FARMING-SYSTEM SPECIFIC EXTENSION CONTENT FOR ENHANCING CLIMATE CHANGE ADAPTATION AND RESILIENT FOOD SYSTEMS IN SORGHUM-BASED DRYLAND FARMING SYSTEMS OF TANZANIA AND BURKINA FASO

OVERVIEW OF ADVICE ON NUTRITIONAL RESILIENCE

CLIMATE CHANGE ADAPTATION AND RESILIENT FOOD SYSTEMS ISSUES

When addressing the resilience of food systems in sorghum-based, dryland farming systems of Africa, the focus of research and extension is heavily skewed on increasing yields of staple crops through prioritization of climate-smart, drought-tolerant, and pest- and disease-resistant varieties. Relatively little attention is paid to nutrition resilience - more specifically micronutrient resilience, which is the ability to withstand dietary diversity shocks without suffering impaired growth or increased morbidity. Staple foods are typically categorized by nutritionists as important sources of certain macronutrients - especially for the poor - but not of micronutrients, which are given lower priority. This impacts mostly on children as well as pregnant and lactating women. So, the issue is how to ensure that nutritional resilience is addressed when providing advice on enhancing the resilience of the sorghum-based food systems.

ESSENTIAL TECHNICAL INFORMATION

Dietary diversity is widely accepted as the gold-standard approach to building nutritional resilience in food systems. The overriding focus is on increasing the availability and lowering the cost of higher-micronutrient quality foods such as fruits, vegetables, and animal-source foods, often complemented by nutrition and behavior-change communications targeted at increasing consumption. The impact of COVID-19 has revealed that shocks lead to reduced consumer incomes, which force changes in food consumption patterns. This usually involves shifting consumption from higher-nutrient foods to relatively less expensive, but also less nutritious, staples.

The options for addressing the decline in the nutritional quality of foods include increasing supplementation coverage for micronutrient-vulnerable populations and expanding the coverage of industrial fortification, which increases the micronutrient content of staple grains and oils with additives after harvest and before retail. But these options may not benefit the rural people in a sustainable way. The proven responses to this micronutrient challenge are: (i) enhancing growth and consumption of micronutrient-rich foods - essentially fruits and vegetables, and (ii) is increasing the intrinsic micronutrient content of the staple foods themselves (e.g. golden pearl millet is high in zinc, orange fleshed potato is rich in vitamin A) . This is termed “biofortification”. Biofortification delivers micronutrients to vulnerable rural populations in the foods they grow themselves and eat every day. It also builds their nutritional resilience because the micronutrients come at no extra cost and stay in their crops, harvest after harvest.

EXTENSION ADVICE ON NUTRITIONAL RESILIENCE

1. MICRONUTRIENT DENSE VEGETABLES

According to the World Health Organization (WHO), a matured person should consume daily 400 grams of vegetable (excluding potato) to live a healthy life. However, insufficient access to market and seasonal fluctuation of available vegetables makes it difficult to intake sufficient amount of vegetables for rural households. Thus, a home garden in rural Burkina Faso and Tanzania are very essential where people can regularly grow vegetables in small piece of land. However, it is also commonly seen that many rural households do not apply appropriate cultivation techniques, which result in limited production, and frequent occurrences of pest and disease attacks.

The common vegetables are tomato, onions,carrots, okra and leafy gevetables. Tomato, onions,carrots, okra and spinach are what is referred to as international vegetables whose seeds are produced by international seed companies and are imported and stocked by agro-dealers. Local vegetables despite being important, their seeds are not traded but grown from saved or obtained from neighbours.

Off-season vegetables are grown using water harvested or at the bottom of river valleys.

Land preparation: Vegetables are either grown in a nursery or directly seeded. Tomato and onion are sown in the nursery but the rest are directly sown in the field.

