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para la
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COMMITTEE FOR INLAND FISHERIES OF AFRICA

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PROGRAMME PROFILE:

INTEGRATED INLAND WATER RESOURCES MANAGEMENT IN DROUGHT-PRONE WEST AFRICAN COUNTRIES¹

I. BACKGROUND

1. West Africa's population is expected to grow from its present level of 260 million to approximately 490 million by 2025. Today, the urban population corresponds to 40 percent of the total and urbanisation is expected to continue to increase. With these changing demographics, demand for food will rise in the sub-region during the next 25 years and irrigation will need to expand to meet the urban requirement for fruits, vegetable, rice and fish through aquaculture.

2. Coastal and inland fisheries are stagnating or declining in the sub-region, which is a real concern in terms of food security. The development of aquaculture appears as a possible solution in the future.

¹ This document was endorsed by the Seventh Session of the Sub-Committee for the Protection and Development of the Fisheries in the Sahelian Zone, 3-6 July 2000.

3. The present population of the region could barely be supported by domestic agricultural production without relying increasingly on the use of irrigation. In the Sahel region, irrigation reduces risks associated with the extreme rainfall variability.
4. Biological environments created by irrigation schemes are favourable to aquaculture in general and fish culture in particular. The integration of irrigation and aquaculture is the association of two farming systems, either on the same plot, or on adjacent plots where by-products of one system are utilized as inputs by the other. The aim is to maximise productivity of water, land and associated resources while contributing to increased fish production.
5. The system of integration can be more or less complete depending on the general layout of the irrigated plots and the fishpond. The fishpond can be located either above the irrigated plots (in this case, the plot is fertilised with water from the fish pond), or on the same plot (where the symbiosis is complete and is performed directly on one plot), or below the irrigated plot (where fish farming is conducted in the drainage water coming from the irrigated plot, after some preliminary environmental precautions).
6. Several regional and international meetings have established an adequate framework for a programme of integrated inland water resources management.
7. The Expert Consultation organized jointly in May 1999 in Accra by FAO and the International Programme for Technology and Research in Irrigation and Drainage (IPTRID) on the **Water Vision for Food and Rural Development in West Africa**, recognised the need to improve water productivity and water efficiency. Increasing water productivity is central to producing food, to fighting poverty and reducing competition for this essential resource.
8. **Integrated Water Resources Management (IWRM)** is an important concept that translated the Vision into action, promoting the co-ordinated development and management of water, land and related resources in order to maximise the resulting economic and social welfare in an equitable manner without compromising the sustainability of the eco-systems.
9. At the **World Water Forum and its Ministerial Conference** (The Hague, March 2000), government officials were requested to put in place policies and strategies for IWRM by 2005.
10. This forum follows the Dublin Conference of January 1992 that had already made recommendations aiming at new water management models, inspired from integrated water resources management concepts. These recommendations were adopted by the United Nations Conference on Environment and Development (UNCED) during the Summit in June 1992 in Rio de Janeiro.
11. Fish farming and other forms of aquaculture are one component of integrated water management that produces food of high nutritional quality. The **21st FAO Regional**

Conference for Africa (Yaoundé, February 2000) acknowledged the importance of aquaculture and recommended that FAO “assist governments in elaborating effective aquaculture policies and streamlining public sector support to foster increased aquaculture production”. The Conference endorsed the policy objective of increased food production and food security through expansion of efforts in areas of sustainable land and water use development.

12. The *Bangkok Declaration*, elaborated during the global **Conference on Aquaculture in the Third Millennium** (Bangkok, February 2000), echoed these sentiments, stating that “the potential of aquaculture to contribute to food production has not been realised across all continents” while “aquaculture complements other food production systems and integrated aquaculture can add value to current use of on-farm water resources”.

13. In this framework, IIA is a strategy to achieve agricultural productivity from every drop of water while improving the financial sustainability of investments in irrigation. Adopting **Integrated Irrigation and Aquaculture (IIA)** through the programme of **Integrated Inland Water Resources Management** will contribute to improved food security in drought-prone West African countries.

