

Training Course Technical Report

Integrated Crop-Livestock Production for Marginal and Favorable Ecosystems

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Amman, Jordan



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**Arab Fund for Economic and Social Development (AFESD)
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In collaboration with

National Center for Agriculture Research and Extension (NCARE)

Conducted By

The International Center for Agriculture Research in the Dry Area (ICARDA)



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EXECUTIVE SUMMARY

Title of the training course

Strengthening Capacity Development in the framework of Agricultural Research for Development in Dry Areas

Partners

- Arab Fund for Economic and Social Development (<http://www.arabfund.org/>)
- Islamic Development Bank (<http://www.isdb-pilot.org/>)
- National Center for Agriculture Research and Extension (<http://www.ncare.gov.io/>)

Purpose

The main purpose of this course is to train participants in sustainable integrated livestock management in dryland production systems. Major topics addressed included rangeland ecology and rangeland grazing management, feed production and animal feeding, flock management and processing of animal products. The course covered theoretical and practical aspects of state of art knowledge and techniques within the aforementioned areas.

Specific objectives of the training course

Main specific objectives of the course are:

- To strengthen capacity in livestock research and extension in crop-rangeland-livestock production systems;
- To share and to learn about research activities and practical experiences of the trainees in their home countries;
- To strengthen research and development partnerships with NARS partners and establishment of a knowledge exchange platform.

Specific outputs

Seventeen (13 male, 4 female) professionally-trained NARS partners from Arab and IDB member countries with enhanced capacity on improving livestock production in crop-range-livestock systems by providing updated information on research and practical activities in the area of integrated crop-rangeland-livestock production systems management. Eleven participants from Algeria, Egypt, Iraq, Lebanon, Morocco, Oman, Palestine, Tunisia, Sudan (1), and Jordan (2) are funded by AFESD, one Sudanese funded by the Sudan contribution to the CGIAR, and the other five participants from Iran, Mauritania, Tajikistan, Uzbekistan, and Pakistan are sponsored by IDB.

GENERAL OVERVIEW

One distinctive feature of dryland livelihoods systems is the key role of livestock in securing household income and asset security and alleviating rural poverty. Sheep and goat production is an integral part of crop-rangeland-livestock farming in the dry regions of the Near East, North Africa, Central Asia and South Asia. They are the primary form of savings, as living assets for the poor, and their products are an important source of income for rural women, who rank among the poorest livestock keepers. Over the last three decades, there has been significant increases in both the small ruminant population and production in drylands. This in turn has caused unrelenting pressure on natural resources, primarily on rangelands that are gradually giving way to desertification. With the gloomy predictions of high population growth in these developing countries, it is likely that constraints on both the land and food supply will become increasingly evident in both the mixed crop/livestock and grazing systems. In addition, projected increases in the demand for livestock products in these countries presents significant opportunities for poor livestock keepers to increase incomes and build assets to improve their livelihoods. However, the animal feed deficit is already widespread and prevents resource poor livestock keepers from taking advantage of the growing market for animal products that would improve their livelihoods. The proposed intensive training course will enhance the national and regional capacity to appropriately address the constraints of this sector in national agricultural development programs.

TOPICS

The main purpose of this course is to train participants in sustainable integrated livestock management in dryland production systems. Major topics addressed include rangeland ecology and rangeland grazing management, feed production and animal feeding, flock management and processing of animal products. The course covers theoretical and practical aspects of state of art knowledge and techniques.

TARGET AUDIENCE

The course is set to target 17 mid-level researchers and extension staff in the national animal husbandry and veterinary services, forage production and rangeland improvement mainly from Arab and IDB member countries (please refer to Annex III). Globally, the course targets specialists working in integrated rangeland-crop-livestock production systems in arid lands.

ORGANIZING COMMITTEE

Mr. Charles Kleinermann, Head, ICARDA Capacity Development Unit (CDU)

Dr. Mourad Rekik, Small Ruminant Production Scientist, ICARDA SIRPS scientific course coordinator

Mr. Masafumi Tamura, Technical Training Officer, ICARDA CDU

COURSE STRUCTURE

The course accounts for a total of about 60 theoretical and practical hours spread over two weeks. It is organized into six different modules and a large share be dedicated to practical demonstrations and field applications: 1. Module 1: Rangelands/Rangelands inventory, monitoring and assessment and grazing management (Week I) 2. Module 2: Feed crops/Promising drought tolerant feed crops in drylands (Week I) 3. Module 4: Nutrition and feeding/feeding system optimization and feed quality improvement techniques (Week II). 4. Module 5: Genetic improvement/ sheep and goat genetic improvement, data recording, management and analysis (Week II). 5. Module 6: Management/ smart management interventions integrating feed, health and reproduction (Week II) 6. Module 7: Value addition/ processing of animal products (Week II).

