CRAFT

Climate resilient value chains for improved livelihoods

Republic of Kenya

Ministry of Agriculture, Livestock, Fisheries and Cooperatives

Climate Smart Dry Bean Production Training Aid

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KALRO
Kenya Agricultural & Livestock Research Organization

SNV

AFA
Our Crops, Our Wealth

CRAFT
Climate resilient value chains for improved livelihoods

MALF&C 2021. Climate Smart Agriculture Dry Bean Production Manual June 2021)

For further information, please contact
Principal Secretary
Ministry of Agriculture, Livestock, Fisheries and Cooperatives
Cathedral Road, Nairobi
P. O. Box 34188-00100 Kenya
Nairobi, Kenya
Telephone: +254-20-2718870
E-mail: psagriculture@kilimo.go.ke
www.kilimo.go.ke

FOREWORD

Beans are the most widely grown pulses in Kenya's varied production systems. They provide food security for most households in Kenya. Production levels have continued to dwindle with each preceding year due to increased vagaries of climate crisis. A review of what causes the low productivity has revealed farmers are not aware of climate change impacts and matching climate smart techniques, are not using good agronomic practices of water harvesting, fertilization and nutrient enhancing techniques, crop protection in field plots and appropriate post-harvest techniques. Lack of focus on desired bean product delivery model has also led to poor marketing options. It is with that in mind that SNV has come up with the present innovative display of technologies on Climate Resilient Agribusiness for Tomorrow (CRAFT) Project in Kenya. The adoption of the climate smart practices and techniques will provide an option for increased productivity and demand for the bean product to most marketing channels.

This training aid is derived from the Bean production manual prepared by CRAFT in conjunction with MALF&C and is meant for farmers, state and non-state extension providers, lead farmers, community-based organizations working with farmers of similar interest in dry bean crop value chain. Going through the aid, it is presented in a language that the ordinary reader can understand and follow through the articulated information. The aid will guide any trainer to reach out to the farmer who might not have much time and ability to read the whole manual. Within two days the trainer/ facilitator will be able to deliver the modules compiled here.

I hope the various bean value chain stakeholders will use training aid to enhance production, marketing and consumption of dry beans so as to contribute towards combating climate change through adoption of climate smart practices, higher incomes, employment, social equality, food and nutrition security, business development and finally conservation of the environment.

Prof. Hamadi Boga PhD. CBS
Principal Secretary,
State Department for Crops Development and Agricultural Research,
Ministry of Agriculture, Livestock, Fisheries and Cooperatives

ACKNOWLEDGEMENT

The Ministry of Agriculture, Livestock, Fisheries and Cooperatives acknowledges the technical support from key stakeholders drawn from Kenya Agricultural and Livestock Research Institute (KALRO), Agriculture and Food Authority (AFA), the Directorate of Food Crops, the Climate Resilient Agribusiness for Tomorrow (CRAFT) project partners lead by Netherlands Development organization (SNV) and Climate Change Agriculture and Food Security (CCAFs) whose diligent efforts made the development and publication of this manual a success. Much gratitude goes to CRAFT project for both technical and financial support during the development of this manual.

We are grateful to KALRO Research Scientists who provided unique information for the bean manual, namely Mr. David Karanja, Dr. Daniel Mutisya, the late Dr Rhoda Nungo, Dr Reuben Otysula and Eliezah Kamau. Other contributing sources are Egerton University (Prof. Paul Kimurto) and SIMLAW Seed Company (Mr Robert Musyoki) for providing information crucial to development of this handbook.

Special thanks goes to the State Department for crop Development and Agricultural Research staff; Paul Obusuru, Veronicah Ndetu, Naomi Kihara, AFA Staff namely; Leonard Kubok, Elizabeth Langat and Milton Munialo, CRAFT project partners: - CCAFs John Recha, Joab Osumba, Teferi Demissie, Agriterra: - Emmanuel Kibet, WeNR:- Annemarie Groot and Confidence Duku; The Ministerial Editorial Committee; Grace Mugo, Douglas Murunga, James Libaako, Goerge Bosire, Nelson Madela, John Juma, and Some Baraka among others for their valuable input; SNV-CRAFT:- Joseph Muhwanga, Oscar Nzoka, Joyce Mbingo, Cosmas Muchina and Winnie Musiomi staff who initiated and supported the process, technical review and publication of this manual.