II. JUSTIFICATION

a) Project Zone

14. The project zone includes Mali, Niger, Burkina Faso and Côte d’Ivoire. This zone encompasses a population of approximately 46 million people occupying an area of 3.1 million km². With the exception of Côte d’Ivoire, the three other countries belong to the Sahelian Zone which is characterised by an arid tropical climate. This area is bordered on the north by the Sahara Desert and to the south by the Sudanese agro-ecological zone, corresponding to mean annual precipitation of 100 mm and 600 mm, respectively. Water constitutes the principal ecological constraint in the Sahelian Zone.

b) Constraints

Sectorial Constraints

15. The whole of West Africa is classified as economically water scarce, countries facing severe financial and capacity problems in meeting their water needs. While there is an urgent requirement to increase the number of irrigation schemes, with or without reservoirs, the financial means are increasingly less available from the states and donors; internal resources and an increased financial participation from the beneficiaries have to be mobilised despite the generally high costs of these schemes. In this context, over the past several years governments have been adopting a policy of transferring the management of irrigation schemes to the beneficiaries. Unfortunately, these new managers often lack adequate support and extension services to enable

them to strengthen their technical and financial management capacities and they remain little involved with the design of water delivery systems which are consequently often poorly adapted to local conditions.

16. Inland capture fisheries are stagnating or declining in the sub-region. Although considerable efforts have been made for the development of fish culture in Sub-Saharan Africa, these remained generally unsuccessful during the last decades. The main reasons for this poor development were highlighted during an Expert Consultation organized in 1992 by the SIFR. These included:

- lack of knowledge on the socio-economical aspects
- inefficient co-ordination of research and development
- lack of effective evaluation processes.

Constraints to IIA

◆ Technical Constraints

17. Certain technical constraints are related to development. A range of trials of Integration Irrigation-Aquaculture has been initiated in the sub-region and different technologies are known in various countries. Trials in rice-cum-fish culture were undertaken in the past but were abandoned for various reasons (exclusion of socio-economical aspects, lack of expertise, thefts, etc...). Other models of integration are poorly known and therefore cannot be utilised to their full potential. These models are often based on indigenous technology implemented spontaneously by users without planning and/or monitoring, often with a weak technical background and a lack of necessary preliminary studies. Lack of better understanding and characterisation of these IIA models presently hinders their wider use.

Other technical constraints are related to management (e.g., availability of fingerlings).

◆ Institutional Constraints

18. In all the countries, an organizational set up is missing to harmonise IIA interventions and identify the role of stakeholders involved with IIA research and development. Until now, adequate attention has not been devoted to monitoring/ evaluation activities and identifying lessons learned. The prerequisite regulatory and legal frameworks remain incomplete for land reforms. It is not unusual to note in Mali and Côte d' Ivoire a lack of title to land in irrigation schemes as well as conflicts between civil and traditional ownership practices.

◆ Socio-economic Constraints

19. In the framework of the development of irrigation schemes and IIA models, problems include poor access to inputs (little access to credit facilities, lack of fingerlings or quality seed,

high cost of feeds and fertilizers, etc.) as well as competition between different farming systems for the use of available inputs (by-products and manpower).

◆ Environmental Constraints

20. Among environmental constraints, pollution of water draining irrigation schemes by the inappropriate application of pesticides hinders the recycling potential of these waters through the development of down-stream aquaculture.

◆ Post-harvest Constraints

21. Concerning marketing, there can be competition with fish coming from capture fisheries as well as processed fish (frozen and smoked). A similar situation exists for rice where the women who are primarily responsible for processing and marketing in the sub-region lack the necessary post-harvest skills.

