Chapter 7

Program 6 of Verification Study

Preparation of Extension Tools and Research Program for the Meki Area

CHAPTER 7 PREPARATION OF EXTENSION TOOLS AND RESEARCH PROGRAM FOR THE MEKI AREA

7.1 Introduction

Under the semi-arid climate of the Meki area, improvement of rain-fed farming techniques is utmost important for local peasants to mitigate annual fluctuation of their crop production. Furthermore, it is crucial to increase crop productivity for improvement of farm income and living standard, to which the Government has attached its development priority. In line with the national policy on food security and poverty reduction, the research-extension linkage has been reinforced under the close relationship between Ministry of Agriculture (MOA) and Ethiopian Agricultural Research Organization (EARO) since 1998. However, their efforts have not sufficiently penetrated into rural areas of Ethiopia due to shortage of budget and staff required for the on-going extension program.

Program 6 aims at verifying basic requirements to optimize the research-extension linkage activities for the semi-arid areas at wareda level as a case study in the Meki area. The Program firstly at preparation of region-oriented extension tools focusing on the specific natural and sociological conditions of the Meki area. There are several extension tools and materials in Ethiopia. They were prepared by MOA being assisted by donors and NGOs. However, they are not accessible for all the DAs and farmers. Taking into consideration high literacy rate in rural area of Oromia Region, the existing extension materials were reviewed for enhancement of their adaptability.

Secondly, the Program envisaged identifying insufficient research information urgently required supplementing the extension message for the peasants in Meki. On the basis of the analysis, research aspects were selected and preliminarily discussed. For this purpose, research information was intensively collected and reviewed in collaboration with the local administration of MOA and OADB as well as agricultural research institutes of EARO.

Program 6 finally produced the extension materials suitable for DAs and other staff concerned with the extension activities under the OADB wareda office and the peasants in the Dugda Bora Wareda. The products consist of some 60 copies of Extension Handbook covering 14 agricultural aspects and 300 to 500 copies of leaflets and posters for each of individual extension aspects.

7.2 Objective

The long-term strategy and programs especially for extension and research are required to improve the rain-fed farming in Meki. The ideas are incorporated into one of the proposed projects under the Master Plan, namely [2-1] Semi-Arid Farming Improvement Project. To elaborate the concept and contents of this project, Program 6 aims at:

1)Overall review of the extension and research programs for improving upland farming practice in the semi-arid area,

2)Execution of the case studies to verify the conditions required for extension materials suitable for the Meki area,

3)Identification of constraints and gaps between existing extension materials and their requirement, and

4)Clarification of future agricultural research subject in the Meki area.

7.3 Plan of Operation

In collaboration with MOA, OADB, EARO and NGOs, Program 6 made overall technical appraisal of the strategy of Research Extension Advisory Council (REAC) in Ethiopia, and approached the goal through the following activities (Attachment X-7-1).

1) Collection, review and categorization of existing extension materials including booklets, pamphlets and posters, etc.,

2) Collection and review of existing research reports and REAC information published by EARO and related organs,

3) Identification of expects of MOA, EARO and other organs to Program 6

4) Clarification of administrative set-up for preparation and distribution of extension materials at federal and regional levels,

5) Identification of urgent needs for extension materials among rural community,

6) Identification of constraints against the rain-fed farming in Meki through workshops with DAs and communities,

7) Preparation of the extension materials, and

8) Preparation of proposal for further agricultural research to accumulate more information so as to improve the extension materials required for the semi-arid areas.

7.4 Extension Materials

7.4.1 Responsibilities

The responsibilities for production of extension materials and distribution to users are clearly demarcated between federal and regional governments. The federal government takes responsibilities for producing prototypes of extension materials and distributing them to regional governments. Then regional governments perform their tasks to adjust them to relevant regional socio-economic conditions, e.g. language, and distribute them to end-users.

7.4.2 Existing Extension Materials

The existing extension materials have been collected at various research organizations and NGOs. The extension materials collected amounted to 52 listed in Attachment X-7-2. They are categorized into the following 14 aspects.

No.	Aspects	No. of Materials Collected
1)	Crop guideline	20
2)	Various useful farming practice	6
3)	Vegetable seed production	1
4)	Vegetable nursery	1
5)	Pest & disease control on grain and horticultural crops	10
6)	Farming tools	1
7)	Food processing	3
8)	Soil conservation	1
9)	Useful information specifically for the central Rift Valley zone	4
10)	Tree nursery	1
11)	Livestock fattening	1
12)	Post-harvest technology	1
13)	Gender issue	1
14)	Apiculture (bee-keeping)	1
	Total	52

It is noted that 39 out of 52 items are written in Amharic, 12 in English and one in Oromo language. Most of them are not fully utilized by end-users because they are not accessible for DAs and farmers. The main reasons include (i) shortage of copies and (ii) less awareness among DAs and farmers.

7.4.3 Basic Condition of Extension Materials Required in Meki Area

(1) Written Languages

The primary education in Oromia Region is given in Oromo language since 1992. Although the people in Meki generally speak in Oromo language, the written languages are different among generations. The written language for adults is confined to Amharic, while one for youth given primary education is Oromo language. This gap in communication language should be firstly taken into consideration.

According to the result of community meeting in Meki organized by the Study Team, an adult generation above 20 years received primary education in Amharic, while school children are less capable to communicate in Amharic. Although Education Bureau promoted an adult education to make up this language gap, the performance was low and the program has already banned.

The community meeting revealed that all of the adults spoke in Oromo language but their communicable written language was confined to Amharic. It was dependent on the grade career. The literacy rate in each community appeared to be correlated to accessibility to school. Sori Dolesa is located far from Meki town with no school facility, while Tuchi Sumeyan is adjacent to the Meki town. The survey results of common language are summarized in Table X.7.1.

Table X.7.1 Common Language in Meki Area

	Total	Written Language			Spoken Language		
		Oromo	Amharic	Illiterate	Oromo	Amharic	Both
Tuchi Sumayan	18	4	13	1	0	0	18
Korke Adi	34	3	15	15	27	7	0
Sori Dolesa	51	1	7	43	51	0	0

From this indication, it seems there is a potential need of extension materials written both in Oromo and Amharic languages for the transition.

(2) Understanding of Poster

The posters are broadly used for agricultural extension in Ethiopia. In view of high illiteracy rates in Oromia Region, it was deemed that posters are more suitable than booklets when extension messages are distributed. In order to evaluate the community's understanding of messages on posters, the JICA Study Team presented some sample posters in the meeting and discussed their understanding and preference.

In the meeting, several different types of the posters were displayed. The posters shown were broadly classified into i) descriptive and ii) non-descriptive types (Attachment X-7-3). The former has captions, while the latter has simple picture without any caption. The participant expressed their perception from the posters, and which was almost closed to the poster theme to generate message. Further more, majority of the participants expressed more preference to descriptive poster than simple picture.

(3) Demand of Extension Materials

Each community might have faced on local constraints. Besides, farmers are eager to know most suitable farming system including crop selection and husbandry methods, suited to local conditions. In order to grasp such demand among farmers, a questionnaire survey for DAs and meeting with communities were carried out.

