ripper furrowing) - Fertilizer Application - Cropping pattern and crop management - Farm record	- Damages by birds, rats and snakes - Market information - Transportation to market - Grain storage	- Proper application of ripper furrowing - Modification / simplification of market survey procedure for horticulture
Oshana Region Uuvudhiya ADC Cattle	- Fodder Production - Disease Control	- Limited transportation to buy medicines - Water shortage for fodder production	- Improvement of practice required for fodder production
Oshana Region Uukuwiyu Uushona ADC Chicken	- Hatchery established and chicks produced - Vaccination against ND (group activity) - Drip irrigation introduced	- Damages by rats and snakes - Shortage of feeds and minerals	- Can be learned from the Onankali group in Oshikoto for feed production
Oshana Region Uukwangla ADC Horticulture	- No group activities	- Green house damaged	- Need for intervention
Omusati Region Etunda ADC Horticulture	- 6 farmers got drip irrigation kit - Marketing program implemented with AgriBusDev - Cropping program for each farmer - Cooperative activities	- Low participation to market survey - High cost of drip irrigation - Poor maintenance of drip irrigation system	-
Omusati Region Okahao ADC Cattle	- Fodder production at demo site - Castration and dehorning - Two auctions held	- Low marketing opportunity & few buyers - High price of medicines and vaccines - Farmers not willing to sell livestock	- Basic information on diseases and drug application should be collected - Apply preventive measures
Omusati Region Tsandi ADC Chicken	- Vaccination against ND - A production project initiated	- No regular and public market for chicken - Limited transportation for ATS - Limited variety of vaccines	- The diseases prevented by vaccines are limited. Why preventive measures not applied.
Omusati Region Etayi ADC Grains	- planting rice/mahangu or sorghum - Preparation for the next season	- Lack of land preparation tools - Shortage of rice seeds and seedlings - Shortage of fencing material	-
Oshikoto Region Okashana ADC Grains	- All farmers harvest 1 ton/ha - 7 farmers sold directly to AMTA - 10 farmers trained on CA	- Demo field is far from farmers' houses - Could not utilize ripper service on time	-

Attachment 1: Challenges addressed by ATs (2/2)

Region / ADC / Activity	Technical Measure / Progress	Challenges	Comment from JICA Team
Oshikoto Region Omuntele ADC Cattle	<ul style="list-style-type: none"> - Marketing cattle following the auction calendar - Vaccination - Deworming - Castration 	<ul style="list-style-type: none"> - Fodder seeds did not germinate. - Demo field is far from farmers' houses - Accessibility to seeds - Less timeframe for training of farmers - Limited number of animal husbandry kits 	<ul style="list-style-type: none"> - Is fodder the only solution for feed shortage?
Oshikoto Region Onankali ADC Chicken	<ul style="list-style-type: none"> - Make own chicken feed using local materials - Use of immunization calendar to control diseases - Recording system implemented 	<ul style="list-style-type: none"> - Households are apart - Inability to make monthly contribution - Diseases especially for chicks - Cement floor 	<ul style="list-style-type: none"> - Wooden chips can be applied to the cement floor
Oshikoto Region Onayena ADC Horticulture	<ul style="list-style-type: none"> - ATs continue providing technical support to farmers - Assistance for irrigation kits - Production of spinach, cabbages, carrots and green pepper 	<ul style="list-style-type: none"> - Water shortage/no access to water - Inability to buy containers, seeds, etc. - Lack and shortage of fencing materials - The irrigation kits received was incomplete - The water tank for the kit is too small 	<ul style="list-style-type: none"> -
Oshikoto Region Ondobe ADC Grains	<ul style="list-style-type: none"> - The crop field expanded - Action plan in place - Some products sold - The group saving account maintained - The member increasing 	<ul style="list-style-type: none"> - Water shortage - Lack of fencing materials - Lack of tools and storage facilities - Pests - Poor soil fertility 	<ul style="list-style-type: none"> -
Oshikoto Region Oshikunde ADC Horticulture	<ul style="list-style-type: none"> - No practical activity 	<ul style="list-style-type: none"> - Lack of water due to wrong connection of inlet pipe - There are not AT - No production in the site 	<ul style="list-style-type: none"> -
Oshikoto Region Okongo ADC Cattle	<ul style="list-style-type: none"> - Collective procurement (drugs) - Managed to harvest fodder seeds - Vaccination, dehorning and deworming - Other farmers willing to join 	<ul style="list-style-type: none"> - Lack of water for fodder production - Lack of suitable fodder seed variety 	<ul style="list-style-type: none"> -
Oshikoto Region Endola ADC Goats	<ul style="list-style-type: none"> - 4 farmers sold 7 goats - Vaccination, castration and deworming - Other farmers willing to join 	<ul style="list-style-type: none"> - Poor pasture - Financial limitation for drugs - Poor coordination among farmers - Abortion 	<ul style="list-style-type: none"> -

Source: Study Team