⇒ In the framework of increasing aquaculture production (essentially fish culture) as well as promoting irrigated crops, the programme will seek to demonstrate in a participatory manner appropriate IIA techniques and practices aiming to alleviate the main technical, economical, socio-cultural, institutional and environmental constraints which have been previously identified.

c) Beneficiaries

22. The main beneficiaries of the programme are irrigation management committees, small-scale farmers involved in irrigated rice, vegetable and pasture production as well as small-scale farmers involved in fish culture. The target groups include women's groups involved in processing, preservation and marketing activities of agricultural products and fish. The indirect beneficiaries are planners and decision-makers, civil servants and researchers from national development and research institutions, extension workers of local support institutions, managers of the Public Sector and Civil Society (NGOs) and farmers' associations (Fish Farmer Associations, Co-operatives of rice producers, ...).

d) Opportunities

23. Recent missions carried out by FAO have highlighted noteworthy opportunities for the development of Integrated Irrigation-Aquaculture in the sub-region. These include:

- potentially important unexploited land and water resources and the high demand for irrigation schemes which remains unsatisfied due to their high costs;
- high priority given by governments to food security issues;

- current policies for transferring management responsibilities of irrigation schemes to beneficiaries along with the adoption of participatory and gender-sensitive approaches to development by support services
- policies for diversification being undertaken by governments which are better adapted to the new economical environment and which offer more possibilities for small-scale farmers to choose enterprises for optimal development of the irrigation sites;
- existing tradition of practising irrigation (farmers having necessary technical skills for producing irrigated crops such as rice and vegetables) combined with the high motivation of producers (rural communities and private entrepreneurial sector) and an interest on the part of donors in the development of the sector;
- awareness of government officials of the decline of fish production;
- establishment of statutory measures such as those in Côte d' Ivoire allocating specific areas upstream of irrigation schemes for aquaculture;
- good local markets for rice and fish as well as good prospects for creating regional markets.

24. Trials conducted by FAO in Asian countries have shown that fish farming in irrigated plots increases substantially the fish production. The West African region has still an under-utilized potential as demonstrated by the following (Source: Sanni, June 2000):

- The area has an important potential in land and water resources. The total surface water potential is assessed to more than 97.10^9 m^3 while the total groundwater potential is estimated to more than 3000.10^9 m^3 .
- The irrigation potential comprises an area between 3,3 et $5.1.10^6$ ha while the total area under irrigation is approximately $3.3.10^5$ ha, i.e. $1/10^{\text{th}}$ of the irrigation potential. If one only considers the area allocated to surface irrigation, there would be a potential of :
 - ✓ 117.000 ha of surface irrigation schemes suitable for IIA development (ex: rice-cum-fish, fish culture in canals);
 - ✓ 153.000 ha of “complete” control schemes suitable for IIA development (ex: fish ponds);
 - ✓ 66.000 ha of inland valleys suitable for IIA development (ex: small-scale fish reservoirs of 0,3 to 1 ha associated with cultivated plots in the area downstream and on the slopes).

P Therefore, there is a very conducive environment and a real potential to increase agricultural and aquaculture production in West Africa through the promotion of sustainable integrated systems of irrigation and aquaculture.

e) FAO and its IIA technical expertise

25. The SIFR Expert Consultation in 1992 identified nine research programmes for the promotion of aquaculture in Sub-Saharan Africa. Amongst these programmes, the integration of aquaculture in irrigation schemes was considered as a rapid means to increase fish production in the region.

26. Moreover, during its meeting in 1997, the Sub-Committee for the Protection and the Development of Inland Fisheries in the Sahelian Zone recommended:

- an inter-regional network be put in place to exchange information and avoid duplication of effort
- aquaculture development be based on better management and improved yield from irrigation “basins” through enhanced stocking and post-harvest techniques
- FAO act as facilitator for networking and information exchange at the regional level.

27. FAO has acquired important know-how in Southern Africa through the programme “Aquatic Resource Management for Local Community Development” (ALCOM). The positive results of this programme have then led to the recent formulation of an Integrated Irrigation-Aquaculture project with the support of IFAD. The IIA technical expertise of FAO will be provided in the present programme through the relevant technical units of Aquaculture and Water Resources of the FAO Regional Office for Africa, Accra, Ghana.

f) Institutional framework

The set up of the institutional framework will have a two-tiered approach.