COURSE IMPLEMENTATION

The course implementation and program is summarized in the course agenda (please refer to Annex I). The course progressed according to schedule with no major changes to be mentioned. A high level of commitment and presence was shown by the trainees throughout the theoretical and the practical parts of the course.

The course started with a presentation by Dr. Mourad Rezik on the expected goals to be achieved during the two-week program by the trainees. Dr. Mounir Louhaichi gave the first session on the description of



rangeland types, range plant eco-physiology, and rangeland ecology. This was followed by Dr. Azaiez O. Belgacem to introduce grazing management. In the afternoon, Dr. Belgacem continued to deliver the lecture elaborating on grazing management (rangeland vegetation sampling and measuring techniques) followed by Dr. Kathryn Clifton on rangeland ecosystem services.

On the second day, Dr. Louhaichi presented a lecture on applications of technology for rangeland monitoring and assessment and this was followed by sessions by Dr. Belgacem who provided insights into different aspects of grazing management. Dr. Louhaichi and Dr. Belgacem shared ICARDA experiences on reclamation methods and techniques which was followed by interactive sessions where participants learned from each other's experience of rangeland restoration and rehabilitation.

On the third day, the trainees were taken for a field visit to the Muchaqqar Station and Majidya site.

On the fourth day, Ms. Sawsan Hassan started with a session to introduce dryland forage production and explained dryland the role of pasture and forage legumes as part of rangeland management and methods for forage evaluation followed by Dr. Jane Wamatu providing a lecture on feeding system optimization and feed assessment tools.

On the fifth day, Dr. Wamatu offered additional insights on feed assessment tools and alternative feed

resources. Ms. Hassan concluded with a session on dryland forage production to explain principles of forage experiments.



On the sixth day, Dr. Muhi El-Dine Hilali gave a lecture on how to add value to animal products. In the afternoon, half of the trainees attended a practical session in Muchaggar Research Station. The remaining trainees listened to a lecture by Dr. Rekik on sheep and goat management constraints in low input system and fertility management packages in sheep and goats.

On the seventh day, the group was switched and the other group did the practical session at the station with Dr. Hilali and the rest of trainees stayed for the lecture by

Dr. Rekik. In the afternoon, a session was given on sensory evaluation of dairy products by Dr. Hilali and Dr. Rekik provided a lecture on synchronizing feeding inputs and reproductive rhythms.



On the eighth day, a session was delivered by Dr. Aynalem Haile on phenotypic characterization, breed descriptions, breeding objectives and selection criteria. This was followed by Dr. Rekik providing an introduction to reproductive technologies to support delivery. In the afternoon Dr. Haile illustrated concepts and organization of community-based breeding programs.

On the ninth day, the trainees visited Khanassry sheep improvement station in Irbid to learn about morphometric measurements, data recording, and editing and storage reproductive biotechnologies.



The last day of the training started with a case study of sheep and goat genetic resources management from the participating countries and was followed by a certificate award ceremony and feedback from the trainees on their experience and suggestions on how to improve the courses.

GENERAL COURSE EVALUATION BY TRAINEES

At the end of the training course, each participant provided feedback on their perception of the effectiveness of the training process, format and content. Most participants qualified it as excellent or very good, and the average score of each criterion range from 4.0 to 4.6 pts/5.0 pts, which indicates a high level of participants' satisfaction (Please refer to Annex IV).

CONCLUSION

The course was successful in reaching its specific objectives and much appreciation was expressed by the participating trainees. The course was a forum for very fruitful and constructive discussions and was enriched by the different country cases that were presented by the participating trainees. The course, has already created a network of knowledge sharing between the trainees which will be supported by the ICARDA scientists to ensure continuity.