The State Department for Crop Development and Agricultural Research and the CRAFT Project is providing an opportunity to disseminate the innovative climate smart and environmental friendly pre- and post-harvest integrated crop management (ICM) practices as well as presenting new technologies and innovations to address emerging challenges and opportunities in the bean producing counties of Kenya and beyond.

Mr. Josphat Muhunyu
Agriculture Secretary,
State Department for Crop & Agriculture Research,
Ministry of Agriculture, Livestock, Fisheries and Cooperatives

CONTENTS

LIST OF ACRONYMS

CTT:	County Coordination Teams
EMF	Environmental Management Framework
ESMF	Environmental and Social Management Framework
ESS	Environmental Social Screening
FFS:	Farmer Field Schools
GM	Gender Mainstreaming
GMS	Gender Mainstreaming System
GAPs:	Good Agronomic Practices
IDM	Integrated Disease Management
IPM	Integrated Pest Management
ISWM:	Integrated Soil and Water Management
KALRO:	Kenya Agricultural and Livestock organization
LD:	Lead Farmer
SWOT	Strengths Weakness Opportunities and Threats
TIMPs:	Technology Innovations Management Practices
ToT:	Training of Trainers
VMG	Vulnerable and Marginalized Groups

TRAINING

A. Purpose for the Training Aid

i) **Facilitator Guide Summary**

This climate smart dry bean production training aid provides climate change adaptation trainers and learners with a wealth of practice-based adaptation knowledge and plan for focused sustainable bean production practices for high quality and increased productivity of the grain with success in climate resilient agriculture (CRA).

ii) The modules

In each module are learning sessions, complete with handouts (derived from the Climate Smart Agriculture Dry Bean Production Manual) and participatory exercises. More importantly, each session there is a detailed step-by-step facilitation guide noting important concepts and knowledge to stress, and key information and advice on how to deliver the session.

B. Training Guide details

- This Training Aid is divided into four parts namely.
- Training content
- Training design
- Instructions for trainers
- Training methods/learning experiences

C. How the Training Guide will be used

Logic of training design and flow to assist Trainers

i) Introduce the module
ii) Draw out the participant's expectations
iii) Relate participants' expectations with module objectives or learning outcomes
iv) Explore the concept and content, switching to different methods of delivery of the content (group exercise, brainstorming sessions, excursions, plenary discussions, role plays) as the session progresses
v) Review the module at the end using participatory approaches like tailor made questionnaires reporting on each module
vi) Distribute the participants hand outs

D. Instructions for Module Trainers/Facilitators

i. Preparation of training materials

- Trainers/ facilitators should familiarize themselves and internalize the guidelines provided by this Training Aid well in advance before commencing the training.
- Stationery for use (flip charts, name tags, markers, writing materials) and LCD projectors required should be available within the training area at the beginning of the training.
- Other visual aids like field equipment and tools should also be arranged in time before the sessions start
- Copies of the modules are distributed at the end of each module; not to lose attention of trainees

ii. Preparation of training venues/sites

Demonstration sites which could be crop land or field where bean is intended for planting

iii. Trainees/target groups

Dry bean farmers growing the crop for food/ processing or consumption but not seed, also agriculture extension officers with background on training and extension and other participants

iv. Training methods

plenary presentations, group exercises/ buzz groups, case studies, problem solving exercises, visits and demonstrations will be employed by the trainer.

E. Training total duration – 12 hours 50 minutes (as per module content)

i) Presentation
ii) Group exercise
iii) Demonstration
iv) Discussion

Module summary Training Day /Sessions

Module 1: Dry Bean importance to Kenya Economy (1hrs. 35 min.)
Module 2: Climate Change/ Crisis, Causes, Effects and Climate Resilient Agriculture (1 hr. 15 min.)
Module 3: Dry Bean Climate Smart Techniques for Resilient Production (1 hr. 30 min.)
Module 4: Options for Value Addition for Increased Dry Bean Product Value for Enhanced Business (1 hrs. 30 min.)

