Training course packages targeting food operators on the adoption and management of the technological innovations

AGRO-ECOLOGICAL INTENSIFICATION AND BIODEGRADABLE MULCHING

Agroecological intensification: sensitisation of farmers and participatory selection of interventions

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Table of Contents

1. FoodLAND technical innovation for local food supply chains: concepts and approaches 3

2. FoodLAND practical training: aims and scope 5

3. Second training packages on the adoption and management of the tested innovations: an overview 6

4. Second training packages on practical information on the adoption and management of the tested innovations 7

- **Agro-ecological intensification and biodegradable mulching** 7
  - **Agroecological intensification: sensitisation of farmers and participatory selection of interventions** 7

1. FoodLAND technical innovation for local food supply chains: concepts and approaches

The FoodLAND project has the ambition to impact on a large number of supply chains and communities, hence the process of food operators' capacity development has to be tailored and as much participative as possible. Accordingly, one of the assumptions of FoodLAND is that sustainable and nutrition-responsive farming systems can be achieved basically by strengthening the capacity development, and specifically by **a)** empowering farmers and processors through the implementation of capacity building processes and concrete opportunities; **b)** creating or consolidating cooperation and shared knowledge to overcome the lack of coordination among food operators; **c)** addressing the inefficient use of resources; **d)** trying to address and build resiliency to the high vulnerability of food systems to climate change; **e)** enhancing the integration of supply chains by creating commercial and stakeholders' networks; **f)** improving the responsiveness of the production sector to the market demand.

To implement these elements of capacity development, FoodLAND proposed the adoption of specific innovations, among which the organizational ones, to create strong and responsive links between producers and encompassing all the intermediate actors along the food value chain, such as researchers, SMEs, NGOs, local and national authorities. In order to ease the creation of those links and guarantee the sustainability over time of the results, 14 Food Hubs will be created in 6 countries as part of the organizational innovations. Food Hubs are conceived as multi-actors centers of innovation where to develop or enhance the organizational and operational conditions enabling local food supply chains (D3.6).

Functional to the implementation of the Food Hubs and of the innovations, the training courses were designed – in form of capacity development activities – as a two-phase process. Firstly, a training session focused on general, preparatory topics was provided to farmers as described and reported in D3.5 ("Group Introductory Training", GIT). According to the project GA, GIT broad set of goals

were: to enhance the knowledge of consumers' nutritional needs and market opportunities, and to boost the notions about climate change, sustainability, resilience, and food culture. Secondly, a specific training session were organized to provide food operators with practical information on the adoption and management of the innovations tested at lab / small scale level and to contribute to validating them at appropriate scale.

However, as the whole approach has been designed by FoodLAND to ensure the inclusion of the local actors from the first moment, both the training sessions were set up accordingly. Indeed, yet in the inception phase of the project, an assessment on participatory methods has been run and Participatory Learning and Action (PLA) approach has been eventually assessed as the best one to ensure the inclusion of multiple perspectives. The main purpose of PLA is to support people within communities to analyze their own situation, rather than have it analyzed by outsiders, and to ensure that any learning is then translated into action (Gosling and Edwards 2003). In addition, a gender-sensitive approach has been applied to the trainings that have been designed considering gender roles and power relations; they have provided equal opportunities to participate in the process by caring to times, venues and use of local languages.

The GITs have been conceived as the first step towards the innovation validation and aim at involving the producers, yet from the inception phase. They are just the first step in a sequence of 6, summed up in **Table 1**. After the GITs, where farmers and processors meet and share their vision and goals for the Food Hubs and exchange information about specific topics, the Food Hubs were created and the innovation tested (first in pre-test, then in pilot phase). The constant iteration between researchers and local actors is a key feature of the project: specifically, the practical trainings focused the single innovations (step 5) are aimed at validating the innovations at adequate scale and planned to trigger feedback loops of control and improvement involving developers and adopters.

