AFRICA TO ASIA: TESTING ADAPTATION IN FLOOD-BASED RESOURCE MANAGEMENT PROJECT

CURRICULUM REVIEW AND IMPROVEMENT WORKSHOP
(24 to 28 February, 2020; Wad Medani and Kassala, The Sudan)

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&

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Without Love, You Can Live
Without WATER, You CANNOT

(Khuram Mubeen)
OUTLINES

➢ Needs Assessment for the Spate Curriculum

➢ Topics related to FBLS specific for the context in Pakistan

➢ Already Offered and Gaps

➢ Actual Structure of the Curriculum

➢ Evaluation and Marking system

➢ Pathway to Continue Strengthening of the Curricula

Additional: Role and Experiences of MNS University of Agriculture Multan for Spate Irrigation Development in Pakistan
Needs Assessment for the Spate Curriculum
Water Mismanagement

- Urbanization
- Deforestation
- Population Increase
- Climate Change

Other Physical Sources

- Spate Irrigated Areas
- Deserts
• **Pakistan 2nd largest country in South Asia** by size (total area 79.61 m ha and population over 200 million.

• Country with **largest area under Spate irrigation** in the world (≈ 2 Million Hectare)

• **2nd largest source of irrigation water** from hill torrent after canal water in Pakistan (Ahmad et al., 2016)

• The population explosion has decreased the **per capita water** in Pakistan from 5,300 cubic meter to less than 1,000 cubic meters in 2016 (Anonymous, 2016).
• Highly ignored areas in Pakistan

• Far off places

• Poorest of the poors reside here
Potential Spate Irrigated Area of Pakistan 
(≈ 6.90 m ha) 

Actual Spate Irrigated Area of Pakistan 
(≈ 2 m ha) 

Van Steenbergen and Mehari (2008) 

Average annual run-off of 12.15 MAF (2 Tarbela dams storage capacity) 
(Sufi et al., 2011) 

Seen as Monster (flood damage) not as potential
Spate Irrigated Areas of Pakistan

(Source: GIS Lab, NARC 2003)
KPK : DI Khan and parts of Lakki Marwat and Kohat.

Sind : Kohistan area - northwestern kirther along Dadu, Jamshoro and part of Karachi district (25 hill torrent systems).

Balochistan : (19 water basins)

Punjab : Dera Ghazi Khan and Rajanpur Districts (13 hill torrent systems)
• By 2025,
  Water Demand (274 MAF),
  Water Supply (191 MAF),
  **Demand-supply gap** \(\approx 83\) MAF (IMF, 2015).

• Regional lowest **water productivity** i.e. 0.13 kg m\(^{-3}\)
  0.39 kg m\(^{-3}\) India
  0.82 kg m\(^{-3}\) China
  (WAPDA)
• Two major reservoirs store only 14 MAF of the 145 MAF flowing annually through Pakistan for 30 days (International standard 120 days).

• **Spate system potential** more than 12 MAF
• Spate irrigated area
  - Not considered in irrigated agriculture
  - Even not reported

• No real statistics available at provincial and national level
  - on crop production
  - other agricultural interventions

• Not a priority in the national development plan generally.
• In general, **limited curricula** in universities of Pakistan

• Spate irrigation is **under researched** (Engineering, Agronomy and other aspects of agriculture)
• Broader **need to document soil and hill torrent water database** across Pakistan

• **Curriculum development will result in**
  Impactful development of spate ecologies
  Uplift in life style of people.
Topics Related to FBLS Specific for the Context in Pakistan
Agronomic
• (Problems and potential, soil and water conservation techniques, Cropping pattern and cropping intensity; Agronomic management of crops; Livestock and fodder production in spate irrigated area; Irrigation Water Rights and water distribution; Groundwater recharge; climate change impact, Agro forestry)

Engineering
• (Arid Agriculture University Rawalpindi has reportedly offered post graduate academic course)
Social:

• **Integration of experts and farmers** to compile and document the indigenous knowledge on water diversion, distribution and management.

• **Training and short courses of the farmers** in social behavior, crop husbandry, marketing and local level water management.

• **Organic market** system and **Infrastructure** should be developed.
Economic:

- Unpredictable flood flows makes farmer economic position vulnerable

- Research on economic parameters for obtaining higher profitability should be explored
Already Offered and Gaps?
• Engineering curriculum

• Agronomic curriculum
Curriculum for B.Sc. (Hons) Agric. at
Agronomy Department, MNS UNIVERSITY OF AGRICULTURE MULTAN
Spate Irrigated Agriculture 3(2-1) (Elective)
Course Number: AGRON-617

Theory

Spate irrigation: concept and facts; Spate irrigation in World and Pakistan; Hill torrents in Pakistan: Problems and potential; Sedimentation and soil fertility; soil and water conservation techniques in spate irrigated areas (mulching, cover cropping, strip cropping); Cropping pattern and cropping intensity; crop yield comparison and economic analysis; Agronomic management of crops; Crop selection: Minor crops; Livestock and fodder production in spate irrigated area; Irrigation Water Rights (Diversion / distribution of water in spate irrigation); Groundwater recharge and farm ponds; Water harvesting techniques; Effect of climate change on spate irrigation.

Practical

Comparative investigations into water conservation techniques under spate irrigation; Determination of soil infiltration rate; Determination of soil water holding capacity.
Field visit to spate irrigated area.
course contents spate irrigated agriculture.pdf
LWCE-712  Spate Irrigation Practices and Managements  3(2-1)

INTRODUCTION:
Definition. spate-irrigated areas in Pakistan, potential in spate areas, advantages & disadvantages and spate irrigation practices in the world.