1)Technical Information

The JICA Study Team preliminarily selected the subjects for multiple-choice by farmers in the meeting. The subjects demanded in each community are summarized in Table X.7.2.

Table X.7.2 Subjects Selected in Meki Area

Subject	Tuchi Sumayan	Korke Adi	Sori Dolesa	
			Male	Female
Soil conservation	18	34	30	
Tree planting	18		31	16
Bee keeping	18			
Poultry farming	18	34		
Plant protection	17			
Weeding	16			15
Multing	16		31	
Harvesting	16		32	
Nursery		34		16
Cattle fattening		34	31	16
Forage production		34	30	
Dairy farming		34		
Credit		34		16
Cooperative		34		
Fertilize□application			31	
Improved seed			30	
Plant density				17
Shilsharo				15
Cow dung manure				15

The technical subject varies with place to place but widely including agronomic constraints, soil conservation, livestock, bee keeping and farmer's organization like cooperative with credit. In case of Sori Dolesa, selection of subjects was largely different by gender. The male participants ranked " harvesting" at the top of subjects, while female participant voted to "proper planting density".

2) Crop guideline

The crops were ranked in terms of necessity of information. In Sori Dolesa, the farmers selected maize and faba beans. Slight difference was also recognized between genders. Other two communities showed similar results in crop selection except for horticulture crops. The farmers in Korke Adi adjacent to Ziway lake requested to provide extension information for such horticulture crops as onion, tomato, cabbage, potato, papaya, etc.

Table X.7.3 Crops Selected in Meki Area

Crops	Tuchi Sumayan	Korke Adi	Sori Dolesa	
			Male	Female
Maize	14	34	30	15
Teff	13	34		
Wheat	13	34	31	
Haricot bean	11	34	29	
Faba bean	7	34	31	14
Chili	7		29	
Barley		34		
Linseed				15
Tomato		34	29	
Onion		34		16
Cabbage		34		15
Potato		34		
Peas		33		14

3) Gap analysis of Demand and Supply

In order to grasp an actual demand of extension materials from the end-users, a questionnaire survey on DAs and community meeting were made. As a result of survey, a great gap was found between demand and supply in terms of absolute shortage of materials and limited coverage of technical information. The following table summarized this aspect in the DA level and community levels.

Table X.7.4 Gap Analysis of Extension Materials Requested by End-Users

	Subject	DA	Tuchi Suneyan	Korke Adi	Sori Dolesa
Technical Information	oxen plowing,	○	○	○	○
	forage	○	○	○	○
	fertilizer application	○	○	○	○
	fish-culture,	○	○	○	
	cooperative,	○	○	○	○
	mulching	○	○	○	○
	credit		○	○	○
	Sowing method		○	○	○
	Cow-dung manure		○		
	Double cropping		○	○	○
	harvesting		○	○	○
	weeding		○		
	Green manure				○
Crop guideline	Chick pea,	○	○		○
	field pea	○	○	○	○
	linseed	○	○		○
	faba bean,	○		○	○
	papaya	○	○	○	○
	cabbage	○		○	
	millet,	○	○	○	○
	barley	○	○	○	○
	lentil	○			○
	sugarcane			○	

Source: JICA Study Team 2001

7.4.4 Drafts of Extension Handbook and Posters

From the above indication on the situation of extension materials in the Meki area, a prototype of extension handbook for the district agriculture officer including development agents was designed and forwarded to compile based on the collected extension materials. The criteria of selecting materials was mainly focused on rain-fed grain crop guideline, useful farming technology and information essential for the Meki area. Besides maize cropping calendar for early and late maturity made by the JICA Study Team was added. And poster on two themes was also designed for the farmers based on the result of community meeting. The component of these extension tools consists of the following materials.

(1) Extension Handbook (380 pages)

1) Crop guideline

- Maize and maize cropping calendar
- Teff
- Wheat
- Haricot bean
- Sorghum
- Chili
- Sweet potato
- Potato

2) Useful farming technology

- Planting elephant grass on the edge of maize field
- Advanced heavy soil management technology
- Inter-cropping maize with *desmodium spp*

3) Useful information for the central rift valley

- Moisture stress area
- Water and soil conservation

(2) Poster (A3 size color)

1) Soil conservation in Meki

This poster aims at introducing current soil conservation activity on going in Meki Area (Attachments X-7-4 to X-7-6).

2) Improvement of rain-fed farming in Meki

In this poster, tie-ridge practice, inter-cropping, crop rotation and proper planting density on maize and haricot bean are introduced.

All the materials were prepared with both Amharic and Oromo languages by translated from Amharic and English to Oromo language through the OADB counterparts.

These extension materials were designed and published as trial product of prototype to focus on the OADB wareda office staff and farmers in the Meki area. Especially, extension handbook is essential for the subject matter specialist and development agent for their extension service, while the poster materials are designed for farmers who prefers colored visual materials with less explanation based on their education background. The materials thus prepared are presented in Attachment X-7-7.

7.4.5 Verification of Prototype Extension Materials

(1) Out line of community workshop

The workshop was held at three communities on 2nd and 6th November 2001 in order to confirm understanding of the prepared extension materials for the community members. The community site is same as the first community meeting held in the beginning of this verification study. The profile of the community is presented below.

Table X.7.5 Out line of Community Workshop

PA	Community name	No of Participants	No of Literate/ illiterate		Literacy rate (%)	Remark
Tuchi Sumeyan	Gende Rasa	34 (Female=5)	A *1)	12	50 %	Adjacent to Meki
			A&O	5		
			Nil	17		
Korke Adi	Wayo Korke Adi	42 (Female=3)	A	24	78.6 %	Adjacent to Meki
			A&O	2		
			O	6		
			Nil	10		
Sori Dolesa	Borta Were	44 (female 14)	A	16	38.6 %	Isolated in between Meki and Alem Tena
			O	1		
			Nil	27		

Remark: *1) A: can read Amharic, O: can read Oromo language, A & O: can read Amharic and Oromo language, Nil: can not read both languages

In this workshop, some of selected crop guideline such as maize and its crop calendar, teff, haricot bean and chili materials were distributed among the participants. With this crop guideline, the prepared posters were also shown to them for getting at theme of the posters. For the poster session, the participants were grouped into 2 groups like 1) literate (Amharic and Oromo), 2) illiterate and given 10 minutes to read poster theme in each group. Then, presentation of their understanding was made from each group.

(2) Understanding of Poster

The result of poster session revealed that understanding of poster theme apparently was correlated with literacy rate. Namely, the literate either Amah or Oromo language could understand the theme of poster more than that of the illiterate. Meanwhile, the illiterate group could also understand more than one third of the group about the descriptive poster. For example in Tuchi Sumeyan, poster of the improvement of rain-fed farming was understood by 18 participants including both well understanding and understanding classes.

