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# COMMITTEE FOR INLAND FISHERIES OF AFRICA

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# CURRENT ECONOMIC OPPORTUNITIES IN SUB-SAHARAN AFRICA

**SUMMARY**

This part of the paper discusses **current economic opportunities** in aquaculture in sub-Saharan Africa. Opportunities occur mostly in grow-out farm operations of the various aquaculture systems, especially in freshwater aquaculture which focuses on Tilapia and catfish pond culture with a profitability index of 0.84 for Tilapia and 0.90 for catfish. With shrimp farming, brackishwater aquaculture is gradually picking up, but its potential too remains poorly realised. Brackishwater including shrimp farming offers more prospects for good economic benefits for investors and society. Preliminary analyses revealed gross profit margins varying from around US $4/kg to US $4.6/kg of shrimp produced, a local employment creation capacity of 0.59/ton, an employment multiplier of 0.91 and an average government-revenue generating capacity of US $208/ton. The industry provides social amenities to its workers and local communities, such as schools, clinics, freshwater wells and roads, and creates employment for women. In spite of the region's vast suitable physical environment, mariculture is practically inexistent. Seaweed is the most dominant marine aquaculture product and its future looks promising. While the economics of seaweed farming in the region is poorly documented, experience from elsewhere shows that the industry, mainly the domain of small-scale farmers, has provided employment to coastal populations, increased their food supply and contributed significantly to the producing countries' foreign exchange earnings. Returns on investment ranging from 93% to 243% have been often reported. Economic opportunities also exist in allied industries such as in hatcheries and feed mills. Although preliminary, economic estimates completed on tilapia hatcheries showed an average profitability index of 0.84. For catfish hatcheries, the index was 1.28. The fish feed industry in sub-Saharan Africa is poorly developed; most commercial feed is imported mainly from outside the region; the excess demand continues to grow. Diversification of culture environments and cultured species, development of private investment in hatcheries, especially those targeting high commercial value species and those in high demand by the consuming public, promotion of domestic private feed industries, promotion of the use of insurance in aquaculture, provision of elaborate and up-to-date market information to commercial producers and the establishment of right policies to guide the development of the sector could stimulate the development of the sector and help uncover the still unexplored economic opportunities in the area.

# I. BACKGROUND

1. Whereas aquaculture has become the fastest growing food activity in the world in the last two decades, contributing substantially to food security, employment generation and foreign exchange earnings in many regions[1], its development in sub-Saharan Africa has been marginal. In 1993, aquaculture production was 32179 tones[2], or approximately 0.15% of the world total. In 2002, 79485 tones were produced. Compared to the 1993 output, this production represents a 2.5-fold increase, but still an insignificant share of the world production (0.2%)[3] .

2. The reasons behind this sluggish development have been widely discussed at several occasions in international fora. Of them, a lack of economic incentive, which resulted from unsound policies, is commonly cited.

3. Until very recently, government policies in most countries in sub-Saharan Africa had paid little attention to promoting aquaculture as a potentially important economic activity. The traditional approach was to promote aquaculture more as a food-supplying activity for local subsistence rather than as an investment-induced industry capable of growing beyond subsistence levels and generating important economic returns.

4. Some countries of the region are considering reversing this policy. The goal is to stimulate the development of aquaculture as a business-oriented enterprise and to uncover and create economic opportunities in the sector.

5. Evaluation of economic opportunities in aquaculture in sub-Saharan Africa is rendered difficult by many factors including the lack of structured studies in the field, the limited availability of economic data, the reluctance and/or the lack of transparency of farm owners and managers in providing costs and returns data.

6. This assessment provides a rather qualitative analysis of the current and potential economic opportunities in aquaculture in the region. Quantified information, based on a few case studies by lack of data, is used wherever available. Experience from elsewhere is also used as appropriate.

7. These opportunities occur mostly in on-farm activities, namely in grow-out operations of the various aquaculture systems. They also exist in allied industries such as hatcheries and feed mills.

