

Project Completion Report

2020

Africa to Asia: Testing Adaptation in Flood-Based Resource Management under the Programme Putting Research into Use for Nutrition, Sustainable Agriculture and Resilience

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Disclaimer

The authors accept full responsibility for the contents of this report. The report does not necessarily reflect the views of the European Commission or IFAD.

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Acronyms

<i>AIRBM</i>	Ayeyarwaddy Integrated River Basin Management
ATVI	Afghanistan Technical and Vocational Institute
CETRAD	Centre for Training and Integrated Research in ASAL Development
DFID	UK Department for International Development
EC	European Commission
FBFS	Flood-Based Farming Systems
FBL	Flood-Based Livelihoods
FBLN	Flood-Based Livelihoods Network
FBLS	Flood-Based Livelihood Systems
GAS	Gash Agricultural Scheme (in Africa)
GAS	Golden Apple Snail (in Myanmar)
GIZ	Gesellschaft für Internationale Zusammenarbeit / German Corporation for International Cooperation
HRC	Hydraulic Research Centre
ICRAF	World Agroforestry Centre
IFAD	International Fund for Agricultural Development
IWMI	International Water Management Institute
KPK	Khyber Pakhtunkhwa Province
KEWI	Kenya Water Institute
MMR	MetaMeta Research
MoIWR	Ministry of Irrigation and Water Resources
MU	Mekelle University
MNSUA	Mohammad Nawaz Sharif University of Agriculture
NARC	National Agricultural Research Center
PASIDP	Participatory Small-scale Irrigation Development Program
PN	Practical Note
PRUNARSAR	Putting Research into Use for Nutrition, Sustainable Agriculture and Resilience
RDF	Research and Development Foundation
SLM	Sustainable Land Management
SNNPR	Southern Nations, Nationalities and Peoples'
SPO	Strengthening Participatory Organization
SNNPR	Southern Nations, Nationalities, and People's Regions
SpNF	Spate Network Foundation
SPO	Strengthening Participatory Organization
TDAS	Toker Delta Agricultural Scheme
ToR	Terms of Reference
UNESCO-IHE	Institute for Water Education in Delft, also IHE Delft
WASH	Water Sanitation Hygiene
WEC	Water and Environment Centre
WB	World Bank
WLE	CGIAR Research Program on Water Land and Ecosystems
WUA	Water User Association
YAWEE	Yemen Association for Water & Environment & Energy

SUMMARY

1. Programme goals and objectives

Project goals: To help develop Flood-Based Livelihood (FBL) policies and programmes that will meaningfully invest in rural people and are based on action research and South-South documentation of practical experiences, and are embedded in long-term capacity building, incorporating programme development at various levels.

Project objectives: To develop models and approaches on inclusive and gender-balanced growth of climate change-stressed areas, which predominantly rely on FBLs.

2. Programme outputs and outcomes

The results are presented in two sections under each sub heading, namely Africa/Asia and Asia (Myanmar), implemented by MetMeta and IWMI respectively.

Africa/Asia

COMPONENT 1: FBL NETWORK ESTABLISHMENT AND STRENGTHENING
EXPECTED OUTCOME
<ul style="list-style-type: none"> • Networks established and functional • Promoting documented knowledge • Network and communication maintained and developed
Output 1.1 New networks established and functional
Output 1.2 Documentation of good practices, innovation and good practices promoted
Output 1.3 Knowledge promoted and programmes developed through national networks
COMPONENT 2: KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT
EXPECTED OUTCOME
<ul style="list-style-type: none"> • FBL relevant research on four themes. • At least 8 practical notes on upscaling drought-resistant and high-value enterprises. • At least 8 quick-win solutions-oriented research programmes linked to capacity building of young professionals. • At least 9 reports linked on the diverse FBLS activities and success of a variety of crops
Output 2.1 Solution-oriented research programmes finalised.
Output 2.2 Initiate new research programmes on emerging issues
Output 2.3 FBL Guidelines developed finalized
COMPONENT 3: CAPACITY BUILDING
EXPECTED OUTCOME
<ul style="list-style-type: none"> • Existing course in MSc programmes (Ethiopia, Pakistan and Yemen) consolidated. Two new MSc programmes • 50 young professionals trained in FBL at the short course offered annually by MetaMeta, ICRAF and partners. • Short annual course for stakeholders, with satellite courses in key regions • 4 Farmer Learning Centres established with FBL training packages • Curriculum review conducted
Output 3.1 Strengthen the content and delivery of FBLS courses in Universities and educational institutions
Output 3.2 Farmer training materials prepared and disseminated
Output 3.3 FBLS knowledge and experience sharing symposium conducted
Output 3.4 Continued support to MSc and PhD students, young professionals and interns
COMPONENT 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES
EXPECTED OUTCOME
<ul style="list-style-type: none"> • Investment-focussed workshop conducted • Investment ideas developed on three to five priority thematic areas • Technical support provided on request to IFAD investment programmes active in the project areas • Proposal review and improvement workshop conducted • Policy development workshop conducted
Output 4.1 Portfolio of FBL investment options prioritised and developed
Output 4.2 IFAD projects under preparation supported on request

Asia (Myanmar)

The original objective of this component was to support farmers increase production and productivity through seed trials and farmer networks. This was modified in Myanmar to focus primarily on addressing the more fundamental need of supporting the Ministry of Agriculture, Livestock and Irrigation to shift to land-water use strategies that enables food systems to deliver more diversified and nutrient dense food, whilst adapting to climatic stress in the Ayeyarwady Delta.

COMPONENT 1: FBL NETWORK ESTABLISHMENT AND STRENGTHENING
EXPECTED OUTCOME
<ul style="list-style-type: none"> This was not a feature of the project in Myanmar.
Output 1.1 N/A
Output 1.2 N/A
Output 1.3 N/A
COMPONENT 2: KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT
EXPECTED OUTCOMES
<ul style="list-style-type: none"> Overall, Department of Agriculture and other Departments under the Ministry of Agriculture, Livestock and Irrigation (MoALI) better equipped to adopt integrated policy implementation strategies in the Ayeyarwady Delta that take advantage of synergies between food production, climate adaptation and nutrition and health policy objectives.
Output 2.1 A Decision Support Tool (DST) to minimize damage to rice crop by flooding
Output 2.2 A DST to facilitate the scaling of rice-fish systems in the Ayeyarwady Delta (due end 2020).
Output 2.3 Publications including three journal articles and contributions to the report "Promoting youth engagement and employment in agriculture and food systems", by the High Level Panel of Experts (HLPE) on Food Security and Nutrition of the UN Committee on World Food Security.
COMPONENT 3: CAPACITY BUILDING
EXPECTED OUTCOMES
<ul style="list-style-type: none"> The Department of Agriculture and other Departments under MoALI better capacitated to use GIS tools for integrated land-water analysis and planning to promote more productive, nutrient dense and climate smart agriculture in the Ayeyarwady Delta. To help DoA link with other organisations to further integrated land-water use planning through synergies generated by combining human resources, funding streams and data and tools To facilitate collective cross-sector dialogs to promote increased collaborative planning especially within the Ministry of Agriculture, Livestock and Irrigation (MoALI), which also includes the Department of Fisheries (DoF).
Output 3.1 Two Decision Support Tools
Output 3.2 Workshops to build capacity within DoA to collect and use geospatial data for landscape analysis and to use and build on Output 3.1
Output 3.3 User Manual on KoboToolbox in Burmese and English languages to ensure that the methods imparted through Output 3.2 are documented and accessible to DoA and other agencies and organizations in Myanmar.
Output 3.4 Training video in Burmese on managing Golder Apple Snail (GAS) infestations to help the Plant Protection Division of DoA to train its extension officers and farmers to manage GAS infestations.
COMPONENT 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES
EXPECTED OUTCOMES
<ul style="list-style-type: none"> Key planning processes likely to significantly impacts land-water resources in the Ayeyarwady Delta adopt PRUNSAR outputs.
Output 4.1 Adoption of Output 1 of Component 2 by the AIRBM project – one of the largest planning exercises in the Ayeyarwady Basin. Latest version of Output 2 of Component 2 also under consideration by AIRBM.
Output 4.2 N/A

3. Key achievements against targets

Africa/Asia

FBL NETWORK ESTABLISHMENT AND STRENGTHENING

- *FBL networks established*: Four country (Ethiopia, Sudan, Yemen and Pakistan) networks strengthened and farmer membership increased. Three new networks were established, in Kenya, Malawi and Myanmar.
- *Knowledge promoted and programmes developed through national networks (IFAD & EC)*: i. Cross - country farmers' knowledge sharing organised. ii. Tailor-made training to selected farmer groups/WUAs. iii. Knowledge products developed and disseminated in local languages. iv. Network secretariats were established for implementation of the projects.
- *Network mechanism and communication developed and maintained*: i) A website developed and maintained. ii) Newsletter developed and maintained. iii. FBLN Foundation established and registered in the Netherlands.

KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT

- *Eight solution-oriented research programmes conducted (IFAD & EC)*: Thematic areas covered were i) Water governance and conflict mitigation ii) Management of soil moisture and fertility iii) Improvement of water diversion, distribution and efficiency, iv) climate change mitigation, v) water harvesting including from roads. From these studies, fourteen [research articles](#), Several [reports](#) capturing the diverse FBLS activities and success of a variety of crops, . Nine [technical sheets](#) on water distribution and rights in Pakistan and Afghanistan, food production and irrigation development amidst the war in Yemen and road water harvesting in Malawi, Kenya and Ethiopia. Well-being surveys on the socio-economic empowerment of youth and women have been conducted in Pakistan, Sudan and Kenya.
- *Eight practical notes and other communication products on cross-country relevant research themes (IFAD & EC)*: Focus areas were water governance, conflict management, and soil moisture and fertility management, improvement of water diversion and distribution efficiency and cross-country findings on FBLS. Fifteen [practical notes](#); one is not yet published and [three](#) were translated to Sindh and Urdu, 44 [blogs](#), [videos](#), 4 [book chapters](#), 9 [technical sheets](#), 14 [brochures and posters](#) and PowerPoint [presentations](#) have been developed and shared in the website as well as during workshops and seminars hosted in support of the project. [Farmer learning materials](#) were also developed in collaboration with the WUAs and disseminated.
- *FBL Guidelines developed finalized*.
A draft [FBLS guideline](#) following an extensive review of mostly existing documents and inputs from country publications has been developed.

CAPACITY BUILDING

- *Three existing MSc programmes consolidated (IFAD)*: From the evidence-base collected during this study, four MSc programmes were established in Sudan, Ethiopia, Pakistan and Yemen.
- *Two new MSc programmes on FBL started*: Several courses have been introduced in programmes in Mzuzu and Lilongwe Universities in Malawi and Egerton and Jomo Kenyatta Universities in Kenya.
- *Four farmer learning centres established (EC)*: Various best practices for productive use of floods were integrated into the Smart Centres in Kenya and Malawi that were already established to promote and upscale water and climate-smart agricultural technologies and practices.
- *FBLS knowledge and experience sharing symposium conducted*: International, regional and national trainings and events conducted (IFAD): Around 1000 young and mid-career professionals, practitioners and farmers and around 150 policy-makers have benefited from the various trainings, workshops and other related events.
- *Internship programme conducted*: Three leadership courses ([2016](#), [2017](#) and [2019](#)) and several internships ([2017](#) and others offered on an individual basis by the FBLN organizations) have enhanced the capacity of about 100 participants including 50 young professionals to become leaders and promoters of FBLS across the countries.

SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES

- *Six proposals for national or provincial investment programmes or development policies created (IFAD & EC)*: Countries involved were Kenya, Sudan, Yemen, Malawi and Pakistan

- *Africa to Asia exchange in at least two proposals facilitated (EC)*: In Sudan, a proposal on the use of electric milk churners by the Aroma women was developed after which a milk churner was sent to Malawi for promotion.
- *Linkage to other WLE activities established (EC)*: The final workshop of the WLE project "Harnessing floods" showcased a good linkage between other projects. In Sudan, it created an opportunity to bring stakeholders from spate areas together to discuss the way forward for FBL activities.
- *IFAD projects under preparation/supported on request (IFAD)*: A knowledge product and a policy brief for upscaling the on-farm water management and yield improvement intervention in Sudan was prepared and shared with the IFAD lead grant manager. A second knowledge project was developed on "A quick guide on improved livelihood opportunities under [FBL livelihood opportunities](#) - spate irrigation".

Asia (Myanmar)

KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT

- *A Decision Support Tool (DST) to minimize damage to rice crop by flooding developed.*
- *A DST to facilitate the scaling of rice-fish systems in the Ayeyarwady Delta (on going until end of 2020).*
- *Publications*: Three journal articles and contributions to the report "Promoting youth engagement and employment in agriculture and food systems", by the High Level Panel of Experts (HLPE) on Food Security and Nutrition of the UN Committee on World Food Security.

CAPACITY BUILDING

- *Two Decision Support Tools developed.*
- *Workshops to build capacity within DoA held. Geospatial data for landscape analysis collected*
- *User Manual on KoboToolbox in Burmese and English languages produced.* This is a public good to be used by DoA, other agencies and organizations in Myanmar.
- *Training video in Burmese on managing Golder Apple Snail (GAS) infestations produced.* This is to help the Plant Protection Division of DoA to train its extension officers and farmers to manage GAS infestations.

SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES

- *DSTs adopted by Ayeyarwaddy Integrated River Basin Management (AIRBM) for basin planning.*
- *DSTs for rice-fish systems under consideration, by AIRBM.*

4. Progress from the previous report

Africa/Asia

- A monthly newsflash was published capturing new FBL interventions or innovative technologies within the project. The newsflash was widely shared with the global network via email, social media platforms as well as the website (www.spate-irrigation.org). See details at: <http://spate-irrigation.org/category/news/>
- Two webinars were conducted on Ecologically-based Rodent Management for food security; and Green Roads for Water, for Resilience & Recovery: <http://spate-irrigation.org/category/news/>
- The field experiment in Sudan on optimizing field water management and crop productivity in Gash was replicated in two *mesgas* (fields) covering (1500 ha). This led to consolidation and official endorsement of the results by the Ministry of Irrigation and Water Resources: [Ministry endorsement letter.pdf](#)
- Five journal articles and one book chapter published; Three blogs were finalized.
- Initiated new research programmes on emerging issues.
- *FBL Guidelines document was edited and finalized.*
- Curriculum review and improvement workshop was conducted in Sudan that consolidated the FBL courses across Kenya, Malawi, Yemen, Pakistan and Sudan.
- FBL knowledge and experience sharing symposium conducted; Water Sector Conference was organized by the Ministry of Irrigation and Water Resources - Flood management was one of the topics discussed. Policy and stakeholder workshop organised in Yemen to discuss the impact of the conflict on the Tihama Spate Irrigation Systems and map better ways to achieve food security, alleviate poverty and to rise livelihoods. See March News Flash at: <http://spate-irrigation.org/category/news/>

Asia (Myanmar)

- The DST for mitigating flood impacts on rice was completed.
- Supported development of the DST for identifying areas most suited to scale up rice-fish systems by collecting data on biophysical, socio-economic and institutional attributes from all 26 townships in the Ayeyarwady Delta.
- This support to the rice-fish scaling DST development is in addition to the fact that the flood mitigation DST provides key foundational data.

5. Innovations (if applicable) and scaling up/adoption of innovations

Africa/Asia

In Pakistan, small grinders for chickpea powder were invented and used. Milk churners were introduced in Pakistan, Malawi and Sudan. These grinders and churners can be powered by solar energy in case an electricity grid is not available. Further, an insecticide spray made out of local poisonous botanical plants was developed. In collaboration with the private sector, some scythes and low energy consuming tree pullers were designed. A fodder chopper was also developed to help in saving time. A catalogue of all the smart tools can be found [here](#).

Asia (Myanmar)

DST to support mitigation of flood impacts on rice; DST to facilitate scaling of rice-fish systems

6. International Public Goods

Africa/Asia

- 14 peer-reviewed articles published; 2 peer-reviewed articles under review; 4 book chapters; 16 practical notes; 9 technical sheets; 3 communication materials

- Seed varieties

Seeds of forgotten varieties were brought back in this project. For instance, in Pakistan FBLN country chapter in collaboration with research centres has enlightened on better agronomic practices (seed application rate, ploughing methods, insect control, soil moisture conservation and ways of reducing post-harvest losses) for local seed varieties such as red kidney beans, moth beans, chickpea, sorghum and mung beans. A report on [suitable seeds for drought and spate irrigation](#), 2 blogs on [experience and seed sharing by Sindh farmers to Balochistan farmers](#) and [chickpea success through WhatsApp](#) have been developed and disseminated. Similarly, 3 [practical notes](#) on forgotten crops have been translated to Urdu and Sindhi for wider use by Pakistan farmers.

Asia (Myanmar)

- The DST for mitigating flood impacts on rice; The Rice-fish DST (available by end 2020)
- Video on managing GAS infestations
- One peer-reviewed journal publication; Two peer-reviewed journal articles pending
- Contributions to the pending report on "Promoting youth engagement and employment in agriculture and food systems", under the High Level Panel of Experts on Food Security and Nutrition of the UN Committee on World Food Security (HLPE)

7. Gender

Africa/Asia

A wide variety of implementation activities strengthened the position of women. Social inclusion and the voices of women were brought to the forefront by providing opportunities at different levels of institutional hierarchy and at the field level. Foreign and local workshops, symposia, practical training programs, knowledge and skill sharing exercise, tertiary level education, farmer field schools etc. While the percentage presence varied, in general, the range was 20-40%. Presence exceeded these ranges in the rain water and road water harvesting trainings, going beyond 50%, showing how water was crucial not only in agriculture but also in the domestic front. The major training and knowledge sharing topics were organic farming, permaculture, water harvesting, in-situ water conservation, farmer field schools, road water harvesting, integrated watershed management and flood-based farming systems. Country-wide responses varied but watershed management and flood based farming systems had a greater appeal than others, emphasising the need in these countries.

Asia (Myanmar)

- Seven female early career scientists trained (6 nationals and 1 international)

- 49 female and 41 male DoA township officers trained in the collection of geospatial data.
- Supported a case study on factors influencing male and female youth livelihoods choices in the Ayeyarwady Delta, especially in relation to small-scale fisheries. As noted in section 6, this is currently contributing to the pending report on “Promoting youth engagement and employment in agriculture and food systems”, under the High Level Panel of Experts on Food Security and Nutrition of the UN Committee on World Food Security.

8. Youth Issues

Africa/Asia

Youth and related issues were dealt with specifically in Kenya, Sudan and Pakistan. A number of topics were covered. A special [study](#) was undertaken in Kenya to understand the appropriate interventions for youth empowerment in FBLs. Youth attractive enterprises is another study that is being undertaken to see how youth can become active members of the FBLN network. A case study on youth representation in rehabilitation programs was undertaken (by County Government of Turkana) for which support was given by this project, to evaluate the involvement of youth in Flood-based systems and the impact of their inclusivity to the success of FBLs.

Asia (Myanmar)

Although youth were not specifically targeted, in this study, there were many instances that youth did participate at the ground level.

9. Climate and Environment

Africa/Asia

The activities related to this topic were, i) Floodwater governance in traditional FBLs, aimed at flood water management to deal with over and underutilisation of the resource. ii) Using road water harvesting, during water shortages especially in seasonal rivers. Knowledge on techniques and practices in harvesting and mitigation of environmental damage, prevention of soil erosion was imparted. Iii) On-farm water management improvement. This was designed to increase overall farm productivity by reducing soil water losses due to evaporation and seepage to increase the overall economic benefits.

Asia (Myanmar)

DSTs were aimed at contributing to the objectives of the Myanmar Climate Change Strategy & Action Plan (MCCSAP) by enabling geospatial analyses for targeting climate adaptive and pro-poor food systems in the delta.

10. Nutrition Focus

Africa/Asia

The project activities sensitized farmers on the benefits of growing indigenous, drought-resistant varieties and already forgotten crops. For instance, the farmers have been sensitized on the benefits of sorghum, chickpea, castor beans and improved guar varieties. Several concept notes on the nutrition and socio-economic benefits have been drafted as knowledge material. The local forgotten seed varieties enrich our diets, safeguard our agriculture, have climate-resilient properties (largely free from pests and diseases), keep traditional knowledge and boost the livelihoods of the farmers as they have good commercial potential and can be excellent cash crops.

Asia (Myanmar)

The rice-fish DST has particular relevance to support the scaling of low-cost and proven RF systems especially in less productive rice cultivation areas in the delta.

11. Knowledge Management

Africa/Asia

Over 7,000 farmers were reached during the action period. Young professionals were part of training and knowledge management activities. Over 1000 professionals and practitioners were in leadership courses. The knowledge-sharing events were conducted at local and regional scale to discuss research outcomes and future steps. Farmer exchange visits were organised to learn from sharing, especially, on solutions to challenges and policy advocacy. Fourteen [research articles](#) were published in peer-reviewed journals; Products prepared during the project period include:

[Practical notes](#); [Reports](#); [Videos](#); [Blogs](#); [Technical sheets](#); [Book chapters](#); [Brochures and banners](#); [Presentations](#).

Asia (Myanmar)

In Myanmar significant knowledge production tools (two DSTs and GAS video) were developed, and has trained over 200 DoA staff (all trainings taken together) in the application of this knowledge; The DST for minimizing flood damage for rice is available online, as will the RF DST once finalized; The GAS video is also available online.