Table X.7.6 Result of Understanding Extension Materials

PA and Community name	Type of Poster	No of Literate/ Illiterate	Understanding of Posters *1)			% of understanding
			W/un	Un	Not	
Tuchi Sumeyun/ Gende Rasa	Soil conservation	11(Lit)*2)	9	2	0	100
		23(Illi)	0	15	1	65
	Improvement of Rainfed farming	11	10	1	0	100
		23	2	16(5) *3)	3	78
Korke Adi/ Wayo Korke Adi	Soil conservation	35	11	24	0	100
		7	2	1	4	42.8
	Improvement of Rainfed farming	35	23	8	4	88.6
		8	1	3	3	57.1
Sori Dolesa/ Borta Were	Soil conservation	17	10	5	3	88.2
		27	8	7(6)	12	55.6
	Improvement of Rainfed farming	17	10	5	3	88.2
		27	8	7(6)	12	55.6

Source: JICA Study Team

Remark: *1) W/un: well understanding, Un: Understanding, Not: Not understanding

*2) Lit: Literate, Illi: Illiterate

*3) The figure of parenthesis refers to number of female participants.

(3) Crop guideline

Crop guideline is an extension material including technical terminology; thus the literate group can not always understand the content of crop guideline without background of basic knowledge.

Therefore, measuring their understanding the content of the crop guideline is unable within the workshop. Therefore, one of index to measure their understanding is confined to literacy rate. On the other hand, family of the illiterate group might include member who could read and write either Amharic or Oromo language, and has a possibility to interpret for him/her, and this relation could be expanded to neighboring.

In future, the Study assessed further potential use of extension handbook and posters on the basis of the experience obtained through the verification study. They are summarized as follow:

1)Each development agent in the respective area is strongly recommended to make up of site specific extension handbook by adding supplemental materials

necessary for command area.

2)Further, each development agent gives regular guidance to the farmers in collective way based on this Extension handbook.

3)Farmer prefers descriptive poster, and each development agent is recommended to make a hand drawing poster to transfer most high demand theme in the command area.

4)Reprint and distribute individual crop guideline to the beneficiary either Oromo language or Amharic based on farmer's preference as much as you can.

7.5 Preparation of Research Programs

The weakness of extension service was clarified through the workshop for the DAs and concerned rural communities with gap analysis of demand and supply, and survey of result of administrative aspect on extension materials. In this gap analysis, insufficient extent on technical information necessary for the Meki area was also illuminated in conjunction with the analysis result of collected existing extension materials. From this indication, it was clarified that site specific agronomic constraints have not fully been studied, especially the agro-ecological problems faced in the Meki area. In this chapter, the aspect of research-extension linkage was studied by focusing on the Meki area, including process of identifying site-specific agronomic constraints.

7.5.1 REAC system

(1) Introduction

The effective technology development and extension service need well-organized linkage among governmental agriculture research organization, extension service organization and end-user-farmers. Based on the past review of the research-extension farmers' linkage aspect, a new regime of Research Extension Advisory Council (REAC) has been approved by the Ethiopian government through the series of workshop since 1998, and launched with approval of US$ 3.6 million by IFAD.

The REAC consists of 3 levels: federal, regional and zonal, with establishment of farmers research group (FRG). For each REAC level, various stakeholders are involved. The advisory councils (Federal-REAC, Regional-REAC and Research Center Based-REAC) will have their own ways of organization, supervision, authority, function and periodic meetings. However in Oromia Region, Regional

REAC has not been established yet.

(2) Objectives

The REAC aims at strengthening "Client - Oriented Research to identify production constraints that the farmer has faced on, to carry out technology development and to transfer for the client under bottom up research oriented system compared to conventional top-down system.

(3) REAC in the Meki Area

1) Framework of Research – Extension – Farmers linkage

In the East Shewa zonal level, the Research Center Based Research Extension Advisory Council (RCB-REAC) has been established in early 2000. The head of wareda agricultural bureau office and one farmer representative from the peasant association (PA: Hate Lama) in the Study Area are the members of the RCB-REAC. In this zonal level RCB-REAC, periodic meeting is held thrice a year with certain purpose as below:

a. 1st meeting: before beginning of the cropping season for reviewing of research programs and formulating extension recommendation

b. 2nd meeting: in a form of joint field trip to evaluate on going research and extension program in a zone and asses feedback

c. 3rd- meeting: at the end of crop season to evaluate the executed research and extension programs

In the research-extension linkage network, the 3 agriculture research centers network covers the east shewa; namely Debra Zeit ARC, Melkasa ARC and Adami Tulu ARC, and the 3 center heads are also co-chairmen of the RCB-REAC.

2) Function

The function of RCB-REAC consists of the 7 major roles as below.

a. Review, prioritize and approves researchable problems as identified by organizations involved in research, extension and the farming community during research review meetings.

b. Reviews the performance of the executed research and extension programs in the zone as related to local production constraints/potentials.

c. Recommends programs of zonal significance for inclusion in collaborative programs in the Federal Research Centers.

d. Recommends and plans collaborative programs for joint zonal agricultural departments and research centers for undertaking on farm level

investigations aimed at improving the efficiency of production systems and farmers resource management.

e. Based on the results of ex-ante and ex-post evaluations of the executed research and extension programs, recommends complementary activities for technology generation, development and transfer.

f. Ensures effective and continuous interactions among farmers, extension field staff, SMSs, researchers and NGOs staff through joint in-service training, seminars, workshops, panel discussions, field days, farmer's day and joint field visits.

g. Submits annual work plans with budget to Regional-REAC, and reports activity and annual reports to RREAC and Federal-REAC.

(4) Progress of REAC in Zonal level

Since the RCB-REAC established in early 2000, three periodic meetings were held on January, September and November in 2000 based on the function framework of research-extension –farmer-linkages. The first meeting was mainly focused on the organization framework in RCB-REAC and responsible research and extension activities including production constraints mandated by each concerned organization in the zonal level, i.e., Nazareth zonal agriculture bureau office, Melkasa ARC, Debra Zeit ARC and Adami Tulu ARC. The second meeting was focused on the ongoing on-farm trials and field visit in the 3 ARCs with production constraints and its solution. Then filed visit by the RCB-REAC was made on Alem Tena Research sub center under Debra Zeit ARC, Adami Tulu ARC, Debra Zeit ARC and the private orchard farm in Awash Yiuer area.

7.5.2 Farmers Research Group and Future Prospect

Farmers Research Group (FRG) is a group that farmers form willing to undertake experimentation on their own fields. FRG is established to strengthen the research-extension-farmers linkage in the process of making agricultural technology generation and transfer client oriented such as;

1) Technical transfer to farmers,

2) Capacity building to farmers.

Currently FRG formation is under pilot stage that the two IPM FRGs nearby the MARC and 7 FRGs around of the Debra Zeit ARC have been established. The process of FRG formation is based on PRA technique. And this progress of FRG in Debra Zeit case has been reported to achieve multiple benefits from working with

FRGs as below, even though it has just started.

- ✓It contributes to identify and prioritize farmers problems based on their interest
- ✓It contributes to discuss farmers problems together and give appropriate solutions
- ✓It strengthened the linkage among farmers, researchers and development agents.
- ✓It contributes to develop demand driven technology
- ✓It contributes to disseminate technology transfer and adaptation efficiently

In the Study Area, no FRG has been established so far and the concerned personnel in the EARO said that expanding FRG into area from point is in the challenge stage under limited human resources as well as budget. Meanwhile the MARC has planned to form FRG in the Meki area that is confined to IPM FRG for Tomato and Onion, Maize seed FRG, Haricot bean FRG and Farming implement FRG in future.