Table 1. Activities with farmers and food processors (SMEs) and participatory approach

Step	1	2	3	4	5	6
Task	**T3.3**	**T3.3**	**T3.4**	**T4.1¸T4.5**	**T5.1¸T5.5**	**T5.1¸T5.5**
Activity	Group introductory training	Food Hubs creation	Innovation undertaking	Innovation tests	Individual and group practical training	Innovation pilot and validation

2. FoodLAND practical training: aims and scope

According to the project bottom-up and participatory approaches, following the courses on introductory topics GIT organized in the early project phase (T3.3), and as component creating / strengthening the Food Hubs as local innovation centres, FoodLAND has organized a second set of training activities with food operators based on active learning methods and gender equality principle (Task 5.1-5.9). In this regard, specific mechanisms (being aware of the gender roles and power relations; providing equal opportunities to participate in the process by putting attention to the times, venues, use of local languages, etc.) will be lifted to ensure women's participation. These training packages are aimed at providing the local farmers and food processors with operational instructions on the adoption and management of the validated innovations.

This second set of training activities has been organised – triggering PLA approach – as individual and group practical (demonstration/capacity building) activities to be conducted in parallel to the implementation of the technological research (where relevant) and of the innovation pilots and validation. These technology-centred trainings aim at strengthening the participants' understanding of novel production and post-harvest techniques, innovative tools and systems (e.g., climate smart/precision agriculture, hydroponics, and integrated aquaculture), new technologies for primary and secondary processing, and supply chain management. Thus they aim at fostering knowledge and operational capacity to deploy, manage, and maintain the validated technological innovations – documented by the released guidelines D4.1 ÷ D4.11 (e.g., training pamphlets, user manuals, flow diagrams, and operational recommendations) and practice abstracts D6.5 – validated jointly at appropriate scale.

3. Second training packages on the adoption and management of the tested innovations: an overview

The second training course aimed at consolidating the food operators' knowledge and practical skills to adopt, manage and validate the project innovations and complement the related guidelines. Specifically, the realized training materials provide local farmers and food operators with a set of notions and concrete information on a series of innovative tools and systems as per the following **Table 2**. It is clear that both the contents and formats of the learning packages widely differ across technologies as well as Food Hubs (when the same type of innovation must be validated in different contexts). The diversity that emerges from the proposed solutions reflects the different needs highlighted by farmers and stakeholders as well as the conditions and opportunities characterizing the local communities. Nevertheless, in order to take into due account the existing heterogeneity inside the local communities, the developed learning materials have been let available on the project intranet so as to be used for further training initiatives across the network of Food Hubs.

4. Second training packages on practical information on the adoption and management of the tested innovations

Agro-ecological intensification and biodegradable mulching

Agroecological intensification: sensitisation of farmers and participatory selection of interventions

FOODLAND

Agroecological Intensification

Sensitisation of farmers and participatory selection of interventions

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1. *Limited land space*
2. *Pests and diseases*
3. *Weeds*
4. *High cost of inputs*
5. *Crop waste and animal residue*
6. *Decreasing soil fertility (productivity)*
7. *Climate change effects*
8. *Limited access to improved inputs*
9. *Income shortages*
10. *Low and variable prices*
11. *etc*

Agroecological intensification (AEI) aims to address these problems using local resources without compromising health of the environment

Improving agriculture performance

- Increased yields
- Better and more effective input use
- Better use of local resources
- Increased farmer resilience against shocks

THROUGH

Improved practices

AIM

Better Incomes

Better Diets

IMPROVED LIVELIHOODS

Principles of agro-ecology

- Increasing biomass recycling while improving nutrient availability and balancing nutrient flow.
- Maintaining favorable soil conditions for plant growth, namely through regulating organic matter and increasing soil biotic activity.
- Reducing losses due to flows of solar radiation, air, and water through managing microclimates, harvesting water, and managing soil through improved soil cover.
- Species and genetic harvesting of the agroecosystem in time and space at the field and landscape levels.
- Promoting essential ecological processes and services by increasing favorable biological interactions and synergisms among agrobiodiversity components.