IRRIGATION PRACTICES:
System design, components of the system, method of irrigation, irrigation water rights, problems in irrigation application, and water conservation techniques.

SOIL AND CROP PRODUCTION:
Soil types and fertility, erosion, types of erosion, soil losses, erosion control practices and options, cropping pattern, cropping intensity, yield comparison and economic analysis and crop water requirements

MANAGEMENT STRATEGIES for Spate Irrigation:
Management problems and constraints, watershed management, contouring, terracing, check dams, delay action dams, field water diversion structures, groundwater recharge/ aquifer storage and recovery techniques, farm ponds & dug wells water injection.

ENERGY SOURCES:
Mechanical, electric, solar, and bioenergy systems for water lifting

PRACTICAL:
1. Infiltration rate determination under different practices
2. Analysis of different water conservation techniques
3. Method of sediment load determination in the flow of torrents
4. Sediment control and management techniques
5. Water allocation in the context of IRBM approach
6. Visit to spate irrigated area
Gaps

• Research and Curricula are deeply interrelated

• Agronomic Curriculum improvement needed on soil loss and erosion monitoring and control strategies

• Farmer trainings and awareness creation about climate change impact

• Focus on fodder and legumes research
• Promotion of Agro-forestry

• Development of local markets and supply chain

• Promotion of high efficiency irrigation system (Drip and Sprinkler where feasible)

• Groundwater monitoring
• Research to develop viable system for production of

Drought tolerant **fruit plants**

(Date palm, zizyphus spp, olive)

**Mushrooms** (Truffle)
• Job creation and allocation on government level for spate irrigation experts / trained human resource

• Facilitation for entrepreneurship environment in spate ecologies

• Establishment of seed production and certification system
• Augmenting spate irrigation with groundwater use

• Developing agronomic recommendations (sowing method and time, row spacing, varietal trials, mechanized farming etc) for

  Higher WUE
  Reduced soil losses
  Improved resource conservation
  More profitable cropping system
• Improve soil moisture conservation (on farm water management)

• Improve prospects for local vegetables, trees and fodder

• Independent Entity (Hill Torrent Development Authorities at national and provincial level) having disciplines
  Agriculture    Livestock    Health
  Forestry       Education etc
Actual Structure of the Curriculum
Engineering component

Example: Agronomy Course at MNS-UAM

Theory
Spate irrigation introduction, Problems and potential, Soil and water conservation techniques; Cropping pattern and cropping intensity; crop yield; Crop selection: Minor crops; Livestock and fodder production, Irrigation Water Rights, Groundwater; Water harvesting techniques; climate change and spate irrigation.

Practical
Comparative investigations into water conservation techniques under spate irrigation
Determination of soil infiltration rate
Determination of soil water holding capacity
Field visit to spate irrigated area.
Evaluation and Marking system
Theory and Practical
• (Exams, Assignments, Tours and Interactive sessions)
• Multi media presentations / lectures, Consulting available books and research findings
• Demonstration through study tour, pictures and short videos

Grading system
A Grade (80-100% marks),
B Grade (65-79% marks),
C Grade (50-64% marks),
D Grade (40-49% marks),
F Grade (below 40% marks)
• **3 Credit Hours Per Week**
  (2 credit hours per week for theory)
  (1 credit hour per week for practical)

• One credit hour carries 20 marks, so 3 credit hours carry **60** marks as under

  12 Mid exam, 24 Final exam,
  4 Sessional marks (quiz, assignments, activities / creativity)
  20 Practical
Pathway to Continue Strengthening of the Curricula
• Provision of latest reference books and relevant literature for curricula

• Provision of class and lab infra structure (Audio visual aids)

• Translating research findings into curricula, publications and taking these to spate farmers
• Development of fully equipped laboratories in universities offering flood based curricula and active in spate irrigation research

• Post doctoral trainings, short courses and exchange visits of scientists involved in flood based livelihoods area research

• Water diversion structures development for uniform water distribution
- Organizing conferences, seminars in member countries periodically

- Short courses and trainings of farmers and students

- Silt load and Sediment Management
• **Bottom up approach** in engineering initiatives e.g. Bhaag Naari Balochistan (Migration of tail farmers)

• **Reforestation** and plantation of feasible trees and shrubs etc

• Feasible **crop diversification research and adaptation system** in line with FAO future smart food crops.
• Small feasible **social action projects** and interventions

(Installation of hand pump / solar panel, provision and plantation of tree seedlings, better drinking water technologies, promotion of kitchen gardening and small business for women e.g. poultry, livestock rearing etc)

• **Collaborative Research Projects** between the countries

• **Researchers and student exchange program** between the spate countries
• Development of infrastructure for movement

• MoUs for collaboration be signed between universities of member countries with spate irrigation
Role of MNS University of Agriculture Multan for Spate Irrigation Development in Pakistan

• Research projects

• Publications on Spate Irrigation

• Awareness through print and electronic media and through international conferences and seminars etc

• Training technical human resource through Research, Academic Courses and study Tours (MPhil and PhD students, undergraduate students)
• Inclusion of Spate Irrigation topic in academic courses of Agronomy

• Development of New Academic course on Spate Irrigated Agriculture

• Availability of spate irrigation literature and books etc in Library of University etc
PICTORIAL STORIES
IFAD Funded Project through Spate Irrigation Network Pakistan (Flood Based Livelihoods Network Pakistan)
Strips of Chickpea, Arugula and Lentil under Spate Irrigation Network Pakistan Project
Withania coagulans (Paneer Plant and Seeds)
(Spate irrigation prospects in Pakistan- Technology times article)

Thanks