7.5.3 Relation with REAC

The RCB-REAC has role to review, prioritize and approve researchable problems as identified by organizations involved in research, extension and the farming community during research review meetings. Thus, the research programs provided through Program 6 should be necessary to be submitted and get approval in the RCB-REAC prior to implementation of the prepared verification trial program. This process is necessary for sharing the information on research activity among the stakeholders involved in RCB-REAC in zonal level.

7.5.4 Identification of Production Constraints by Zonal level of REAC

The process to identify production constraints that have been faced by the farmers in the East Shewa Zone is based on the report from the stakeholders involved in the RCB-REAC, and field visits activities. In the first RCB-REAC meeting, the reported agronomic constraints in the zone by the East Shewa Zonal Agriculture Office are summarized below:

(1) Crop Variety

- Tieback of certain wheat variety types such as Pavon-76 and HAR 1685 before maturity
- Poor germination rate and variety degradation are observed on Pavon 76 wheat variety since farmer has supplied seeds.
- Occurrence of non- uniform growth on maize variety BH660.

(2) Soil Fertility

- Some wheat varieties (Pravon-76, HAR 1685 and HAR710) have been severely damaged by abnormal rain fall during maturing stage (el nino year).
- Productivity reduction problem on some improved vegetable crops varieties at different localities.

(3) Pest and Disease

- Disease incidence on highly productive maize varieties such as BH660 and PHB 3253 around Shashamane and Siraro area.
- Increase of beetles attack on teff and wheat crops in Gimbichu and Akaki wareda and on maize and sorghum crops in Bosat and Fantale wareda.
- Incidence of purple blotch on Adama Red Onion variety and *anthracnose* on papaya.
- Low effect of the product manufactured in Adami Tulu Insecticide factory

(4) Extension aspect

- Not only shortage of maize varieties but also distribution problem for the drought prone areas such as short mature variety of ACV3 and ACV6.
- Lack of irrigation guidance service to the farmer engaged in irrigation farming
- No attention is paid to indigenous multi purpose trees.
- Lack of attention is paid to control and conserve slow growing acacia varieties from deforestation through human activity by the local communities.
- Shortage/low level of awareness creation and demonstration on alternative tree species to widely spreading Eucalyptus tree in and around crop fields.
- Lack of impact assessment and sustainable use of broad bed management (BBM), tie-ridge and mold board plough to improve farmers living condition.
- Price of the sheller and thresher are beyond the purchasing power of farmers.

(5) Research aspect

- Shortage of data/information about irrigation techniques and methods (soil type, weather condition, crop varieties)
- Shortage of research outputs on biological soil and water conservation measures such as crop rotation, strip cropping, relay cropping etc.

- Lack/shortage of enough data/information about ground water potential for irrigation development.
- Lack of data /information about the effect and contribution of crop rotation and fertilizer application for cropping season.
- As the physical soil and water conservation measures were practiced through introduction from other countries, the locally specific test and identification of single and appropriate measures are insufficient.
- Lack of enough research data /information on the residual effects of different agro-chemicals used.
- Shortage of research outputs on agronomic measure on soil and water conservation such as crop rotation, strip cropping, relay cropping, etc.
- Problems on how to implement agro-forestry and lack of area specific techniques and methods.

(6) Weed problem

- The economic importance of exotic weeds spread being unknown /unidentified by farmers and zonal SMSs.
- Parthenium weed spp, which spreads quickly and cause weed problem.

7.5.5 Result of DAs Workshop

The OADB wareda office deploys 27 DAs for execution of extension program covering 54 PAs. Each DA is attached to two (2) PAs, namely Extension Block (EB) as presented in Attachment X-7-8. This workshop for the development agents was held on September 24 in order to identify the site-specific agronomic constraints and demand of technical information including crop guideline within the study area. And this workshop result was applied to set up the research program focused on the Meki Area with the result of agronomic constraints identified by the RCB-REAC. The workshop was convened in Meki with 37 participants of the development agents including SMSs attached to the Dugda Bore Wareda agriculture office. The questionnaire focusing on agronomic constraints was distributed to each development agent 3 days prior to the workshop and collected at the workshop. The major agenda was made up of,

- ✓ Goal of Program 6,
- ✓ Progress of the RCB-REAC
- ✓ Report of the agronomic constraints by the development agents

✓ General discussion.

Through the DA's report and general discussion, grass-root problem of peasant farmers facing with agronomic constraints was elucidated. Collected questionnaires were also analyzed in crop-wise and general agronomic constraints. Of course quantitative degree per each constraint was not grasped from the questionnaire but frequency of reporting by the DAs was counted and compiled in Attachment X-7-9. The following shows the summary of agronomic constraints more than 10 reports over the 23 DAs responders.

1)Disease problem (rust, smut) on cereal grain crops

2)Disease problem (early/late blight) on chili pepper

3)Pest damage like cut worm, army worm, African ball worm, aphids, stalk borer and etc on cereal grain crop

4)Termite problem on crop growth and disturbing the farm land by anthill formation

5)Birds and wild animals damage on crops

6)Weed infestation problem, especially *Megira Saree(Setaria spp) and Xiloo weeds*

7)Erratic rainfall to cause moisture stress on crop growth

8)Water logging problem caused by flood or poor drainage

9)Soil erosion caused by deforestation, overgrazing, open grazing and wind

10) Poor quality of improved seeds specially wheat variety ; Pavon 76

11) Poor land preparation practice before sowing

12) High seed rate used more than recommended rate.

13) Low soil fertility with low water holding capacity

Remark: No (8) - water logging problem was reported by only few DAs but hilly side of the Study Area is expanded with vertisol soils and water logging management technology is potentially required, thus this constraints was listed.

7.5.6 Results of Community Meeting

Organizing the rural community meeting was carried out in order to grasp a grass-root demand of extension materials and production constraints prevailing in the community. And the meeting was held in the 3 different sites where were Tuchi Sumeyan, Korke Adi on July 31, and Sori Dolesa on August 7, respectively. The three communities were selected based on distance from Meki city under the assumption of

literacy rate that may be higher in the PA nearby Meki compared to the PA located far from Meki city. In the community meeting, the following agenda was mainly focused, and the profile of each community is shown bellow table.