12. Scaling up potential of the project or activities

Africa/Asia

- Sudan: The Ministry of Irrigation and Water Resource has officially endorsed the on-farm water management improvement interventions in the Gash irrigation scheme in Sudan. The project team and the Ministry shared a policy note with IFAD outlining the benefits of the interventions and the approaches and financial resources required for upscaling to the whole 80,000 ha Gash irrigation scheme. The Ministry has committed to co-fund 40% of the two million investment budget. Plan International, an international NGO that participated in the second year (2019) field trials, has decided to invest in upscaling the interventions from 2000 to 10,000 ha.
- Malawi: Road water harvesting has intensified, which has drawn great interest from development partners such as the World Bank Malawi Office, road authorities and their partners who have enhanced capacity to integrate road water management in their initiatives and investment plans. The achievements are detailed [here](#). The Universities have undertaken the task of up-scaling capacity building programmes.
- Pakistan: The NEWARBI project and mini barrages, aims to improve spate systems in the country by improving water distribution and introducing a menu of good practice. In another case study, a proposal for the entire command area at Bala Narri, Balochistan was also prepared; funding is being explored at the national level with USAID, PPAF and the Punjab and Balochistan governments.
- Kenya: the government plans to construct 125,000 pans to harness floodwater in support of the project as presented in this [excerpt](#). Scaling-up in collaboration with GIZ and county governments of Marsabit, Turkana, Kakamega, Busia, Kisumu and Siaya has been initiated.

Myanmar/Asia

Both DSTs are tools for applying technologies at scale in the delta. They can both be applied to other regions of Myanmar, if data is available.

The GAS video has already been applied throughout the delta to train 19,199 mainly small-scale farmers. It is applicable wherever GAS is an issue in Myanmar.

13. Partnerships

Africa/Asia

- Sudan: The current partnerships formed include the farmers, Plan International, an international NGO already technically and financially contributing to the field research, and several local organizations including the Agricultural Research Corporation (ARC), Kassala University and the Gash Agricultural Scheme Department (GASD). Upscaling the GAS on-farm water management improvement interventions that combine internal field bunds, canals has opened new opportunities for partnerships through international meetings and conferences. For example, UN organizations, NGOs, donors, and many other public and private water sector institutions active throughout the country are now aware of the projects outcomes. Partnerships have been done between the FBL team and the private sector for the preparation of the milk churners for the Aroma women. The linkages are still active and could be active for other interested project countries.

- Pakistan: RDF and SPO were mainly involved in improving the operational capacity of the farmers in Bagh Narri and Naj Gaj. A partnership has been formed between the FBL network and RDF which works on solar packs for rural equipment e.g. small grinders and milk churners. Further, partnerships have been formed with the three academic institutions actively involved in FBLs; Arid Zone University, Gomal Zam University and DG Khan Agriculture College.
- Kenya: networks were formed with organizations like GIZ, land reclamation committees, water resources user associations, community forest associations and commodity-based farmer networks like for grains. In addition, the project has formed strong linkages with county governments of Marsabit, Tana River, Turkana, Busia, Siaya, Voi and Meru, where several investment initiatives are taking shape. In collaboration with GIZ, other partnerships have been formed with county governments of Kakamega, Busia, Kisumu and Siaya. Moreover, the on-going Ph.D. research by the country coordinator on youth attractive enterprises has contributed immensely to the strategic project objective of supporting young people to be active members of the FBLN. Linkages have been formed with educational institutions such as Egerton University, JKUAT, CETRAD, KEWI, University of Nairobi (UoN) and Kenya School of Government. Follow-ups shall be done by the Kenyan chapter to ensure FBLs courses are fully mainstreamed in their curricula. Partnerships were also formed between the FBLs team and IFAD Sudan who financially supported a team to Kenya for a 10-day training on water harvesting. Future collaborations were discussed and are expected to happen.
- Ethiopia: DREAM conference paved the way to form partnerships specially to discuss the impacts of the GIZ -SDR programme.
- Malawi: new partnerships have been initiated with the Institute of (Road) Engineers, Seed Traders Association, World Bank Malawi Office, World Fish Centre and several local NGOs and government authorities. Other partnerships have been formed between Mzuzu and Lilongwe Universities that offer FBLs courses.

Asia (Myanmar)

- Collaboration with WorldFish to leverage knowledge, staff and funding around a common goal of building capacity for integrated policy implementation, which builds on ACIAR investments in rice-fish trials.
- Close partnerships across different sectors for informed land-use planning within Myanmar. Inter-departmental dialogs especially between DoA and Department of Fisheries on common challenges (e.g. overlaps between agriculture and leasable fisheries and resulting conflict). Collaboration with the Plant Protection Division of DoA to build capacity for farmer training to manage Golden Apple Snail infestations in flood season rice.

14. EC/IFAD visibility activities

Africa/Asia and Asia (Myanmar)

Visibility was given via in-country and foreign workshops, knowledge sharing and training programmes, web-based material used for dissemination, peer-review publications for both projects. In all the activities conducted, IFAD/EC support has been acknowledged, by using the logos and a written statement. The FBLN acknowledges the support in the spate irrigation [website](#).

15. Conclusions

Africa/Asia

- Aimed at maximizing the livelihood potential in the flood prone areas of Africa and Asia, 6 partner countries, namely, Ethiopia, Kenya, Malawi, Pakistan, Sudan and Yemen have successfully formed the FBL network under this project and are functional (website). The FBLN foundation has been registered in the Netherlands.
- Engagements initiated with farmers, water professionals and practitioners, policy makers professionals, practitioners, and policy-makers across the target countries were strengthened through joint implementation of network activities.
- Farmer networks have been strengthened through the training and innovative technology development and transfer and the farmers are actively utilizing the knowledge gained for practical solutions from the project.
- Water and agriculture sectors have been part of the trainings which is an important part of institutionalizing activities and innovative interventions for the future.

- Consultative meetings for universities in Kenya and Malawi are still in progress to ensure that the FBL courses are mainstreamed into the curricula. Other universities that have the courses already in the system will continue offering the courses.
- Intensive project implementation has generated substantial data and information on investment proposals and policies. Combining these with evidence, the following investment proposals drafted during the project period will be further improved

Asia (Myanmar)

- This component of the project was implemented in Myanmar. The aim was to better equip the Department of Agriculture and other Departments under the Ministry of Agriculture, Livestock and Irrigation (MoALI) to adopt integrated policy implementation strategies in the Ayeyarwady Delta.
- Two DSTs were developed, one to help reduce flood damage to rice and the other for rice-fish scaling, utilizing a landscape approach for planning food systems in the flood prone Delta. A video that was produced to manage the GAP infestations were widely accepted.
- PRUNSAR funds with funds from the CGIAR's Research Program on Water, Land and Ecosystems (WLE) and the CGIAR Research Program on Fish (FISH) were leveraged to come to a common understanding on the need for spatial analysis. Funds from an additional source has been pledged for upscaling. Work on this will continue through 2021.

MAIN REPORT:

I. BACKGROUND

This project has two distinct components. One component is led by MetaMeta (Africa/Asia). And the other by IWMI, Asia (Myanmar). For each heading the outputs and outcomes are reported separately for clarity.

Countries: Kenya, Malawi, Myanmar activities were supported entirely by EC funds. Sudan (extended activities), Ethiopia, Pakistan and in some instances Yemen and Afghanistan activities commenced under the IFAD project and further supported and consolidated with EC funds. Specific mention is made to reflect the outcomes in relevant sections. (IFAD Project Grant Number: 2000000694)

Africa/Asia

Project goals: To help develop Flood-Based Livelihood (FBL) policies and programmes that will meaningfully invest in rural people and are based on action research and South-South documentation of practical experiences, and are embedded in long-term capacity building, incorporating programme development at various levels.

Project objectives: To develop models and approaches on inclusive and gender-balanced growth of climate change-stressed areas, which predominantly rely on FBLs.

The specific objectives:

- To strengthen farmer and knowledge network established in Africa and Asia: that builds on the Flood-Based Livelihoods Network Foundation, and outreach of regional and national centres of ICRAF. The network is equipped with mechanisms for active engagement of farmer leaders and other practitioners (including policy-makers, investors and educators) in and across target and other selected countries in Africa and Asia;
- To strengthen the capacity of human resources, local institutions and FBL knowledge: to strengthen the knowledgebase of men and women staff of local institutions contributing to water and food security in areas where FBL is practiced, taking evidence-based local practice in the eight target countries as the point of departure;

- To develop and implement capacity building programmes: Undertake capacity building including mainstreaming of FBL in farmer learning centres, and higher education and contributing to the development of a group of young male and female professionals;
- To support investment programmes and policy development: Policies that are informed and shaped by good FBL practices, supported by South-South shared documentation and evidence-based research

Myanmar (Asia)

Project goals: The overall goal was to support inclusive and nutrition-dense food production systems in the Ayeyarwady Delta in Myanmar.

Project objectives: To support land-water use analysis and planning in the Ayeyarwaddy Delta – Myanmar’s rice bowl and flood-prone delta.

Specific Objectives:

- To develop a Decision Support Tool and associated capacity building within the DoA to facilitate decision making to reduce losses due to flooding
- To develop a rice-fish suitability map for the delta – a derivative of the rice suitability maps - partnering with WorldFish-Myanmar.

Project Components, Outputs and Outcomes

Africa/Asia

COMPONENT 1: FBL NETWORK ESTABLISHMENT AND STRENGTHENING
EXPECTED OUTCOME
<ul style="list-style-type: none"> • Networks established and functional • Promoting documented knowledge • Network and communication maintained and developed
Output 1.1 New networks established and functional
Output 1.2 Documentation of good practices, innovation and good practices promoted
Output 1.3 Knowledge promoted and programmes developed through national networks
COMPONENT 2: KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT
EXPECTED OUTCOMES
<ul style="list-style-type: none"> • FBL relevant research on four themes. • At least 8 practical notes on upscaling drought-resistant and high-value enterprises. • At least 8 quick-win solutions-oriented research programmes linked to capacity building of young professionals. • At least 9 reports linked on the diverse FBLS activities and success of a variety of crops
Output 2.1 Solution-oriented research programmes finalised.
Output 2.2 Initiate new research programmes on emerging issues
Output 2.3 FBL Guidelines developed finalized
COMPONENT 3: CAPACITY BUILDING
EXPECTED OUTCOMES
Existing course in MSc programmes (Ethiopia, Pakistan and Yemen) consolidated. Two new MSc programmes
<ul style="list-style-type: none"> • 50 young professionals trained in FBL at the short course offered annually by MetaMeta, ICRAF and partners. • Short annual course for stakeholders, with satellite courses in key regions • 4 Farmer Learning Centres established with FBL training packages • Curriculum review conducted
Output 3.1 Strengthen the content and delivery of FBLS courses in Universities and educational institutions
Output 3.2 Farmer training materials prepared and disseminated
Output 3.3 FBLS knowledge and experience sharing symposium conducted

Output 3.4 Continued support to MSc and PhD students, young professionals and interns
COMPONENT 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES
EXPECTED OUTCOMES
<ul style="list-style-type: none"> • Investment-focussed workshop conducted • Investment ideas developed on three to five priority thematic areas • Technical support provided on request to IFAD investment programmes active in the project areas • Proposal review and improvement workshop conducted • Policy development workshop conducted
Output 4.1 Portfolio of FBL investment options prioritised and developed
Output 4.2 IFAD projects under preparation supported on request

Myanmar (Asia)

COMPONENT 1: FBL NETWORK ESTABLISHMENT AND STRENGTHENING
EXPECTED OUTCOME
<ul style="list-style-type: none"> • This was not an output that was planned. But, collaborations formed platforms for dialogue in Myanmar.
Output 1.1 N/A
Output 1.2 N/A
Output 1.3 N/A
COMPONENT 2: KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT
EXPECTED OUTCOMES
<ul style="list-style-type: none"> • Overall, Department of Agriculture and other Departments under the Ministry of Agriculture, Livestock and Irrigation (MoALI) better equipped to adopt integrated policy implementation strategies in the Ayeyarwady Delta that take advantage of synergies between food production, climate adaptation and nutrition and health policy objectives.
Output 2.1 A Decision Support Tool (DST) to minimize damage to rice crop by flooding
Output 2.2 A DST to facilitate the scaling of rice-fish systems in the Ayeyarwady Delta (due end 2020).
Output 2.3 Publications including three journal articles and contributions to the report "Promoting youth engagement and employment in agriculture and food systems", by the High Level Panel of Experts (HLPE) on Food Security and Nutrition of the UN Committee on World Food Security.
COMPONENT 3: CAPACITY BUILDING
EXPECTED OUTCOMES
<ul style="list-style-type: none"> • The Department of Agriculture and other Departments under MoALI better capacitated to use GIS tools for integrated land-water analysis and planning to promote more productive, nutrient dense and climate smart agriculture in the Ayeyarwady Delta. • To help DoA link with other organisations to further integrated land-water use planning through synergies generated by combining human resources, funding streams and data and tools • To facilitate collective cross-sector dialogs to promote increased collaborative planning especially within the Ministry of Agriculture, Livestock and Irrigation (MoALI), which also includes the Department of Fisheries (DoF).
Output 3.1 Two Decision Support Tools
Output 3.2 Workshops to build capacity within DoA to collect and use geospatial data for landscape analysis and to use and build on Output 3.1
Output 3.3 User Manual on KoboToolbox in Burmese and English languages to ensure that the methods imparted through Output 3.2 are documented and accessible to DoA and other agencies and organizations in Myanmar.
Output 3.4 Training video in Burmese on managing Golder Apple Snail (GAS) infestations to help the Plant Protection Division of DoA to train its extension officers and farmers to manage GAS infestations.
COMPONENT 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES
EXPECTED OUTCOMES
<ul style="list-style-type: none"> • Key planning processes likely to significantly impacts land-water resources in the Ayeyarwady Delta adopt PRUNSAR outputs.
Output 4.1 Adoption of Output 1 of Component 2 by the AIRBM project – one of the largest planning exercises in the Ayeyarwady Basin. Latest version of Output 2 of Component 2 also under consideration by AIRBM.
Output 4.2 N/A

II. IMPLEMENTATION PROGRESS:

A. Project expenditure by year

All figures are in EURO	Year 01 2016 (Jun-Dec)	Year 02 2017 (Jan-Dec)	Year 03 2018 (Jan-Dec)	Year 04 2019 (Jan-Dec)	Year 05 2020 (Jan-May)	Cumulative total- 2020.05.31
Yearly budget (As per signed agreement)	767,990	526,020	231,449	-	-	1,525,459
Funds received each year	575,992	-	-	586,513	-	1,162,505
Yearly expenditures	37,583	400,916	283,492	538,238	265,230	1,525,459
Funds balance by year	538,410	137,494	(145,999)	(97,724)	(362,954)	(362,954)

B. Brief comments on advances from IFAD, expenditures and pre-financing

The grant agreement between IFAD and IWMI (EURO 1.5 million) was signed on 17 June 2016, to implement the project under the umbrella of CRP on Water, Land and Ecosystems (WLE) which was led by IWMI. The initial implementation period was from 17 June 2016 to 31 December 2018. The first tranche of funds was received in December 2016. This was one month before the first financial reporting period which was from 17 June to 31 December 2016. Since the first few months were spent establishing collaborative links with local partner institutions, the spending was low in the first year. As the work progressed, additional sites were added (because of promising results) and the project completion date was extended up to 31 March 2020, to enable the completion of activities that were undertaken. The second tranche was received only in April 2019, therefore, the partners and IWMI had to pre-finance, to cover the expenses incurred during the intervening period. The project was extended again by two months, ending in 31 May 2020, due to the pandemic (COVID-19) that impacted the entire world. As at the completion date, the total pre-financing by partners and IWMI stands at EURO 362,954 (three hundred and sixty-two thousand nine hundred and fifty-four).

C. Monitoring and Evaluation Arrangements

Africa/Asia

Monitoring and Evaluation (M&E) was carried to: 1) ensure the production of quality deliverables, 2) ensure that ongoing activities are responsive to what is working and what is not, and 3) maximize eventual impact on the cost-effectiveness and sustainability of the proposed interventions.

The Logical Framework developed at the beginning of project, and was further refined following the inception phase. Of Key set indicators were, the number of target beneficiaries with improved food security and livelihoods due to adoption of key solution-oriented results as well as best and good practices; the extent of the knowledge created and disseminated in the form of farmer-exchange events, journal articles, practical notes, policy briefs, case study videos; the number of networks created and their achievements in providing advisory services and enhancing the capacity of professionals, practitioners and farmers.

Continuous proactive interactions within and among the project implementing partners ensured that deliverables were completed on time and verified the results on the ground. These interactions took place in different forms: mid-year and annual progress meetings, output driven supervision missions, conferences and workshops, webinars, joint development of progress reports and frequent discussions through WhatsApp and other social media outlets. The M&E was adapted to suit the local settings. For instance, the farmer learning centres that were to be part of each country's output, were integrated into existing centres – e.g. In Kenya and Malawi, the Smart Centres that were already established to promote and upscale water and climate-smart agricultural technologies and practices were used. The Smart Centres are hosted by well-established institutions, which proved to be critical for sustainability.

Asia (Myanmar)

The primary activities under this project were the development of the two DSTs. M&E activities were based on a series of activities and the needs assessment to understand the specific components and the processes involved in the development of DSTs was a key one. The data sets, capacity needs of the staff, rigorous standards of quality control in developing DSTs, production speed, their interpretation and final use were some of the indicators used. Regular contact was made to monitor the progress against a time line, which was accompanied by field visits by the project leader. Progress review meetings were held regularly, as and when needed. The production of the GAS video and its dissemination by DoA took place under close monitoring.

D. Physical progress by output against targets

Africa/Asia

See Annex 1 for cumulative achievements and Annex 2 for specific details

Component 1: FBL NETWORK ESTABLISHMENT AND STRENGTHENING

Output 1: New networks established and functional

Outcome 1:

1.1 Four country networks strengthened and farmer's membership increased. This outcome was fully achieved. Four existing country networks (Ethiopia, Sudan, Yemen and Pakistan) were strengthened and farmers' membership increased by 30-40% (IFAD). The Business Model Canvas was instrumental in guiding Mekelle University (MU), Hydraulic Research Centre (HRC), Strengthening Participatory Organization (SPO) and Water and Environment Centre (WEC) through the identification of the value propositions for their beneficiaries, the key activities, partners and the resources involved.

1.2 Four new networks established. In Kenya, Malawi and Myanmar, new networks were established each with a minimum of 50 members. In Kenya, a database of farmers in Kajiado, Turkana and Tana River Counties has been developed and maintained. However, Afghanistan which was one of the new countries in the network could not actively promote FBLS activities due to the recurrent insecurity in the country. This led to the 80% accomplishment in this outcome.

Output 2: Documentation of good practices, innovation and good practices promoted

Outcome 2: Promoting documented knowledge

Knowledge promoted and programme developed through national networks (IFAD & EC).

- i. Cross - country farmers' knowledge sharing organised.
- ii. Tailor-made training to selected farmer groups/WUAs.
- iii. Knowledge products developed and disseminated in local languages.
- iv. Country network secretarial support. In each country, network secretariats were selected to aid in the implementation of the project. With the support of the implementing partners, each country was led by a project coordinator.

Output 3: Knowledge promoted and programmes developed through national networks

Outcome 3: Network and communication maintained and developed

Network mechanism and communication maintained and developed. The major activities undertaken under this outcome were:

- i) A website developed and maintained.
- ii) Newsletter developed and maintained.
- iii. FBLN Foundation established. FBLN Foundation was registered in the Netherlands in 2016 after changing the name from Spate Irrigation Network Foundation. The change was meant to make it more diverse in terms of floodwater management. Through the network, over 1500 farmers have been reached where the farmers have been enlightened on diverse FBL activities and experiences from across the countries.

Component 2: KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT

Output 1: Solution-oriented research programmes finalised.

Outcome 1: Eight solution-oriented research programmes conducted (IFAD & EC).

Students and young professionals undertook FBL research on the following thematic areas: i) Water governance and conflict mitigation
ii) Management of soil moisture and fertility
iii) Improvement of water diversion, distribution and efficiency,
iv) climate change mitigation,
v) water harvesting including from roads.

Output 2: Initiate new research programmes on emerging issues

Outcome 2: Eight practical notes and other communication products on cross-country relevant research themes (IFAD & EC).

The main communication products developed here focussed on water governance, conflict management, and soil moisture and fertility management, improvement of water diversion and distribution efficiency and cross-country findings on FBL. Fifteen [practical notes](#); [one](#) is not yet published and [three](#) were translated to Sindh and Urdu, 44 [blogs](#), [videos](#), 4 [book chapters](#), 9 [technical sheets](#), 14 [brochures and posters](#) and PowerPoint [presentations](#) have been developed and shared in the website as well as during workshops and seminars hosted in support of the project. [Farmer learning materials](#) were also developed in collaboration with the WUAs and disseminated.

Output 3: FBL Guidelines developed finalized

FBL guidelines developed. A draft [FBL guideline](#) following an extensive review of mostly existing documents and inputs from country chapters has been developed.

Component 3: CAPACITY BUILDING

See Annexes 4 and 5 for details

Output 1: Strengthen the content and delivery of FBL courses in Universities and educational institutions

Outcome 1:

- 1.1 Three existing MSc programmes consolidated (IFAD).
- 1.2 Two new MSc programmes on FBL started.

Output 2: Farmer training materials prepared and disseminated

Four farmer learning centres established (EC).

