**EAP - IRRIGATION MANAGEMENT MODERNIZATION**

**(AAA - TA - P130522)**

**TERMS OF REFERENCE for COUNTRY ASSESSMENTS**

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**BACKGROUND**

1. The EAP Region is undergoing rapid economic transition, with significant implications for agriculture. The demand for the sector's products continues to expand and diversify as incomes grow. But the availability of productive resources to the sector is tightening: off-farm employment opportunities compete for the farmer's time and entrepreneurial attention and make hired labor scarce at peak times; water is needed for urban, industrial and commercial use; agricultural land is being urbanized. Small scale, rice based subsistence agriculture will require dramatic transformation into viable commercial farming systems if the current farming population (with annual per capita income measured in hundreds of dollars) is to join the economic mainstream (where incomes are measured in thousands of dollars) in the foreseeable future.

2. These rapid changes in the environment of irrigated agriculture will require adjustments to the concepts underlying irrigation modernization, which include the changing role of government role in the water resources and irrigation sector towards service delivery concepts. Governments will remain the stewards of national water resources. Some associated tasks – measuring and reporting water availability and distribution; defining priorities among sectors; controlling over-abstraction and regulating pollution – acquire greatly increased importance as competition for water develops. Other tasks – for example protection of environmental services and responding to some of the anticipated impacts of climate change – are entirely new. Where irrigation agencies have not been able to respond adequately to farmers' needs, the latter are more and more taking the initiative by investing in whatever is necessary to procure the water that they need. While this has significantly contributed to increases in agricultural production, it has also led to unsustainable overexploitation of both surface and groundwater resources and increased energy intensity of production. Taken together, the future "mixed rural economy" of agriculture, commerce and small scale industry, the growing competition for land and water and the intensification of energy use all point to the need for spatially integrated planning that extends beyond each of the individual sectors.

3. Irrigation and drainage operations in the large scale systems need to be reoriented towards delivering a well-defined service at an agreed interface between agency operators and farmers (whether an individual large farmer, or in the interim, a group of farmers) and other users. Both supply and demand for water are variable, and terms such as "reliable" and "adequate" must be interpreted in that context: water agencies cannot deliver more water than there is in the dam or river – but they can clarify how much water will be delivered to each user in any particular hydrological circumstance, so that users know with considerable certainty the minimum they are likely to receive. This in turn lets the user plan the most productive combination of cropped area,

varietal choice, and input levels. Definition of service at the interface with users is often weak, and will be critical in determining the priority elements of modernization strategies (financial, legal, institutional and infrastructural).

4. While modernization concepts will vary among and within countries, it is generally true that poor and outdated management practices and infrastructure have led to poorly defined services, and unproductive use of water in the agricultural sector. Commonly, operation and maintenance are poorly funded due to inadequate cost-recovery and budget allocations; stakeholders' involvement is constrained by unclear water and land rights and poorly conceived IMT programs; and human resources and institutional capacity in service and support agencies has declined as the relative attractiveness of a career in the public sector has declined – while staff are expected to provide modern service-oriented institutions, based on more sophisticated equipment and technologies, and responding to the emerging challenges.

5. Irrigation Management Modernization (IMM) to ensure sustainable growth, poverty reduction, environmental protection and national food security will involve dilemmas and trade-offs. These may include conflicts of objectives between national and local governments and river basin organizations; prioritizing economic water productivity versus equity; basic food security versus sector value added; whether to support small holder subsistence agriculture or facilitate farm exit strategies; how to deal with the water, energy and food nexus; controlling informal water economies that are unsustainable; payment for services versus incentives for performance; and the appropriate role of the private sector. Many of these choices are essentially political – there is no "right" or "wrong" option – but political choice can be greatly influenced for the better by the quality and timeliness of the information and analysis presented by technical specialists.

6. The transformation in irrigated agriculture required to maintain basic trends in production and productivity raises technical, institutional and political questions that the regional study intends to answer:

    - Politically, how can the traditional "protective" posture towards the rural sector embrace a position that promotes the transition to a new and different commercial agriculture, and the associated reform of the irrigation, credit, marketing, input supply and extension institutions?

    - Institutionally, proper accounting of existing over-use, related environmental degradation, and future demands for priority allocations (domestic and commercial) will reveal substantial gaps between supply and demand: how can the impact on services to agriculture and other uses can be best managed?