Nursery is prepared by cultivating through fine tilth and raised bed. Fine compost and fertilizer, mostly DAP is added. Seeds are drilled at close spacing and covered with soil. The nursery is then irrigated. Shed is built to protect seedlings and regularly irrigated. Once the seedlings are well established, harden before transplanting. This is achieved by removing the shed and reducing the frequency of irrigation.

In all cases, seedlings from the nursery or seed are planted in the field. The fields are prepared well, weeds removed and ridged for irrigation. Crops from the nursery are transplanted in the morning in fertile soil. The other vegetable crops are directly seeded.

Management: Fields should be weed free and top-dressed using 100 kg N/ha pests and diseases controlled. Agro-dealers and extension staff should be aware of appropriate use of chemicals. Tomatoes should either be trained to grow on raised beds or use stakes to trellis them.

Harvest: Tomato is harvested when fruits are turning yellow to red and onions when the leaves are showing signs of wilting. Okra and egg plants when fruits are big but still retain their original colour. Leafy vegetables when leaves are fully grown but not showing signs of ageing. If pesticides have been used waiting for 10 days before harvesting.

2. EXTENSION ADVICE ON FRUITS

Most common home garden fruit crops are citruses and mango. Citrus is budded and mango is grafted. In both cased obtain planting material from a reputable nursery.

Prepare planting holes of 50 cm deep and a radius of 30 cm. Fill the bottom of the hole with decomposed compost mixed with top soil. The spacing for citrus is 7 by 7 m and for mangoes

9 by 9 m. Plant but ensure that the budded or grafted portion is above soil level. Make a basin around each plant with a diameter of one metre that will be used for irrigation. Feel the soil when drying and irrigating.

Ensure that branches do not grow below the budded point and do not allow the trees to produce fruits during the frst two years. For mangoes, control pests by applying pesticide at flowering, when fruits are young and when half mature. Recommendations are on the labels.

3. EXTENSION ADVICE ON BIOFORTIFICATION

Tanzania has National Biofortification Guidelines (United Republic of Tanzania Ministry of Agriculture, 2020). The key messages that the extension agents should be aware of for purposes of advising farmers are given in the Table below. These messages are applicable to Burkina Faso.

STEPS	KEY MESSAGES
Seed Multiplication and Distribution	Proper packaging with appropriate colour code facilitates identification and usage of biofortified seeds. Well-trained agro-dealers are key to ensuring farmers have access to quality seeds and follow good agricultural practices.
Production of Biofortified Crops	Use of genuine biofortified seeds and other recommended agro-inputs together with application of GAP enhance production and yield of biofortified crops.
Post-Harvest Management (PHM)	To maintain intended qualities and quantities of biofortified crops, stakeholders along the value chain must adopt recommended agricultural practices and measures to mitigate Post-Harvest Loss (PHL).
Processing and Marketing of Biofortified Crops	● Processers of biofortified food products should consider that consumer acceptance depends largely on sensory characteristics, nutritional value, keeping qualities and/ or shelf life; ● Promotion of biofortified foods is key to ensure acceptability.
Utilisation of Biofortified Foods	● Observing principles of hygiene and safety is necessary during preparation of biofortified foods to minimize contamination and food borne diseases; ● Mass feeding with bio- fortified foods is useful for wider population coverage to make a substantial impact on reducing micronutrient deficiencies.
Gender	Gender mainstreaming in biofortification initiatives is essential in scaling-up, adoption and consumption of biofortified foods
Social and Be- haviour Change Communication (SBCC)	SBCC messages should target beneficiaries, influencers, enablers and those involved in delivering the interventions to increase use of biofortified foods.
Climate Change	● Development of biofortified varieties with resilience to climate change will ensure sustained production and utilization of biofortified products; ● Many of the developed varieties are resilient to climate change.
HIV/AIDS and Tuberculosis	Promote the use of iron/zinc-rich biofortified foods among people living with HIV/AIDS and TB to increase micronutrient intake.