1)Present communication system within the community

2)Most appropriate communicable language (verbal & written)

3)Production constraints

4)Identification of extension materials demand for technical information and crop guideline

Table X.7.7 Profile of the Community

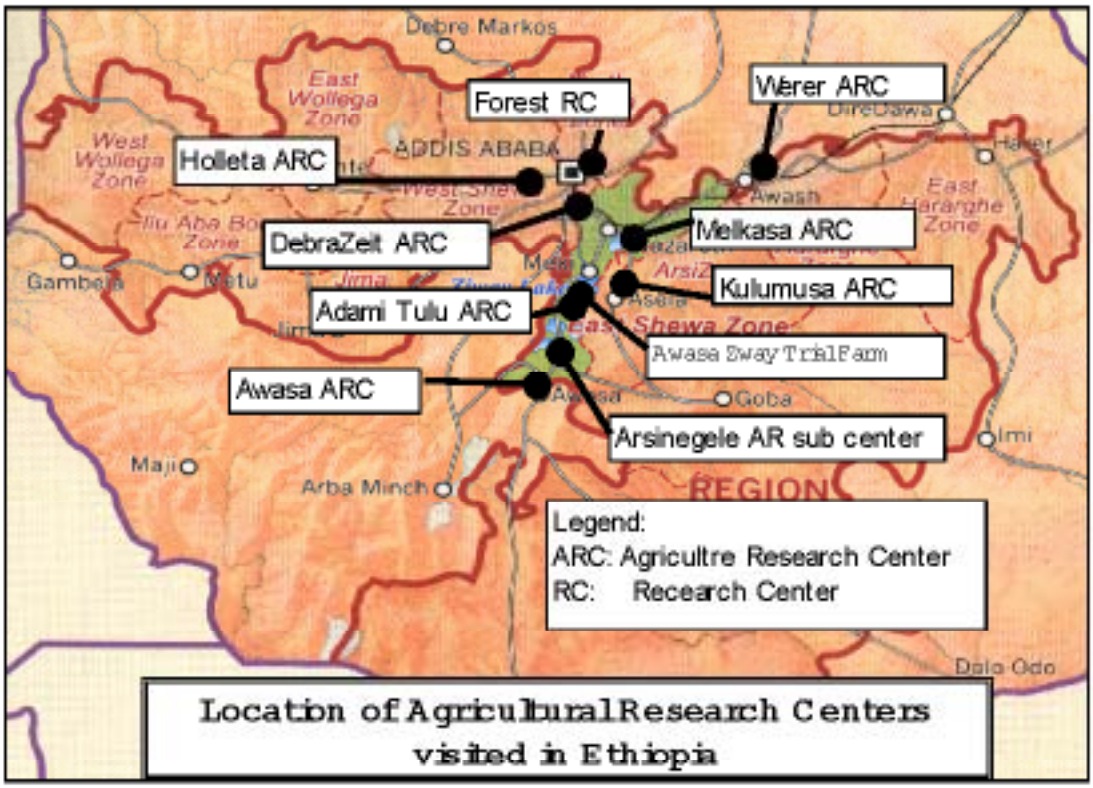
PA	Community name	No of Participants	Agronomic constraints	*Grade career (%)	Remark
Tuchi Sumeyan	Gende Rasa	18	- Soil erosion - Shortage of rainfall	72.2 %	Adjacent to Meki
Korke Adi	Wayo Korke Adi	34	- Soil erosion - Shortage of rainfall	50 %	Adjacent to Meki
Sori Dolesa	Borta Were	51 (Female 17)	- Shortage of rainfall	23.8 %	Isolated in between Meki and Alem Tena

Source: JICA Study Team, Remark: Grade career is defined as person who has a few year academic career of primary school.

Community's awareness on their production constraints in terms of agronomic aspect was mainly confined to soil erosion and shortage of rainfall.

7.5.7 Review of Research Output

Reviewing of research output so far generated in the respective agriculture research center; EARO was made by collecting research paper, annual report and etc with exchanging idea related to Program 6. The visited agriculture research organization is presented below.



The collected documents are listed in Attachment X-7-10. Reviewing the paper was aimed at screening useful research output which can be applicable to the Meki area, located in the CRV with a semi arid climate associated with an erratic, unreliable and low rainfall, averaging around of 750 mm per annum. Each respective agriculture research center has focused on the research activity oriented to site-specific agro-ecological constraints and in the East Shewa zone including the Study Area, the three agricultural research centers mentioned before are the major research network to focus on the CRV agro-ecological area. Thus, reviewing research papers were mainly made on the output generated by the aforementioned research network with supplemental outputs produced in the surrounding of Meki Area under other research bodies. Awasa college Ziway trail farm and Kulumusa ARC have sub-research center, located in similar agro-ecological zone of Meki. The research mandates of three research centers are summarized below.

1) Melkasa Agriculture Research Center(MARC)

MARC is one of the leading research centers catering for the dry land area of the country and focuses on research activities of semi-arid agro ecological zone. Research mandates comprises seven fields; namely, fruit, vegetables, lowland pulse, sorghum and maize, farming implements, food science.

2) Debra Zeit Agriculture Research Center

DZARC carries out various research activities focusing on central highland on its mandate crops in breeding, crop protection, agronomy, soils and socio economics. Research on livestock basically focused on dairy, poultry, forage crops and nutrition. In horticulture, research is conducted on onions, shallots and grapevine. DZARC has 7 sub-research centers in different agro-ecological zone. One out of the 7, the Alem Tena sub-station within the Study Area focuses on tef and wheat crops.

3) Adami Tulu Agriculture Research Center(ATARC)

ATARC represents the semi-arid zone of the country with the mandate of improving the productivity of cattle, goat and equine under five research divisions comprising of animal production, animal feeds and nutrition, animal health, socio-economics and research-extension.

As mentioned before, most essential agronomic constraints is moisture-stress on crop growth due to erratic, insufficient rainfall and progressive land degradation interacted with pressure imposed to land generated by human activities. Improving a current farming system to sustainable way in Meki area, various useful research output were reviewed and summarized in the Attachment X-7-11.

7.5.8 Proposed Research Program for the Meki Area

Many useful research output have been generated by the respective agriculture research center in the East Shewa zone but due to research-extension weakness, most of research output has not fully been expanded in the end-user level. Taking into account of zonal level REAC result of agronomic constraints and the reports of the development agents in the Study Area, the following research program is proposed to carry out in the Meki area for verification purpose.

1) Effect of Alley cropping on maize grain

The current rain-fed farming in Meki area is facing on low total agricultural production and land productivity, coupled with a high rate of population growth with overgrazing and an alarming of land degradation, thus requires a strategy that will lead both to an increase in agricultural production and control of land degradation. Increasing cropping intensity through alley cropping systems is one of the ways to increase agricultural production in the marginal farming situation. Alley cropping provides fuel wood, animal fodder, cash products, green manure and soil mulching materials.

2) Effect of Inter-cropping maize with haricot bean, mung bean and cowpea

In the CRV farmers practice sole cropping and variation in yield is observed from year to year and hence farmers are not sure of the outcome of their crops in a given cropping season. In Melkasa ARC, intercropping trial resulted in multi benefit in terms of land use efficiency, net return. The result revealed that 2 rows maize/1 row bean pattern gave maximizing net return in addition to sustain soil fertility.

3) Screening of Drought tolerant cultivars of bread wheat variety in Meki Area

In the Meki area, Pavon 76 is only the improved variety commercially marketed, and reported with characteristic of variety degradation which appeared to be caused by several factors including self-seed production. Originally, Pavon 76 was an oldest bread wheat variety released for the irrigated area. Meanwhile, Kulumusa ARC has developed several bread wheat varieties for lowland, and screening several promising varieties is high demanded in the Meki area.