MODULE 1: DRY BEAN IMPORTANCE TO KENYA ECONOMY

1.1 Learning outcomes

This module aims to familiarize trainees with opportunities exploited in bean production, and how that has provided employment to most persons as producers, processors, and traders. By the end of the training the participants should be able to realize:

a) How dry bean has been an important food security crop
b) Learn how bean ecological suitability has defined the volumes of production
c) Learn of the various abiotic and biotic factors have led to low yields
d) How projected climate change will impact negatively to bean production if the necessary mitigation measures are not used for resilient agriculture

1.2 Module duration

Table 1: Module summary for Importance of beans in Kenya's Economy

Importance of beans in Kenya's Economy			
Sessions	**Training methods**	**Training materials**	**Time**
1.3.1 Introduction to the module and levelling expectations	• Participants' introductions • Presentation	• Flips charts • Felt pens, masking tape or sticker glue, notebooks and pens • Participants Handouts	20 minutes
1.3.2 Scope of bean production in Kenya	• Plenary Presentations Group Exercise	• Participants Handouts	30 minutes
1.3.3 Constraints of bean production: abiotic and biotic	• Plenary Presentations • Discussion	• Flips charts • Felt pens • PowerPoint presentations • Participants Handouts	40 minutes
1.3.4 Projected climate change effect to dry bean production	• Plenary Presentations • Group Exercise	• PowerPoint presentations • Participants Handouts	45 minutes
1.3.5 Module review	• Plenary presentation • Discussion	• Flip charts • pens	20 minutes
TOTAL			2 hr. 35 min.

1.4 Facilitator's Guide

Table 2: Importance of dry beans to Kenya's Economy

Module 1: Importance of dry beans to Kenya's Economy	
1.4.1 Introduction and levelling of expectations and objectives	Session guide
Introduction (10 minutes) *(The facilitator/ trainer welcomes participants to the module on Importance of beans in Kenya. They are then invited to introduce themselves and state their expectations. Trainees writes on flip chart their expectations on bean crop production)***Module objectives (10 minutes)** • To demonstrate how beans are important pulses in Kenya economy • To present opportunities in bean production for youth and women • To present projected climate change effect to bean production	• Summarize Participants' "Expectations" and display. • PowerPoint Presentation by group • Distribute handouts on Objectives and Training Program Attention!
1.4.2 Scope of bean production in Kenya	
Bean production (20 minutes) (*Facilitator explores/ explains how dry bean has contributed to food and nutritional security; urban to rural areas).*	• Explain how most persons; men and women still could exploit the short duration crop.
1.4.3 Constraints of bean production: abiotic and biotic	
Constraints of dry bean production (30 minutes) *(Facilitator explains how drought, pests and diseases cause heavy losses of dry bean grain yield).* • Clarifies abiotic and biotic factors combined lead to loss of crop yield (figure 1).	
1.4.4 Projected climate change effect to dry bean production	
Projected Climate change effect (25 minutes) *(The facilitator explains how dry bean production will be affected by projected climate scenarios now and in the future).* **Discussions (20 minutes)** (*Let all participates ask questions suggest how mitigation for resilient agriculture could be applied)*	Demonstrate how weather patterns will cumulatively lead to poor yields. Give handouts. See Figure 2

Figure 1: Pest effects on crops
(courtesy: Sciencedirect.com)

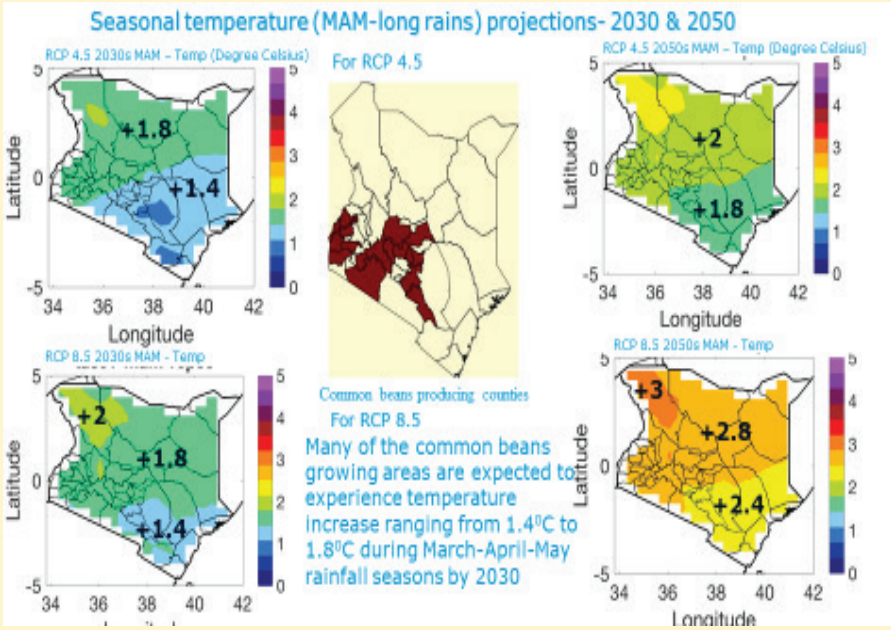


Figure 2: Temperature change in Kenya *(courtesy: CRAFT project 2020)*

1.4.5 Module review	
• **Recap on importance bean and how climate change affect production in different regions (20 minutes)** *(Facilitator reviews content of the modules; highlighting areas of concerns raised by the participants)*	Any clarifying issues on climate change.