    - Institutionally, how can water user organizations and agencies that have been subsidized providers of irrigation services, be reformed to relate to the new context of payment for service (and service for payment) that commercial farmers will demand?

- Technically, what revisions to existing infrastructure are required to suit new management arrangements to serve multiple uses, especially commercial farmers producing high productivity commodity crops?

- In parallel with these basic issues, what developments in communications technology, remote sensing, and other new technologies might significantly alter the future of irrigated agriculture?

- Investment strategies, how can they accommodate a complex long term reform agenda to meet the above investment needs?

**PURPOSE OF COUNTRY ASSESSMENT**

7. Various countries in the region have resumed significant investment in the irrigation sector following the recent food crisis. Increasingly they have indicated that these renewed efforts would be underpinned by irrigation modernization to address many of the above mentioned challenges. They are also looking to international organizations like the World Bank, ADB and FAO to contribute to the development of their modernization concepts and strategies, looking afresh at institutional capacities, fiscal sustainability and the trade-offs between food security, poverty alleviation, environmental protection, equity and efficiency. The World Bank, FAO and ADB initiated a regional process to stimulate discussions and debates within and among countries on irrigation modernization opportunities, challenges and directions, and on the future of irrigation services in the context of the changes on both the demand and supply side caused by changing food consumption patterns, reduced farm size, rural-urban migration, on-farm labor shortages and mechanization.

8. The Country Assessments are an essential part of this regional process. Their purpose is to identify practices, lessons learnt and new forward-looking options on irrigation management modernization needed to inform and enrich the process of exchanges, national debates, assessments and international synthesis. This Terms of Reference provides guidelines for the implementation of the Country Assessments.

**OBJECTIVES OF COUNTRY ASSESSMENT**

9. The overall objective of the country assessments is to identify practices, lessons learnt and new forward-looking options on irrigation management modernization in the context of the transformation of the economy and the transition of the agriculture sector to inform and enrich the process of exchanges, national debates, assessments and international synthesis and to contribute to the regional World Bank, FAO, ADB flagship report on Irrigation Management Modernization.

10. Specific objectives are to identify: (i) strength and weaknesses of the present country systems, (ii) triggers for modernization of irrigation management, (iii) development of irrigation service provision during the transition from smallholder subsistence farming to commercially viable farming

operations, (iv) modernization approaches, practices and lessons learnt, and (v) new forward-looking options on irrigation management modernization.

**SCOPE OF COUNTRY ASSESSMENT**

11. A common framework with a common set of metrics is provided that enables the various irrigation modernization situations to be brought under one umbrella to enable countries to compare, benchmark and discuss the integrated development and implementation of these programs and to identify best practices and lessons learnt. It proposes a uniform process that first looks at current national strengths and weaknesses in the irrigated sector, then envisages a future where farmers and farming are integrated into the mainstream economy. Modernization priorities for the irrigation sector are then identified that are both productivity-enhancing in the short term, while also consistent with the anticipated medium to long term needs of the sector.

12. By using the following ABCDEF assessment framework, the country teams (Indonesia, Vietnam and China) can engage in discussions to identify strength and weaknesses of the present country systems, develop a "future" for irrigated agriculture and prepare an assessment of the modernization concept. Assessments of other countries (Malaysia, Myanmar, Thailand, Korea, Japan) will be made by FAO using their available material with possible cross support and verification visits to some of these countries. Modernization experiences outside the Region will be collected and synthesized through the World Bank Anchor in HQ.

**FRAMEWORK FOR COUNTRY ASSESSMENT**

13. The Framework for country assessments consists of three main dimensions: (i) the very basic management activities as expressed in the ABCDEF acronym; and (ii) the levels at which these basic management functions are executed (country, basin, irrigation system, sub-system, farm); and (iii) the interface between the various levels.
14. The following ABCDEF framework provides a neutral framework for describing the components that are required for comprehensive water resources management at each interface– information, priorities, rules, institutions and infrastructure. The framework does not propose any solutions.

15. Components of the ABCDE+F dimension of the framework

    A. ACCOUNTING – the process of knowing how much water of which quality is available at a management unit (country, basin, city, irrigation system, WUA) and how it is used. Rational planning begins with sound estimates of the extent of resources available, the pattern of current use (abstraction, diversion, consumption, return flows) and how proposed interventions will affect these flows. Accounting also provides the basis for auditing as part of the performance review process, and communicating the results in a timely manner to non-specialists, ordinary citizens, and policy makers. Understanding these interactions and the constraints and tradeoffs they imply will drive the required

"coalition for change" to begin a serious debate that leads to and guides the irrigation modernization process.