Output 3: FBL knowledge and experience sharing symposium conducted

International, regional and national trainings and events conducted (IFAD). So far, about 1000 young and mid-career professionals, practitioners and farmers nearly 150 policy-makers have benefited from the various trainings, workshops and other related events.

Output 4: Continued support to MSc and PhD students, young professionals and interns Internship programme conducted. Three leadership courses ([2016](#), [2017](#) and [2019](#)) and several internships ([2017](#) and others offered on an individual basis by the FBLN

organizations) have enhanced the capacity of about 100 participants including 50 young professionals to become leaders and promoters of FBLs across the countries.

Component 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES

Output 1: Portfolio of FBL investment options prioritised and developed

Outcome 1:

1.1 Six proposals for national or provincial investment programmes or development policies created (IFAD & EC).

1.2 Africa to Asia exchange in at least two proposals facilitated (EC). In Sudan, a proposal on the use of electric churners by the Aroma women was developed after which a milk churner was sent to Malawi for promotion.

1.3 Linkage to other WLE activities established (EC).

Output 2: IFAD projects under preparation supported on request

Outcome 2: IFAD projects under preparation supported on request (IFAD).

Asia (Myanmar)

See Annex 1 cumulative achievements and Annex 3 for specific details

Component 1: FBL NETWORK ESTABLISHMENT AND STRENGTHENING

Network development was not a focus of this project as distribution of agricultural technologies to farmers was not amongst the project activities.

Component 2: KNOWLEDGE DEVELOPMENT AND MANAGEMENT

Output 1: A DST to facilitate decision making to reduce flood impacts on rice in the Ayeyarwady Delta along with 78 core maps at Township level, three for each of the 26 townships covering the three rice categories have been developed.

Output 2: A DST to facilitate the scaling of rice-fish systems in the Ayeyarwady Delta is under development (due end 2020).

Output 3: Several publications have been generated or are in production arising out of project activities. While these are listed in Section IV, the ability of the project to provide input into the report "Promoting youth engagement and employment in agriculture and food systems", being drafted by the High Level Panel of Experts (HLPE) on Food Security and Nutrition of the UN Committee on World Food Security is of particular note.

Component 3: CAPACITY BUILDING

See Annexes 4 and 5 details

Output 1: Capacity of MoALI developed using 2 DSTs. - use of geospatial data for landscape analysis, and thereby to better inform land use decisions.

Output 2: Workshops to build capacity within DoA to collect and use geospatial data for landscape analysis and thereby for more informed land use planning.

Output 3: User Manual on KoboToolbox in Burmese and English languages.

Output 4: Training video in Burmese on managing Golder Apple Snail (GAS) infestations.

Component 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES

Output 1: DSTs used for AIRBM project planning exercises – one of the largest planning exercises in the Ayeyarwady Basin. Tasked with developing the Ayeyarwady Basin Strategy, the AIRBM project has the potential to influence how land and water resources are utilised in the Basin. The fact that the DST was used in developing rice suitability maps for the Basin as a whole suggests potential for PRUN SAR to have Basin-wide impact in relation to more climate-smart rice cultivation.

E. Progress by Outputs realized since the submission of previous report

Africa/Asia

Component 1: FBL NETWORK ESTABLISHMENT AND STRENGTHENING

Network and communication mechanisms maintained and developed

- A monthly newsflash on FBLs interventions or innovative technologies was shared with the global network via email, social media platforms as well as the website (www.spate-irrigation.org). See details at: <http://spate-irrigation.org/category/news/>
- Two webinars were conducted on Ecologically-based Rodent Management for food security; and Green Roads for Water, for Resilience & Recovery: <http://spate-irrigation.org/category/news/>

Component 2: KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT

Solution-oriented research programmes finalised

- The field experiment in Sudan on optimizing field water management and crop productivity in Gash was replicated in two *mesqas* (fields) covering (1500 ha). This led to consolidation and official endorsement of the results by the Ministry of Irrigation and Water Resources: [Ministry endorsement letter.pdf](#)
- Five Journal articles published (2020)
- One book chapter published: Nthara, M. (2020). Rainwater Harvesting for improved food security and environmental conservation; experiences from Malawi.
- Three blogs were finalized:

Initiate new research programmes on emerging issues

- Ideas were generated on the emerging topic of "Macro-primary nutrient balances in FBLs" based on field activities in Malawi. This has been documented in a practical note: <http://spate-irrigation.org/wp-content/uploads/2020/09/PN-39-print.pdf>
- An overview paper in a previously not studied Nai Gaj spate irrigation command area in Sindh province, Pakistan was published: <http://spate-irrigation.org/wp-content/uploads/2020/08/Overview-Paper-18-1.pdf>.
- Pakistan country team have conducted field visits and identified plants with medicinal value in the biodiversity rich Sanghar hill forest. This will be further researched and integrated into the agronomy. See the March News Flash at: <http://spate-irrigation.org/category/news/>

FBLs Guidelines document was edited and finalized.

Component 3: CAPACITY BUILDING

Strengthen the content and delivery of FBLs courses in Universities and educational institutions

- Curriculum review and improvement workshop held in Sudan that consolidated the FBLs courses across Kenya, Malawi, Yemen, Pakistan and Sudan. (<http://spate-irrigation.org/resource-documents/library-2/curriculum-review-2020/>)

FBLs knowledge and experience sharing symposium conducted

- Water Sector Conference was organized by the Ministry of Irrigation and Water Resources. [Sudan Water Sector Conference.pdf](#)
- Policy and stakeholder workshop organised in Yemen to discuss the impact of the conflict on the Tihama Spate Irrigation Systems and map better ways to achieve food security, alleviate poverty and to rise livelihoods. See March News Flash at: <http://spate-irrigation.org/category/news/>

Asia (Myanmar)

Component 2: KNOWLEDGE DEVELOPMENT AND MANAGEMENT

Output 1: The DST to facilitate decision making to reduce flood impacts on rice in the Ayeyarwady Region has been completed and handed to the Land Use Department of DoA. Training and validation workshops were held in Naypyidaw for senior DoA staff including GIS specialists, and in the Ayeyarwady Region Office for staff from all DoA townships in the Ayeyarwady Region. The maps generated by running the tool are

available on Myanmar Information Management Unit (MIMU) and the Myanmar Water Portal websites, two leading online sources of information on natural resources management in Myanmar. The DST has also been incorporated into one of the largest planning initiatives for the Ayeyarwady Basin, the AIRBM project.

Output 2: Field data was collected during December 2019 – February 2020 for input into the model. PRUN SAR funds were used to hire three Myanmar graduates as interns for data collection and for the data collection activities. These interns worked with WorldFish and DoF staff during the data collection process.

Outputs 3: Several publications were commenced. Two journal submissions will be made in December 2020 (Leh et al. and Arulingam et al. – see Section IX), while the report of the High Level Panel of Experts on Food Security and Nutrition of the UN Committee on World Food Security, to which this project is contributing, is due in October 2021

Component 3: CAPACITY BUILDING

Output 1: Same as for Outputs 1 and 2 under Component 2.

Output 2: Already completed.

Outputs 3 and 4: Already completed

Component 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES

Output 1: In June 2020, the maps derived from the DST for minimizing flood damage of rice was shared with the AIRBM project through Dr. Olaf Verheijen, a senior consultant to the project. He confirmed by email in October that the project has incorporated the maps into its rice suitability map covering the Ayeyarwady Basin.

F. Difficulties encountered and measures taken/plans to resolve problems

Africa/Asia

Difficulties/challenges	Measures taken to solve problems
In Yemen, activities were limited due to the war situation, making it difficult to visit spate irrigation areas, e.g. the Tihama region.	Local experts led activities through online coaching and supervision of the FBLN team using varied social media (Zoom, IMO) and regular telephone communication.
In Malawi, some of the activities were rescheduled as a result of the after-election demonstrations that took place, making it difficult to visit the field sites at times	Visits were planned flexibly to be able to adjust the visits to the planned and unplanned demo's. Furthermore, responsibility for follow-up was given to the local irrigation office, for whom it was easier to access the field sites.
In Kenya, the last months' outputs have been affected by lockdown due to Covid-19.	Consultants were involved to finalise on the pending activities outside of Nairobi especially in Turkana County.
In Afghanistan, the security situation in the country has not stabilized affecting the overall activities in the country.	The possible activities possible were conducted with a few farmers and the FBLN team in the country through social media and regular telephone

	communication.
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Asia (Myanmar)

Difficulties/challenges	Measures to be taken to solve problems
As noted earlier in this report, written permission was obtained from IFAD to utilize project funds for dredging an irrigation canal in Kyonkadun Village in the Ayeyarwady Delta. The objective was to restore the functioning of a sluice gate around which the project, in collaboration with WorldFish, test a multi-stakeholder local institutional arrangement to manage irrigation in a more fish-friendly manner. The difficulty was locating a suitable dredging service given that the quote for dredging from IWUMD was well over the funds available.	It was decided not to pursue the activity to avoid any misunderstandings with IWUMD.

III. INNOVATIONS

Africa/Asia

- Small grinders for chickpea powder preparation and milk churners were introduced. This has helped to save time and energy for women. These grinders and churners can be connected to solar power in cases where the electricity grid is not available.
- An insecticide spray made out of local poisonous botanical plants was also invented.
- In collaboration with the private sector, some scythes and tree pullers were designed to help in reducing the energy needed. The scythe was tested on sorghum crop in [Sudan](#) and some recommendations were given by the farmers; i) the tested scythe works better with light biomass like wheat hence for sorghum, a strong handle and sharpened blade were recommended ii) working by pushing mechanism was recommended as opposed to the pulling of biomass mechanism.
- Further, a fodder chopper was also developed to help in saving time as compared to cutting fodder by hand. A catalogue of all the smart tools can be found [here](#).

Asia (Myanmar)

- Two DSTs that can be used for spatial planning at a basin level for rice and rice-fish production systems. These can generate a number of spatial maps that are more geographically targeted and aimed at mitigating flood impacts.
- A video on low cost and eco-friendly methods for managing GAS infestations to train extension officers. This has helped train a larger number of farmers.

IV. INTERNATIONAL PUBLIC GOODS

Africa/Asia

Fourteen journal articles have been published in internationally peer-reviewed journals while one has been accepted for publication and two are under review. 4 book chapters, 16 practical notes, 9 technical sheets, 13 different types of different communication materials (blogs, twitters, newsflash, pictorial guides etc.) have been produced. See Annex 6 for details.

Seeds of forgotten varieties and good practices for their cultivation were introduced. A report on [suitable seeds for drought and spate irrigation](#), 2 blogs on [experience and seed sharing by Sindh farmers to Balochistan farmers](#) and [chickpea success through WhatsApp](#) have been developed and disseminated. Similarly, 3 [practical notes](#) on forgotten crops have been translated to Urdu and Sindhi for wider use by Pakistan farmers.

Asia (Myanmar)

1 journal article has been published. Two journal articles are under preparation; contribution to a UN publication, 7 project/technical reports and The rice suitability maps available in public domain. See Annex 6 for details.

V. GENDER ISSUES

Africa/Asia

Gender is key to understanding and improving local FBLs. Efforts to strengthen the position of women and to promote social inclusion through project activities were highlighted. The importance of gender and inclusivity in different FBLs was emphasized during training topics such as water harvesting, permaculture, organic farming and agroforestry. Opportunities for women to share their views at different fora were presented. Especially in the capacity building component, gender was given due attention in the training programs. For instance, in the International symposium in Kenya, FBLs programmes and international training on water harvesting, permaculture, organic farming and agroforestry to the Sudan delegates issues affecting gender were highly emphasized. Topics that address the specific needs, priorities and challenges of women were discussed in all major training and knowledge and experience sharing programmes. Out of the 19 presentations done in the FBLs symposium in Kenya, 6 presentations were done by female participants. 4 of the presentations enlightened the participants on the benefits of inclusivity in FBLs and ways of economically empowering both the youth and women. In addition, out of the 52 participants of the symposium 13 were female participants. In the international training on organic farming, water harvesting and permaculture, 8 out of the 16 participants were females. A case study of Turkana county has emphasized on how the county is supporting the female farmers in FBLs. In the curriculum review workshop, out of the 22 presentations, 10 were done by female participants. Further, in Malawi 8 women graduated from the farmer field school. In another instance, out of 3156 farmers trained on rainwater harvesting and in-situ water conservation, 2057 were women. Similarly, in another training on road water harvesting 56 out of the 136 farmers were female. In Ethiopia, 66 experts out of which 180 participants trained on integrated watershed management and flood-based farming systems in ASAL areas, Horn of Africa were female.

In the knowledge development component, women and youth were not left out. Among the 6 PhD researchers supported by the project, 2 were female researchers. One student from Pakistan completed her studies and graduated while the second from Ethiopia is expected to graduate in 2021. In Kenya, an MSc female student was financially and technically supported by the project has graduated, published a research article and a practical note. During the internship programme, 3 out of the 8 interns were female. In Sudan, [smart tools](#) such as electric churners are meant to relieve the workload of women and create income opportunities in the areas where households depend on floods.

Five young women professionals were recruited during the program to support country programs

Asia (Myanmar)

In Myanmar, although gender was not specifically targeted, the DoA staff membership was well represented by women. Limited information on gender was gathered by the case studies commissioned from local universities.

In terms of capacity building however, the beneficiaries were overwhelmingly women. A healthy percentage of DoA staff directly trained by the project were women. All six early career professionals who interned under this project were also women.

The commissioning of case studies from Yangon, East Yangon, Hinthada and Dagon Universities provided opportunities for students and faculty staff to engage in socio-economic research, and for the students to use these case studies as their dissertations. The majority of these participants were women.

VI. YOUTH ISSUES

Africa/Asia

In Kenya, a [study](#) was conducted to understand the right interventions for youth empowerment in FBLs. Further, the on-going Ph.D. research by the country coordinator on youth attractive enterprises will contribute to the strategic objective of supporting young people to be active members of the FBLN. In light of the above, a presentation was done on the opportunities and challenges for the participation of young people in FBLs in Kenya. In another case, the County Government of Turkana requested for assistance in gathering records on youth representation in the Turkana Rehabilitation Programme to evaluate the involvement of youth in flood-based systems and the impact of their inclusivity to the success of FBLs. Manuscripts detailing their involvement have been prepared and will be shared soon. In Sudan and Pakistan, a well-being survey has been conducted.

Asia (Myanmar)

In Myanmar, youth have not been targets as direct beneficiaries, although youth have likely been amongst the beneficiaries of the farmer trainings by DoA using the video on managing Golden Apple Snail infestations, since the definition of 'youth' varies.

The only direct focus on youth was the co-funding provided to the case study on youth engagement in small-scale fisheries in the delta, that represents knowledge products (draft journal article and contributions to a high level United Nations Report (also in draft), rather than direct benefits to youth.

VII. CLIMATE AND ENVIRONMENT

Africa/Asia

The research and case studies finalised in the action period focussed on: i) Floodwater governance in traditional FBLs. This aimed at improving water distribution and sharing to among others mitigate under and overutilization of floods that could cause soil fertility depletion and waterlog respectively. ii) Using road water harvesting. This activity created awareness and introduced techniques and practices for harnessing water from flooded roads. It addresses climate-induced floodwater shortages from seasonal rivers as well as mitigates environmental damage through sheet erosion and gully formation. Iii) On-farm water management improvement. This was designed to increase overall farm productivity by reducing soil water losses due to evaporation and seepage to increase the overall economic benefits. Soil moisture management practices were also highly emphasized for improved crop productivity.

Myanmar (Asia)

The DST to minimize flood damage to rice directly addresses the primary climatic risk to rice cultivation in the Ayeyarwady Delta. The DoA estimates that annually, 350,000 tons of rice is lost at a cost of between USD 16 million and 22 million to approximately 62,000 mainly smallholder farmers. Erratic flood patterns are attributed to both direct human actions such as poldering and irrigation with poor infrastructure maintenance and irregular rainfall. By analysing 30 years of rainfall data, slope, salinity and other parameters together with the characteristics of floating, flooded and modern rice, the DST provides the information needed for more informed land use and cropping decisions to be taken to minimize future impacts of floods. duration builds capacity to increase rice yields (potentially by 350,000 tons/year), whilst also addressing the climate-related risk posed by flooding.

By using the DST to minimize flood damage to rice as its base map, the DST for rice-fish scaling also incorporates climate resilience with respect to the impacts of flooding in the delta. It is also believed that converting 10% of irrigated paddy lands to integrated rice-fish farming offers one solution for adapting to or mitigating the effects of climate change (Dubois et al. 2019).

VIII. NUTRITION FOCUS

Africa/Asia

The project has sensitized farmers on the benefits of growing indigenous, drought-resistant varieties and already forgotten crops. For example benefits of sorghum, chickpea, castor beans and improved guar varieties have been highlighted. Several concept notes on the nutrition and socio-economic benefits have been drafted. The local forgotten seed varieties enrich our diets, safeguard our agriculture, have climate-resilient properties (largely free from pests and diseases), keep traditional knowledge and boost the livelihoods of the farmers as they have good commercial potential and can be excellent cash crops.

Asia (Myanmar)

Nutrition has been central to the project's activities in Myanmar. While the ADS, MSNPAN represent important policy advances that emphasize nutrition in food systems, a primary obstacle to putting these policies into action is the lack of modern geospatial landscape analysis tools, that can help better identify opportunities for crop diversification and integrated farming, whilst also addressing key drivers of climatic risk. A failure to optimise land-water resources in such a manner will also fail to produce nutrient dense food. Thus, the two DSTs supported by this project contribute to address these needs.

The DST to minimize flood damage to rice builds capacity to increase rice yields (potentially by 350,000 tons/year), whilst also addressing the climate-related risk posed by flooding. Linked to rice is the training video on managing GAS infestation, which addresses the second most prevalent cause of rice loss in the Ayeyarwady Delta (flooding being the first).

The DST supporting rice-fish scaling is especially significant from a nutritional standpoint given the nutrient density of fish. According to WorldFish calculations, scaling rice-fish systems can increase fish production by 100,000 tons, with the added benefit of generating an additional USD 100 million each dry season in the Delta, without significantly undermining rice production (Dubois et al. 2019). As noted in more detail in Sections IX and X of this report, IWMI and WF have earmarked funds for promoting the use of this DST in planning and scaling by MoALI in 2021.

IX. KNOWLEDGE MANAGEMENT

Africa/Asia

The project implemented knowledge-sharing events at the local and regional scale to discuss research outcomes and future steps. In each country, the project team organized farmer exchange visits to present and compare findings from their farmer activities as well as to define key solutions to the challenges faced as well as issues to present later to policy-makers. Over 7,000 farmers were reached during the action period.

Fourteen [research articles](#) were published in peer-reviewed journals; one has been accepted for publishing and two are awaiting publication. A total of 180 young professionals were trained in the annual workshop in Mekelle University on the design and implementation of FBL systems in their countries. Over 1000 professionals and practitioners from the project countries have been reached during the main workshops and leadership courses organized. For instance, the DREAM conference conducted in Ethiopia alone hosted about 250 participants similar to the national conference in Pakistan. Another training in Kenya attracted 16 Sudanese government delegates interested in floodwater harvesting. Products prepared during the project period include:

[Practical notes](#); [Reports](#); [Videos](#); [Blogs](#); [Technical sheets](#); [Book chapters](#) [Brochures and banners](#); [Presentations](#) shared during the different knowledge and experience sharing platforms.

Asia (Myanmar)

In Myanmar, knowledge creation and management are summarised in the following table.

Knowledge Created	Activity	Knowledge Management
Understanding of agro-ecological suitability (and unsuitability) for growing the three categories of rice in the Ayeyarwady Delta. This generates the capacity to to adapt rice planting to minimize flood damage.	<i>DST to reduce flood damage to rice</i>	The DST now resides with the Land Use Division of DoA and DoA's GIS Unit. A copy of the model and data are also with IWMI. Physical copies of all maps generated using the DST have been distributed to the LUD, the DoA's Ayeyarwady regional Office and each of the 26 township offices in the delta. These maps are also available online at: http://themimu.info/assessments-and-publications and https://www.myanmarwaterportal.com/news/1968-rice-environment-suitability-maps-for-the-ayeyarwady-region-ayeyarwady-delta-1.html The DST has also already been used by the AIRBM Project to develop rice suitability maps for the Ayeyarwady Basin. This means it is now integrated into one of the largest planning initiatives linked to land use and food systems in the Ayeyarwady Basin.
Once completed, the DST will identify areas in the Ayeyarwady Delta most suitable for rice-fish integration.	<i>DST to support rice-fish scaling</i>	Once completed, this tool will be handed over to the Department of Fisheries, with a copy retained by WorldFish. The analysis using the DST will drive policy and planning dialogs co-convened by WF and IWMI in 2021 to promote the administrative decisions needed to begin the scaling process. This will include the participation of key donors given the need to finance scaling activities.
Knowledge generated amongst DoA extension staff and farmers on ecologically sustainable and low-cost methods for	<i>Training video on managing GAS infestation</i>	This knowledge has been captured on a DVD that has been distributed to the Plant Protection Division of DOA and to all DoA's townships in the Ayeyarwady Delta. It is also available online at: https://www.facebook.com/watch/?v=294563757895546

Knowledge Created	Activity	Knowledge Management
minimizing the impacts of the Golden Apple Snail on rice crops.		
<p>Knowledge has been generated on several aspects of using geospatial data for landscape analysis. This includes knowledge on the use of a GPS-enabled Tablet with KoboToolbox to collect, store and transfer field data, and knowledge on the architecture and application of the DST to minimize flood damage to rice. These capacities clearly apply beyond the scope of this DST, being applicable to a wide range of applications across landscapes and crops.</p>	<p><i>Training of 90 DoA staff from its 26 township offices in the use of KoboToolbox</i></p>	<p>The knowledge is documented in the English and Burmese versions of User manual titled "Introduction to QGIS and Kobotoolbox for Mapping Flood Based Farming Systems", available with the all DoA township offices in the delta and online at: https://www.myanmarwaterportal.com/repository/2211-introduction-to-qgis-and-kobotoolbox-for-mapping-flood-based-farming-systems.html, and http://themimu.info/node/103784?fbclid=IwAR0xt_a013-IK2UtzN8Toi17E1YxuR3yWNPV44V1MaozLoOfYa3NDMmHPec</p>

X. SCALING UP POTENTIAL

Africa/Asia

Two successful years of field trials and evidence-based documentation resulted in the official endorsement of the on-farm water management improvement interventions in the Gash irrigation scheme in Sudan by the Ministry of Irrigation and Water Racecourses. Plan International, an international NGO that participated in the second year (2019) field trials, has decided to invest in upscaling the interventions from 2000 to 10,000 ha. The project team and the Ministry shared a policy note with IFAD outlining the benefits of the interventions and the approaches and financial resources required for upscaling to the whole 80,000 ha Gash irrigation scheme. The Ministry has committed to co-fund 40% of the two million investment budget.