Figure 3: Adverse weather conditions *(Source: nation.com)*

MODULE 2: CLIMATE CHANGE/ CRISIS, CAUSES, EFFECTS AND CLIMATE RESILIENT AGRICULTURE

2.1 Learning outcomes

This module aims to familiarize trainees with climate change, causes, effects, mitigation, and climate resilient agriculture (CRA). By the end of the training the participants should be able to

a) Define climate change or crisis
b) Understand what are causes and the effects of the crisis
c) Understand climate crisis hazards and risks
d) Understand how gender is affected by climate crisis

Explain the relationship between human activities and climate crisis

2.2 Module summary

Table 3: Module summary for Introduction to Climate Change and Climate resilient agriculture

Introduction to climate change and climate resilient agriculture (CRA)			
Sessions	**Training methods**	**Training materials**	**Time**
2.2.1 Introduction to the module and level-ling expectations	• Participants' introductions • Presentation	• Participants Handouts	25 minutes
2.2.2 Introduction to climate change, effects & causes	• Plenary Presentations Group Exercise	• PowerPoint presentations • Participants Handouts	30 minutes
2.2.3 Climate change hazards and risks	• Plenary Presentations • Group Exercise • Discussion	• PowerPoint presentations • Participants Handouts	• 1 hour
2.2.4 Climate change and how it affects gender	• Plenary Presentations • Group Exercise	• PowerPoint presentations • Participants Handouts	• 1hour
2.2.5 Module review	• Plenary presentation • Discussion	• Flip charts • pens	• 20 minutes
TOTAL			**3 hr. 15 min.**

2.3 Facilitator's Guide

Table 4: Facilitators to Module 2

Module 1: Climate change and resilient agriculture	
2.3.1 Introduction and levelling of expectations and objectives	
	Session guide
Introduction (15 minutes) *(The facilitator/ trainer welcomes participants to the module on climate crisis/change They are then invited to introduce themselves and state their expectations. Trainees writes on flip chart their expectations)* **Module objectives (10 minutes)** • To define the meaning of climate change and climate crisis • To state how climate change affects men, women and youth	• Summarize Participants' "Expectations" and display. • PowerPoint Presentation • Distribute handouts on Objectives and Training Module. See photo