28. The first tier consists of a core of four countries (Mali, Niger, Ivory Coast and Burkina Faso) which will be actively involved in IIA research and development (demonstration activities). Each country will establish a national network to ensure free flow of information and skills, co-ordinated by a designated lead institution. The national network will be made up of irrigation and fisheries institutions, associations of fishermen, irrigation management committees, research and/or training institutions, institutions of environmental protection, NGOs, consultants' firms and other beneficiaries. IIA development activities that will be demonstrated in each of the country will be co-ordinated by a National Co-ordinator with the support of a multidisciplinary team.

29. National networks will subsequently be linked to a sub-regional network with WARDA (West African Association for Rice Development, Bouaké, Ivory Coast) as possible Regional Co-ordinator. This operational framework would enable the programme to have important links with regional research networks that are already located at WARDA, such as the Inland Valley Consortium (IVC) and the Regional Network on Rice Research. This choice would be even more justified by the potential secondment of an ICLARM Representative to WARDA for fish culture research.

30. The second tier would become active as IIA technologies are demonstrated and the sub-regional networking is fine-tuned. This would include countries or other stakeholders from the region outside the core who would wish to participate in the network.

g) Related issues

31. The programme would offer possibilities for university co-operation on integrated water resources management. This would facilitate the development of national research and development projects.

32. In the context of strengthening national capacities and setting up a regional training programme for the training of national trainers in IIA, a TCDC expert from Asia would be recruited.

h) Links with partners and existing programs

33. The programme would build up a regional network based on existing regional networks (the Inland Valley Consortium (IVC), the Regional Association for Irrigation and Drainage (ARID), the Eco-regional Programme for Humid and Sub-Humid Tropics of Sub-Saharan Africa (EPHTA)) and would create synergy with research institutions belonging to the CGIAR Group (West African Association for Rice Development (WARDA), the International Institute for Tropical Agriculture (IITA) and the International Centre for Living Aquatic Resources Management (ICLARM)) in order to avoid duplication of effort, to promote complementarity and to maximise the utilisation of resources. It would benefit from the lessons learned from past and on-going programmes/projects (ALCOM, IIA/IFAD).

i) Links with SPFS

34. The programme would strengthen the integration of the “water control” and “diversification” components of the Special Programme for Food Security (SPFS) through the introduction of IIA activities at pilot sites in all concerned countries. SPFS demonstration sites would be used for the promotion of improved IIA techniques and practices or the transfer of newly adapted IIA techniques and practices. It would also offer opportunities for undertaking IIA constraints analyses through the steering committees and SPFS Monitoring Committees at national, regional and local levels.

III. OBJECTIVES

General Objective

35. The programme of inland water resources management will contribute to improved food security in drought-prone West African countries, in particular Mali, Niger, Burkina Faso and Ivory Coast.

Indicators: Twenty-five percent increase in agricultural and fish production through integrated irrigation and aquaculture systems, 20% reduction in post-harvest losses for both fish and irrigated crops (rice and horticultural crops) and 20% increase in global income for members of women groups responsible for the processing, preservation and marketing of agricultural and fish products.

Specific objectives

36. The programme has the following specific objectives:

- SO 1 :** Strengthened national capacities to assess IIA potential and improve IIA production techniques and practices by the end of year two;
- SO 2 :** Established integrated irrigation and aquaculture systems, financially and ecologically viable, socio-culturally acceptable, improving land and water productivity as well as irrigation efficiency, managed by the farmers/fishermen by the end of year five;
- SO 3:** Improved processing, preservation and marketing of agricultural and fishery products through women's groups by the end of year five; and
- SO 4 :** And by the end of the fifth year, regional co-operation, information and skills exchange on IIA research and development strengthened, through a functional IIA network.