In Malawi, road water harvesting has intensified and at the same time drawn great interest from development partners such as World Bank Malawi Office, road authorities and their partners who have enhanced capacity to integrate road water management in their initiatives and investment plans. The achievements are detailed [here](#). Other linkages have been formed with the academic institutions in the country and future action plans have been drafted for action in a bid to scale up the capacity building component.

In Pakistan, the NEWARBI project and mini barrages were launched in 2019. The project aims to improve spate systems in the country by improving water distribution and

introducing a menu of good practice. A [baseline report](#) on new water rights for basin management and inclusivity in Naj Gaj where flood irrigation is extensively practiced has been prepared. The report discusses rights on water distribution systems before and after the construction of mini barrages. A large dam is being constructed and will start operation in 2021. Further, drafts on water distribution and water conflicts have been drafted for further action. In another case study, a proposal for the entire command area at Bala Narri, Balochistan was also prepared; funding is being explored at the national level with USAID, PPAF and the Punjab and Balochistan governments.

In Kenya, partnerships have been formed with the government of Kenya who actively participated in the symposium held in Kenya. In light of the above, the government promised to construct 125,000 pans to harness floodwater in support of the project as presented in this [excerpt](#). Scaling-up in collaboration with GIZ and county governments of Marsabit, Turkana, Kakamega, Busia, Kisumu and Siaya has been initiated. Further, the universities have agreed to continue with research in the field of floodwater management and action plans have been drafted for follow up immediately after the activities resume to normal due to Covid-19.

Asia (Myanmar)

The following table summarizes the status and potential for scaling of the various outputs in Myanmar.

Output	Scaling
<i>DST to reduce flood damage to rice</i>	All consultations and training needed for stakeholder buy in and scaling have been conducted during 2018-2020. Consultations began with discussions with DoA on key challenges in the Ayeyarwady Delta, that led to rice losses to flooding being identified as the primary challenge. To ensure accuracy of the DST and to build confidence in the output, all levels of DoA were consulted at several stages of developing the DST. This included the Land Use Division in Naypyidaw, the Ayeyarwady Region staff of the DoA and the Department of Land Use Planning, and DoA staff from all 26 townships in the delta. Training involved ensuring DoA staff at all administrative levels to ensure senior staff understood broadly how the DST worked and how it could be applied, while DoA's GIS staff received in-depth training on the technical structure of the DST and how it should be run. This was supplemented by classroom and in-field training on geospatial data collection for DoA's township staff to enable updating of the DST. In addition, the incorporation of the DST by the AIRBM project further increases the potential for influencing land use and rice cultivation decisions across the delta.
<i>DST to support rice-fish scaling</i>	As WorldFish are the lead agency, IWMI plans to collaborate with WF to this end in 2021. Funds and activities have been assigned for policy and planning level dialogs grounded in this DST under the CGIAR Research Program on FISH, in which IWMI is a Tier 1 partner. Important groundwork for scaling has already been done by WF through its successful ACIAR-funded rice-fish field trials, and the decision by His Excellency Dr. Aung Thu, Minister MoALI, to allow up to 15% of rice fields to be used for fish culture.
<i>Training video on managing GAS infestation</i>	The video has already been scaled across the Ayeyarwady Delta, capacitating 19,199 farmers. Random interviews with a few of these trainees by IWMI suggests that other farmers are also adopting these practices, having learned from the trainees. Scaling is also facilitated by making the video publicly available for farmers to download.

XI. PARTNERSHIPS

Africa/Asia

In Sudan, the on-farm water management improvement field interventions in the Gash Agricultural Scheme (GAS) has proven to be a powerful platform for networking and partnership establishment and strengthening. The current partnerships formed include the farmers, Plan International, an international NGO already technically and financially contributing to the field research, and several local organizations including the Agricultural Research Corporation (ARC), Kassala University and the Gash Agricultural Scheme Department (GASD). In December 2019, the Ministry of Irrigation and Water Resources (MoIWR) endorsed for upscaling the GAS on-farm water management improvement interventions that combine internal field bunds, canals. This opened new opportunities for partnerships like the National Water Sector Conference organized by the MoIWR on 18 and 19 February 2020 in Khartoum. Flood-based Livelihood System (FBL) was among the major thematic areas of the Conference. The conference brought together UN organizations, NGOs, donors, and many other public and private water sector institutions active throughout the country. Partnerships have been done between the FBL team and the private sector for the preparation of the milk churners for the Aroma women. The linkages are still active and could be active for other interested project countries.

In Pakistan, RDF and SPO were mainly involved in improving the operational capacity of the farmers in Bagh Narri and Naj Gaj. A partnership has been formed between the FBL network and RDF which works on solar packs for rural equipment e.g. small grinders and milk churners. Further, partnerships have been formed with the three academic institutions actively involved in FBL; Arid Zone University, Gomal Zam University and DG Khan Agriculture College.

In Kenya, networks were formed with organizations like GIZ, land reclamation committees, water resources user associations, community forest associations and commodity-based farmer networks like for grains. In addition, the project has formed strong linkages with county governments of Marsabit, Tana River, Turkana, Busia, Siaya, Voi and Meru, where several investment initiatives are taking shape. In collaboration with GIZ, other partnerships have been formed with county governments of Kakamega, Busia, Kisumu and Siaya. Moreover, the on-going Ph.D. research by the country coordinator on youth attractive enterprises has contributed immensely to the strategic project objective of supporting young people to be active members of the FBLN. Linkages have been formed with educational institutions such as Egerton University, JKUAT, CETRAD, KEWI, University of Nairobi (UoN) and Kenya School of Government. Follow-ups shall be done by the Kenyan chapter to ensure FBL courses are fully mainstreamed in their curricula. Partnerships were also formed between the FBL team and IFAD Sudan who financially supported a team to Kenya for a 10-day training on water harvesting. Future collaborations were discussed and are expected to happen.

In Ethiopia, a partnership was also formed under the DREAM conference in which the impacts of the GIZ -SDR programme were discussed. GIZ has supported flood management in several countries even during the annual flood management course in Mekelle University. The project has through GIZ-SDR programme has seen three articles published in Ethiopia related to flood based livelihood systems; [assessing the potential locations for flood based farming using satellite imagery](#); [facilitating livelihoods diversification through flood-based land restoration in pastoral systems of Afar](#); and [water spreading weirs altering flood, nutrient distribution and crop productivity](#)

Following the on-going field research on comparing various nutrient regimes and road water harvesting practices in Malawi, new partnerships have been initiated with the Institute of (Road) Engineers, Seed Traders Association, World Bank Malawi Office, World Fish Centre and several local NGOs and government authorities. Other partnerships have been formed between Mzuzu and Lilongwe Universities that offer FBL courses.

Asia (Myanmar)

Project collaborating organisations in Myanmar

Partner category	Activity			
	<i>DST to reduce flood damage to rice</i>	<i>DST to support rice-fish scaling</i>	<i>Training video on managing GAS infestation</i>	<i>Capacity building for collection and analysis of geospatial data</i>
Implementing partners	<ul style="list-style-type: none"> Land Use Division of the Department of Agriculture 	<ul style="list-style-type: none"> Department of Fisheries 	<ul style="list-style-type: none"> Plant Protection Division of the Department of Agriculture 	<ul style="list-style-type: none"> Land Use Division of the Department of Agriculture
Other government departments	<ul style="list-style-type: none"> Ayeyarwady Regional Office of the DoA All 26 township offices of the DoA in the delta. 	<ul style="list-style-type: none"> Department of Agriculture 		
International agencies		<ul style="list-style-type: none"> WorldFish 		

XII. EC VISIBILITY ACTION

Africa/Asia

In general, the FBLN acknowledges the support given by EC in the spate irrigation [website](#). In specific countries, the journal articles, book chapters and brochures and presentations make special reference to EC for providing financial assistance. See Annex 7 for details.

Asia (Myanmar)

Since the focus in Myanmar was on capacity building, visibility for the project was mainly as a result of training events and the covers of publicly available documents. Example:

XIII. CONCLUSIONS

Africa/Asia

- The project "Testing adaptation in flood-based resource management under the programme putting research into use for nutrition, sustainable agriculture and resilience" comprised 4 key components. These were, establishing the FBL network and strengthening, capacity building, support to investment programmes and policies, knowledge development and solution management.
- Aimed at maximizing the livelihood potential in the flood prone areas of Africa and Asia, 6 partner countries, namely, Ethiopia, Kenya, Malawi, Pakistan, Sudan and Yemen have successfully formed the FBL network under this project and are functional (website). As

at now, there are 800 members from the participating countries. Two new networks have been established, namely Myanmar and Afghanistan. The activities are on-going and in the future there is potential for new networks to join the larger network. Work in Afghanistan had to be abandoned due to political unrest in the county. The FBLN foundation has been registered in the Netherlands.

- Engagements initiated with farmers, water professionals and practitioners, policy makers professionals, practitioners, and policy-makers across the target countries were strengthened through joint implementation of network activities.
- Farmer networks have been strengthened through the training and innovative technology development and transfer and the farmers are actively utilizing the knowledge gained for practical solutions from the project. As such, a variety of solution-oriented interventions have been successfully implemented in all the partner countries, based on the needs of farmers in the flood-prone areas.
- Water and agriculture sectors have been part of the trainings which is an important part of institutionalizing activities and innovative interventions for the future.
- The topics covered during the project activities were practices related to water distribution, water rights, soil moisture retention and soil fertility, new crops and fisheries, and conflict mitigation mechanisms.
- Consultative meetings for universities in Kenya and Malawi are still in progress to ensure that the FBL courses are mainstreamed into the curricula. Other universities that have the courses already in the system will continue offering the courses.
- Intensive project implementation has generated substantial data and information on investment proposals and policies. Combing these with evidence, the following investment proposals drafted during the project period will be further improved: Road water harvesting - green roads in Malawi, on-farm water management in Sudan, climate resilience in Malawi, youth attractive enterprises in Kenya, water distribution and conflicts management in Pakistan and rehabilitation of FBLN in post-war Yemen.

Asia (Myanmar)

- Key project activities in Myanmar such as development of the two DSTs take a long-term view of the development process in Myanmar. It recognizes the critical need to contribute to basic capacity building in agencies such as the Departments of Agriculture and Fisheries if recent and new policy directions in favour of more diverse and nutrient dense food systems are to be realised at field level. In the two DSTs, the project is delivering key tools that contribute to an urgent shift to modern land use planning approaches based on geospatial analyses. This inadequacy in modern landscape analysis capacity is in fact explicitly recognised in the Agriculture Development Strategy. Through the DSTs therefore, the project directly contributes to closing this gap, whilst concurrently supporting implementation of the ADS, MS-NPLAN and the MCCA.
- Grounded results in this regard however regard time as tools must lead to analyses, negotiation over what the results of analyses mean in terms of planning options and decisions, and the planning and financing of on-ground implementation.
- IWMI, the implementer of PRUNSA in Myanmar, will carry on this process in 2021 through the collaborations with WorldFish, bringing in also other CG Centres such as the International Rice Research Institute (IRRI) and the International Food Policy Research Institute (IFPRI), to form a more cohesive and potent coalition of international expertise, especially through the One-CG reform process underway.
- The project has realised quicker results in other aspects of capacity building, primarily through the training video for managing Golden Apple Snail infestations, that so far has reached almost 20,000 farmers – these are only those farmers formally trained by the DoA using this video, and does not account for other farmers who may adopt these practices from the trainees.

- The project has also provided important experience for several early career national Myanmar nationals, all of whom are women. Another early career female IWMI staff member is currently participating in the High Level Panel of Experts on Food Security and Nutrition of the UN Committee on World Food Security, ensuring that PRUNSAR investments are making contributions at the global scale in the food systems and nutrition space.
- The project has also leveraged at least USD 175,000 from the CG Research Program on Water, Land and Ecosystems, which contributed to financing the time of a senior GIS specialist at IWMI who guided development of the DST related to minimizing flood impacts on rice.
- In conclusion, it is suggested that the long term contributions of this project are embedded in the two DSTs in particular, and the collaborative relationships these have fostered within MoALI.

ANNEXES

Annex 1: FBLS Cumulative achievements table Africa/Asia

Output/Activity	Indicators	Accomplishments/Outputs	
		Description	Completion (%)
<i>Output 1. Flood based livelihoods network establishment and strengthening</i>			
1.1. Four country networks strengthened and farmer's membership increased (IFAD)	<ul style="list-style-type: none"> • Networks established and functional 	Four current country networks in Pakistan, Yemen, Sudan and Ethiopia and strengthened and farmers' membership increased by over 50%. In Pakistan, 4 farmer networks with over 5,000 farmers and professional have been registered. 92 Gash farmers' associations in Sudan also became organized members of the national network though 3 are not active anymore. In Yemen, 63 WUAs with 189 members have been created in Wadi Zabid, Mawr, Siham and Rima. Similarly, 8 traditional WUAs in Ethiopia were modernized.	100%
1.2 Network mechanism and communication maintained and developed (IFAD and EC)	<ul style="list-style-type: none"> • Network and communication maintained and developed 	A website has been developed and maintained where all local knowledge is uploaded and disseminated to other project countries and other interested parties. Project activities and achievements were also widely shared through the Water Channel (thewaterchannel.tv), websites of implementing partners and FBLS dedicated social media outlets: WhatsApp group, Twitter (@FBLN_media) and Facebook (@spate.irrigation.org). Further, a monthly newsflash was prepared and disseminated.	100%
1.3 Knowledge promoted and programme developed through national networks (IFAD and EC)	<ul style="list-style-type: none"> • Promoting documented knowledge 	FBLN foundation was established and registered in the Netherlands. The county networks organized several learning events that engaged over 7,000 farmers. They also contributed to the 15 published practical notes that cover topics as varied as fodder production, groundwater recharge and improved wells, soil moisture management, design of flood diversion and distribution structures, road water harvesting, micro-climate and rodent control and management.	100%
1.4 Four New	<ul style="list-style-type: none"> • Number of 	In Kenya, Malawi and Myanmar, new networks were established each with a	80%

networks established (EC)	networks established and functional	minimum of 50 members. Due to prohibitive security situation, the Afghanistan country network could not actively promote FBLS programmes	
Output 2: Knowledge development and solution management			
2.1. Eight practical notes and other communication products on cross-country relevant research themes prepared (IFAD-EC)	Number of practical notes and knowledge products	Fifteen practical notes covering cross-country relevant themes have been published along with several knowledge and communication products; blogs , videos , brochures and posters	100%
2.2. Eight solutions-oriented research programmes conducted (IFAD and EC)	<p>FBL relevant research on four themes</p> <p>At least 8 quick-win solutions-oriented research programmes linked to capacity building of young professionals</p> <p>At least 9 reports linked on the diverse FBLS activities and success of variety of crops</p>	<p>Studies that either involved or were led by young professionals have been completed across the thematic areas: i) Water governance and conflict mitigation ii) Management of soil moisture and fertility, crop and fodder production iii) Improvement of water diversion, distribution and efficiency, iv) Micro-climate and watershed management, v) Water harvesting including from roads, vi) Ground water recharge, livestock and domestic water supply, vii) rodent control and management, and environmental issues</p> <p>Fourteen research articles, research reports, book chapters, PowerPoint presentations and technical sheets have been published</p>	100%
2.3. FBL guidelines developed (EC)	Guidelines developed and disseminated	Draft guidelines have been developed and will be finalized and widely shared after incorporation of 2020 results.	80%

Output 3: Capacity building			
3.1 Three existing MSc programmes consolidated (IFAD)	Existing MSc programmes (Ethiopia, Pakistan & Yemen) consolidated	Four MSc programmes were consolidated in Ethiopia, Sudan, Pakistan and Yemen with the incorporation of new and emerging topics and improved interactive training approaches and methods.	100%
3.2 Regional courses and events conducted (IFAD)	Number of Professionals, Practitioners, farmers and policy-makers with enhanced capacity in FBLS	<p>180 practitioners/professionals and 10 policy-makers have benefitted from the Regional course in Ethiopia.</p> <p>Over 7,000 farmers have enhanced their capacity in FBLS through the farmer trainings, field days and farmer to farmer exchange programmes.</p> <p>Several regional and national events were organized and about 1000 young and mid-career professionals, practitioners and farmers nearly 150 policy-makers have benefited from the various trainings, workshops and other related events.</p> <p>For instance; the first leadership course took place in Kenya and Tanzania and the event was graced by 23 participants from the project countries who also interacted with 20 farmers (17 male and 3 female) from Tanzania.</p> <p>A national workshop conducted in Port -Sudan Toker was attended by 70 participants ad 3 policy-makers.</p> <p>DREAM conference organized in Ethiopia engaged 250 professionals/practitioners (10% were policy-makers) on better water floodwater spreading and management techniques as well as investment priorities in arid lowlands.</p> <p>The National Conference on the potential and opportunities of spate irrigated area in Pakistan attracted 270 young and mid-career professionals, 50 farmers and 30</p>	100%

		government officials	
3.3 Two new MSc programmes on FBL started (EC)	Two new MSc programmes developed	Several courses on FBLS have been introduced in MSc programmes in Lilongwe and Mzuzu Universities (Malawi) and Egerton and Jomo Kenyatta University in Kenya. Further engagements were conducted in early 2020 to consolidate mainstreaming of the courses in the universities and three other tertiary institutions. Action plans for follow up have been developed.	90%
3.4 Four farmer learning centres established (EC)	Four farmer learning centres established with FBL training packages	The original idea of establishing standalone FBLS farmer learning centres turned out to be ineffective from both the learning and financial perspectives. Accordingly, technologies, good and best practices for productive use of floods were integrated into the Smart Centres in Kenya (2) and Malawi (1) that were already established to promote and upscale water and climate-smart agricultural technologies and practices. The Smart Centres hosted several learning and exchange events that benefited nearly 1500 farmers. However, several farmers have been reached during workshops, field days and farmer to farmer exchange visits.	75%

3.5 Internship programme conducted	Short annual course for stakeholders, with satellite courses in key regions	Three leadership courses and several internship programmes enhanced the capacity of 100 participants including 50 young professionals to become leaders and promoters of FBLS across the target country and beyond.	100%
Output 4: Support to investment programmes and policies			
4.1 Six proposals for national or provincial investment programmes or development policies created (EC)	Investment-focussed workshop conducted Investment ideas developed on three to five priority thematic areas	<p>Investment workshop was conducted in Kenya that facilitated the preparation of five proposals on cross-country relevant investment areas: Youth attractive value chains, Social and economic empowerment of women, Climate change resilience, Food and fodder security, and Policy and institutional strengthening.</p> <p>In Kenya, three detailed proposals have been developed on floodwater management and multiple use for Turkana and the Amaya Counties. Other country-specific investment proposals are in the tunnel in collaboration with GIZ. The other country-specific investment and upscaling proposals finalized are On-farm water management and yield improvement (Sudan); Connecting roads, floodwater harvesting and livelihoods (Malawi); Remodelling water rights and floodwater distribution system (Pakistan). In Malawi, a proposal review and improvement workshop was conducted to share knowledge and skills in developing persuasive project proposals, share successes and experiences of previous projects implemented by the association and discuss case studies on the FBLS project that can be used to strengthen project proposals. Finally, a policy development workshop was conducted in Sudan.</p>	100%
4.2 IFAD projects under preparation supported on request (IFAD)	Technical support provided on request to IFAD investment programmes active in project areas	<p>Two deliverables were observed on request from IFAD: a quick guide on improved livelihood opportunities under spate irrigation- <u>FBLS livelihood opportunities</u>; investment-oriented blog on the promising water-saving and yield-enhancing on-Farm water management interventions in Gash in Sudan.</p> <p>In Ethiopia, linkages were made with the IFAD PASIDP offices who collaborated with the country chapter in supporting farmer scholarships, farmer to farmer experience sharing events and training of experts on spate irrigation. Similarly, due to the partnership made by the Sudan chapter and the IFAD offices, a representative from the North Kordofan state participated in the knowledge sharing workshop. In Kenya, a proposal on water harvesting, agroforestry,</p>	100%

		organic farming and permaculture was prepared for Sudanese delegates in collaboration with IFAD Sudan who also financially supported sixteen delegates on a 10-day training on the aforementioned topics.	
4.3 Africa to Asia exchange in at least two proposals facilitated (EC)		In Sudan, a proposal on the use of electric churners by the Aroma women was developed after which a milk churner was sent to Malawi for promotion.	60%
4.4 Linkage to other WLE activities established (EC)		The final workshop of the WLE project: Harnessing floods was a good case of linkage between projects. The completion workshop for the project served as an opportunity to gather stakeholders from the spate areas in Sudan and discuss the way forward on FBL activities for the benefit of the country. The findings of the WLE project have been highly adopted in the support of the Sudan FBLS chapter.	90%