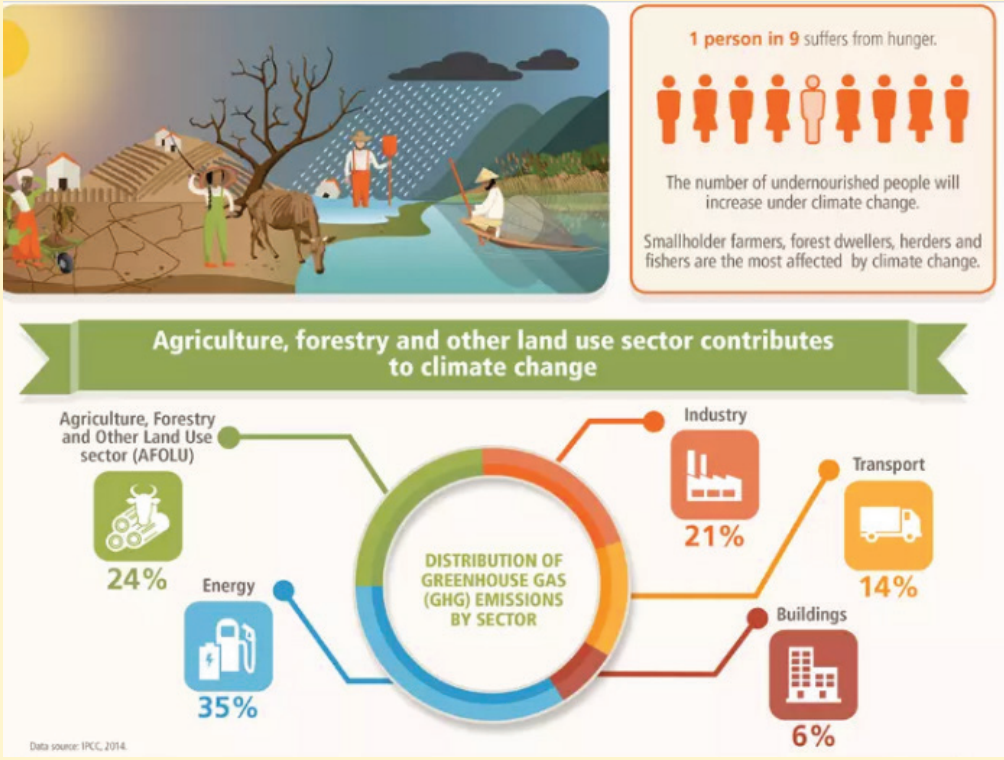


Figure 4: Contribution to climate change (Source: researchgate.com)

2.3.2 Introduction to climate change, effects and causes

Climate change, effects & causes (10 minutes)

(*Facilitator explores/ explains effects of climate to dry bean production and causes in various regions in Kenya)*

Group Exercise (20 minutes)

(Participants writes on flip chart and transfers on PowerPoint and presents to all in the plenary)

- Explain how climate change is likely to affect all
- PowerPoint presentations by participants.

See figure

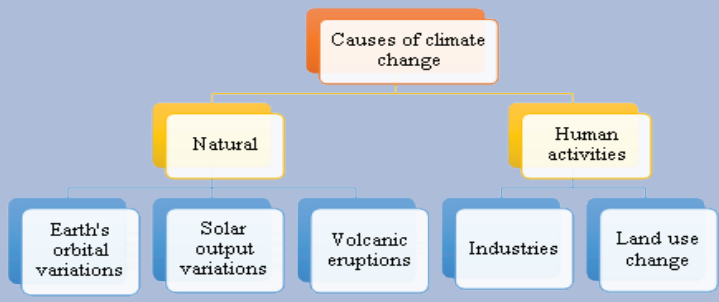


Figure 5: Causes of climate change *(Adapted: SNV products)*

2.3.3 Climate change hazards and risks

Climate change Hazards & Risk (30 minutes)

(Facilitator explains risks of diseases increase, and environmental damage of the plots for production)

Group discussion (30 minutes)

(*Presentation of more risks observed by trainees).*

- Clarifies difference of risks and hazards
- Group presents additional risks.

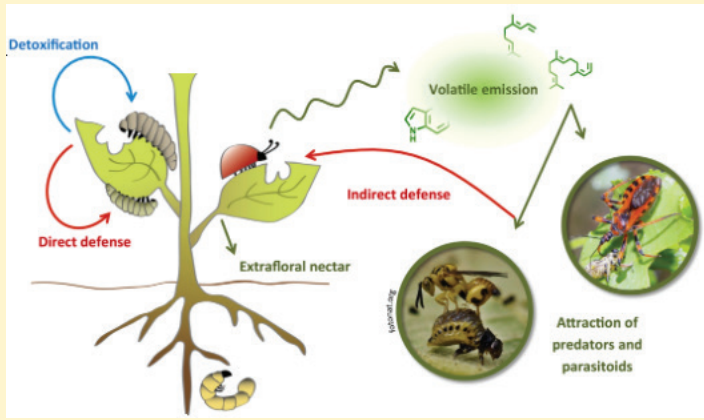


Figure 6: Climate change hazards & risks (Adapted from Researchgate.com)

2.3.4 Climate change; how it affects gender	
Climate change effect to gender (40 minutes) *(Facilitator explain how roles in dry bean production are affected in the risk areas).* **Discussions (20 minutes)** (*Let all participates ask questions suggest how mitigation for resilient agriculture could be applied)*	Distinguish how roles of women and men is affected in climate crisis. Give handouts Allow participants ask questions on various mitigation options on increased inclusivity.