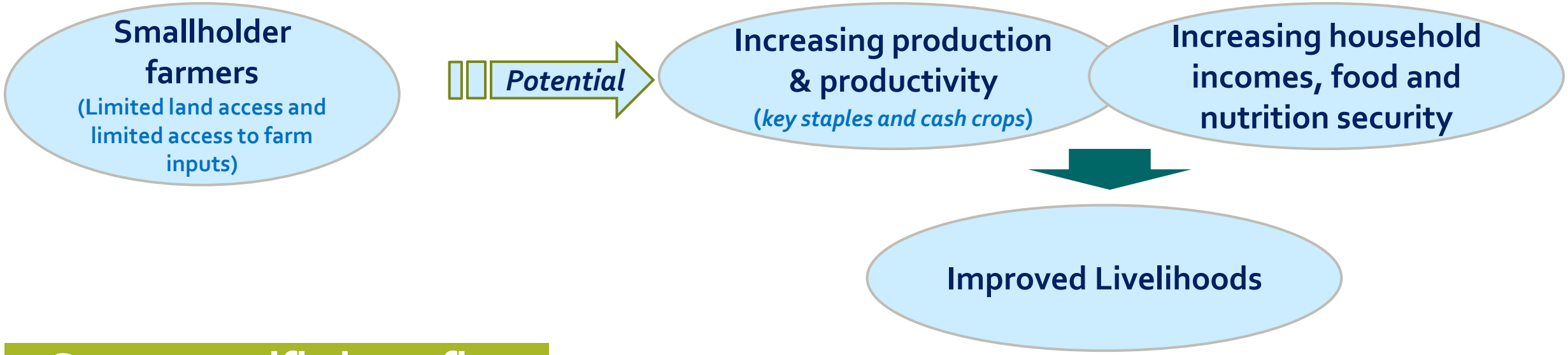
Examples of AEI practices and their benefits

	Practice	Benefits
1	**Mulching**	Controls weeds, soil erosion, moisture and soil nutrients loss
2	**Recycling and use of biomass and agricultural by-products**	Waste disposal; improves soil fertility and productivity
3	**Use of organic inputs and balanced use of inputs**	Improves soil fertility and productivity
4	**Soil and water conservation**	Improves water availability; Controls loss of soil nutrients and water
5	**Integrated pest management**	Controls spread of pests and diseases without significantly affecting environmental health

Cont….

	Practice	Challenge (s)
6	**Integrated soil and nutrient management**	Sustains soil fertility; controls pests and diseases; mitigates effects of climate change
7	**Agroforestry**	Controls soil erosion; mitigates climate change; permits production of fruit, energy and fodder trees along with food crops
8	**Crop rotation**	Controls pests, diseases, weeds and maintains soil fertility and productivity
9	**Intercropping**	Allows production of diversity of crops on same plot, contributing to food, nutrition and income security; controls weeds; improves soil fertility, limits soil errosion; improves land productivity
10	**Diversification**	Contributes to food, nutrition and income security

Summary of benefits of AEI to smallholder farmers



Some specific benefits

1. *High production more per unit area*
2. *Lower expenditure on farm inputs*
3. *Production of diverse foods, increasing ability to get balanced diet*
4. *Higher ability to produce food all year round*
5. *Higher ability to produce fodder*
6. *Stability of production over years*

More food available to feed family and to sell

AEI Practices: Mulching

Spreading various covering materials on the surface of the soil to minimize moisture losses and weed population and to enhance crop yield

One could use agricultural residues e.g. straws, husks, grasses and cover crops (live mulches), sawdust, compost, and manures.