Asia (Myanmar)

Output/Activity	Indicators	Accomplishments/Outputs	
		Description	Completion (%)
Output 1. Pro-poor scientific, technological and institutional innovations, knowledge and policies developed and delivered, with emphasis on the needs of low-income smallholder farmers including women.			
1.1. At least 30 improved technology options developed and accessible to farmers <i>(e.g. New varieties, labour saving)</i>	At least 30 improved technology options developed and available to farmers	Myanmar: <ul style="list-style-type: none"> One training video in Burmese on managing Golder Apple Snail (GAS) infestations, promoting low-cost and eco-friendly management methods developed in collaboration with the Plant Protection Division of the DoA. 136 DoA extension officers covering all townships, and 19,199 mainly smallholder farmers in the Ayeyarwady Region trained. The video is also available on line. The significant 	

<p><i>technologies, new approaches to existing technologies)</i></p>		<p>losses to GAS in 2017 and 2018 have not been repeated in 2019 and 2020 after this training. This represents an additional 1.2 million and 2.98 million kg of rice saved annually in the Ayeyarwady Region. At a per-farmer scale, this means economic losses of between USD154 to 231 are avoided annually during the rainy season.</p> <ul style="list-style-type: none"> • One short in-field awareness video on understanding soil and its character for rice production 	
<p>1.2 Improved technology adapted to local conditions tested in at least 50 pilot sites.</p>	<p>Tests conducted in at least 50 pilot sites for Improved technology adapted to local conditions.</p>	<p>Myanmar: No specific tests were carried out. However, the training methods in the GAS video has been successfully adopted across the Ayeyarwady region.</p>	
<p>1.3 At least 10 farming systems sustainably improved in terms of productivity, resilience or more efficient use of natural resources</p>	<p>At least 10 farming systems adopt technologies that sustainably improved their productivity, resilience or ability to use natural resources more efficiently.</p>	<p>Myanmar:</p> <ul style="list-style-type: none"> • The resilience of fllo0d season rice to the Golden Apple Snail (the primary pest) increased through the training of DoA extension staff and farmers across the Ayeyarwady Region. Based on past data, the fact that GAS incidents have not been reported in 2019 and 2020 suggests this has contributed to increasing rice productivity in the region by between 1.2 million and 2.98 million kg annually. • The DST on mitigating damage to rice from flooding is now available to the DoA to advice farmers for better aligning rice cultivation to local agro-ecological conditions. • The DST on rice-fish will provide the basis for identifying most suitable areas for scaling small-scale rice-fish systems suitable for adoption by small-scale farmers. WoldFish estimates these systems can increase fish production by 100,000 tons, generating an additional USD 100 million each dry season in the Ayeyarwady Region, without significantly undermining rice production. 	

Output 2. Evidence to support policies and approaches			
2.1. Results from at least 8 cases studies producing evidence that approaches or technologies lead to nutritional outcomes.	Outputs of at least 8 cases studies producing evidence that approaches or technologies lead to nutritional outcomes.	Myanmar: No specific studies were carried out, but the RF DST leverages field trials by WF that confirm that integrated RF systems can improve the gross profit margin of rice farmers by up to 41% when 13% of a rice field is converted for fish, whilst contributing between 700kg and 940kg of fish from one hectare of farmland (Dubious et al. 2019).	
2.2 At least 12 recommendations integrated into pro-poor policies, institutional arrangements or regulations	At least 12 pro-poor recommendations adopted by policies, institutional arrangements or regulations	Myanmar: The need is to build capacities for policy implementation given the existence of several forward-looking policies that prioritize small-scale farmers and nutrition. Both DSTs (rice resilience to floods and rice-fish scaling) provide key evidence to support flood resilient approaches (e.g. rice variety choice, timing) and rice-fish policy change and scaling approaches. Combined, they provide key knowledge necessary for implementing these key national strategies including the ADS, MS-NPAN and the M CCSAP.	
Output 3. Capacity for pro-poor agricultural research and its uptake enhanced among researchers, non-research stakeholders and institutions.			
3.1. Capacity of at least 40 000 farmers or aqua-culturalists improved by project training activities;	At least 40 000 farmers or aqua-culturalists gain new practical knowledge through project training activities	Myanmar: 19,199 farmers mainly smallholder farmers have been trained in methods for reducing crop loss due to Golden Apple Snail infestations in the Ayeyarwady Delta.	

3.2 At least 8 scientists in target country NARS or other ARD institutions trained.	At least 8 scientists in target country NARS or other ARD institutions gain new knowledge through training.	<p>Myanmar:</p> <ul style="list-style-type: none"> • Six GIS scientists from the DoA trained in the architecture and operation of the DST for minimizing rice yield losses due to flood damage. In-house training was followed by three days of applied training at the DoA’s GIS unit in Yangon where IWMI’s national consultant developing the maps worked with the GIS staff to run the model and address any further questions on its structure and operation. • 136 DoA staff trained in mitigating GAS infestations: <ul style="list-style-type: none"> ○ State and Region: 28 ○ 6 Districts: 30 ○ 26 Townships: 78 	
3.3. At least 8 networks for innovation testing, dissemination and participatory lesson learning	At least 8 networks established for innovation testing, dissemination and participatory lesson learning		
3.4. Capacity of at least 10 SMEs developed in agricultural input supply or marketing.	At least 10 SMEs benefited by capacity building in agricultural input supply or marketing		
<i>Output 4. Partnerships established between CGIAR centres, CGIAR and non-CGIAR research institutions, and research and non-research development institutions for more effective delivery of research outputs.</i>			

<p>4.1. All CGIAR interventions based on inclusive partnerships (conform to the CRP or Challenge Programme model)</p>	<p>Inclusive partnerships underpin all CGIAR interventions</p>	<p>Myanmar:</p> <ul style="list-style-type: none"> • Collaboration with WorldFish to leverage knowledge, staff and funding to build capacity for integrated policy implementation. Brought together funding from PRUNSAR, the CGIAR Research Programme on Water, Land and Ecosystems (part-funding for map development) and builds on ACIAR investments in rice-fish trials. Enabled an ongoing systematic approach to a) developing DST for informed land use planning supporting increased flood resilience of rice and identifying a scaling strategy for rice-fish systems (in progress); and b) inter-departmental dialogs especially between DoA and Department of Fisheries on common challenges (e.g. overlaps between agriculture and leasable fisheries and resulting conflict), and c) inter-agency consensus building on the need for DST to resolve these issues while exploring options for more productive food systems such as rice-field fisheries. • Close network developed with especially the land Use Division of DoA for capacity development in using geospatial tools. This ensured the relevance and accuracy of the DST for minimizing flood damage of rice, and has led to key capacities such as the ability to collect geospatial data in each township. This network developed through the LUD, resulted in a consultative map development process at all relevant administrative levels within DoA including officials in Naypyidaw, the Ayeyarwady Regional Office and all relevant 	
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		<p>township offices.</p> <ul style="list-style-type: none"> • Collaboration with the Plant Protection Division of DoA to build capacity for farmer training to manage Golden Apple Snail infestations in flood season rice. 	
4.2. At least 10 value chains involving private sector and other actors developed, tested, and	10 value chains involving private sector and other actors developed, tested		
4.3 At least 3 typologies of partnerships established; CGIAR and NARs, CGIAR and NGOs and PPP (e.g. CGIAR and Commercial Seed Companies)	At least 3 partnerships established		
<i>Output 5. Complementarities and synergies with research, extension and innovation programmes and activities supported by the Commission and member states, and by IFAD.</i>			
5.1. Research results adopted and scaled up by in 6 development projects funded by IFAD or other donors	6 development projects adopt and scale up research results	<p>Myanmar:</p> <ul style="list-style-type: none"> • Decision support tool supporting flood risk reduction for rice adopted by the World Bank funded AIRBM Project and scaled from the Ayeyarwady Region to the Ayeyarwady Basin level. If fully utilized, the maps can contribute to the following in the delta: between 248,000 – 350,000 tons of rice saved annually, and economic losses for farmers reduced by between USD 	

		<p>16 million and 22 million annually, supporting approximately 62,000 farmers.</p> <ul style="list-style-type: none"> • ii) A near-final version of the decision support tool for scaling rice-fish systems under consideration by the AIRBM Project, after explicit interest in rice-fish systems expressed by the World Bank. • The video on managing Golden Apple Snail infestations significantly expanded the DoA's extension capacity from a single in-field demonstration site to a virtual tool available at all 26 township officers in the Ayeyarwady Region, and online via Facebook for farmers. This was a demand driven output addressing an important extension gap in addressing the second most important cause of monsoon season rice yield loss in the delta. • PRUNSAR funds were used to support a case study on factors influencing male and female youth livelihoods choices in the Ayeyarwady Delta, especially in relation to small-scale fisheries. On the basis of this work, the lead IWMI researcher Ms. Indika Arulingam was invited to be part of the High Level Panel of Experts on Food Security and Nutrition of the UN Committee on World Food Security (HLPE). She will be a co-author of the report on "Promoting youth engagement and employment in agriculture and food systems", to be presented at the CFS48 Plenary session in October 2021. The HLPE was established to advise the Committee on World Food Security (CFS), an intergovernmental and international platform 	
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		dealing with food security and nutrition.	
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Annex 1: Myanmar (Asia) – Activities, outputs, and potential impact

Activity	Outputs	Outputs listed in Grant doc.	Outcome	Potential Impact
Decision Support Tool (DST) to minimize flood damage to rice	<p>DST handed over to DoA:</p> <ul style="list-style-type: none"> A random forest model for map generation, with Input data, the Script (random forest model and mean calculation) and Output data. 78 core maps at Township level, three for each of the 26 townships, showing the suitability (or unsuitability) of the water-soil environment for three rice categories based on their respective 	<ul style="list-style-type: none"> Knowledge generated and managed 	<ul style="list-style-type: none"> This DST replaces out-dated hand-drawn maps dating to the 1950s (pers. com. Director, Land Use Division) Capacity created in DoA to adapt rice planting to minimize flood damage. Capacity to better target extension services and seed production, since better estimates are possible of where rice varieties can be grown. 	<ul style="list-style-type: none"> If fully utilized, the maps can contribute to the following in the delta: <ul style="list-style-type: none"> i. Between 248,000 – 350,000 tons of rice saved annually ii. Economic losses for farmers of between USD 16 million and 22 million avoided annually, supporting approximately 62,000

Activity	Outputs	Outputs listed in Grant doc.	Outcome	Potential Impact
	<ul style="list-style-type: none"> characteristics. Maps at the delta scale for the DoA's Ayeyarwady Division Office and DoA in Naypyidaw. Additional Township maps showing the overlap of suitability for the three rice categories at different suitability levels. Printed 'Map Books' for each Township, Ayeyarwady Division Office and the Land Use Division (LUD) and other divisions within the DoA in Naypyidaw Large 3x2 feet vinyl wall maps for easy reference in each Township office. 		<ul style="list-style-type: none"> Maps available in public domain to be used for further analysis: <ul style="list-style-type: none"> i. http://themimu.info/assessments-and-publications and ii. https://www.myanmarwaterportal.com/news/1968-rice-environment-suitability-maps-for-the-ayeyarwady-region-ayeyarwady-delta-1.html 	<ul style="list-style-type: none"> farmers. Already used by the World Bank funded AIRBM Project to develop rice suitability maps for the basin. This is the largest and only real basin-wide integrated planning process. Provides the basis for identifying areas of the delta that are NOT suitable for rice, where other more suitable food production options could be considered. This links to the rice-fish DST being developed for the delta (see below).
Provision of DoA with GPS-enabled tablets	<ul style="list-style-type: none"> A GPS-enabled tablet provided to each of the 26 DoA townships offices. 	<ul style="list-style-type: none"> Capacity building programmes developed and implemented 	<ul style="list-style-type: none"> 90 DoA staff from the 26 Townships now have for the first time, the capacity to collect GIS data for land use planning. 	<ul style="list-style-type: none"> This ability to collect GIS data by township staff is a fundamental step if DoA is to use modern geospatial tools for land use planning, noting the ADS acknowledges a lack of such capacity as a major impediment to policy implementation.
Training of DoA on the use of KoboToolbox	<ul style="list-style-type: none"> Three training workshops for DoA township staff. Handbook on KoboToolbox in Burmese and English. Classroom training was followed up by in-field application of the training. An IWMI GIS specialist and rice specialist visited each Township office and spent a day in the field with the trainees to ensure they have fully understood the classroom training. 	<ul style="list-style-type: none"> Capacity building programmes developed and implemented 	<ul style="list-style-type: none"> DoA now able to undertake rapid landscape analyses for more informed and effective policy formulation and implementation. Township staff collected additional data to further refine the rice suitability DST. Township staff using the TABs and training to collect data for other projects including FAO. 	<ul style="list-style-type: none"> Greater use of landscape analyses to a) resolve cross-sector disputes and b) adopt integrated policy implementation strategies (e.g. ADS, MS-NPAN, MCCSAP).
Training of DoA's GIS scientists to understand and use the	<ul style="list-style-type: none"> Six GIS scientists from DoA trained. Class training followed up by an IWMI GIS specialist spending 3 days with the GIS scientists running the model to ensure the classroom training is 	<ul style="list-style-type: none"> Capacity building programmes developed and 	<ul style="list-style-type: none"> DoA GIS staff understand the model that generates the rice suitability maps, and are able to run their own analyses and update the model with new data. 	<ul style="list-style-type: none"> Further addresses the geospatial capacity gap highlighted in the ADS.

Activity	Outputs	Outputs listed in Grant doc.	Outcome	Potential Impact
DST	fully understood.	implemented		
Final workshop for validating DST on rice suitability	<ul style="list-style-type: none"> A two-stage workshop held first with senior staff from the Departments of Agriculture, Fisheries and Land Planning at the Ayeyarwady Division, and then with staff from the DoA Township officers (Report attached) 	<ul style="list-style-type: none"> Capacity building programmes developed and implemented 	<ul style="list-style-type: none"> Validation of the maps and DST including feedback on actions to improve them. Increased likelihood of acceptance and use of the DST. 	Covered above.
Support to WF in developing a rice-fish suitability DST for the delta	<ul style="list-style-type: none"> A pre-final version developed, using the rice suitability DST as the base (see attached) 	<ul style="list-style-type: none"> Knowledge generated and managed 	<ul style="list-style-type: none"> By end 2020, the rice-suitability DST would be available. The RF DST will enable WF and IWMI to further engage with MoALI departments on how RF can be scaled in the Delta. The lack of this spatial analysis was a critical bottleneck, given that ACIAR funded WF RF trials¹ (showing land-water productivity can double) supported a fundamental change in land use policy, now allowing for up to 15% of a rice field to be converted to a fish pond.² This DST now facilitates scaling RF by identifying most suitable areas. The current version of the RF DST is currently under consideration by the AIRBM project. Discussions with consultants on this project indicate that RF represents a particular interest expressed by the World Bank that funds the AIRBM project. 	<ul style="list-style-type: none"> According to WF calculations, scaling rice-fish systems can increase fish production by 100,000 tons, generating an additional USD 100 million each dry season in the Delta, without significantly undermining rice production (Dubois et al. 2019 + infographic – both attached). The RF DST will help WF and IWMI leverage recent high-level decision, within the government resulting from WF field trials, that recognizes, for the first time, that land assigned for rice production can now include up to a 15% conversion to fish culture. This represents a critical policy change away from the restrictive land use rules under the Farmland Law, which have hitherto made RF systems illegal.

¹ 'Development of Rice Fish Systems (RFS) in the Ayeyarwady Delta, Myanmar' project funded by the Australian Centre for International Research (ACIAR).

² This was a key outcome of the International Rice-Fish Symposium is the five point 'Naypyidaw Integrated Rice-Fish Agreement – August 2018', endorsed by His Excellency Dr. Aung Thu, Minister MoALI. See ACIAR Rice-Fish Systems Symposium Proceedings August 2018" available at:

<https://digitalarchive.worldfishcenter.org/bitstream/handle/20.500.12348/4222/cce411501e271b93732e1e7df1ec4244.pdf>

Activity	Outputs	Outputs listed in Grant doc.	Outcome	Potential Impact
Policy Dialog with senior staff from MoALI Departments	<ul style="list-style-type: none"> Dialog held on 30th January 2020, opened by the DG, MoALI (report attached) Focus: challenges and collaboration on adoption of geo-spatial tools for integrated policy implementation in the food sector 	<ul style="list-style-type: none"> Investment programmes and policy development supported 	<ul style="list-style-type: none"> Cross-sector challenges impacting effective land-water use planning identified A clear recognition including by the DG, MoALI of the importance of geo-spatially based Decision Support Tools Willingness to work with IWMI, WF and other CG centres to further develop this capacity. 	<ul style="list-style-type: none"> Opened a platform for IWMI and WF to use the two DSTs to continue the dialog on land use planning in 2021, focussing on generating agreement on suitable areas for scaling rice-fish systems in the delta along with an implementation strategy.
Partnership development to promote integrated policy implementation in the Delta	<ul style="list-style-type: none"> Ongoing collaboration with WF-Myanmar whereby financing and human resources across several projects have been harmonized, and link with and build upon the activities under the FBFS project. These include bilateral funding to WF from ACIAR; funding from the CGIAR FISH Research Program managed by WF, and the CGIAR Research Program on Water, Land and Ecosystems. 	<ul style="list-style-type: none"> Investment programmes and policy development supported 	<ul style="list-style-type: none"> A common vision developed on what the priority needs are to support Myanmar effectively implement a range of key policies and strategies in the food systems-water and land use-climate adaptation space, taking advantage of complementarities between these policies. Significant data, tools and knowledge generated in building in-country capacity for informed land use planning with respect to flood mitigation and food systems diversification in the Delta. Relationships with key government agencies developed that has created both the trust and willingness to further collaborate towards building capacities enabling more diverse and nutrition-dense food systems. 	<ul style="list-style-type: none"> These outcomes represent clear impact pathways built on synergies created by combining institutional resources. However, as is the nature of generating change, these are ongoing pathways, to which both IWMI and WF have committed further resources in 2021. In addition, IWMI and WF will be working with other CG Centres through the emerging 1-CG system, to collectively engage with MoALI and other agencies on policy application in this space.
Capacity building of	<ul style="list-style-type: none"> Training video in Burmese on managing Golder Apple Snail (GAS) 	<ul style="list-style-type: none"> Capacity building 	<ul style="list-style-type: none"> 136 DoA extension offers covering all townships in the delta trained to 	<ul style="list-style-type: none"> GAS is the second most important driver of monsoon

Activity	Outputs	Outputs listed in Grant doc.	Outcome	Potential Impact
DoA's extension services	infestations, promoting low-cost and eco-friendly management methods developed in collaboration with the Plant Protection Division of the DoA.	programmes developed and implemented	effectively train farmers in managing GAS infestations. <ul style="list-style-type: none"> 19,199 mainly smallholder farmers in the delta trained by DoA using the video in methods to avoid/manage GAS infestation. Information on managing GAS publicly available: https://www.facebook.com/watch/?v=294563757895546 	<ul style="list-style-type: none"> season rice yield losses in the delta. The DoA estimates over 1,200 ha was affected in 2018. Since significant losses to GAS in 2017 and 2018, this has not occurred in 2019 and 2020 after management practices were adopted. Between 1.2 million and 2.98 million kg of rice could be saved annually in the delta. At a per-farmer scale, annual economic savings could be between MMK 200,000 and 3,00,000 (USD154 to 231).
In-country capacity of early career professionals developed	<ul style="list-style-type: none"> Four female early career professionals (graduates) trained. 	<ul style="list-style-type: none"> Capacity building programmes developed and implemented 	<ul style="list-style-type: none"> Three early career professionals understand methods for cross-disciplinary data collection from field and government agencies One trainee acquired expertise in GIS by modelling rice suitability environments, and is capable of independently training others. 	
Capacity building of external early career professionals	<ul style="list-style-type: none"> Ms. NIKOLA SCHULTE-KELLINGHAUS (DEPARTMENT OF GEOGRAPHY, RHEINISCHE FRIEDRICH-WILHELMS-UNIVERSITÄT BONN) completed her Master's Thesis based on her work in developing the rice suitability maps. (Thesis available from author) 	<ul style="list-style-type: none"> Capacity building programmes developed and implemented 		
Peer-reviewed publications	<ul style="list-style-type: none"> Dubois, M. J., Akester, M., Leemans, K., Teoh, S. J., Stuart, A., Thant, A. M., ... & Radanielson, A. M. (2019). Integrating fish into irrigation 			

Activity	Outputs	Outputs listed in Grant doc.	Outcome	Potential Impact
	<p>infrastructure projects in Myanmar: rice-fish what if...?. Marine and Freshwater Research, 70(9), 1229-1240.</p> <ul style="list-style-type: none"> Leh et al. (In prep.) Agricultural land suitability modelling for flood-based farming systems: A random forest and GIS approach for rice in the Ayeyarwady Delta, Myanmar. To be submitted to <i>Science of the Total Environment</i>. December 2020. 			