When it comes to climate change, gender ...
ensia.com

kindpng_1880929.png

Figure 7: Gender issues illustration in agriculture

2.3.5 Module review	
• **Recap of climate change / crisis effects (20 minutes)** *(Facilitator reviews content of the modules; highlighting areas of concerns raised by the participants)*	Any clarifying issues on climate change.  (source: kindpng-1880929)

MODULE 3: DRY BEAN CLIMATE SMART TECHNIQUES FOR RESILIENT PRODUCTION

3.1 Learning outcomes

In this Modules the trainees will learn techniques in climate smart water and soil management techniques, and mitigation options in terms of excess. By the end of the training the participants should be able to:

a) Learn skills in climate smart water and soil management
b) Acquire climate smart management of bean pests, weeds and diseases
c) Learn of climate smart skills in use of pesticides and fertilizer inputs

Table 5: Module summary for Climate Smart Techniques for Resilient Dry Bean Production

Climate Smart Techniques for Resilient Dry Bean Production			
Sessions	**Training methods**	**Training materials**	**Time**
3.3.1 Introduction to the module and levelling expectations	• Participants' introductions • Presentation	• Flips charts • Felt pens, note books and pens • Participants Handouts	30 minutes
3.3.2 Climate smart in water and soil management	• Plenary Presentations • Group Exercise	• PowerPoint presentations • Participants Handouts	• 1 hour
3.3.3 Climate smart in bean pest, weed and disease management	• Plenary Presentations • Group Exercise • Discussion	• Flips charts • PowerPoint presentations • Participants Handouts	• 1 hour
3.3.4 Climate smart in use of pesticides and fertilizer inputs	• Plenary Presentations	• PowerPoint presentations • Participants Handouts	• 40 minutes
3.3.5 Module review	• Plenary presentation • Discussion	• Flip charts • pens	• 20 minutes
TOTAL			**3 hr. 30 min.**

3.4 Facilitator's Guide

Table 6: Facilitators Guide to Module 3

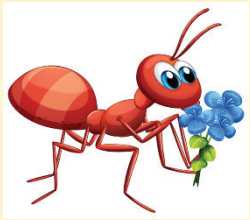
Climate Smart Techniques for Resilient Production	
3.4.1 Introduction and levelling of expectations and objectives	
	Session guide
Introduction (20 minutes) *(The facilitator/ trainer welcomes participants to the module on dry bean resilience in production. They are then invited to introduce themselves and state their expectations. Trainees writes on flip chart their expectations on bean crop production)* **Module objectives (10 minutes)** • To explore climate smart in water and soil management techniques • To disseminate skills for pest, weed and disease management • To know when to avoid overuse of pesticides and fertilizers in dry bean crop	• Summarize' "Expectations" and display. • PowerPoint Presentation by group • Distribute handouts on Objectives and Training Module.
3.4.2 Climate smart in water and soil management	
Bean production (30 minutes) (*Facilitator explores/ explains dry bean ecological requirement for water and soil fertility. Does the farmer know when to take soils for nutrient determination before next crop planting? As for the bean variety being produced how much moisture is required to maturity? Is the dry spell sufficient for grain drying?).* **Group Exercise (30 minutes)** *Trainees divide themselves into groups of 5 persons and evaluate if techniques used in dry bean production by farmers are climate smart with increased climate crisis.*	• Focus be on who will carry out the various management tasks. • Are the farmers practicing true climate smart techniques and reaping the benefits?

Figure 8: Farm to market (Photo courtesy: weforum.org and theepochtimes.com)

3.4.3 Climate smart in bean pest, weed and disease management

Constraints of dry bean production (30 minutes)
(Facilitator / trainer explains how drought, pests and diseases occur at different crop development. Threshold for control are key to prevent yield loss).

- When is the time to spray against certain pest or disease? What type of weed control is effective



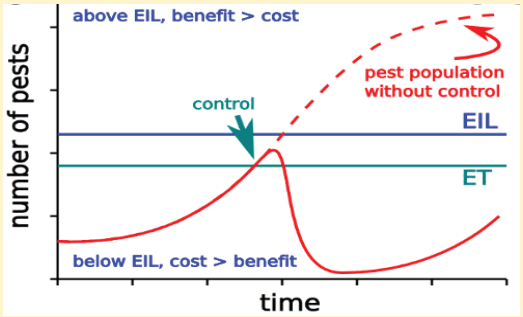


Figure 9: Constraint of production (Graph courtesy: eorganic.org)

3.4.4 Climate smart in use of pesticides and fertilizer inputs

Projected Climate change effect (20 minutes)

(Facilitator/ trainer explains importance for judicial use of pesticides and fertilizer inputs).

Discussions (20 minutes)
(*Let all participates ask questions suggest how mitigation for resilient agriculture could be applied)*

Explain how increased pesticides and fertilizers increase greenhouse gas emissions (GHG), and how to mitigate that.

