Lao People's Democratic Republic
Peace Indepndence Democracy Unity Prosperity

Ministry of Agriculture and Forestry

Department of Planning and Finance

Lao Agriculture Competitveness Project

Technical Recommendation Package For maize

Prepared by:

Bounneuang Doungboupha, Peter Lentes and Madonna Casimero

Edited by: Phouthone Siripahanthong

Supported by:

LACP
โຄງການຜະລິດກະສິກຳເປັນສິນຄ້າ ຢູ່ ສປປ ລາວ
Lao Agriculture Competitiveness Project

Technical Recommendation Package for Maize Production

Prepared by: Dr. Bounneuang Douangboupha, Dr. Peter Lentes, and
Dr. Madonna C. Casimero,
Edite by: Mr. Phouthone Siripahthong

Technical package for Maize Production Groups (MPG)

Objective: To provide PAFOs and DAFOs with detailed requirements to provide technical and management extension to Maize Production Groups (MPG) who would request Matching Grants from the LACP. The technical Package for MPGs establishes a model procedure for technical support that ensures quality and safety of maize production by adoption of GAP techniques.

This technical package builds on experience from investment plan (IP) of Rice Seed Multiplication Group (SMG) and Rice Production Group (RPG), which ensured the understanding of technical recommendations, GAP adoption, postharvest, processing, packaging , certification, and marketing.

The consultant team of LACP has put this technical package together to enable a good understanding of GAP and the implementation of the Investment Plans for Maize. The technical package provides PAFO and DAFO with the required information for the implementation of technical support for MPGs. The Shedule and timeliine for the supervision of MPGs in the field, has also been developped by the LACP consultants team. This timeline is to be followed with each MPG that has received a matching grant, as it is an annex to each IP.

1. Enhance management capacity of the maize production group (MPG)

For the MPG's management committees, an internal control committee (ICM) must be nominated or selected (ICS) to ensure that internal control is set up to maintain adherence of all group members to the commercial production protocols and standards. The ICM will check if maize producer farmers have passed/attended the production training and the training of maize GAP conducted by the DOA of PAFO. The ICM will provide support to the government staff in providing technical advice and inspection to the group on the recommended maize production techniques and GAP adoption.

2. Enhance the technical competency of the maize growers through training, experiential learning and extension support during the cropping season.

- Maize farmers will undergo a training on maize production (at least 3 days training) to learn the recommended maize production practices and good agricultural practice.
- The maize production farmers will be provided with the maize production manual developed by Maize and Cash Crop Research Center under the NAFRI or LACP. This will serve as the quick reference guide of the farmers to properly implement the recommended practices for maize crop production.

- Farmers who complete the required maize production training and GAP training get an accredication as qualified maize producers from PAFO,
- Maize farmers should follow the recommended practices for maize production. Maintainance of crop health, proper application of organic fertilizer and chemical fertilizer following the recommended rate, conduct monitoring of insect pest and disease regularly, follow the instructions on proper use of pesticide to avoid: residues of pesticide in the product, environmental damage, and harm to human and animals.
- The extension staff/ village's faciliator should pass training course on integrated maize production, skilful implementation in farm level, is able to monitor GAP implementation by the farmers during the cropping season and provide technical advice as needed
- The extension staff/village's faciliator will teach the farmers to properly record their production practices.
- During the crop production season, the farmers will undertake a field inspection (Seedling period, 2 weeks after planting, tassel period and before harvest) by a deputized staff of NAFRI/DOA, Technical staff from crop section under PAFO.
- Maize will be processed (harvested, dryed, cleaned, sorted, packaged) accordingly before marketing.
- Farmers can only sell maize products that have received GAP certification from PAFO LAB, graded, cleaned, packaged and lebelled with needed information that can be recalled,
- The MPG will create a database or registry of the product that is sold. Information to be included in the registry will include the following: 1) Name of customer ; 2) Address and contact number: 3) Maize variety; 4) Date, month and year, 5) Total amount of maize grain 6) Certification status 7) Market price per kilogram,

3. For the MPGs to properly implement their plans, the following activities will be undertaken:

- The PAFOs and DAFOs will conduct a 3-day maize GAP training for the farmer groups, The training course will compose theory part 30 % and 70% of practise. It will be conducted at the field level and implemented by technical staff of the PAFOs with back-up from techncial staff from DTEAP, and NAFRI. The resource persons from the NAFRI/DTEAP should have a long and wide-breadth of experience on maize production and good capabilities in teaching farmers. The learning field during the training will be a maize production field at the MPGs.
- The PAFOs will provide the farmers with a Manual for GAP of maize . That will guide the farmers on the good agricultural practices
- During the cropping season, an extension staff from the DAFO/PAFO will be assigned to provide technical assistance and support to commercial maize farmers.