- Before applying mulch, remove weeds and water thoroughly
- Apply 2-4 inches of mulch. Finer mulches (<half inch) should be applied no more than 2 inches deep.
- Mulch should be replenished over time and care should be taken to avoid mulch build-up

- Deep mulching when ground is wet can stress the plant due to excess moisture
- Mulch should not be packed close to the stem of the plant
- One should avoid using fresh grass clippings as mulch
- Fine mulch when laid in thick blankets reduces water and air penetration

Advantages of mulching

- Mulching protects soil from wind and water erosion
- It improving the infiltration of rain and irrigation water by maintaining a good soil structure
- Helps to retain water in soil during dry weather
- Organic mulch material is an excellent food for soil organisms and provides suitable conditions for their growth.
- Mulch suppress weed growth
- Helps prevent the soil from heating up too much
- Organic mulch, on ddcompsoing provide nutrients to the crops

Challenges associated with mulching

- Under a mulch layer, slugs and snails can multiply rapidly. Ants and termites that cause crop damage may also find optimal living circumstances.
- When crop residues are utilized for mulching, there is an increased risk of pests and diseases persisting.
- When carbon-rich materials such as straw or stalks are used for mulching, microbes may use nitrogen from the soil to decompose the material. As a result, nitrogen may be temporarily unavailable for plant growth.
- The availability of organic material is typically the primary constraint for mulching. Its production or collection usually requires labor and may conflict with crop production.

AEI Practices: Intercropping

Growing two or more crop types on one field

Mixed intercropping - *two or more crop types grown, seeded, and harvested together*

Row/Strip intercropping - *two or more crop types alternated in rows or sections*

Relay cropping - *planting a second crop type into an existing standing crop once it's reached the reproductive stage*

1. Combine high-growing and wide-growing species
2. Match shallow-rooted plants with deep-rooted ones.
3. Select species with similar water needs
4. Match plants that do not compete for sunlight (one able to develop in the shade of the other)
5. Avoid grouping crops of the same family to mitigate pest invasions
6. Add culinary herbs for the repellant effect.
7. Plant legumes with non-legumes to improve soil fertility
8. Choose slow-growing and fast-growing types. When the latter is harvested, the former will have enough space to develop.
9. Consider any inhibitory properties of the plants
10. Select plants for physical support and ease of management

AEI Practices: Crop Rotation

Growing a series of different types of crops in the same area across a sequence of growing seasons

Also entails choosing not to plant anything at all in a given season and allowing the land to rejuvenate while bare until the next season