B. BARGAINING – the political process of setting priorities for the allocation of water among competing uses, including the environment at the various levels of the system (basin, irrigation system and sub systems). This process accommodates the demand side for present and future needs for water and services and also includes consideration of risk management strategies for food security, and varying priorities under normal conditions, periods of water shortage and emergency situations. This is also the place where the policy questions/dilemmas like food security vs productivity come into play. Issues of principle – such as the circumstances and mechanisms under which water can be re-allocated, allowable over-abstraction rates for non-renewable resources, etc – also fall within the political sphere.

C. CODIFICATION — formalizing the outcome of the bargaining process as rules, regulations and procedures. While step 'B' may establish some quantitative elements of the service at each interface, specific rules and decision variables will involve additional details.

D. DELEGATION — the institutional arrangements for implementation of rules and procedures related to the provision of services, the management of assets which includes investments, the sharing of costs and associated administration. The ultimate financial arrangements, funding mechanisms and availability of funds are essentially result of the negotiation process (in B).

E. ENGINEERING — the infrastructure: storage, conveyance, flow control, groundwater/surface water conjunctive use and irrigation application technology necessary to provide and monitor the provision of the agreed levels of service. More broadly, this might also include accessibility and connection to markets through roads, shipping or other means of transport and access to energy. The engineering decisions will be an agreed optimum of level of service, associated cost of service, and cost recovery/accountability mechanisms.

Finally, this framework is completed by:

F. FEEDBACK – the process of monitoring and corrective action taken by the parties involved within the ABCDE interactions, including monitoring of investments and results, and responding to new situations such as construction of a new storage facility that changes water availability, or exogenous factors such as climate change.

16. The levels of the framework: Water resources are managed in a tiered format – basins, administrative units, sectors, users (e.g. towns, industries, irrigation systems). Within an irrigation system the government may operate the main system, water user associations operate distributaries, and individual farmers operate their holdings.

17. In this tiered approach, the interface at each level specifies the service provided by one level to the next – thus nationally, urban usage may be prioritised over agricultural usage; domestic use may be

reserved at some minimum level before all other uses; within an irrigation scheme, orchard crops may get priority over field crops, etc.

**USE OF THE FRAMEWORK**

18. This framework will use the service standard to describe the current and desired future situation at successive levels – basin, irrigation system, WUA, farmer. The service standard describes the transactions between the managers and users at successive interfaces. For each successive level, ABCDEF defines the service at the interface with the lower level. The framework is normative (it does not "promote" one approach over any other), and the service standard may be different for different interfaces. The arrangements at each level may be different: government may set overall national policies that affect every level of water resources management, and government agencies may operate the major storage facilities. Private contractors may operate and maintain major canals, and WUA's operate the distribution channels. Similarly, for urban water, municipalities or private sector utilities may own and operate facilities. These variations can productively co-exist provided the service standards at the interfaces are fully defined.

19. Designing an irrigation modernization program involves bottom-up/top-down iterations of ABCDE at system level. Investment costs will increase with increasing service levels. An optimum has to be found through an iterative negotiation process between service provider/investor and client/payer for service cost. Such process will be repeated when partners feel the need to modify existing arrangements. The result will be an agreed level of service at an agreed level of cost reflecting the institutional, technical, financial and cultural optimum. Almost any change will have implications for some or all of the ABCDE elements.

20. Present management practices in some irrigation schemes contain a high degree of social accord among the users expressed in non-formal management rules taking many social, physical and multi-use factors in consideration. In other cases rules are absent or unobserved, so that favored farmers take what they want while others are left with whatever is excess.

**ASSESSMENT ACTIVITIES**

21. The country assessments should contain information about the present management situation for at least three levels at which there is an interface between a larger and a smaller management unit, to capture the environment in which irrigation management modernization is taking place: (i) Basin; (ii) Irrigation System ; (iii) Water User Association System. The assessment will provide a typology of the country, basin and irrigation systems considered and description of the elements of the ABCDEF Framework as elaborated in Annex 1 to this ToR and any other important characteristic encountered.