- The extension staff/MPG's faciliator will hold regular visits and meetings with farmers at the critical growth stages. The extension staff/ MPG's faciliator will monitor the implementation of the GAP by the farmers during the cropping season and provide technical advice as needed
- The extension staff/ FPG's faciliator will teach the farmers to properly record their production practices
- The extension staff/ MPG's faciliator will coordinate with the Crop Section under PAFO for the field inspection of the maize production farms according to GAP's technical guideline, post-harvest technology and quality testing of the maize produced by the farmers
- The DAFO/PAFO will create a database or registry of accredited maize producer farmers and GAP farmers. The information to be included in the database/registry will include the following: 1) Name of farmer ; 2) Address: 3) Maize variety grown; 4) Month when maize is planted; 5) Farm area (in hectare/rai) and 6) Contact number. 7) Total amount of maize grain 8) Certification status 9) Market price
- If possible, the GPS coordinates of the maize production farm is also taken

4. Summary of the Good Agricultural Practices

4.1. Pre-crop management

4.1.1 Farm location and facilities (GAP 1)

Concerning commercialized maize production, farmers should follow criteria as below:

- Select flat land with good soil texture or optimum slope land which is under recommendation. Maize is able to grow in almost all soil types, but sandy loam is more suitable.
- Preferably, irrigation should be available
- Easy road access to the area of maize production
- The farm can be evaluated by a team of evaluators before croping
- The source of seed must be known. Seed can come from the Maize and Cash Crop Research Center or it's network, or it can be purchased from private shops or originate from production. Use varieties recommended for the area. These have better growth performance, stable yields and are preferred by farmers and consumers, obtain high-quality seeds from accredited or reputable seed sources
- Farm facilities are clean and well maintained.
- Farm supplies in stores are organized and labeled properly
- Farm equipment and machinery maintenance registry indicate that these are in good running condition

4.2 In-field Crop Management

4.2.1 Land preparation (GAP 2)

In flat land:
The PAFO and DAFO will conduct a training on the proper use of tractors and handtractors for soil preparation, which should include the following points:

- From February to March, soil must be plowed while it is still drying at 30 cm depth. Use sun drying for 10-15days. Big tractor and hand tractor permit using. For acidic soil with PH<5,5 lime needs to applied at 200kg/rai. Then 3-4 t/ha of manure or compost should apply to the field before harrowing and leveling the field needs to be done.
- If maize is cultivated in lowland rice field after rainfed rice, rice straw and rice stalk need to be burried in the soil by using rotary. After that, the field is flooded for 7 days, then drained and let to dry for 5-7days. Plowing and horrowing are done while the soil still has moisture.

In sloping land:

- Contour line must be created. The distance between contour is 15 m apart and the length depends on the field size. Fodders as *Paspalum Atratum* or *Tephrosia candoda* or guinea grass, or stylo are recommended to mix with fruit tree in parallell to the slope to reduce soil erosion and avoid surface runoff. Grass strips will increase water retention and infiltration into the soil. Soil ploughing is done in between contour line. Big tractor is permited using where land is less sloping. However, in area higher than 25 degree, hand tractor only is permited using. The maize is to be planted between the grass strips.

4.2.2 Seed preparation (GAP 3)

Quality seed utilization is a pivotal point to increase maize production. Farmers must select high quality of hybrid or composite maize varieties to grow. The source of seed must be known and varieties should be popular among local farmers. Varieties need to have good growth performance, stable yields and should be preferred by farmers and consumers. High-quality seed should be obtained from accredited or reputable seed sources. If self produced seed is used, it must be highly purified and free from pests and diseases. The preferred varieties by farmers and customers in Xayabury are CP888, Pacific and LVN10

4.2.3 Planting (GAP 4)

Flat planting:

- Suitable planting period of maize is from the end of April to the end of June. It should be grown when soil is being moisture but it isn't suddenly after raining while it is still wetting. Maize is planted in rows. The distance between rows is 75cm, and plant distance is 25-30cm by using the handmade seed dropping equipment or seed dropping machine which is attached with hand tractor and big tractor. These are able simoultaneously dropping maize seed and fertilizer. The required amount of seed per hectare is 18-21kg.

- To improve soil quality and increase farmer income, intercropping of redbean (Vigna angularis) between maize's row is recommended with plant distance of 20-50cm apart by droping 4-10 seeds per hole.

In sloping land:

- It is similar to flat planting. However, planting can be done by hand dropping 2 seeds per hole or using the handmade seed dropping equipment, but seed dropping machine deos't suite to slope land. The required amount of seed per hectare is 18-21kg.
- To protect soil surface runoff and increase farmer income, intercropping of redbean (Vigna angularis) between maize's row is recommended with plant distance of 20-50cm apart by droping 4-10 seeds per hole.