4) Effect of Crop rotation

The current rain-fed farming in Meki area is facing with low total agricultural production and land productivity, coupled with a high rate of population growth with overgrazing and an alarming of land degradation, thus requires a strategy that will lead both to an increase in agricultural production and control of land degradation. Apart from alley cropping, the way to increase crop production is through a proper crop rotation scheme. But continuous cereal grain crop cultivation is widely prevailing in the Meki area, which has caused to decline in soil fertility and build-up weed, insect pest and disease incidence and occurrence. Alleviating these agronomic constraints, the effect of maize-pulse crop rotation resulted in significant benefit in the MARC.

5) The effect of tie-ridge and mulching on maize grain yield

In the drought prone area, maize growth is usually damaged due to severe moisture stress caused by erratic rainfall during the silking and tasseling growth stage, and which growth stage is sensitive to drought and cause delayed silk growth. Consequently the embryo sac abortion can lead to disastrous yield losses. Under this drought prone area, the effect of tie-ridge should be experimented in on-farm level in combination with mulching practice.

6) Irrigation experiment for horticulture crop

Along to the Meki river basin, small-scale irrigation farming is widely prevailing by pumping river water up to the field under guidance of Wareda OIDA staff. However, the knowledge of water management technology among the OIDA wareda staff is insufficient in terms of measurement of water discharge, operation of water gate,

intermittent irrigation interval, monitoring and evaluation of water use efficiency. This is major constraint to delay technical transfer to the farmer and cause excessive water use. From this background, irrigation experiment for major horticulture crops should be necessary to carry out with capacity building for the OIDA staff.

7) Effect of improved production package practice on grain crop

Knowledge and farmer's awareness about the relative importance of each package component to overall crop yield could give farmers optional flexibility for step wise adoption of technology, according to their condition and resources. And a) component of the package on maize production comprises a chemical fertilizer (DAP 100 kg and Urea 50 kg/ha), b) early weeding once at 3 weeks after emergence, c) row sowing with recommended plant spacing and population, d) sowing in the furrow of ridges tied at 6 m interval. These useful component technologies should be verified in Meki area by combining them.

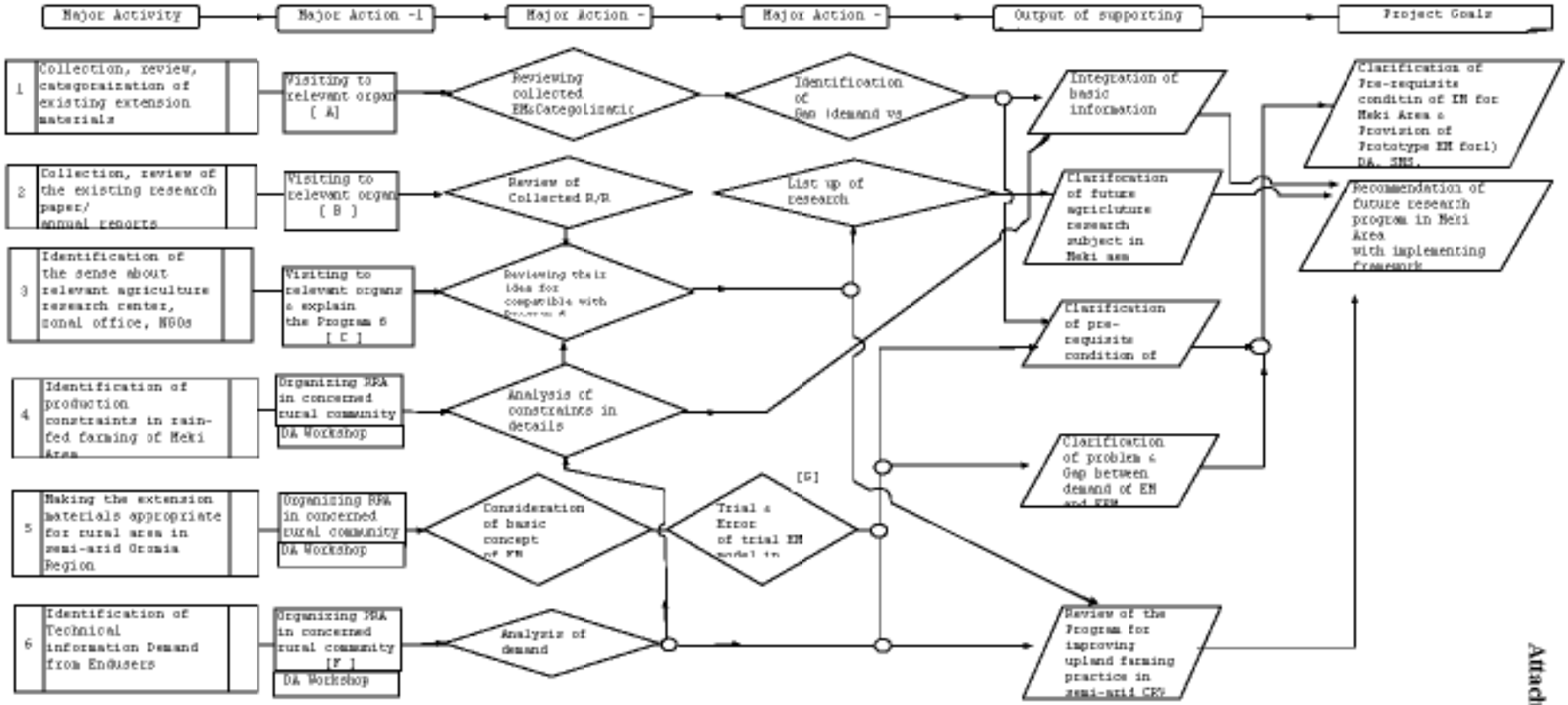
8) Effect of agro-forestry on soil fertility maintenance, and soil and water conservation

Tree crop interaction has positive and negative aspects depending on species, zone and management. Introduction of trees or shrubs in crop lands inevitably reduce the area available for crops, but the benefits from shelter and/or nutrient enhancement that will compensate for the area lost should be considered. Thus as mentioned in the proposed program (1) and (2) about Meki condition, agro-forestry trial should be conducted by introducing promising multipurpose tree spps.

9) Effect of Broad bed furrow on crop yield

In the western edge of CRV hilly side of the Study Area, vertisol soils are dominantly expanded, and where is widely cultivated with wheat, teff and chickpeas. Annual rainfall in this hilly area is also increased up to 800 - 900 mm along to increasing elevation. Vertisols have very slow internal drainage with infiltration rates of between 2.5 to 6.0 cm per day and management practices should be developed for minimizing water accumulation on the soil surface and improving aeration within the top 30 - 40 cm of the profile. Water logging problem on wheat and maize is reported by the respective DA. Thus a surface drainage technology known as broad bed and furrow (BBF) has been found to give better crop yield, and hence should be introduced to end users

General Work Flow of Program 6



Remark: 1| EEM: Existing Extension Ma R/R: Research Report
2| EM: Extension Material
3| Target Group - Subject Matter Specialist, Development Aent, Farmers

