Training Briefs
AHI brief
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A farming system in Harar, Ethiopia, where farmers face difficulties in deciding which farm enterprises should be expanded or reduced to achieve optimum gains to food, income and natural resource management

This course is designed to facilitate the decision-making of farmers and development actors in optimum use of scarce resources of land, labour, nutrients and water for improved productivity, income and natural resource management in diverse production systems.

Training Course on System Optimization Based on Demand, Markets and the Resource Base

While technological innovations are vital to solving system constraints, their efficiency can be limited unless they are targeted to address key constraints and to contribute to overall household production objectives. Contrasting production systems demand different technological innovations and entry points to bring immediate change before targeting complex natural resource management issues. Diversity in production objectives among households, for example with some households concentrating on marketable commodities and others on food security and self-sufficiency, also requires targeting of technological interventions. Resource-poor farmers, particularly those far away from markets, face difficult decisions over the use of scarce resources in their production systems, including land, labour, nutrients and water. Decisions on the allocation of resources are often made with traditional wisdom on financial gains and food security, with limited assessment or appreciation of the impact of management decisions on other system components (feed production, soil fertility management and soil erosion, for example).

A considerable amount of information on crop and livestock technologies and methods is available within rural communities and districts, yet predictions and recommendations are difficult due to the variable nature of biological and socio-economic systems and the trade-offs that characterize production and resource/input management decisions. Models that utilize locally-collected data to simulate livestock productivity, increases in marketable enterprises, intensification of nutrient cycling and improved market response can enable initial recommendations for sustainable livelihood improvements. Incorporation of market demand, farmer production objectives, risk assessment and farmer decision-making into system modelling allows the development of robust decision support tools. With the ability to consider multiple variables simultaneously, these tools can enable more accurate and optimal targeting of innovations to foster multiple household objectives including the productivity of crop-livestock systems, household income and food security, and system sustainability. This course assists researchers and development actors to target technologies and other innovations for solving key production, marketing and sustainability constraints.

	CURRENT SITUATION			SCENARIO I		SCENARIO II		SCENARIO III	
Nutrients	*RDA*	*Current*	*Difference*	*nutrients*	*Cash income (birr/cu)*	*nutrients*	*Cash income (birr/cu)*	*nutrients*	*Cash income (birr/cu)*
Energy (kcal)	2000	1448	-552.00	4139.80		2235.00		101.75	
Protein (g)	37.5	15.02	-22.48	39.73		37.84		2.57	
Zinc (mg)	15	5	-10.00	15.78		10.86		20.69	
Calcium (mg)	528	183	-345.00	568.68		406.85		43.34	
Vit A	10.00	2.45	-7.15	62.85		23.79		0.001	
Income		684			488.71		1200		2011.98

Table 1. Nutrient budget and cash income of households in an enset/root crop-based system, under current cropping system and after the system is optimized primarily for human nutrition (Scenario I), for human nutrition and cash income (Scenario II) and for cash income (Scenario III). 1 USD = 8.6 Ethiopian birr.

Course Overview

Part 1: The course will begin with a detailed overview of existing analytical tools and methods, and how they can be utilized in identifying and characterizing production systems and households with diverse resource endowments and production objectives. Due emphasis is given on the use of social research tools, including semi-structured key informant and group interviews and discussion with community leaders, to extract reliable data for the analysis. It will also enhance the capacity of participants in verifying the reliability of diverse data sources before using them for crucial decision-making, and modelling. During this introductory session, methods to quantify the household resource base including farm size, cropland allocations, household consumption units and nutrient intake, and differences in gender and sex in human nutrition and health, are displayed. Practical exercises will enable participants to access and process extensive data sets on the production system and household resource use; and to collect representative data sets for diverse social strata and production systems.

Part 2: The second part of the course emphasizes methods for quantifying resources, including farm and household nutrient levels and household income. These methods will assist in quantifying the nutritional status of households by day, week and year. It will also enable participants to compare various cropping systems in terms of both food security and cash income. Pre-existing and new data sets will be utilized to identify which human nutrition component is missing in the system. Methods for identifying the need for intervention by policy makers and development actors will be displayed.

Part 3: Once system characterisation is finalized by participants, conclusions reached through quantitative analysis must be validated with respect to the needs and perceptions of household members and local leaders. At this time, health and nutrition experts will collaborate in assessing the extent to which the nutritional deficit of the respective systems has negatively impacted the health status of household members. This integrated assessment of production systems and livelihoods will be done in the field together with farmers, health experts and course participants. Negotiation support tools to harmonize the perceptions and priorities of different resource users (by wealth and gender) and outside experts will be employed in reaching decisions on the desired future state of farming systems. Local health and nutrition indicators will be developed at this time together with farmers, as the first step in establishing a monitoring system to track changes occurring as a result of farming system innovations.

Part 4: The final component of the course will assist participants to practically use various mathematical and social models for analysing systems and modelling improved production scenarios that optimize income generation (integration of high value enterprises), food security (human nutrition) and environmental health. Participants will learn about methods that can be utilized to improve the existing system in collaboration with farmers and local leaders for improved livelihoods, food security and environmental resilience over time.

Application Domain

Smallholder farming systems in the eastern African highlands facing moderate to severe resource constraints—whether land, labor, nutrient, financial or a combination of these.

Course Details

Teaching Methods: The course will be conducted using a combination of methods, including field surveys to identify existing production systems and identify farmers' production objectives (up to 3 days); classroom lectures on modelling principles, data types and data collection procedures; and practical exercises on the use of modelling tools, data analysis and interpretation of results.

Target groups include young researchers and extension experts from ASARECA countries, particularly AHI partner sites of Ethiopia, Kenya, Tanzania, Uganda and Rwanda. The anticipated number of participants is 25. Contributors from partner institutions will participate as resource persons, as these tools and methods have been developed in close collaboration with NARIs of Ethiopia, Kenya and Tanzania and other governmental and non-governmental organizations.

Duration: 8 to 10 days.

Community negotiation on the potential integration of improved production scenarios in Areka, Ethiopia

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