Annex 2: Physical progress by output against targets – Africa/Asia

Component 1: FBL network establishment and strengthening

Output 1: New networks established and functional

Outcome 1:

1.1 Four country networks strengthened and farmer's membership increased. Four new networks established.

This outcome was fully (100%) achieved. Four existing country networks (Ethiopia, Sudan, Yemen and Pakistan) were strengthened and farmers' membership increased by 30-40% (IFAD). The Business Model Canvas was instrumental in guiding Mekelle University (MU), Hydraulic Research Centre (HRC), Strengthening Participatory Organization (SPO) and Water and Environment Centre (WEC) through the identification of the value propositions for their beneficiaries, the key activities, partners and the resources involved. In Pakistan, the national chapter facilitated the establishment of 4 farmer networks in Khyber Pakhtunkhwa (KPK), Balochistan, Punjab and Sindh covering 15 spate irrigation systems in the country. So far, over 5000 farmers, professionals and experts have been registered in the Pakistan country network as compared to the existing 800 registered farmers before the onset of the project. The networks in KPK, Balochistan and Punjab were organised by SPO while the Sindh network was organised by Rural Development Foundation (RDF). In **Balochistan** WUAs were trained on suitable winter crops and the introduction of new crops such as white kidney beans, musk melon and moth beans. In **Sindh**, the farmers were more interested in crop production and command area development like desilting of canals, drinking water pond improvement and flow dividing flow structures. In **Sudan**, the set focal areas were Gash, Hud El Silem, Toker Delta and Khor Abuhabil Agricultural Schemes. However, much of the focus was in the Gash with 92 farmer associations so far though 3 are not active. Each association has registered between 300-600 farmers bringing the total to 45,000 registered farmers. Toker Delta was not active due to some administrative issues. Despite the war and insecurity in **Yemen**, 63 water user associations with a total of 189 farmers have been registered in Wadi Zabid, Mawr, Siham and Rima. Further, 460 members from universities and other institutions were registered in the Yemen network. Before the onset of the project, none of the farmers were registered into the network. In **Ethiopia**, the focus areas were spate irrigation systems in Oda, Tsige'a in the Raya Valley in Tigray and Amaro in Southern Nations, Nationalities, and People's Regions (SNNPR) who have actively participated in research on improving water diversion and distribution. 8 traditional WUAs from Alamata, Oda and Wereda Spate irrigation schemes were selected, registered and transformed in strong and modern WUAs.

1.2 Four new networks established. In Kenya, Malawi and Myanmar, new networks were established each with a minimum of 50 members. In Kenya, a database of farmers in Kajiado, Turkana and Tana River Counties has been developed and maintained. However, Afghanistan which was one of the new countries in the network could not actively promote FBLS activities due to the recurrent insecurity in the country. This led to the 80% accomplishment in this outcome.

Output 2: Documentation of good practices, innovation and good practices promoted

Outcome 2: Promoting documented knowledge

Knowledge promoted and programme developed through national networks (IFAD & EC).

The main activities under this outcome were:

i. Cross - country farmers' knowledge sharing organised.

Several cross- country field-based activities have been developed reaching over 7000 farmers; with scholarships offered to farmers to attend relevant workshops hosted in the countries. For instance, in Ethiopia, sixteen model farmers and six pastoralists from Tigray, Afar, Southern People Nations and Nationalities (SPNN) gathered in Alamata to discuss issues on water management, agronomic practices, crop protection and water rights among other issues and the proceedings are [here](#). Similarly, the Development of Resilience Empowering Measures for the Ethiopian Lowlands (DREAM) conference held in Ethiopia was meant to take stock of promising opportunities on FBLS in the Ethiopian lowlands. It was attended by 254 practitioners, out of which 10% were policy-makers. In [Malawi](#), several farmer trainings on improving community resilience through FBLS have been documented, reaching over 3500 farmers. In Kenya, farmer field days have been held in [Kajiado](#), Turkana and [Tana River](#) Counties in collaboration with the NGOs and local organisations in the areas. Two national knowledge and experience workshops were conducted in [2017](#) and [2018](#) in Sudan. Similarly, courses on [water management](#) and [testing of smart tools](#) were arranged through the national networks. In Pakistan, a national conference on the potential and opportunities of FBLS

was conducted. The conference was attended by 270 young and mid-career professionals, 50 farmers and 30 government officials. Other national workshops have been conducted in collaboration with the WUAs and Gomul University, especially for soil fertility management sessions. To increase the network coverage, TV coverage and print media were incorporated in several instances.

ii. Tailor-made training to selected farmer groups/WUAs. A database of the WUA members in each country was developed and updated. For instance, in Kenya ten easy to understand PowerPoint presentations developed by FBLN <http://spate-irrigation.org/resource-documents/farmer-learning-materials> were utilized during various farmer exchange events that engaged 300 farmers. In Pakistan, videos and [pictures](#) were used to sharing knowledge with different farmer groups. Farmers in Balochistan were more interested in the introduction of suitable winter crops and new improved varieties such as moth beans, white kidney beans, [oil seeds](#), musk melon and any other [minor crops](#). In Sindh, the farmers were more focused on crop production and improvement of the command area like desilting of canals, [construction of village protection bunds](#) and flow dividing structures as well as [drinking water pond improvement](#). In Malawi, [26 farmers](#) trained in a farmer field school on better agronomic practices and planting methods in FBLS have graduated. Hands-on presentations and videos were used during awareness sessions with the farmers as they are easy to understand as compared to lectures.

iii. Knowledge products developed and disseminated in local languages. In collaboration with the farmers and Water User Associations (WUAs), topics and activities depending on country priorities, needs and interests in FBLS were developed. For instance, 3 [practical notes](#) have been published in Sindhi and Urdu. The published practical notes have been disseminated to government officials and farmers within the respective countries and across other countries as the material has also been translated into English. Similarly, [technical sheets](#) on water rights in Pakistan have been published and shared with farmers in the country. Further, 2 brochures ([one](#), [two](#)) were prepared in the local language. Further, SPO has created a quarterly newsletter in the local language, with information on trainings, farmer visits and exchange activities. Also, the material on [improved livelihoods in spate irrigation](#) was translated to Sindh. In Sudan, the [proceedings](#) of a national knowledge and experience sharing workshop were translated into Arabic.

iv. Country network secretarial support. In each country, network secretariats were selected to aid in the implementation of the project. With the support of the implementing partners, each country was led by a project coordinator.

Output 3: Knowledge promoted and programmes developed through national networks

Outcome 3:

Network mechanism and communication maintained and developed. The major activities undertaken under this outcome were:

i) A website developed and maintained. A website was developed, where all the materials relevant to the project were uploaded and disseminated to the project countries as well as other relevant parties. The web team developed country assigned web pages with promotional information and links to country documents. The site has provision for continuously updating the photo library. See, for example, FBLN Malawi (fblnmalawi.org), IWMI Myanmar (<http://fbfs.iwmi.org/partners/>) and HRC Sudan (<http://fbln.hrc-sudan.sd>). The website has continuously been updated with information from the project countries as well as others from FBLN, especially those who were registered members via the website. Other platforms such as WhatsApp groups have been developed within countries (farmers and experts) as well as during workshops for inter-country knowledge transfer have proven to be helpful. Project activities were also shared widely through social media platforms such as Twitter (@FBLN_media), Facebook page (@spate.irrigation.org) and the Water Channel (thewaterchannel.tv)

ii) Newsletter developed and maintained. A monthly newsflash has been published capturing new FBLS interventions or innovative technologies within the project. This newsflash has been widely shared with the global network via email, social media platforms as well as the website. Further, the newsflash is also shared through the country networks to interested parties during meetings, workshops and farmer field visits. Communication and farmer network plans for each country chapter were developed during the internship programme held in the Netherlands in 2017. In all the project countries, a database of members has been developed and frequently updated to ensure all the members are well informed. Occasionally, a special newsflash for special promotion has been published e.g. covering the effect of war situation on spate irrigation in Yemen. In Pakistan, a quarterly newsletter in the local language detailing information on training, farmer field visits and seed exchange activities has been developed. The local language newsletter enabled the

project to reach more farmers in the country. Notes translated in Sindhi and Urdu on oilseed, pulses beans and truffle mushrooms cultivation under spate irrigation have been shared among farmer groups, universities and local institutions.

iii. FBLN Foundation established. FBLN Foundation was registered in the Netherlands in 2016 after changing the name from Spate Irrigation Network Foundation. The change was meant to make it more diverse in terms of floodwater management. Through the network, over 1500 farmers have been reached where the farmers have been enlightened on diverse FBL activities and experiences from across the countries.

Component 2: KNOWLEDGE DEVELOPMENT AND SOLUTION MANAGEMENT

Output 1: Solution-oriented research programmes finalised.

Outcome 1: *Eight solution-oriented research programmes conducted (IFAD & EC).*

Students and young professionals undertook FBL research on the following thematic areas: i) Water governance and conflict mitigation

ii) Management of soil moisture and fertility

iii) Improvement of water diversion, distribution and efficiency,

iv) climate change mitigation,

v) water harvesting including from roads.

From these studies, fourteen [research articles](#) have been published in international peer-reviewed journals, one has been accepted for publication and two are under review. Several [reports](#) capturing the diverse FBL activities and success of a variety of crops have been published. Nine [technical sheets](#) on different subject matters such as water distribution and rights in Pakistan and Afghanistan, food production and irrigation development amidst the war in Yemen and road water harvesting in Malawi, Kenya and Ethiopia. Well-being *surveys on the socio-economic empowerment of youth and women have been* conducted in Pakistan, Sudan and Kenya. Manuscripts have been prepared and shall be disseminated upon publication.

Output 2: Initiate new research programmes on emerging issues

Outcome 2:

Eight practical notes and other communication products on cross-country relevant research themes (IFAD & EC).

The main communication products developed here focussed on water governance, conflict management, and soil moisture and fertility management, improvement of water diversion and distribution efficiency and cross-country findings on FBL. Fifteen [practical notes](#); [one](#) is not yet published and [three](#) were translated to Sindh and Urdu, 44 [blogs](#), [videos](#), 4 [book chapters](#), 9 [technical sheets](#), 14 [brochures and posters](#) and PowerPoint [presentations](#) have been developed and shared in the website as well as during workshops and seminars hosted in support of the project. [Farmer learning materials](#) were also developed in collaboration with the WUAs and disseminated.

Output 3: FBL Guidelines developed finalized

Outcome 3:

FBL guidelines developed. A draft [FBL guideline](#) following an extensive review of mostly existing documents and inputs from country chapters has been developed.

Component 3: CAPACITY BUILDING

Output 1: Strengthen the content and delivery of FBL courses in Universities and educational institutions

Outcome 1:

1.1 *Three existing MSc programmes consolidated (IFAD).*

Drawing from solution-oriented research, evidence-based documentation and other knowledge and experience harnessing activities, four MSc programmes were consolidated in Sudan, Ethiopia, Pakistan and Yemen. In Yemen modules on spate irrigation, water use efficiency and conflict

resolution have been fully incorporated into an MSc course at Sana'a University. Also, a short course on road water harvesting has been mainstreamed into the Integrated Water Resource Management (IWRM) MSc course in the same university. In Pakistan, soil loss and erosion monitoring and control strategies as well as fodder production courses are offered at the graduate level at Arid Zone University, Gomal Zam University and DG Khan Agriculture College. In Kassala University, Sudan, groundwater recharge and floodwater governance courses have been adopted both at the undergraduate and postgraduate levels. In Ethiopia, courses on watershed management and ecosystem services in FBL have been fully mainstreamed in Mekelle University. Also, short annual courses are offered at the same university on the diverse water management experiences in the country. These annual short courses encompass interactive lectures and field visits and offer new insights to participants from the project countries and outside. In Afghanistan, a Water Centre was established at Kabul University in 2018. The centre educates young professionals on varied technical and management aspects of FBL. In Myanmar, collaborations have been done between Yangon, Hinthada and Yenzin Universities who offer courses in FBL. IWMI provides technical guidance to both university staff and students in research studies on FBL.

1.2 Two new MSc programmes on FBL started.

Several courses have been introduced in programmes in Mzuzu and Lilongwe Universities in Malawi and Egerton and Jomo Kenyatta Universities in Kenya. In tertiary institutions in Kenya, floodwater management courses have been introduced in Kenya Water Institute (KEWI) and Centre for Training and Research in ASAL (CETRAD) but mainly from a disaster management perspective. Consultative meetings in [Kenya](#) and [Malawi](#) have since been conducted in a bid to fully mainstream the courses in the institutions. It has therefore been concluded that most of the institutions need to widen their scope on the subject and technical support would be offered when necessary. Action plans by the two country chapters have been developed and shall be followed even after the completion of the project.

Output 2: Farmer training materials prepared and disseminated

Outcome 2:

Four farmer learning centres established (EC).

As communicated in the 2018 progress report, the project team concluded that establishing farmer learning from scratch exclusively for FBL issues is not effective from both the learning and the financial perspectives. Accordingly, various good and best practices for productive use of floods were integrated into the Smart Centres in Kenya and Malawi that were already established to promote and upscale water and climate-smart agricultural technologies and practices. Over the past five years, the Smart Centres hosted several learning and exchange events that benefited nearly 1500 farmers. However, different farmer trainings have been conducted during workshops, field days and the farmer-to-farmer exchange programmes. In Malawi alone, nearly 4000 farmers in different districts have been reached during farmer trainings, field days and farmer exchange visits aimed at improving community resilience as depicted [here](#). Further, 26 farmers (8 women and 18 males) have [graduated](#) from the FBL farmer field school. The farmers were enlightened on better agronomic practices in FBL. Some farmer learning materials developed for different countries can be found [here](#).

Output 3: FBL knowledge and experience sharing symposium conducted

Outcome 3:

International, regional and national trainings and events conducted (IFAD).

So far, about 1000 young and mid-career professionals, practitioners and farmers nearly 150 policy-makers have benefited from the various trainings, workshops and other related events. For example; the first leadership course took place in Kenya and Tanzania from 29th February to 11th March 2016. The event was graced by 23 participants from the project countries who also interacted with 20 farmers (17 male and 3 female) from Tanzania. The main resource materials shared during the leadership course can be found [here](#). The second leadership course took place from 15th to 24th May in Wageningen and attracted 18 participants (8 young professionals (interns) and 10 leaders). The leadership course was organized in parallel with the internship programme (the 8 interns) to make connections between the interns and the leaders. The resource materials for the [internship](#) and [leadership course](#) can be found here. For five years, the annual regional FBL and Watershed Management short course in Ethiopia engaged 180 practitioners/professionals and 10 policy-makers. Further, an international symposium was conducted in Kenya where cross-country experiences were shared among 52 participants and the proceedings can be found [here](#). Due to the interest triggered

by the symposium, training on road water harvesting was given to 30 county officials in the Arid and Semi-Arid Lands (ASALS) of Kenya. Further, an [international training](#) on rainwater harvesting, organic farming, permaculture and agroforestry was conducted in Kenya. This enlightened 16 Sudanese government officials on the investment potential of FBLS and road water harvesting. Further, a [national workshop](#) was held in Port-Sudan Toker on July 14th and 15th 2018 as a way of strengthening the network as well as contribute to the build-up of knowledge on the potential use of FBLS. The workshop was attended by 70 participants with 3 policy-makers. Another [knowledge and sharing workshop](#) was conducted in Sudan with more than 60 participants (22 farmers and 38 professionals) from Gash, Delta Toker, Khor Abu Habil and Hud El Silem Agricultural Schemes and 4 policy-makers. The [DREAM conference](#), a culmination of several years of cooperation between GIZ and FBLN, was held in Ethiopia from 29th September to 3rd October 2019. The conference engaged over 254 professionals/practitioners (10% were policy-makers) on better water spreading and management techniques as well as investment priorities and in turn provided a good basis for wider networking and cooperation. A National Conference on the potential and opportunities of spate irrigated held in Pakistan attracted 270 young and mid-career professionals, 50 farmers and 30 government officials. Further, a [curriculum review](#) and improvement workshop was conducted from 24th to 28th February 2020 at the Hydraulic Research Centre (HRC) and Kassala University, Sudan. Representatives from the FBLN and universities in Yemen, Kenya, Pakistan, Malawi and Sudan graced the event to review the current initiatives of incorporating FBLS into the education curriculum as well as collaborative ways of improving the curriculum. The launch of the NEWARBI project in Pakistan was attended by a few delegates from the FBL network. The project intends to improve water distribution in the major spate areas and develop a good standard modality to improve spate systems in Pakistan. Finally, annual international courses on water harvesting have been developed in partnership with the FBL network and the University of Firenze to help in creating awareness on the subject. Several scholarships have been offered to participants from developing countries with a special bias on those from the country chapters.

Output 4: Continued support to MSc and PhD students, young professionals and interns
Outcome 4:

Internship programme conducted.

Three leadership courses ([2016](#), [2017](#) and [2019](#)) and several internships ([2017](#) and others offered on an individual basis by the FBLN organizations) have enhanced the capacity of about 100 participants including 50 young professionals to become leaders and promoters of FBLS across the countries.

Component 4: SUPPORT TO INVESTMENT PROGRAMMES AND POLICIES

Output 1: Portfolio of FBL investment options prioritised and developed

Outcome 1:

1.1 Six proposals for national or provincial investment programmes or development policies created (IFAD & EC).

In Kenya, mapping of potential FBLS was conducted and the total area was estimated at 400,000 hectares within 90% of the area falling in 10 out of the 35 counties with the potential for FBLS. An investment to tap the potential was estimated at USD 1.65 billion. It is from the mapping findings that 3 proposals have been developed for Turkana and the Amaya Counties (Samburu, Isiolo, Baringo and Laikipia). Also, there are on-going investment discussions with GIZ and Busia, Kakamega and Kisumu counties of Kenya. Further, investment and upscaling proposals have been developed for on-farm water management and yield improvement (Sudan), connecting roads, [floodwater harvesting and livelihoods](#) (Malawi), [rehabilitation of FBLS in post war](#) (Yemen), remodelling water rights and floodwater distribution system, sustainable water fund (FVO), Bhag Balochistan command area development project (Pakistan). A proposal for the entire command area at Bala Narri, Balochistan was also prepared; funding is being explored at the national level with USAID, PPAF and the Punjab and Balochistan governments.

An investment workshop was also conducted in Kenya immediately after the symposium held in March. Five proposals on cross-country relevant investment areas: [youth attractive value chains](#), [social and economic empowerment of women](#), [climate change resilience](#), [food and fodder security in drylands](#), and [policy and institutional strengthening](#). In Malawi, a [proposal review and improvement](#) workshop was conducted to share knowledge and skills in developing persuasive project proposals, share successes and experiences of previous projects implemented by the association and discuss case studies on the FBLS project that can be used to strengthen project proposals. It was concluded

that proper research into the different fields is required to have a proper back up for each proposal. Finally, a policy development workshop was conducted in Sudan.

1.2 Africa to Asia exchange in at least two proposals facilitated (EC).

In Sudan, a proposal on the use of electric churners by the Aroma women was developed after which a milk churner was sent to Malawi for promotion.

1.3 Linkage to other WLE activities established (EC).

The final workshop of the WLE project: Harnessing floods was a good case of linkage between projects. The completion workshop for the project served as an opportunity to gather stakeholders from the spate areas in Sudan and discuss the way forward on FBL activities for the benefit of the country. The findings of the WLE project have been highly adopted in the support of the Sudan FBL chapter.

Output 2: IFAD projects under preparation supported on request

Outcome 2:

IFAD projects under preparation supported on request (IFAD).

A knowledge product and a policy brief for upscaling the on-farm water management and yield improvement intervention in Sudan was prepared and shared with the IFAD lead grant manager. Another deliverable in response to a request from IFAD is a quick guide on improved livelihood opportunities under spate irrigation [FBL livelihood opportunities](#). In Ethiopia, linkages were made with the IFAD PASIDP offices who collaborated with the country chapter in supporting farmer scholarships, farmer to farmer experience sharing events and training of experts on spate irrigation. Further, the country PASIDP coordinator participated in the leadership course in 2017 and the reverse was observed in the project kick-off and completion workshop of PASIDP II. Similarly, due to the partnership made by the Sudan chapter and the IFAD offices, a representative from the North Kordofan state participated in the knowledge sharing workshop. In Kenya, a proposal on water harvesting, agroforestry, organic farming and permaculture was prepared for Sudanese delegates in collaboration with IFAD Sudan who also financially supported sixteen delegates on a 10-day training on the aforementioned topics. FBL was a major topic discussed in water harvesting.

Annex 3: Physical progress by output against targets - Myanmar (Asia)

Component 1: Network Development

Network development was not a focus of the project as distribution of agricultural technologies to farmers was not amongst the project activities.

Component 2: Knowledge development and management

Output 1: A DST to facilitate decision making to reduce flood impacts on rice in the Ayeyarwady Delta along with 78 core maps at Township level, three for each of the 26 townships covering the three rice categories. This replaces outdated hand-drawn maps dating to the 1950s (pers com Director, Land Use Division), creating new capacity within the Land Use Division of the DoA to adapt rice planting to minimize flood damage. It also offers the potential to better target extension services and seed production, since better estimates are possible of where rice varieties can be grown. If fully utilized in the delta, the DST can contribute to saving 248,000 – 350,000 tons of rice annually. In addition to bolstering food security, this would avoid annual economic losses of between USD 16 million and 22 million affecting approximately 62,000. The fact that the DST has already been used by the World Bank funded AIRBM Project to develop rice suitability maps for the Ayeyarwady Basin is both validation of its robustness and a significant step towards application.