Annex I: Course Program

Day 1: 18 Sept 2016		
08:30-09:30	Registration and opening	Capacity Development Unit
09:30-10:00	Overview of program	Dr. Mourad Rekik
10:00-10:30	Coffee break	
10:30 – 11:30	Rangeland Ecology & Management Session 1: Description of rangeland types, range plant eco-physiology, range ecology	Dr. Mounir Louhaichi
11:30-12:30	Rangeland Ecology & Management Session 2: Introduction to grazing management	Dr. Azaiez O. Belgacem & Dr. Mounir Louhaichi
12:30-13:30	Lunch	
13:30-14:30	Rangeland Ecology & Management Session 3: Grazing management (rangeland vegetation sampling and measuring techniques)	Dr. Azaiez O. Belgacem
14:30-16:00	Rangeland Ecology & Management Session 4: Rangeland ecosystem services	Dr. Kathryn Clifton
Day 2: 19 Sept 2016		
08:30 – 10:00	Rangeland Ecology & Management Session 5: Applications of technology for rangeland monitoring and assessment	Dr. Mounir Louhaichi
10:00-10:30	Coffee break	
10:30 – 12:00	Rangeland Ecology & Management Session 6: Grazing management (determination of carrying capacity)	Dr. Azaiez O. Belgacem
12:00-12:30	Drylands Forage Production Session 1: Cactus as forage for livestock	Dr. Mounir Louhaichi & Ms. Sawsan Hassan
12:30-13:30	Lunch	
13:30 – 15:00	Rangeland Ecology & Management Session 7: Grazing management (grazing systems and practices)	Dr. Azaiez O. Belgacem
13:30 – 15:00	Rangeland Ecology & Management Session 8: Reclamation Methods and Techniques (ICARDA experiences) Session 9: Examples of rangeland restoration/rehabilitation from participating countries (Sudan, etc.)	Dr. Mounir Louhaichi & A.O. Belgacem Participants
Day 3: 20 Sept 2016		
8:00 – 15:00	Field Visit Venues: Mchaqqar Station & Majidya site	Dr. Mounir et al.
Day 4: 21 Sept 2016		
08:30 – 10:00	Drylands Forage Production: Introduction to dryland forage production	Ms. Sawsan Hassan
10:00-10:30	Coffee break	
10:30 – 12:30	Feeding System Optimization	Dr. Jane Wamatu
12:30-13:30	Lunch	
13:30-15:00	Drylands Forage Production: Dryland pasture/forage legumes and methods for forage evaluation	Ms. Sawsan Hassan

15:00-15:15	Coffee break	
15:15-16:30	Feed Assessment Tools – Part I	Dr. Jane Wamatu
Day 5: 22 Sept 2016		
08:30-10:00	Feed Assessment Tools - Part II	Dr. Jane Wamatu
10:00-10:30	Coffee break	
10:30-12:30	Dryland Forage Production Dryland forage production: Principles of forage experiments	Ms. Sawsan Hassan
12:30-13:30	Lunch	
13:30-16:00	Alternative Feed Resources	Dr. Jane Wamatu
Day 6: 25 Sept 2016		
8:30-12:00	Added Value to animal products - Milk Production and quality - Milk processing (cheese and yogurt) - Introduction to meat processing	Dr. Muhi El-Dine Hilali
12:00:12:45	Lunch	
12:45:16:00	Added Value to animal products (Group 1) Practical: Milk processing (cheese and yogurt) at Muchaggar Research Station	Dr. Muhi El-Dine Hilali
13:30:16:00	- Introduction to sheep and goats management constraints in low input systems (Group 2) - Fertility management packages in sheep and goats (Group 2)	Dr. Mourad Rekik
Day 7: 26 Sept 2016		
8:30-12:00	Added Value to animal products (Group 2) Practical: milk processing (cheese and yogurt) at Muchaggar Research Station	Dr. Muhi El-Dine Hilali
8:30-10:00	Introduction to sheep and goats management constraints in low input systems (Group 1)	Dr. Mourad Rekik
10:00-10:30	Coffee break	
10:30-12:00	Fertility management packages in sheep and goats (Group 1)	Dr. Mourad Rekik
12:30-13:30	Lunch	
13:30-14:30	Added Value to animal products Session: Sensory evaluation of dairy products	Dr. Muhi El-Dine Hilali
14:30-16:00	Synchronizing feeding inputs and reproductive rhythms	Dr. Mourad Rekik
Day 8: 27 Sept 2016		
08:30-10:00	Phenotypic characterization and breed description (concept of Production Environmental Descriptors)	Dr. Aynalem Haile
10:00-10:30	Coffee break	
10:30-12:30	Breeding objectives and selection criteria	Dr. Aynalem Haile
12:30-13:30	Lunch	