Attachment X-7-1

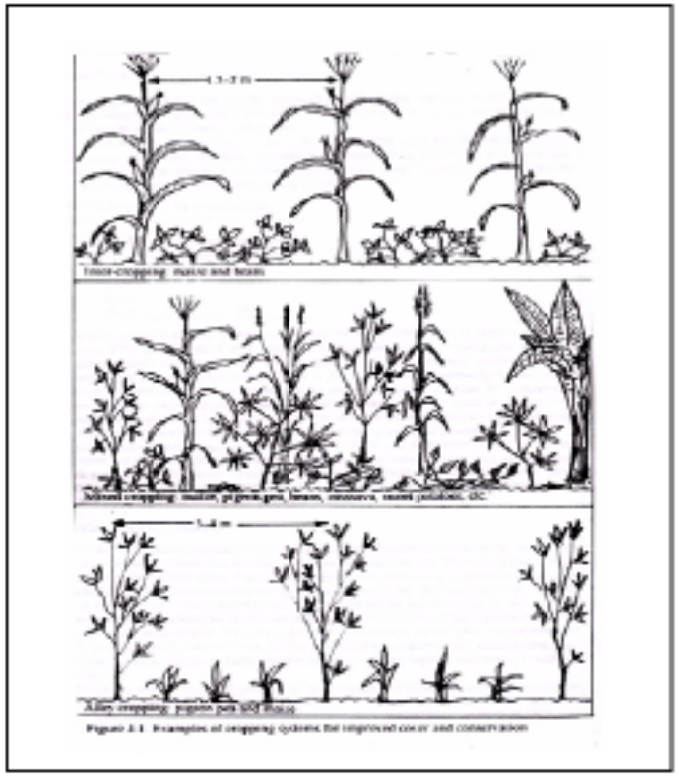
List of the Collected Existing Extension Materials

No	Subject	Type	Language	Format	Issued by
1	Sorghum	Crop guideline	Amharic	Leaflet	MARC
2	Haricot bean-1	ditto	ditto	ditto	ditto
3	Haricot bean-2	ditto	ditto	ditto	ditto
4	Wheat	ditto	ditto	ditto	ditto
5	Enset	ditto	ditto	ditto	ditto
6	Maize	ditto	ditto	ditto	ditto
7	Chili	ditto	ditto	ditto	ditto
8	Sweet Potato	ditto	ditto	ditto	ditto
9	Potato	ditto	ditto	ditto	ditto
10	Banana	ditto	ditto	ditto	ditto
11	Citrus	ditto	ditto	ditto	ditto
12	Tomato	ditto	ditto	ditto	ditto
13	Onion	ditto	ditto	ditto	ditto
14	Tef	ditto	ditto	ditto	Holleta ARC
15	Haricot bean	ditto	English	Booklet	MARC
16	Sorghum	ditto	ditto	ditto	ditto
17	Seminar on Wheat agronomy	ditto	ditto	Report	SG 2000
18	Manual of Maize agronomy	ditto	ditto	ditto	ditto
19	Maize agronomy	ditto	Oromia	Booklet	ditto
20	Wheat agronomy	ditto	Amharic	ditto	ditto
21	Soil conservation	Useful practice	Amharic	Leaflet	MARC
22	Planting elephant grass on the edge of maize filed	ditto	ditto	ditto	MOA
23	Advanced heavy soil management technology	ditto	ditto	Booklet	ditto
24	Weed control	ditto	ditto	ditto	ditto
25	Protection of forest fire	ditto	ditto	Booklet	ditto
26	Intercropping between maize & desmodium spp	ditto	ditto	Booklet	ditto
27	Seed Production guideline for haricot bean, onion, chili	Seed production	English	Leaflet	MOA
28	Vegetable Seedling Managemen Techniques	Vegetable Nursery	Amharic	Booklet	EAROVICIPE
29	Major Vegetable Disease & their management	Disease control	ditto	ditto	EAROVICIPE
30	Wheat stripe rust	ditto	English	Leaflet	Save the Children
31	Tef Rust	ditto	ditto	ditto	ditto
32	Maize Gray leaf spot	ditto	ditto	ditto	ditto
33	Maize Turcicum leaf high	ditto	ditto	ditto	ditto
34	Faba beans black root rot	ditto	ditto	ditto	ditto
35	Virus diseases of pepper	ditto	ditto	ditto	ditto
36	Coffee berry Disease	ditto	ditto	ditto	ditto
37	Major Vegetable Insect Pest & their management	Insect control	Amharic	ditto	ditto
38	Pest management for sorghum	ditto	ditto	ditto	MOA
39	Farming Implements	Farming tools	Amharic	Leaflet	MARC
40	Food Science	Food processing	ditto	Leaflet	MARC
41	Corn cooking method wother flour	ditto	ditto	Booklet	SG 2000
42	Food & Food Nutrition Program	ditto	ditto	ditto	MOA
43	Water & soil Conservation	Soil conservation	Amharic	Booklet	MOA
44	Integrated Agriculture Developmen Program	Useful information for CRV	ditto	ditto	ditto
45	Rain-fed Farming	ditto	ditto	ditto	ditto
46	Moisture stressed area	ditto	ditto	ditto	ditto
47	Economic benefit crop	ditto	ditto	ditto	ditto
48	Agro-Forestry	Tree nursery	Amharic	Booklet	Min of Agri.
49	Livestock	Livestock	ditto	ditto	ditto
50	Post harvest technology	Post harvest	ditto	ditto	ditto
51	Gender and agriculture development	Gender issue	ditto	ditto	ditto
52	Apiculture	Apiculture guideline	ditto	ditto	ditto

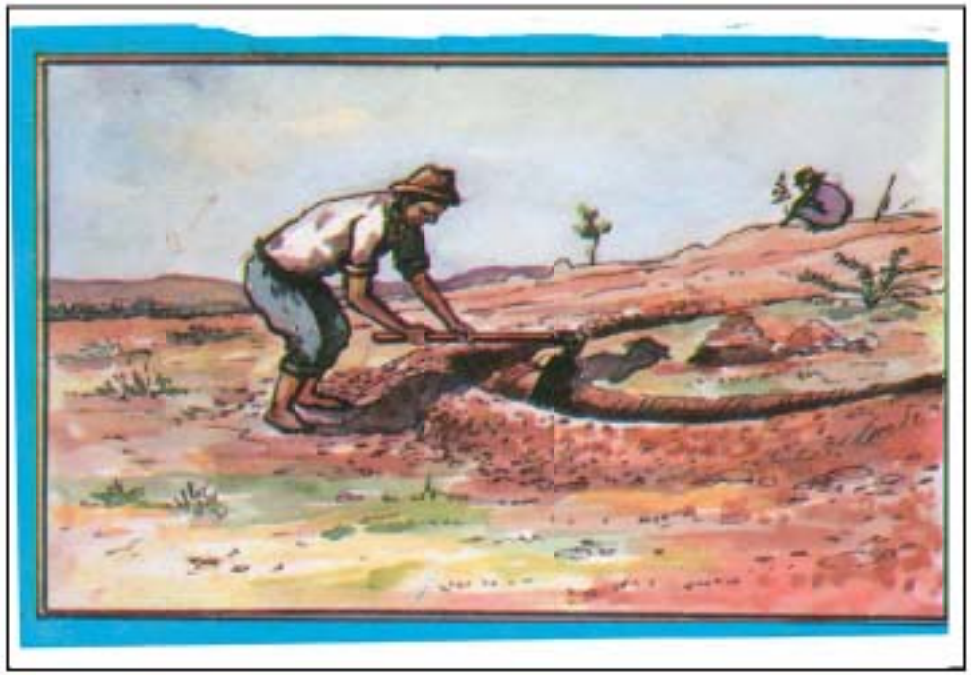
Source: JICA Study Team

Type of Posters and Understanding of Farmers

(1) Descriptive Type



(2) Non Descriptive Type



(1) Poster: Soil Conservation in Dugda Bora (Amharic and Oromiffa version)

Attachment X-7-4

Ittisa/Eegumsa Biyyee Aanaa Dugda Boraatti

የአፈር ጥበቃ በዲጋዳቦራ ወረዳ

Iddoo / Lafa Qonnaa Lolaadhan hubame.