22. The country assessment will do the following steps:

    1. Assessment of the Present Situation: Using the ABCDEF Framework assess the present situation of each of the components on Basin, Irrigation system and WUA level. What is

working well now, and what is not working well – for example, if we look at the agreed priorities and rules (B and C) for allocating water to an irrigation project, does this conform to what actually happens for a specified level of water availability (A), or are "ad hoc" interventions made in response to events? Does ABCDE at the WUA level result in a specified service to an individual farmer? Should this (and does this) result in equitable distribution? The simplest test of the coherence of ABCDE is that the service that a farmer *should* be receiving can be determined from a review of the service definition, and that service can be *observed* in a field visit.

2. Assessment of the desired Long Term Situation: To define the desired modernization concept the ABCDE framework can again be applied to formulate a vision that has addressed the key questions and the different policy dilemmas. In the longer term (10-20 years), and particularly for the large-scale irrigation sector, how does government perceive the nature of agriculture and associated size and scale of farm operations? What cropping patterns are anticipated in the large scale irrigation sector to meet future food security needs? What levels of irrigation services and related agriculture support services are needed and what does this entail for the institutions and infrastructure?

   The anticipated future scenario – assuming there are significant differences to today's irrigation – will probably entail delivery of a better defined service to a smaller number of operational holdings. The interface between operators and farmers will likely be more formal, with measurement structures, recording devices and regular recording of volumes and flow rates. What are the implications of these new scenarios for:

   i. Institutions – Governance, Accountability Mechanisms, Regulation, Audits, Role of Government, Users and Private Sector,
   ii. Human Resources – Quantity, Quality, Capacity – Outsourcing
   iii. Service provision – Decision process , levels and cost of service for irrigation and other users/uses and agricultural support, Management Information and decision support systems
   iv. Asset Management - Infrastructure, Flow Control, Operation and Maintenance arrangements, Cost Recovery,
   v. Financing arrangements for investment and management (O&M). Who (WUA, farmers, Government, Private sector) invests in what?
   vi. Complementary Research and Policy Actions on Adaptation and Green Growth

3. Assessment of the short-term Actions to ultimately arrive at the desired long term situation. By using the ABCDE framework we plan to address the following types of issue:

   i. What (if anything) needs to be done now at each level to improve the definition of the service at each interface, and specifically to farmers? Are rules absent (C), or in place but not enforced (D)? Is the infrastructure fit for purpose (E)? Are financial and staffing levels adequate to ensure sustained service delivery (D)? This analysis will no doubt raise a variety of issues, and should provide the basis for short-term (0-5 year horizon) plans to improve the performance of irrigated agriculture (F).

ii. What investments in Irrigation Management Systems and facilities will contribute most to the achievement of the long term vision? Irrigation facilities if constructed to good standards and properly maintained operate for decades. It is thus appropriate for this round of irrigation modernization to concentrate expenditure on those physical and organizational improvements that will contribute most to the long-term vision of the sector. On the other hand, the improvements to the information base, better definitions of service, enhanced institutional capacity and general stewardship of water resources at larger scales will certainly strengthen governments' capacity to face today's critical problems of over-abstraction, pollution, and climate-change impacts. None of these areas of progress will in any way detract from services to the existing farmer population.

**Activities, Deliverables and Time Schedule (October 2012 – March 2013)**

1. Kick-off workshop (Bangkok- October 2012)
    i. introducing the country teams
    ii. explanation of assessment framework
    iii. discussion work program
2. Assessments (October – December 2012)
    i. Information gathering and processing (October-November)
    ii. National workshop (Mid December 2012)
    iii. Draft Country assessment report (End December 2012)
3. Regional Workshop
    i. Formulation of main lessons and best practice and final Draft Country assessment report (End January 2013)
    ii. Presentation at Regional Workshop (February 2013)