IV. EXPECTED RESULTS

37. The list of expected results for each of the specific objectives follows:

SO 1 : Strengthened national capacities to assess IIA potential and improve IIA production techniques and practices by the end of year two;

❖ Strengthened national capacities to assess IIA potential

- R1.1 20 national statisticians (5/country) trained to collect statistical data on irrigation and inland fishery
- R1.2 A regional office of statistical analysis and mapping (GIS) operational
- R1.3 IIA national maps and IIA regional map produced.
These maps will allow for the characterisation of the IIA physical potential in order to promote the regional transfer of appropriate

IIA technologies and sensitise decision makers on the potential contribution of IIA to increased agricultural and aquaculture production.

❖ **Strengthened national capacities to improve IIA production techniques and practices**

- R1.4 12 IIA specialists from the Public Sector and Civil Society (NGO) completed long-term scholarship programmes and returned to assist the programme.
- R1.5 An IIA training curriculum developed during a regional workshop
The development of the training curriculum implies the preparation of training modules for each IIA model.
- R1.6 20 national trainers (5/country) of technician-extension worker level trained at regional level in a participatory manner on IIA technologies

SO 2 : Established integrated irrigation and aquaculture systems, financially and ecologically viable, socio-culturally acceptable, improving land and water productivity as well as irrigation efficiency, managed by the farmers/fishermen by the end of year five;

❖ ***Techniques and practices of existing local IIA models improved and new IIA techniques and practices of introduced IIA models adapted.***

- R2.1 An inventory report elaborated on local IIA models as well as on IIA research studies conducted in the sub-region
- R2.2 Multidisciplinary feasibility studies (technique, financial and economical, socio-cultural, environmental and sanitary) carried out for the selected IIA models (to be promoted in the sub-region).
- R2.3. A Research Master Plan elaborated, enabling the formulation and the implementation of national research programmes by country and a regional research programme with the research institutions of the CGIAR Group.
The research master plan is based on the IIA constraints identified at national level in a participatory manner. It will include the identification of key indicators for the monitoring-evaluation process.
- R2.4. Demonstration protocols elaborated for the selected IIA models

❖ **Improved IIA techniques and practices of local models and newly adapted IIA techniques and practices of introduced models (production) demonstrated.**

- R 2.5 40 IIA demonstration sites, covering a total area of at least 400ha developed for improved water control with the participation of beneficiaries
- R2.6 40 Water User Associations (10/country) established/strengthened for the development and management of water control structures
- R2.7 1200 farmers/fishermen trained in a participatory manner in the technical and financial management of integrated irrigation and aquaculture systems (including water management)
- R2.8 improved and newly adapted IIA production techniques and practices demonstrated at the 40 sites

SO 3: Improved processing, preservation and marketing of agricultural and fishery products through women's groups by the end of year five;

- R3.1 A market study of IIA related products (analysis of constraints and opportunities) carried out for each production zone.
- R3.2 40 women's groups (10/country) established/ strengthened and organized
The organization of women's groups will aim to ensure access to and control over post-harvest equipment, credit, etc.
- R3.3 The members of 40 women's groups are trained on post-harvest techniques and practices as well as self-management
- R3.4 Improved techniques and practices of processing, preservation and marketing are demonstrated to the 40 women's groups
- R3.5 Local market infrastructure and structures put in place and/or improved

SO 4 : And by the end of the fifth year, regional co-operation, information and skills exchange on IIA research and development strengthened through a functional IIA network;

- R4.1 The Office of the Regional Co-ordination established and operational
- R4.2 4 National Co-ordination Units established and operational
- R4.3 A Multidisciplinary Steering Committee established and operational
- R4.4 A Pan-African Workshop "Review of IIA National Experiences" conducted
This Pan-African workshop will enable new stakeholders to take part in the network.
- R4.5 IIA communication tools developed (quarterly liaison bulletin, video cassette on IIA technologies demonstrated in the sub-region, WFD, etc...)
- R4.6 Study tours organized for 10 trained extension workers.