Output 2: A DST to facilitate the scaling of rice-fish systems in the Ayeyarwady Delta (due end 2020). In 2021, the finalised version will be used by WorldFish and IWMI to leverage a recent high-level decision within the government (influenced by WF field trials) that allows for the first time, up to 15% of land assigned for rice production to be converted to fish culture. The analysis provided by the DST will identify most suitable areas in the delta for scaling – a crucial knowledge gap impeding dialog with MoALI agencies regarding the scaling of rice-fish systems already tested by WorldFish, which estimates that rice-fish can increase fish production by 100,000 tons, generating an additional USD 100 million each dry season in the delta, without significantly undermining rice production.

Output 3: Several publications have been generated or are in production arising out of project activities. While these are listed in Section IV, the ability of the project to provide input into the report *"Promoting youth engagement and employment in agriculture and food systems"*, being drafted by the High Level Panel of Experts (HLPE) on Food Security and Nutrition of the UN Committee on World Food Security is of particular note. It is an important achievement for the project given that the HLPE was established to advise the Committee on World Food Security, an intergovernmental and international platform dealing with food security and nutrition. The opportunity to provide input arose as a result of the case study on youth engagement in small-scale fisheries that was part funded by this project.

Component 3: Capacity Building

Output 1: Both DSTs described under Component 2 also represent important capacity building outputs as they collectively significantly improve MoALI's capacity to use geospatial data for landscape analysis, and thereby to better inform land use decisions. It is expected that policy and planning dialogs planned by IWMI and WorldFish on the basis of these two tools in 2021 will facilitate concrete land use decisions and their implementation. The adoption of the rice-related DST by the AIRBM Project (it is also considering the rice-fish scaling DST prototype) is an added pathway for impact, potentially for both DSTs.

The DST consists of a random forest model for map generation together with Input data (data used to run the random forest model), the Script (random forest model and mean

calculation script) and Output data (the mean of 300 iterations). It was developed by using existing data on rainfall, slope, salinity, soils and other parameters, supplemented by primary data collection during the flood seasons of 2017, 2018 and 2019 by project staff in collaboration with DoA township staff and farmers. The DST was validated by township DoA staff during on a two-day workshop, based on their detailed knowledge of the agro-ecological (including flood) conditions in their respective townships.

Output 2: Workshops to build capacity within DoA to collect and use geospatial data for landscape analysis and thereby for more informed land use planning. As a result of these workshops, all DoA township offices in the delta have for the first time the capacity to collect GIS data to support rapid and more accurate landscape analyses for more informed and effective policy formulation and implementation, including adaptation to climate change.

This DST builds on Output 1 by using it as a base map, and focusing especially on areas where flooding is predicted to cause low rice productivity. A particular feature of this DST is that it blends agro-ecological data with socio-economic and administrative data to reflect suitability for rice-fish not only in terms of field conditions, but also in terms of the level to which input supplies and output markets are available.

Output 3: User Manual on KoboToolbox in Burmese and English languages. These outputs form part of the capacity generated by Output 2 with respect to the DoA. Their availability online also means they can also inform the work of other government agencies, students, academics and others in Myanmar, facilitating the wider adoption of GIS for landscape analysis.

Output 4: Training video in Burmese on managing Golder Apple Snail (GAS) infestations. This has already had significant uptake since it has been used to train 136 DoA extension officers covering all townships, and 19,199 farmers in the delta. The video was developed in collaboration with the Plant Protection Department of DoA which provided the technical expertise. The video has been distributed to all township offices in the delta as DVDs.

Component 4: Support to investment programmes and policies

Output 1: Adoption of Output 1 of Component 2 by the AIRBM project – one of the largest planning exercises in the Ayeyarwady Basin. Tasked with developing the Ayeyarwady Basin Strategy, the AIRBM project has the potential to influence how land and water resources are utilised in the Basin. The fact that the DST was used in developing rice suitability maps for the Basin as a whole suggests potential for PRUN SAR to have Basin-wide impact in relation to more climate-smart rice cultivation.

Annex 4: Number of Farmers/ Beneficiaries participating in Project Activities Africa/Asia

Activity	Women	Men	Total
Sudan, Gash Agricultural System (GAS) – Series of in-field trainings on adopting improved on-farm water management interventions that has, for example, doubled the yield of the local sorghum variety (Aklamoy) while at the same time reducing floodwater consumption by 30%	1000	3500	4500

Malawi –in-situ and road water harvesting technologies and practices to mitigate the livelihood impact of rampant dry spells in the country	2617	1392	4009
Kenya – Activity on productive involvement of men and women in FBLS activities as well field events	1000	1300	2300
Good and best practices on productive use of floods integrated into three Smart Centres in Kenya (2) and Malawi	215	632	847
Pakistan: Varied field and research activities that introduced good and best floodwater management, agronomic and engineering practices	121	1000	1121
Total	4953	7824	12777

Asia (Myanmar)

Training types and number of participants

Training	Women	Men	Total
Training of DoA and DoF staff from its 26 township offices in the use of KoboToolbox.	49	41	90
DoA GIS scientists trained to understand and use the DST for reducing flood damage to rice	02	04	06
DoA staff trained in mitigating GAS infestations	Not known ³	Not Known	136
On the job training of early career professionals	06	0	06
Total			238

Annex 5: Training types and number of participants Africa/Asia

Training	Women	Men	Total
FBLS Symposium and investment workshop in Kenya	20	54	74
National Conference in Pakistan: Potential and prospects of spate irrigation	50	300	350
International training to Sudanese delegates in Kenya	8	8	16
Annual short course in Ethiopia	40	120	160

³ As stated in footnote 1.

Leadership and Internship programmes	50	100	150
DREAM conference in Ethiopia	100	150	250
knowledge-sharing events in Sudan	60	200	260
Knowledge and experience sharing activities in Pakistan	135	215	350
Malawi: National FBLS workshop and knowledge sharing events	162	47	209
Total	625	11947	1819

Asia (Myanmar)

Activity	Women	Men	Total
Training video in Burmese on managing Golder Apple Snail (GAS) infestations	Not known ⁴	Not known	19,199
Total			19,199

Annex 6: International Public Goods Africa/Asia

Annex 6.1: Practical notes

1. [Managing the Microclimate](#). Practical note no. 27.
2. [Fodder Production with Spate Irrigation and Road Runoff](#) Practical note no. 28.
3. [Improvements in the design of flood diversion structures](#). Practical note no. 29.
4. [Understanding and addressing the drought in Kenya: opportunities of harvesting water with roads](#). Practical note no. 30.
5. [Road crossings for water harvesting in seasonal rivers: Non-ventilated drifts as sand dams](#). Practical note no. 31
6. [Ground recharge and saving in spate irrigation areas: Case study, Wadi Zabid](#). Practical note no. 32.
7. [Simple mechanization for dug-out ponds construction](#). Practical note no. 33.
8. [Study on the ecosystem of Kachi plain with focus on spate irrigated areas of Bhag Narri, Balochistan – Pakistan](#). Practical note no. 34.
9. [Constructing roads in Low-lying floodplains to optimize ecological and economic functions](#). Practical note no. 35.
10. [Moisture conservation in flood-prone areas in Kenya: A case study of Kamukuru, Kajiado County](#). Practical note no. 36.

⁴ The DoA does not track gender during training events, and were therefore unable to provide this information. Unlike the other trainings, the GAS trainings were conducted by the DoA itself using the video developed by the project.

11. [Experiences with road runoff harvesting and agroforestry in Kitui and Machakos County.](#) Practical note no. 37.
12. [The use of trees and shrubs in spate irrigation areas.](#) Practical note no. 38.
13. [The use of minor crops in spate irrigation translated to Sindhi.](#) Practical note no. 8.
14. [Food legumes \(pulses\) for spate irrigated farming in Pakistan translated to Urdu.](#) Practical note no. 6.
15. [Desert truffle mushrooms in spate irrigation area \(Urdu\).](#) Practical no. 14
16. [Soil moisture management in FBLS](#) – Synthesis paper; Not yet published.

Annex 6. 2: Reports

Ethiopia

1. [Proceedings: DREAM ASAL Conference.](#)
2. [Farmer to farmer experience sharing report, Alamata.](#)
3. [Potential bright spots for flood-based irrigation systems in Marsabit County.](#)
4. [Potential bright spots for flood-based irrigation systems in Turkana County.](#)
5. [Harnessing floods to enhance livelihoods and ecosystems.](#)
6. [Report on the 7th cycle annual regular international short course](#) on integrated watershed management and flood-based farming systems in arid and semi-arid lowlands of Africa.

Yemen

1. [The war impact on food security in the Tihama Region. Case study: Wadi Zabid and Wadi Siham.](#)
2. [Evaluating the potential of road rain water harvesting in Yemen. A case study of the Maghrabah Manakah Bab Bahil Road, Sana'a Governorate.](#)
3. [Roads rain water harvesting \(RRWH\) in Yemen.](#) Towards the development and management of roads for water.
4. [Manual for rooftop rainwater harvesting systems in the Republic of Yemen.](#)
5. [Research proposal:](#) Soil water conservation techniques in spate areas using traditional knowledge, Case of Tihama region.

Kenya

1. [Flood-based livelihood systems; the way forward.](#) Report on the status and potential of agriculture and FBLS in specific for the Kenyan Counties Tana River, Turkana and Samburu.
2. [Farmer field day in Kajiado.](#)
3. [Proceedings of the Flood-Based Livelihood Systems International Symposium in Voi Wildlife Lodge,](#) Taita Taveta, Kenya.
4. [Proceedings to the international training on water harvesting, permaculture, organic farming and agroforestry.](#)
5. [Proceedings of flood based livelihoods project mission](#) with the Department of Water, Pastoral Economy and Land Reclamation Turkana County.
6. [FBLS Curriculum review and development in Kenya.](#)
7. [Garissa- Tana River mission report.](#)
8. [Flood based farming system project stakeholder workshop Kajiado County.](#)

9. [Tana River Stakeholder meeting.](#)
10. A report on [roll-out of FBLN Project development in Busia and Siaya Counties](#), Kenya.
11. [Roadside tree planting manual](#)

Pakistan

1. [Resource conservation through strip cropping of chick pea, Taramila and Lentils in spate irrigated area](#)
2. [Soil fertility management through alternate strip of inter-crops in spate irrigated areas of Dera Ghazi Khan, Pakistan.](#)
3. [Field research report on spate irrigated crops in Sindh, Balochistan and the Punjab.](#)
4. [Seeds suitable under drought and spate irrigation.](#)
5. [Pakistan flood based farming systems network in association with strengthening participatory organization, regional center Quetta Pakistan.](#)
6. [Flood management and farming practices, water rights and socioeconomic outlook, Pakistan.](#)
7. [Nai Gaj Baseline Report: New water rights for basin management and inclusivity in a spate irrigation project.](#)

Afghanistan

1. [Codification of water rights Afghanistan. Case study of water rights and water codification of Nimruz Province.](#)

Sudan

1. [Harnessing floods for improved livelihoods and ecosystem services project.](#)
2. Report on [curriculum review and improvement workshop](#) in Sudan
3. [Tailor-made training course on water management in mega irrigation schemes.](#)
4. [Toker delta: revitalizing the bright history to a brighter future](#)
5. [Testing scythe in Mesga 14 East- Kassala block.](#)
6. [Knowledge sharing workshop in Sudan \(English or Arabic Version\)](#)
- 7.

Malawi

1. [Overcoming dry spells with flood-based farming systems.](#)
2. [SMART technologies for improved livelihoods and environmental management.](#)
3. [Resolving land tenure issues under spate irrigation: A case of FBLN Malawi.](#)
4. [Assessing the potential of using road water in agriculture production in Balaka District, Southern Malawi.](#)
5. [Launching road-runoff water harvesting campaign for 2017/18 season in Malawi.](#)
6. [Flood based farming system; Approaches to enhancing community resilience to climate change.](#)
7. [Low cost technologies for improved livelihoods.](#)
8. [Rainwater harvesting – Opportunities and challenges](#) in addressing water scarcity in Malawi.
9. [Harnessing floods, building community resilience.](#) The positive side of flood disasters, Zomba farmers reap from winter cropping.
10. [Documenting case studies](#) on FBLS in Malawi
11. [Graduating farmers](#) from FBLS farmer field school
12. Report on [FBLS workshop](#)
13. [Farmer trainings on FBLS](#)

14. [Staff capacity building on FBLS](#)
15. [Rainwater harvesting and utilisation](#)
16. [Building community resilience through spate irrigation](#)
17. [Improving agricultural production using flood water; From disasters into opportunities](#)
18. [Spate irrigation in Malawi: status, potential and challenges.](#)
19. [Improving community resilience to climate change; piloting of rainwater harvesting and conservation agriculture.](#)
20. [Water harvesting from roads: options for semi-arid areas.](#)

Myanmar

Overall

1. [Roads in flood plains.](#)
2. [How to make green roads for water.](#)

Annex 6. 3: FBLS Guidelines

1. FBLS [Guidelines](#) draft.

Annex 6. 4: Investment proposal

1. [Fodder production with road water harvesting in African drylands.](#)
2. [Youth \(Male and female\) empowerment in the agricultural sector.](#)
3. [Investment proposal for enhancing resilience to climate change in FBFS.](#)
4. [Economic empowerment of women in flood based agriculture sector.](#)
5. [Unlocking the potential: Targeted investment for a more rewarding and resilient flood-based livelihood system.](#)
6. [Letter to IFAD Malu.](#)
7. [Prospects and challenges of mainstreaming road water harvesting in soil and water management programmes un Malawi.](#)
8. [Effects of war security in Yemen.](#)
9. Project [proposal review](#) and improvement meeting

Annex 6. 5: Technical sheets

1. [Codifying water rights in contested basins of Afghanistan.](#)
2. [Concept paper on spate irrigation and irrigation sector development in Awaran District.](#)
3. [Roadside borrow pits as ponds for off-season small-scale irrigation.](#)
4. [Food security, consumption, complications and coping mechanisms;](#) Case study Tihama (Wadi Zabid and Wadi Siham).
5. [Food production, irrigation, marketing and agricultural coping mechanisms;](#) Case study Tihama (Wadi Zabid and Wadi Siham).
6. [From the mother of all ponds: Road water harvesting in Masala, Ethiopia.](#)
7. [Water distribution agreement Narri Balochistan – Translation from Kalat State Document Press Conference of Kachi Canal Farmers.](#)
8. [Decision on allocation of additional water for Mithri Weir Balochistan.](#)
9. [History and revenue collection procedure at Bhag Narri Balochistan.](#)

Annex 6. 6: PowerPoint presentations

1. [Leadership course 2016.](#)
2. [Internship course, 2017.](#)
3. [Leadership course, 2017.](#)
4. [FBS Symposium, 2019.](#)
5. [Curriculum review, 2020.](#)
6. [Water rights, water distribution and water conflicts.](#)
7. [Towards improved field water management in Gash Agricultural Scheme, Eastern Sudan.](#)
8. [Towards improved on-farm water management and higher productivity in Gash Agricultural scheme in Sudan.](#)
9. [Sorghum production under spate irrigation systems.](#)
10. [Overview of Pangani Basin.](#)
11. [Improvements of flood water diversion and distribution efficiency of FBFS.](#)
12. [Water harvesting – practices and recent innovations.](#)

Annex 6. 7: Research articles

Published

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8. Malota, M., & Mchenga, J. (2020). [Revisiting dominant practices in floodwater harvesting systems: making flood events worth their occurrence in flood-prone areas.](#) *Applied Water Science*, 10(1), 6.
9. Al-Qubatee, W., Hellegers, P., & Ritzema, H. (2019). [The Economic Value of Irrigation Water in Wadi Zabid, Tihama Plain, Yemen.](#) *Sustainability*, 11(22), 6476.
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11. Yigzaw, N., Mburu, J., Ackello-Ogutuu, C., Whitney, C., & Luedeling, E. (2019). [Data for the evaluation of irrigation development interventions in Northern Ethiopia.](#)

12. Gumma, M. K., Amede, T., Getnet, M., Pinjarla, B., Panjala, P., Legesse, G., ... & Siambi, M. (2019). [Assessing potential locations for flood-based farming using satellite imagery: a case study of Afar region, Ethiopia.](#) *Renewable Agriculture and Food Systems*, 1-15.
13. Amede, T., Van den Akker, E., Berdel, W., Keller, C., Tilahun, G., Dejen, A., ... & Abebe, H. (2020). [Facilitating livelihoods diversification through flood-based land restoration in pastoral systems of Afar, Ethiopia.](#) *Renewable Agriculture and Food Systems*, 1-12.
14. Getnet, M., Amede, T., Tilahun, G., Legesse, G., Gumma, M. K., Abebe, H., ... & Akker, E. V. (2020). [Water spreading weirs altering flood, nutrient distribution and crop productivity in upstream–downstream settings in dry lowlands of Afar, Ethiopia.](#) *Renewable Agriculture and Food Systems*, 1-11.
15. Modelling risks and uncertainty in flood-based farming systems using a knowledge based approach. *Accepted in the Journal of Agricultural Systems*

Under review.

1. Enhancing traditional floodwater governance system for inclusive and resilient FBLs in the Tana River floodplains in Kenya. Article submitted to the *Water Resources Management Journal*.
2. Mapping flood-based farming systems with Bayesian network. Submitted under review in the *Journal of Knowledge-based Systems*.

Annex 6.8: Book chapters

1. Khan, Q. U., & Sayal, O. U. (2019). [Spate Irrigation: Impact of Climate Change with Specific Reference to Pakistan.](#) In *Irrigation-Water Productivity and Operation, Sustainability and Climate Change*. Intech Open.
2. Nthara, M. (2020). [Rainwater Harvesting for improved food security and environmental conservation; experiences from Malawi.](#)
3. de Trinchera Gomez, W. L. F. (2018). [Rainwater-Smart Agriculture in Arid and Semi-Arid Areas.](#)
4. Flood Based Livelihoods Network: [When floods are advantageous not hazardous.](#) Booklet.

Annex 6. 9: Brochures and posters

1. Spate irrigation brochure in local language. <http://spate-irrigation.org/wp-content/uploads/2020/03/IMG-20200313-WA0007.jpg>
<http://spate-irrigation.org/wp-content/uploads/2020/03/IMG-20200313-WA0006.jpg>
2. [Improved livelihood opportunities in spate irrigation](#) (brochure).
3. [Effective water harvesting and land management techniques close to road bodies – Pictorial guide for labour intensive programs.](#)
4. [Flood-based livelihood systems: Harnessing floods to enhance livelihoods and ecosystems. Poster.](#)
5. [Africa to Asia: Testing Adaptation in Flood-Based Resource Management.](#) Poster.
6. [Flood-Based Livelihoods Network.](#) Banner.
7. [Using floods as an asset.](#) Flyer
8. [Africa to Asia: Testing Adaptation in Flood-Based Resource Management.](#) Banner.
9. [Flood-Based Livelihoods Network: When floods are advantageous not hazardous.](#) Brochure.
10. [Improved Livelihood opportunities in Flood-Based Livelihood Systems.](#) Banner.

11. [Remote Sensing for Flood-Based Livelihood Systems](#). Banner
12. Testing adaptation in Flood Based Livelihoods Systems. Onsite production and remote monitoring of seredo sorghum in Kamukuru village, Kajiado County. Poster
13. [Taking stock of a Decade-long Evidence-Based experiences of Flood-Based Livelihood Systems in Africa and Asia: Knowledge and Experience Sharing Symposium](#). Flyer
14. [Water Management in Mega Irrigation Schemes](#). Brochure

Annex 6. 10: Blogs

Ethiopia

1. [Kingdoms of spate](#).
2. [From the mother of all ponds: road water harvesting in Massala, Ethiopia](#).
3. [Watershed improvement: The upstream-downstream question](#).
4. [Roads-induced floods: Blessings or curse?](#)
5. [Reading the rain](#).
6. [Resisting drought](#).
7. [Land to women and landless youth](#).
8. [It is the microclimate! You didn't see?](#)
9. [Gambela frontier news](#).

Malawi

1. [Lake Malawi: The vanishing blessing](#).
2. [Climate change: Droughts and floods in Malawi](#).
3. [The potential of road water harvesting: A Malawian demonstration](#).
4. [A lecture on water by professor nature](#).

Kenya

1. [Flood-Based Livelihoods Symposium: Harnessing the potential of flood water](#).
2. [Creating opportunity out of a problem: the hidden cotton plant](#).
3. [Resolving the drought puzzle in Northern Kenya](#).
4. [Man-made pastures: Postcard from Nthia, Makueni County, Kenya](#).
5. [Rocks: The blessing in disguise](#).
6. [Sorghum Superpower](#).
7. [Fodder production with road water harvesting in African drylands](#).
8. [Turkana: From desolation to hope by recognizing the potential of floods](#).
9. [Postcard from Mbitini: Roads against drought](#).
10. [The Kenyan farmer who travelled his country](#).

Pakistan

1. [A year in spate irrigation: floods as a blessing, rain as a problem](#).
2. [Locust attacks in Pakistan](#).
3. [Symbiosis: Pastoralists and farmers in Balochistan](#).
4. [Lockdowns in rural Pakistan- what to do](#).
5. [Effect of dam construction on underground flows in Jamshoro, Pakistan](#).
6. [Broody: The essential art of hatching](#).
7. [Locust threat averted in Sindh, Pakistan](#).
8. [The power of peers: Community certification](#).