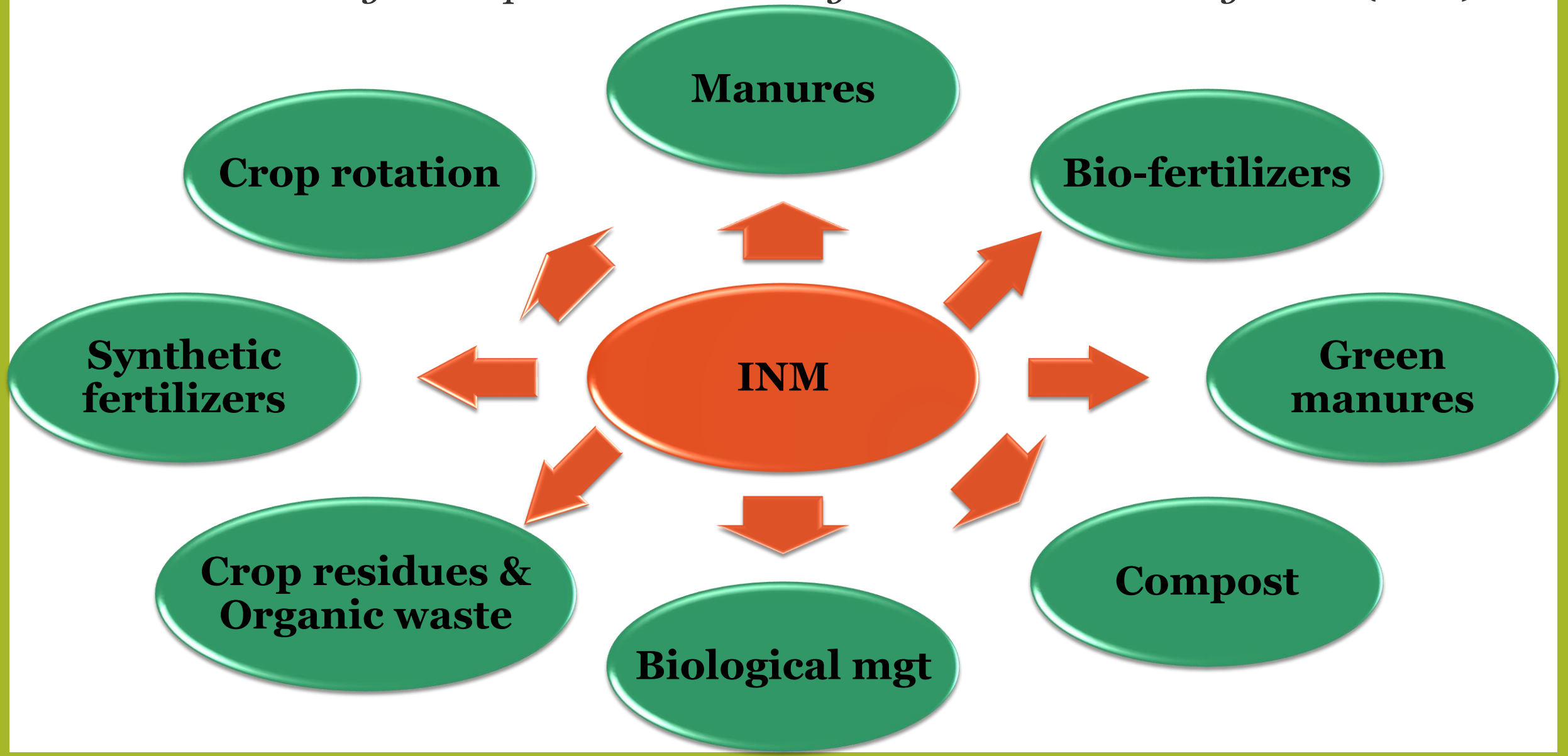
Can be

- One-year rotation, two years, or three years rotation

1. Rotate by plant part harvested.
2. Rotate by plant family.
3. Rotate by plant compatibility.
4. Rotate by nutrient requirements.
5. Rotate by rooting depth and type.
6. Include legumes and cover crops

AEI Practices: Integrated soil and nutrient management

Involves soil management practices and integrated nutrient management (INM)