## Annex 1. Elements of ABCDEF Framework

| *Level and Typology* | **Accounting**<br><br>Knowing, either precisely or in statistical terms, the quantity and quality of water available and used. | **Bargaining**<br><br>Having a process to decide on priorities for allocation of the available water in specific hydrological conditions | **Codification**<br><br>Translating the priorities into rules, regulations and procedures for water allocation | **Delegation**<br><br>Having the institutions in place to implement the agreed rules and procedures on delivery of service<br><br>(incl. HR and fiscal arrangements) | **Engineering**<br><br>Having the physical infrastructure in place to deliver the agreed allocations | **Feedback** |
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| **Country**<br>climate, demography, economy, trade<br>policy: food security, water security, role agriculture in economic development<br>decentralization/gvt levels<br>management culture and planning system, including planning horizons | National overview of water balance in all river basins.<br>Prioritization of water use | Stakeholder platforms:<br>National water council or higher in case of international rivers/aquifers<br>Policy dilemmas (countries look at options and risk and make a policy decision) | Water laws and implementing regulations<br>Incl.<br>Water (use) rights | Institutional structures<br>Unbundling of roles – legislator, regulator, operator<br>Fiscal arrangements | | |
| **Basin**<br>Open, closed<br>Seasons, storage<br>CC Vulnerability<br>Competition<br>Management | Water accounting systems | MIS and Planning systems,<br>Stakeholder platforms: Basin water council | Basin water management, conservation and allocation plans<br>Service agreements and charges for all uses and users | RBO<br>Revenues<br>Governance<br>Service standard<br>Accountability mechanisms | Hydro-meteo networks, MIS<br><br>Bulk water management infrastructure i.e. storage, conveyance, diversion flood protection and works, | |
| **Service Interface**<br>**Basin – Main Irrigation System** | Water Account | Irrigation representation in bulk water allocation negotiations | Bulk water service standards and agreements<br>Bulk water allocations | Accountability Mechanism<br><br>Payments for bulk water delivery | Data Sharing system<br><br>Discharge Measuring and control Device | |
| **Main Irrigation System**<br>Rice, non-rice<br>Surface, ground, conjunctive<br>Gravity, pumped | Water accounting systems | MIS and planning systems<br>Stakeholder platforms:<br>Irrigation | Water allocation and delivery plans<br>Operating strategy<br>Service agreements | Irrigation service<br>Revenues<br>Governance<br>Service standards | Storage;<br>Abstraction, conveyance, distribution and delivery ; | |

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| Collective, individual users<br>Other uses | | Committee<br>Other uses | and charges<br>Cropping plans/schedules | Partnership with WUA/WUAF<br>Accountability mechanisms | drainage;<br>Recharge<br>Flow control, regulating, monitoring and measuring | |
| **Service Interface Main Irrigation – Sub-Irrigation System (e.g. Irrigation Agency - (Federated ) WUAs)** | Water account | WUAF (and possible other users) representation in water allocation negotiations | WUA(F) water use rights | Service standards<br>Role sharing, Governance<br>Partnership<br>Revenues | Data Sharing<br>Measuring and control Device | |
| **Sub irrigation systems**<br>Intermediate delivery (e.g. secondary systems under different management as the "upstream system **".** | Water accounting systems | MIS and planning systems<br>Stakeholder platforms: | Water allocation and delivery plans<br>Operating strategy<br>Service agreements and charges<br>Cropping plans/schedules | WUAF organization – staff , capacity<br>Irrigation service<br>Service standards<br>Accountability mechanisms<br>Formalization WUA, rights and obligations, revenue and charges | Storage<br>Abstraction, conveyance, distribution and delivery –<br>Drainage<br>Recharge<br>Flow control, Monitoring and measuring<br>Distribution and farm gate delivery | |
| **Service interface WUAF - WUA** | Water account | WUA (and possible other users)<br>representation in water allocation planning and distribution schedules | | | Data Sharing<br>Measuring and control Device<br>Payment mechanism | |
| **WUA-sub system (tertiary units)** | Water accounting systems | Stakeholder platforms:<br>WUA | Water allocation and distribution plan<br>Cropping plans/schedules<br>Service agreements and charges | WUA organization – staff , capacity,<br>Formalization WUA, rights and obligations, revenue and charges<br>Accountability Mechanisms | Drainage<br>Pumps, storage, wells, etc. | |
| **Service interface WUA – Farmer.** | Water account | User<br>representation in water allocation planning and distribution schedules | | | Data Sharing<br>Measuring and control Device<br>Payment mechanism | |

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| **Farm**<br>Tenure -Individual farm vs farming unit?<br>Subsistence, small, commercial<br>Irrigation technology; basin, pressure, etc. | Water accounting systems. | Level of dependence on other farmers: final distribution, | Water use right and flexibility in water ordering and delivery system<br>Service agreements | rights and obligations, revenue and charges<br>Accountability mechanisms | On farm irrigation and drainage technology<br>Access to energy<br>Pumps, storage, wells, etc. | |