9. [Farmer to Farmer knowledge transfer](#): Experience and seed sharing by Sindh farmers to Balochistan farmers.
10. [Chickpea success through WhatsApp](#).
11. [King capillary: The miracle water buffer](#).

Afghanistan

1. [From the water governance front](#).
2. [Managing the polder patchwork](#).

Myanmar

1. [Rice growing in the water](#).

Yemen

1. [Starving the Tihama: Impact of war on spate irrigation systems in Yemen](#).
2. [One very hard hit for Yemen](#).
3. [Appeal to the negotiators at the Yemen Peace talks in Sweden](#).

Sudan

1. [Gash the traveler](#).
2. [Post card from the Beja, Akla Almahata, Eastern Sudan: Health, water, Education, Work](#).
3. [Freeing up her time with electric churners](#).
4. [Eye on the dry](#).

Annex 6. 11: Videos

Pakistan

1. [Covid 19: Emergency flood relief in DG Khan, Pakistan](#).
2. [Farmer rehabilitation Balochistan](#).
3. [Mustard oil production – Pakistan](#).
4. [Flooding in Zhob District, Balochistan](#).
5. [Flood water management in Bhaag – Kachi Balochistan- Pakistan](#).
6. [Chickpea trail](#).
7. [Drilling small borehole for drinking water](#).
8. [Drinking water in Bhaag](#).
9. [Knowledge exchange farmer to farmer in spate irrigation regions of Pakistan](#).
10. [Spate irrigation in Balochistan](#).
11. [Spate irrigation opportunities and groundwater in Balochistan](#).
12. [Spate irrigation in Sindh](#).
13. Harvest time charity in Pakistan. <http://www.thewaterchannel.tv/media-gallery/6794-sorghum-harvest-in-pakistan>
14. Sorghum harvest
15. [Construction of mud walls](#)
16. [Harvest of aragula](#)
17. [Desert locusts](#)

Ethiopia

1. [5th cycle training FBF Ethiopia](#).

2. [Road development and sand mining – New employment opportunities in Tigray, Ethiopia.](#)
3. [Harvesting road runoff to recharge ground water.](#)
4. [Spate irrigation first floods.](#)
5. [Road water harvesting in Tigray, Ethiopia.](#)
6. [Harnessing floods to enhance livelihoods and ecosystem services project.](#)
7. [Harvesting road water in Amhara, Tigray.](#)
8. [Flood based livelihoods in Ethiopia: Activities, challenges and way forward.](#)

Malawi

1. [Harvesting road water in Malawi: Opportunities ahead.](#)
2. [FBLS Malawi.](#)
3. [Integrated Aqua- Agriculture Malawi.](#)
4. [Roads for water: Experiences from Malawi.](#)
5. [Status of flood based farming systems in Malawi.](#)

Kenya

1. [Creating pastures in African Drylands using Road water harvesting.](#)
2. [Flood based rice farming in Ahero.](#)
3. [Mwova: Farmer of the year \(Road water harvesting and hay sale\).](#)
4. [Experiences with road runoff harvesting and agroforestry in Kitui and Machakos County, Kenya.](#)
5. [Stakeholder workshop on sorghum and pearl millet under spate irrigation.](#)
6. [What can sorghum and millet offer to spate irrigation?](#)
7. [Machakos road water harvesters.](#)
8. [Kenya- catching road runoff in ponds.](#)
9. [Agriculture and FBF in the Tana Delta.](#)
10. [Field trip Turkana, Samburu.](#)
11. [Assessment of flood based farming potential in Kajiado County.](#)
12. Land degradation and water waste in the ASALs of Kenya.

Sudan

1. [Testing the scythe.](#)
2. [On-farm water management in Gash.](#)
3. [Towards improved field water management in the GAS, Eastern Sudan.](#)
4. [Closing the unfairness gap in Gash flow distribution.](#)
5. [Harnessing flood to enhance livelihood and ecosystem services in the Gash River basin 2.](#)
6. [Water harvesting systems in Sudan.](#)
7. [Harnessing floods to enhance livelihood and ecosystem services in the Gash River Basin.](#)
8. [Lifting water from a well in a hout.](#)
9. [Flood based farming system Sudan Chapter.](#)

Yemen

1. [Mulching techniques for soil water conservation and its impact on ground water conservation in spate areas – Yemen.](#)
2. [Yemen: Managing floodwaters through spate irrigation systems.](#)
3. [The starving Tihama, Yemen.](#)
4. [Flood based livelihoods in Yemen.](#)

Afghanistan

1. [Frankly speaking: Floodplains and siltation.](#)
2. [Afghanistan: The untapped Helmand river.](#)

Myanmar

1. [Early state of flood based farming systems in Myanmar.](#)
2. [Kick off workshop: Flood based livelihoods network, Myanmar.](#)
3. [Index-based flood insurance.](#)
4. [Underground taming of floods for irrigation.](#)
5. [Flood based farming system in Myanmar.](#)

Global

1. [Spate irrigation network – flood irrigation and the spate irrigation network foundations.](#)
2. [Flooding rangeland for fodder production in Somaliland.](#)
3. [Spate irrigation in Somaliland.](#)

Annex 6. 12: Farmer learning materials

1. [Spate irrigation -minor crops](#)
2. [Spate irrigation – milk churners](#)
3. [Prosopis juliflora](#)
4. [Spate irrigation – Livestock breed](#)
5. Improved livelihood opportunities ([English](#) or [Sindh](#))
6. [Drinking water ponds in spate irrigated areas](#)
7. [Spate irrigation – oilseed crops for spate irrigated farming](#)
8. [Spate irrigation – setting up Acacia Ehrenbergiana](#)
9. [Spate irrigation – Sorghum](#)
10. [Improving flood diversion soil bunds](#)
11. [Improving local grain storage](#)

Asia (Myanmar)

Peer-reviewed (published)

- Dubois, M. J., Akester, M., Leemans, K., Teoh, S. J., Stuart, A., Thant, A. M., ... & Radanielson, A. M. (2019). Integrating fish into irrigation infrastructure projects in Myanmar: rice-fish what if...?. *Marine and Freshwater Research*, 70(9), 1229-1240. Available online at: <https://www.publish.csiro.au/MF/MF19182>

Peer-reviewed (in prep.)

- Leh et al. (In prep.) Agricultural land suitability modelling for flood-based farming systems: A random forest and GIS approach for rice in the Ayeyarwady Delta, Myanmar. To be submitted to *Science of the Total Environment*. December 2020.
- Arulingam, I. de Silva, S.; Senaratna-Sellamuttu, S. and Palal, M. (In prep.) Youth livelihood aspirations and realities: What role for fisheries? A case-study of Kyonkadun Village, Ayeyarwady Delta, Myanmar. To be submitted to *Development and Change* by end 2020.
- Promoting youth engagement and employment in agriculture and food systems”, under the High Level Panel of Experts on Food Security and Nutrition of the UN Committee on World Food Security (HLPE).⁵

⁵ The lead author is not known currently as this is a work in progress. Ms. Indika Arulingam from IWMI is contributing to the publication as noted in earlier sections of this report.

Other publications

- Leh, M.; Aung, Y. M.; Moet, M. P and de Silva, S. 2019. *Introduction to QGIS and Kobotoolbox for Mapping Flood Based Farming Systems*. Available online at: <https://www.myanmarwaterportal.com/repository/2211-introduction-to-qgis-and-kobotoolbox-for-mapping-flood-based-farming-systems.html>, and http://themimu.info/node/103784?fbclid=IwAR0xt_a013-IK2UtzN8Toi17E1YxuR3yWNPV44V1MaozLoOfYa3NDMmHPec
- Palal Moet Moet. 2019. *Trends in farmer crop choices, their drivers and resulting changes to farming systems in the Ayeyarwady Delta: A Case Study from Nyaungdon and Pyapon townships*. Case study 1. Testing Flood-Based Farming Systems Project.
- Than Pale, Shin Tynn Tun and Daw Saw Oo. 2019. *Placing Flood-Based Farming Systems within the overall rural household economy in the Ayeyarwady Delta*. Case Study 2. Testing Flood-Based Farming Systems Project.
- Hla Kyi. 2019. *Perceptions of benefits and costs of seasonal flooding, and flood management needs amongst rural communities*. Case Study 3. Testing Flood-Based Farming Systems Project.
- Lwin Maung. 2019. *Perception of Benefits and Costs of Seasonal Flooding and Flood Management needs among Rural Communities in the Ayeyarwady Delta*. Case Study 4. Testing Flood-Based Farming Systems Project.
- Myint Thida, Win Thanda Oo, Mu Thet. 2019. *Trends in Agriculture Technology Adoption and Their Development Dividends amongst Rural Communities in the Ayeyarwady Delta: A Case Study from Hinthada and Maubin townships*. Case Study 5. Testing Flood-Based Farming Systems Project.
- The training video on GAS is publicly available at: <https://www.facebook.com/watch/?v=294563757895546>

The rice suitability maps available in public domain at: <http://themimu.info/assessments-and-publications> and <https://www.myanmarwaterportal.com/news/1968-rice-environment-suitability-maps-for-the-ayeyarwady-region-ayeyarwady-delta-1.html>

Annex 7: EC Visibility Action

Africa/Asia

Pakistan

- 1 [research article](#) was published that acknowledge the support received from the FBLN and IFAD
- 1 [paper](#) was published that acknowledges the support received from the FBLN, MetaMeta and IFAD
- 1 [paper](#) was published that acknowledges the support received from the FBLN and MetaMeta
- 1 [book chapter](#) acknowledged the FBLN Pakistan.
- 1 [brochure](#) acknowledges IFAD & EC.

Malawi

- 1 journal [article](#) acknowledges financial support by IFAD.

Kenya

- [Flyer](#) on the FBLN symposium
- [Blog](#) on harnessing the potential of floodwater.
- [Proceedings](#) of the symposium
- Testing adaptation in Flood Based Livelihoods Systems. Onsite production and remote monitoring of seredo sorghum in Kamukuru village, Kajiado County. Poster

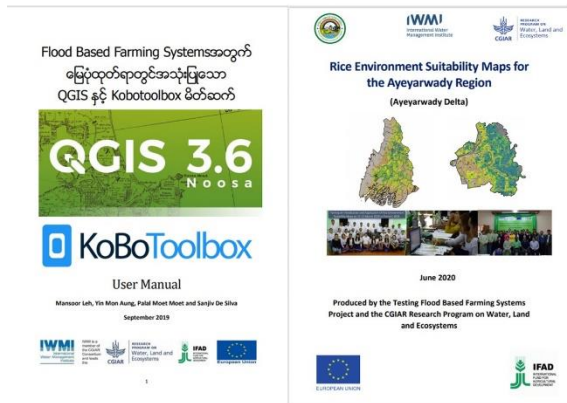
Sudan

- [Report](#) on national workshop in Toker.

- Testing the scythe [website](#).
- Report ([English](#) or [Arabic](#) version) on knowledge and experience sharing workshop in Sudan
- Sudan country [website](#)

Yemen: MSc-thesis on the potential of Roads for Water

Asia (Myanmar)



Myanmar (Asia)

Annex 8: Project Components, Outputs and Outcomes

Component	Outputs	Outcomes
Network Development	<p>Networks per se were not a focus. However, collaborations were established with WordFish-Myanmar whereby financing and human resources across several projects have been harmonized, and link with and build upon the activities under this project. These include bilateral funding to WF from ACIAR; funding from the CGIAR FISH Research Program managed by WF, and the CGIAR Research Program on Water, Land and Ecosystems.</p> <p>Close collaboration has also been developed with the DoA, especially the Land Use Division and the Ayeyarwady Regional Office.</p>	<p>A long-term vision for supporting informed land use planning to support synergistic integrated policy implementation for more diversified, nutrient-rich, pro-poor and climate smart food systems in the Ayeyarwady Delta. Has led to two DSTs addressing climate adaptation needs and potentially promoting more diverse, nutrient rich and profitable food systems through rice-fish scaling. Ability to jointly leverage IWMI’s relationships with the DoA and IWUMD, and WF’s relationship with the Department of Fisheries, to engage senior officials across the Ministry of Agriculture, Livestock and Irrigation in policy and planning dialogs, grounded in the DSTs towards identifying mechanisms for integrated policy implementation.</p>
Knowledge development and management	<p><u>A DST to facilitate decision making to reduce flood impacts on rice in the Ayeyarwady Delta.</u></p> <ul style="list-style-type: none"> • A random forest model for map generation, together with Input data (data used to run the random forest model), the Script (random forest model and mean calculation script) and Output data (the mean of 300 iterations) • 78 core maps at Township level, three for each of the 26 townships covering the three rice categories • Three maps at the delta scale, one each for the three rice categories • Additional maps showing the overlap of the three rice categories for each township at different percentage suitability 	<ul style="list-style-type: none"> • Replaces outdated hand-drawn maps dating to the 1950s (pers com Director, Land Use Division) • Capacity created to adapt rice planting to minimize flood damage. • Capacity to better target extension services and seed production, since better estimates are possible of where rice varieties can be grown. • If fully utilized in the delta, the DST can contribute to: <ul style="list-style-type: none"> ○ Saving 248,000 – 350,000 tons of rice annually ○ Avoiding annual economic losses for approximately 62,000 farmers amounting collectively to between USD 16 million and 22 million. • Already used by the World Bank funded AIRBM Project to develop

Component	Outputs	Outcomes
	<p>ranges.</p> <ul style="list-style-type: none"> • Printed 'Map Books' for each Township containing all the maps related to a specific Township • Printed 'Map Books' with maps for use by the Land Use Division and other divisions within the DoA in Naypyidaw • Large 3 feet x 4 feet vinyl wall maps of each Township map for easy reference for each Township DoA office. <p><u>A DST to facilitate the scaling of rice-fish systems in the Ayeyarwady Delta (due end 2020)</u></p> <ul style="list-style-type: none"> • An IWMI-WF led by WF. • Uses flood mitigation DST as the base. 	<p>rice suitability maps for the Ayeyarwady Basin. This is the largest and only real basin-wide integrated planning process.</p> <ul style="list-style-type: none"> • Scaling rice-fish systems already field tested by WF can increase fish production by 100,000 tons, generating an additional USD 100 million each dry season in the delta, without significantly undermining rice production (Dubois et al. 2019 + infographic – both attached). • Will help leverage recent high-level decision within the government (influenced by WF field trials) that recognizes, for the first time, up to 15% of land assigned for rice production can now be converted to fish culture. Represents a critical policy change away from the restrictive land use rules under the Farmland Law, which have hitherto made most RF systems illegal.
	<p>PRUNSAR funds were used to support a case study on factors influencing male and female youth livelihoods choices in the Ayeyarwady Delta, especially in relation to small-scale fisheries. On the basis of this work, the lead IWMI researcher Ms. Indika Arulingam was invited to be part of the High Level Panel of Experts on Food Security and Nutrition of the UN Committee on World Food Security</p>	<ul style="list-style-type: none"> •

Component	Outputs	Outcomes
	<p>(HLPE). She will be a co-author of the report on “Promoting youth engagement and employment in agriculture and food systems”, to be presented at the CFS48 Plenary session in October 2021. The HLPE was established to advise the Committee on World Food Security (CFS), an intergovernmental and international platform dealing with food security and nutrition.</p>	
<p>Capacity Building</p>	<p>The two DSTs listed above can also be considered as part of capacity building.</p>	<p>As above.</p>
	<p>A GPS-enabled tablet provided to each of the 26 DoA townships offices.</p>	<ul style="list-style-type: none"> • Township offices have for the first time the capacity to collect GIS data for land use planning. • DoA enabled to undertake rapid landscape analyses for more informed and effective policy formulation and implementation, including adaptation to climate change. • Handbook on KoboToolbox in Burmese and English.
	<p><u>Training of 90 DoA staff from its 26 township offices in the use of KoboToolbox.</u> Classroom training was followed up by in-field application of the training. An IWMI GIS specialist and rice specialist visited each Township office and spent a day in the field with the trainees to ensure they have fully understood the classroom training.</p>	
	<p><u>Six DoA GIS scientists trained to understand and use the DST for reducing flood damage to rice:</u> Desk-based training was followed up by an IWMI GIS specialist spending 3 days with the GIS scientists in the DoA office, running the DST to ensure the classroom training is fully understood.</p>	<ul style="list-style-type: none"> • DoA GIS staff understand the DST that generates the rice suitability maps, and are able to run their own analyses and update the DST with new data.
	<p><u>Training video in Burmese on managing Golder Apple Snail (GAS) infestations,</u> promoting low-cost and eco-friendly management methods developed in collaboration with the Plant Protection Division of the DoA. The video is publicly available at: https://www.facebook.com/watch/?v=294563757895546. In Myanmar, Facebook is a commonly used resource by farmers.</p>	<ul style="list-style-type: none"> • Used to train 136 DoA extension officers covering all townships, and 19,199 mainly smallholder farmers in the delta. • Significant losses to GAS in 2017 and 2018 have not been repeated in 2019 and 2020 after this training. • Between 1.2 million and 2.98 million kg of rice could potentially be saved annually in

Component	Outputs	Outcomes
		<p>the delta.</p> <ul style="list-style-type: none"> • At a per-farmer scale, annual economic savings could be between MMK 200,000 and 3,00,000 (USD154 to 231).
	<p>One early career Myanmar female professional (Ms. Palal Moet Moet) trained in project coordination and geospatial data collection. As the project’s coordinator, she was involved in all outputs; has benefited from a two-month training in the Netherlands (MetaMeta), and has represented the project and IWMI at a conference on gender at the Institute of Development Studies (IDS), UK.</p>	<ul style="list-style-type: none"> • Experienced in project coordination. • Experienced in organizing and running training workshops. • Experienced in developing training videos. • Acquired basic GIS analysis skills. • Experienced in undertaking social science research. • Experienced in presenting research findings at international forums. • A co-author on one published and one draft peer-reviewed journal article. <ul style="list-style-type: none"> ○ Dubois, M. J., Akester, M., Leemans, K., Teoh, S. J., Stuart, A., Thant, A. M., ... & Radanielson, A. M. (2019). Integrating fish into irrigation infrastructure projects in Myanmar: rice-fish what if...?. <i>Marine and Freshwater Research</i>, 70(9), 1229-1240. ○ Leh et al. (In prep.) Agricultural land suitability modelling for flood-based farming systems: A random forest and GIS approach for rice in the Ayeyarwady Delta, Myanmar. To be submitted to <i>Science of the Total Environment</i>. December 2020. • Employment with IWMI, moving from intern to project coordinator to staff over the period of this project.
	<p>Four Myanmar female early career professionals (graduate interns)</p>	<ul style="list-style-type: none"> • Three interns understand methods for cross-disciplinary

Component	Outputs	Outcomes
	<p>trained is planning for and collecting agro-ecological, socio-economic and institutional data.</p>	<p>data collection from field and government agencies</p> <ul style="list-style-type: none"> • One intern acquired expertise in GIS by supporting development of the DST for reducing flood damage to rice. She is also now experienced in conducting workshops on GIS and KoboToolbox.
	<p>One female German national's Master's Thesis at the University of Bonn based on her involvement in developing the DST for minimizing flood damage to rice.</p>	<ul style="list-style-type: none"> • Draft journal manuscript on the DST development to be submitted end 2020.
<p>Support to investment programs and policies</p>	<p>Both DSTs (rice resilience to floods and rice-fish scaling).</p>	<p>Provide key evidence to support flood resilient approaches (e.g. rice variety choice, timing) and rice-fish policy change and scaling approaches. Combined, they provide key knowledge necessary for implementing several key national strategies:</p> <ul style="list-style-type: none"> • The Agriculture Development Strategy by facilitating decisions to minimize rice losses supporting agricultural productivity mostly for smallholder farmers (a key focal group for the ADS). The rice-fish DST will further both the smallholder poverty reduction and land-water productivity objectives of the ADS. It will provide key knowledge to take advantage of a major policy change that emerged as a result of evidence from ACIAR funded WorldFish rice-fish trials, whereby smallholder farmers will be allowed to convert part of their rice farms to fish ponds. Specifically, the Ayeyarwady Regional Minister for agriculture, livestock, natural resources and environmental conservation U Tin Win Aung, decreed that rice smallholders (<15 acres) in

Component	Outputs	Outcomes
		<p>possession of 'Form-7' for rice production can, as of October 2019, convert up to 15% of their rice holding for integrated agriculture (rice-fish-vegetable) production. At the union level parliamentarians have taken this one step further and have agreed that up to 30% of a rice holding could be converted for integrated agriculture. (See Chapter 10 in https://digitalarchive.worldfishcenter.org/bitstream/handle/20.500.12348/4222/cce411501e271b93732e1e7df1ec4244.pdf). These overcome the long-standing rule prohibiting the conversion of rice fields to any other land use – a critical constraint to food system diversification. By identifying areas most suitable for rice-fish systems, the DST will help answer the question of where scaling should be prioritized.</p> <ul style="list-style-type: none"> • The Myanmar Climate Change Strategy and Action Plan (MCCSAP) by supporting adaptation of rice cultivation to rainfall variation, and • The Multi-Sectoral National Plan of Action on Nutrition (MS-NPAN) and the ADS by identifying areas suitable for more nutrient-dense, productive and profitable food systems by scaling rice-fish systems, noting also that better matching food systems to agro-ecological and climatic conditions is also a strategy espoused in the MCCSAP.