13:30-14:30	Reproductive technologies to support delivery system of improved genetics	Dr. Mourad Rekik
14:30-16:00	Community based breeding program: concepts and organization	Dr. Aynalem Haile
Day 9: 28 Sept 2016		
08:00-16:00	Field Visit: Venue Khanassry sheep improvement station (Irbid): Morphometric measurements, data recording, editing and storage – Reproductive biotechnologies (artificial insemination and pregnancy diagnosis)	Dr. Aynalem Haile and Mourad Rekik
Day 10: 29 Sept 2016		
08:00-10:30	Study cases of sheep and goats genetic resources management from the participating countries	Dr. Aynalem Haile & participants
10:30-11:00	Coffee break	
11:00-12:30	Course evaluation Distribution of certificates Official closing	Capacity Development Unit
12:30	Lunch	

Annex II: Trainers

Name & Surname	Institution	E-mail
Dr. Aynalem Haile	ICARDA Small Ruminant Senior Scientist - Breeding and Genetics, SIRPS	A.Haile@cgiar.org
Dr. Azaiez Ouled Belgacem	ICARDA Rangeland Scientist, Regional coordinator, Arabian Peninsula Program	A.Belgacem@cgiar.org
Dr. Jane Wamatu	ICARDA Associate Scientist - Animal Nutritionist, SIRPS	J.Wamatu@cgiar.org
Dr. Kathryn Clifton	ICARDA Rangeland Ecology & Management, SIRPS	K.Clifton@cgiar.org
Dr. Mounir Louhaichi	ICARDA Range Ecology and Management Research Scientist, SIRPS	M.Louhaichi@cgiar.org
Dr. Mourad Rekik	ICARDA Small Ruminant Production Scientist, SIRPS	M.Rekik@cgiar.org
Dr. Muhi El-Dine Hilali	ICARDA Dairy Technologist, SIRPS	M.Hilali@CGIAR.ORG
Ms. Sawsan Hassan	ICARDA Research Associate - Forage Systems, SIRPS	S.Hassan@cgiar.org



Dr. Aynalem Haile is a Senior Small Ruminant Scientist at ICARDA where he is involved in various projects dealing mainly with small ruminant breeding and genetics, and has over 20 years of research and development experience in various national and international research and development organizations. He holds a PhD in Animal Genetics and Breeding from National Dairy Research Institute, Karnal, India, and a MSc in Animal production, Alemaya University, Ethiopia. He has received short-term courses such as project management, outcome mapping, project design and proposal development, group facilitation skills, poultry management, planning, monitoring and evaluation, animal breeding, capacity building for sustainable use of animal genetic resources in developing countries, and data analyses. He is a member of several professional associations and networks, and serves as regular reviewer for many scientific journals. He received many awards including: ICARDA Scientist of the year for 2012; Certificate of recognition for outstanding contribution in organizing the 5th All Africa Conference on Animal Agriculture held in Addis Ababa, Ethiopia, October 25-28, 2010; Gold medal and certificate for outstanding contribution to Ethiopian Society of Animal production: October 4, 2007; Fellowship for PhD research from ILRI for one year: January 2005- January 2006; and Fellowship for MSc research from ILRI for two years: January 1997 – December 2000. He has authored or co-authored more than 165 publications in peer-reviewed Journals and edited proceedings.



Dr. Azaiez Ouled Belgacem is Regional Coordinator and Rangeland Scientist, Arabian Peninsula Program in ICARDA, to coordinate the project Improving food security and sustainable natural resources management through enhancing integrated agricultural production systems in the Arabian Peninsula. He holds PhD in Biological Sciences. Faculty of Sciences of Sfax Tunisia, and two MSc in Ecology. Faculty of Sciences of Sfax Tunisia, and in Natural renewable resources. Mediterranean Agronomic Institute of Chania Greece. Before he joined ICARDA, he worked for Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) after working at the Institute of Arid Lands (Institut des Régions Arides), Medenine Tunisia. He has authored or co-authored more than 70 publications.



Dr. Jane Wamatu is Associate Scientist - Animal Nutritionist in the Sustainable Intensification and Resilient Production Systems (SIRPS) program. She holds a PhD in Ruminant Nutrition from University of Hohenheim, Germany, and two MSc in Animal Production from University of Hohenheim, Germany and another MSc in Appropriate Rural Technology and Extension Skills from University of Flensburg, Germany. Before joining ICARDA, she gained academic and research experience in animal nutrition and ruminant feeds in Kenya. She has authored and co-authored more than 10 publications, including book chapters and conference papers.