4.2.4 Irrigation (GAP 5)

In Xayabury province, maize is growing mostly in wet season. Consequently therefore, it relies on rainfall only. If it is flat or row planting, soil moisture must be maitained while harrowing. It is no need to apply water. Because, soil will be compacted after irrigation and seed will rot and not germinate. If, rain is missing for long period, irrigation should be done 7-10 days after germination. Flood method of irrigation is to be applied but without allowing standing water. During the growing period, the crop is irrigated when required.

When crop is cultivated as ridge/raised bed planting, furrow irrigation is followed to acccelerate germination. Care needs to be taken at first irrigation, because water should not overflow on the ridges/beds. As a rule of thumb, the irrigation should be applied in furrows up to 2/3rd height of the ridges/beds. The next irrigation is done 7-10 days later. In raised bed and when irrigation water is limited, the irrigation water can also be applied in alternate furrows to save irrigation water. To increase the water use efficiency of the crop, above ground drip irrigation is or sub surface drip irrigation are recommended where appropriate.

4.3 Nutrient management (GAP 6)

Application of fertilizer to maize right amount and right time

- Organic fertilizer and chemical fertilizer should be applied.
- Organic fertilizer is very important because, organic fertilizer, like crop resedue or animal manure can provide minor nutrient, such as Ca, Mg, S, Cu, Fe, Mn, Zn for maize. Organic fertilizer further improves soil structure and soil biological activity.
- Organic fertilizer recommendation rate for maize in Lao PDR is : manure or compost 3-4 tons per hectare.
- For chemical fertilizers, the rate of application is (NPK) 60 kg N, 30 kg P and 30 kg K. It needs to split in two applications. First application is basal during planting for 200kg/ha. The second application is top dressing by urea(46-00-00) in 20-25 days after germination for 46kg/ha. However, it shouldn't broacast. The proper technique is making a ditch beside of

the maize plant then dropping in fertilizer and fill up slighly by the soil or use a sharp stick or small spade makes a hole nearby the maize plant for 10 cm then dropping in a fertilizer.

4.6 Pest, disease and weed management (GAP 7)

Weed control:

- Weed management is very important because, weed competes with maize for nutrients and water. Weed also provides hiding places for insect pests, rodents and carried diseases. The annual yield loss in maize because of weed problems is estimated to be approximately 25%. Thence, 20-25 days after planting, the first hand weeding round needs to be conducted.
- In case labour difficiency, modarte and low harmful herbicide can be applyied such are: Atrazine 50% wp in 4 kg/ha, Glyphosate95%TC in 2kg/ha, alachlor60 EC in 2,5kg/ha and 2,4D in 0,6-0,95 litre /ha. One application only in 7-10days after weed germination.
- Depending on the density of weeds, 1 or 2 more weeding rounds are needed during the growing period by knife cutting in 40-45 DAP.

Pest and disease control:

- Regular field monitoring for pest and diseases needs to be undertaken to assess pest and diseases damages
- Application of integrated pest management technique
- Use mechanical control, botanical pesticide,biological control method, when pest incidence is observed or preventive measure by planting healthy crop, chemical application is allowed as a last option if the other methods do not bring the required results.
- The major insect pests of maize are:
    - Hairy caterpillar: This pest becomes a serious concern when attacks in epidemic form. The adult will lay an egg on maize leaf in three weeks after seed germination. Then new hatching, larvae damage the crop by feeding on young leaves and soft stem;
    - Stemborer: After hatching, larvae enter the stem by scraping followed by boring through whorl and also damage a cop. If available, the maize borer can also be managed by using tricho-cards twice having 40,000 eggs of Corcyra parasitized by *Trichogramma chilonis*. Make first release on 10 days old crop and second 1 week after first release. When pest is still high incident, insecticide application must be sprayed by Deltamethyl(Decis) in10-15 cc/20 litres of water, Cypermetrine(Cymbus) in10-15cc per 20 litres of water.

The major diseases of maize are: **downy mildew,** control measures can be as follows:

- Planting by using a treated seed by mixing a seed with Carbendazim 3g/1kg of seed
- Proper drainage of the fields.
- Spray mancozeb @ 500 g/ha with 250 L of water in two weeks after sowing

4.7. Harvest management (GAP 8)

For use as grain, cob should be harvested about 120 days after planting. Exact timing depends on the varieties. Maize is ready to be harvested when the maize plants in whole field are turning yellowist color or the cob moisture is about 20-25%. After rains, the cobs must dry up before harvesting them.

4.8 Postharvest management

Once the harvested cob is ready dryed, the grain can be directly grain shelled after removing the corn husk. The grain should be dried on a paved cement surface or on a or tarpolin sheet until the grain moisture declines to 12-14%. It is also possible to dry the cob first and do the grain shelling after drying. The grain is to be packed in appropriate bags and to be protected from rodents and pests during storage.