ጠፍሮ የተሸፈኘ / የተጎዳ ማሳ

Iddoo/Bakka dhiigamni Biyyee Cimaa

በአፈሩ ከሀሉት በጣም የተጠቃ መሬት

Laaftoo(Akaashiyaa Saligna) dhaabuu

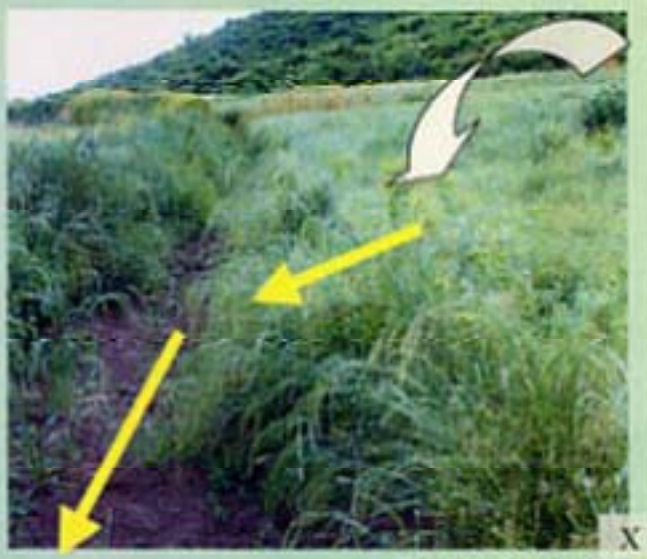
የግራር /አካሺያ ሳሊግና/ ተከላ

Cheek Daamii /Ittisa qotuu

የውሃ ሐይል መቀነሻ /ቼክ ዳም/ ሥራ

Boraatii Lollaa hojjachuu

የቦይ /የውሃ መውረጃ /ሥራ

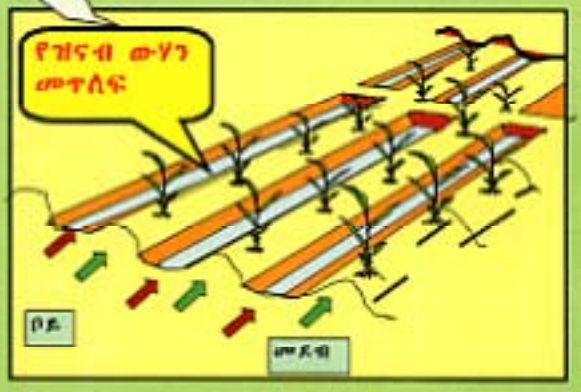


Daagga Hojjachuu

እርከን ሥራ

በዲግዳ ቦራ ወረዳ
በዝናብ ማምረትን ማሻሻል

1. የውሃ መከተሪያ

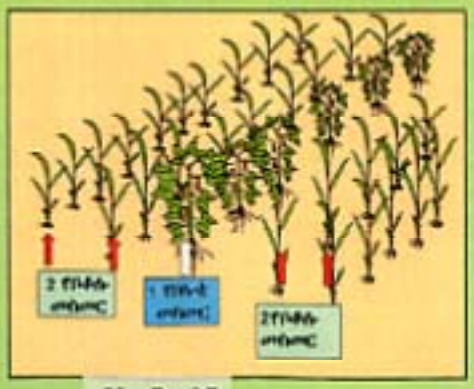


2. ትክክለኛ የዘር አዘራር

ቦቆሎ
75ሳ.ሜ በመስመሮች መካከልና
20 ሳ.ሜ በተክሉች መካከል 25 - 30
ኪ .ግ ዘር በሄክታር
ቦሎቄ
40 ሳ.ሜ በመስመር መካከል ሆኖ ከ60 -
80 ኪ .ግ ዘር በሄክታር

3. በፈረቃና በሥብጥር መዝራት

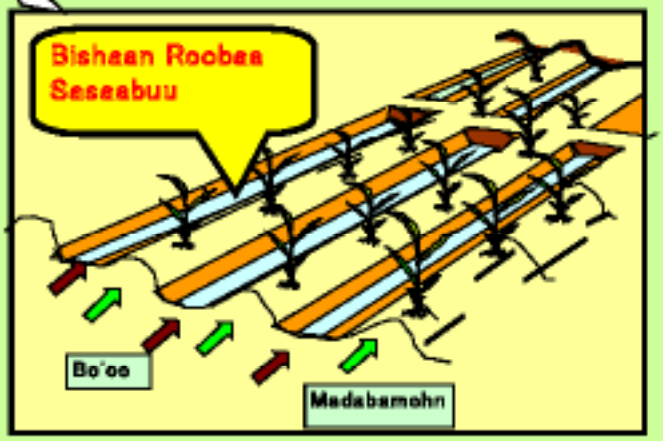
1ኛ ዓመት 2ኛ ዓመት 3ኛ ዓመት



Japan International Cooperation Agency JICA

Aannaa Dugda Boraatti Qonna Roobaan Qofaa Fooyasuu

1. Bo'oo Bishaan itti Kuufamuu /hidhamu hojjechuu



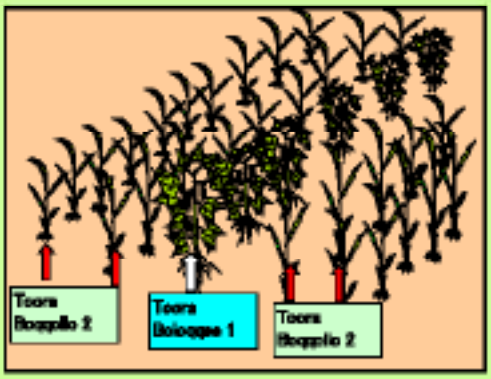
2. Facaasa Sirrii gaggeesuu

Boqqoollo:
- 25–30 Sanyii kilo graama heektaara tokkootti
- Toora jiduu saantiimeetira 75 fi toora keessa saantiimeetira 20

Boloqqee:
- Toora jiduu saatiimeetira 40 sanyii kiloograama 60-80 heektaaratti. .Sanyii kiloograama 100-120 heektaaratti bittineesuudhan

3. Facaa Dabaree fi Walkeessa Facaasuu

Bara 1ffaa | Bara 2ffaa | Bara 3ffaa



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