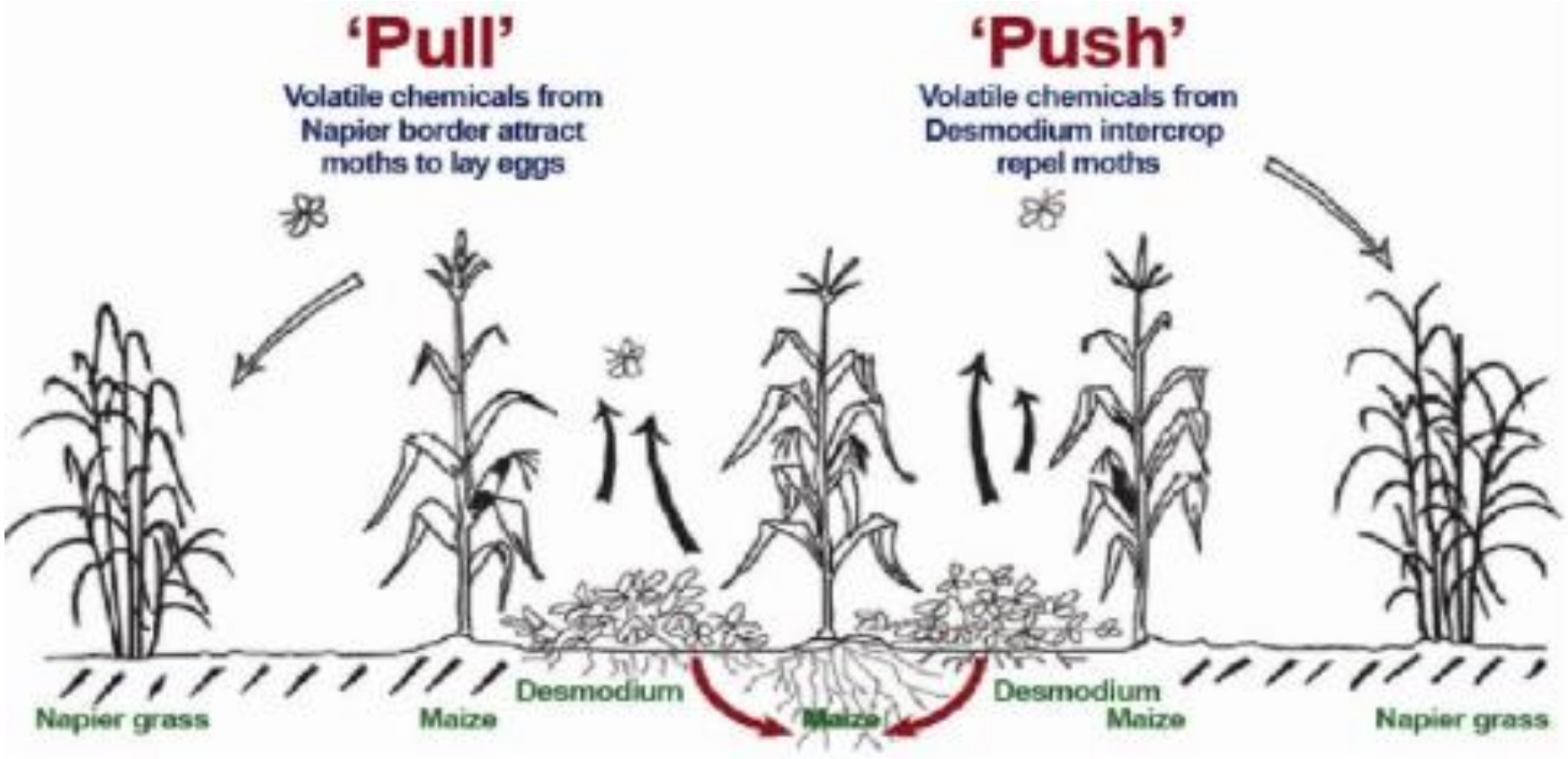


AEI Practices: Integrated pest management

Involves long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

1. Use plants that repel pests e.g. lemon grass and attract pollinators
2. Use multiple cropping
3. Plant tolerant varieties
4. Apply pesticides
5. Use predator animals or insects that kill the pests
6. Extract and make natural organic toxins
7. Apply good agricultural practices

Pull Push Technology



- Napier grass, desmodium legume and mazie planted in same garden as shown in the figure
- Desomodium produces odor that repels stemborers, that would otherwise destroy maize
- Napier attracts the stemborer pests, which lay eggs on it
- Napier grass produces glue-like material that sticks on stemborer larva stopping hatching

AEI Practices: Soil and water conservation

*Activities that **prevent or reduce soil erosion**, compaction; and conserve or drain water while maintaining or improving soil fertility*

Soil and water conservation measures

Physical

- Terraces
- Bunds
- Contour ditches
- Retention reservoirs and dams
- Grassed waterways
- Planting pits

Biological and Agronomic

- Strip cropping
- Mix cropping and Intercropping
- Mulching
- Contour planting/farming
- Agroforestry
- Grazing management
- Choice of crops – cover crops & with good biomass, canopy, and extensive root system
- Crop rotation and fallowing
- Conservation tillage

GROUP EXERCISE: Participatory selection of AEI practices

Guide for selection of interventions

1. Generate list of production constraints group members face
2. Rank the the generated constraints using pairwise ranking to get 4 top ranked constraints
3. For each of the top 4 priority constraints, list AEI practices that farmers consider as potential solutions
4. Rank the AEI practices using pairwise ranking to get the top 4 for each constraint
5. List all the AEI practices selected in 4 and rank them using pairwise ranking. The number of practices to be promoted by each group is to be determined based on feasibility.

THANKS FOR LISTENING