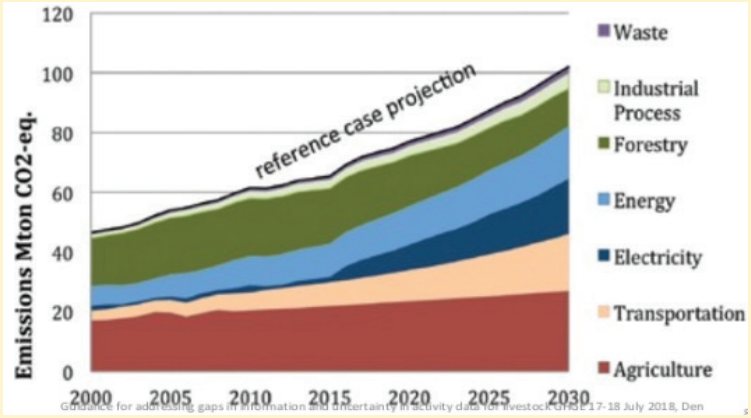


Figure 10: GHG projected emissions (Kenya), 2010-2030 (Graph courtesy: efdinitiative.org)

3.4.5 Module review

- **Recap on climate smart technologies for increased dry bean production (20 minutes)**

  (Facilitator/trainer invites trainees to evaluate their understanding of concepts of climate bean production)

When are production techniques considered a climate smart?

MODULE 4: OPTIONS FOR VALUE ADDITION FOR INCREASED DRY BEAN PRODUCT VALUE FOR ENHANCED BUSINESS

4.1 Learning outcomes

Trainees will learn of ever-changing market dynamics of dry bean products. By the end of the training the participants should be able to:

a) Plan and supply dry bean products as the market demand
b) Strategize on consumer product preference satisfaction
c) Increase gross margins for increased profits
d) Manage competition and market dynamics

Table 7: Module Summary for Value Additions for increased bean product value and enhanced business

Value addition for Increased Market Demand and Enhanced Business			
Sessions	**Training methods**	**Training materials**	**Time**
4.1.1 Introduction to the module and levelling expectations	• Participants' introductions • Presentation	• Flips charts • Felt pens, note books and pens • Participants Handouts	• 30 minutes
4.1.2 Market demand for various bean products validation	• Plenary Presentations • Group Exercise	• Flips charts • Felt pens • PowerPoint presentations • Participants Handouts	• 50 minutes
4.1.3 Considering consumer product preference	• Plenary Presentations • Group Exercise • Discussion	• Flips charts • Felt pens • PowerPoint presentations • Participants Handouts	• 1 hour
4.1.4 Increasing gross margins for profits	• Plenary Presentations	• Participants Handouts	• 30 minutes
4.3.5 Competitor and market dynamic management	• Plenary Presentations • Group Exercise	• Flip charts • pens	• 20 minutes
4.1.6 Module review	• Plenary presentation	• Participants Handouts	20 minutes
TOTAL			**3 hrs. 30 min.**

4.2 Facilitator's Guide

Table 8: Facilitators Guide to Module 4

Value addition for Increased Market Demand of Bean grain	
4.2.1 Market demand for various bean products validation	
	Session guide
Introduction (20 minutes) *(The facilitator/ trainer welcomes participants to the module on dry bean competitive marketing skills. They are then invited to introduce themselves and state their expectations. Trainees writes on flip chart their expectations on bean crop production)* **Module objectives (10 minutes)** • To evaluate market demand for dry bean products • To determine consumer bean market preference • To plan for production volumes for high gross margin/ profits • To manage competition and market dynamics	• Summarize' "Expectations" and display. • PowerPoint Presentation by group • Distribute handouts on Objectives and Training Module.
4.2.2 Market demand for various bean products validation	
Market sourcing (20 minutes) (*Facilitator explores various dry bean grain products. Skills for measuring level of demand of the product stated).* **Group Exercise (30 minutes)** *Trainees divide themselves into groups of 5 persons and list farmer skills for marketing bean grain in their areas. What other marketing skills are available?*	• Who will process the dry bean grain to the various market products? Youth, women or men? • Encourage farmers/ trainees to explore unique marketing skills/ channels.