Dr. Kathryn Clifton is a Landscape Ecologist in the Rangeland Ecology & Management in the Sustainable Intensification and Resilient Production Systems (SIRPS) program. Dr Clifton is a USA national and completed her PhD degree in Ecosystem Science and Management from Texas A&M University, USA in May 2014 where she did her dissertation on Linking Institutional Characteristics to Successful Communal Land Management in Cumbres de Monterrey National Park, Mexico. She has practical experience working in developing countries including the Philippines on a USDA funded Agro-Enterprise project and as a Technology Adviser for Asia, as a GIS Specialist in Baltimore, and as a Research Assistant on a Forage Prediction project in Mongolia with Texas A&M University. Before joining ICARDA she spent a semester at the FAO through the Texas A&M Agriculture and Natural Resources Policy Fellowship. She has worked as part a team on the following projects: forage prediction modeling, pine beetle infestation modeling for different climate change scenarios, household surveys creation and analysis, and the application of GIS and remote sensing in rangelands.



Dr. Mounir Louhaichi is a Principal scientist at ICARDA in the Sustainable Intensification and Resilience of Production Systems (SIRPS) program, and is engaged in research related to rangeland ecology and management in non-tropical dry areas. Dr. Louhaichi holds a Ph.D. and a MSc in Rangeland Ecology and Management from the Oregon State University (OSU), USA. He has a proven track record of more than 25 years in rangeland ecology and management, including over 10 years of research focused on the development of technological alternatives for better natural resources management in advanced research institutions, and over 10 years in the improvement and rehabilitation of degraded rangeland in the dry areas targeting developing countries. He is also a certified GIS professional (GISP) with focus on landscape ecology and its applications on monitoring and assessing rangeland vegetation,

herd's movement across the landscape, and climate change impact. Prior to joining his current institution, he held a position of a researcher at OSU where he was actively engaged with the BLM, Forest Service, USGS, and USDA/ARS in various projects developing needed tools and protocols. He is an active member of several scientific and professional associations, such as IALE, ASPRS, and SRM. He is a recipient of several awards and honors, such as ICARDA award for "Outstanding Scientific Article" for 2012, several scholarships and nomination to various honor societies.



Dr. Mourad Rekik is a senior scientist at ICARDA in the Sustainable Intensification and Resilience of Production Systems (SIRPS) program. He is with more than 25 years of academic and research experience in the area of animal reproduction and also small ruminants' production and management in drylands. Dr. Rekik holds a PhD in animal production from the University of Reading in UK. He also holds a degree as agricultural engineer from the National Institute of Agronomy in Tunisia. Prior to joining ICARDA, he worked as university lecturer for 23 years in several universities in Tunisia and was actively involved in several national and international research projects. He also coordinated several research for development projects involving multidisciplinary research teams working in an integrated approach. Over years, he has built a strong international reputation in the field of sheep and goats research. Areas of research expertise extend to sheep and goats

reproduction and interactions with nutrition, health and genetics. He has authored and co-authored more than 70 peer-reviewed publications, including book chapters and conference papers. He was member of the British Society of Animal Science, is active member of the FAO-CIHEAM subnetwork on sheep and goats nutrition and has built strong professional relationship with many advanced research centers in particular School of Animal Science at the University of Perth and INIA Madrid.



Dr. Muhi El-Dine Hilali is a livestock scientist, with 13 years of experience in dairy science, food technology, analytical methods, development of processing chain, milk management and processing, characterization and analysis of dairy products, sensorial and organoleptic properties of dairy products, small ruminant farm management and nutrition, participatory on-farm research work. He holds a PhD in food science and biotechnology from BOKU University, Vienna, Austria. He also holds M.Sc. in food science from Aleppo University, Aleppo, Syria. Prior to joining ICARDA, he served as an assistant at Aleppo University, Faculty of Agriculture in department of Food Science from 1995-2002, and was teaching different subjects related to dairy science. He has authored and co-authored more than 32 peer-reviewed publications, including book chapters, conference papers, etc.



Ms. Sawsan Hassan is a Forage System Research Associate in the Sustainable Intensification and Resilience of Production Systems (SIRPS) program in ICARDA with more than ten years of experience in monitoring germination and growth of rangeland seedlings in government nurseries, rehabilitation of community-based rangelands, screening for cold tolerant cactus accessions *Opuntia ficus indica*, evaluating several halophyte species in response to soil salinity, evaluating the effect of different water harvesting techniques on shrubs establishment, and collecting, manage, and analyze scientific data. She holds a MSc in Field Crops in Agriculture from University of Aleppo, Syria. She has authored and co-authored more than 10 publications, including book chapters and conference papers.