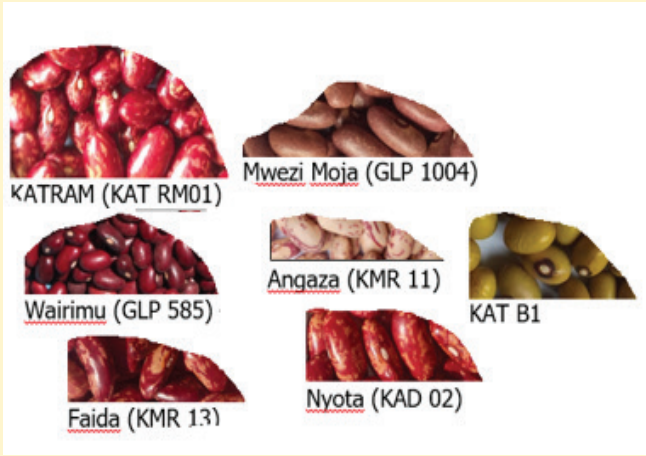


Figure 11: Making decisions on bean varieties. Photo courtesy:123rf.com

4.2.3 Considering consumer bean product preference

Consumer product (30 minutes)

(Facilitator / trainer invites session of participatory learning to come up with specific market bean product preference; schools, hotels and supermarkets. etc.).

Group work (30 minutes)
Let participants come up with attractive new ways of testing bean products in target markets, and the plenary all evaluate options for increased sells.

- Only market-demand driven products will sell easily.

Figure 12: Dry beans value addition. Photo: D. Karanja

4.2.4 Increasing gross margins for profits

High gross margins (20 minutes)
(Facilitator/ trainer leads trainees to consider level of investment
of various inputs in consideration of projected sales).

High sales are as result of equivalent high inputs.

Calculating a gross margin

The basic formula for calculating a gross margin is as follows:

Gross margin = Gross income - Variable costs

4.2.5 Competitor and market dynamic management

Competitor and market management (20 minutes)

Facilitator/ trainer lead trainees on how to guide farmer identify his /her competitors and explore mitigation solution to reduce / eliminate competition.

An entrepreneur hones skills to remain above his/ her competitors with superior products / services, and with least delivery costs.

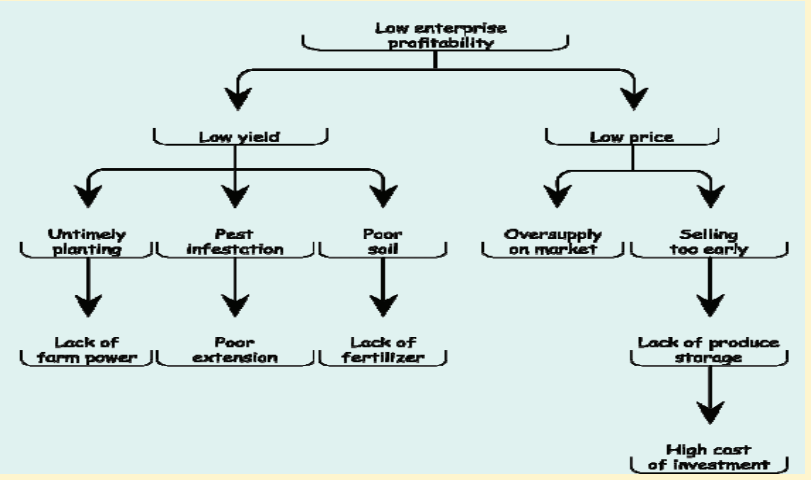


Figure 13: Illustration of market dynamics

4.2.6 Module review	
• **Recap on bean products and marketing skills (20 minutes)** *(Facilitator/trainer invites trainees to evaluate their understanding of concepts of climate bean production)*	When are production techniques considered a climate smart?

Table 9 Training Evaluation

Module	Rating		
	Very Useful	Useful	Of Limited Use
Module 1 – Dry Bean importance to Kenya Economy			
Module 2- Climate change/ crisis, causes, effects and climate resilient agriculture			
Module 3- Dry Bean Climate Smart Techniques for Resilient production			
Module 4- Options for Value Addition for Increased Dry Bean Product Value for enhanced business			

WAY FORWARD

To generate the way forward divide the participants into groups and they come up with a way forward on the next steps.

Republic of Kenya

Ministry of Agriculture, Livestock, Fisheries and Cooperatives

Principal Secretary
Ministry of Agriculture, Livestock,
Fisheries and Cooperatives
Cathedral Road, Nairobi
P. O. Box 34188-00100 Kenya
Nairobi, Kenya
Telephone: +254-20-2718870
E-mail: psagriculture@kilimo.go.ke
www.kilimo.go.ke

CRAFT
Climate resilient value chains for improved livelihoods

SNV Netherlands Development Organisation
Ngong Lane, off Ngong Road
P.O. Box 30776, 00100 Nairobi, Kenya
Tel: +254 724 463355
Email: kenya@snv.org