# II. OPPORTUNITIES IN GROW-OUT OPERATIONS

8. The region has a wide variety of ecosystems with strong potential for aquaculture development. These ecosystems range from inland (freshwater) to brackish (coastal) and marine (sea farming) waters. However, their full potential remains unrealised.

9. Inland (freshwater) aquaculture is the major source of farmed fish. Of the 79,485 tones of aquaculture products in 2002, freshwater aquaculture represented about 62,956 tones, or 79%. If the aquatic plant production is excluded from the total, freshwater aquaculture accounts for 87% of the 2002 fish production.

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[1] State of World Fisheries and Aquaculture (FAO, 1996).

[2] FAO yearbook. Volume 94/2. 2002.

[3] For example, Asia's production increased twofold but represented about 89% of the world total, which was 39798571 tones in 2002.

10. Assuming all this production came from pond aquaculture, the least productive system, and with a conservative estimation of the region's average fish yields of 1000 kg/ha/year and 1.2 crops per year, about 75,547 ha (755 $km^2$ ) of land would have been used to produce this volume of fish. This farmed area represents about 0.06% of the land assessed as having the potential for finfish farming in southern Africa[4] alone[5].

11. Inland aquaculture occurs mainly in ponds. Cases of growing fish in reservoirs, concrete tanks, cages, paddies, irrigation canals and pens are rather scarce. Elsewhere in the world, freshwater finfish such as tilapia, carps and catfish are widely and economically cultured in these systems, providing sizable net revenues to farmers. These opportunities are yet to be extensively explored in the region.

12. Tilapia and catfishes are the two most popularly cultivated species. In 2002, the two species accounted for 60% of the freshwater production, or 52% of the region's total aquatic animal aquaculture production[6]. With shrimp farming, brackishwater aquaculture is gradually picking up, but its potential too remains poorly realised.

13. In 2002, farming sub-Saharan Africa's brackishwaters produced an estimated 6522.5 tones of fish, or 8% of the total aquaculture production. In Madagascar, whose share of the region's 2002 shrimp production was 85%, only about 1795 hectares, or 4% of the land suitable and available for shrimp farming (50.000ha), were farmed in 2002.

14. In other countries, besides Mozambique where 600 tones of shrimp were produced in 2002 on an estimated 400 ha, or 1.1% of the 35000 ha of land potentially available for shrimp farming, brackish water aquaculture is either non-existent or insignificant. Sub-Saharan Africa's brackish water aquaculture production was 6522.5 tones in 2002, which represented 0.5% of the world's total (1292476 tones). This is in spite of the vast physical potential that exists in West, East and Southern Africa. Yet, shrimp farming can be an economically important activity in sub-Saharan Africa, from both the investors' and countries' economies perspectives.

15. Economic analyses completed on three shrimp farms in Madagascar showed net returns to management ranging from US $26,035/ha/yr to US $37,255/ha/yr when economic performance is evaluated at the average shrimp price in Europe[7]. These returns correspond to before-value-added gross[8] profit margins varying from around US $4/kg to US $4.6/kg.

16. Nationally, the shrimp industry employed an estimated 3080 well paid[9] permanent workers in 2001. This is a significant number; it amounts to an equivalent of 71% of the workforce employed in the industrial capture fisheries. Of these, 1607 employments, or 52% were on-farm jobs; the rest occurred in related activities such as in hatcheries (14%), processing (24%), administration (7%) and the rest (3%).

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[4] Includes Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe.

[5] Kapetsky, J.M. 1994. "A strategic assessment of warm water fish farming potential in Africa". FAO CIFA Technical Paper No27. Rome; FAO 67pp.

[6] Tilapias accounted for 41% of the freshwater production, equivalent to 35% of the total non-plant aquaculture production. Catfishes represented 19% of the freshwater production, or 17% of the total non-plant aquaculture production.

[7] Companies would not reveal prices of their value-added products in importing markets. Shrimp cultivated in Madagascar sells for more than the average Europe price as it enjoys high quality fame because, the shrimp farming industry having just taken off, the farming environment is still unpolluted; shrimp is also produced using environment friendly practices.

[8] Excludes also processing, handling and transportation costs.

[9] Wages are by far higher than in the public sector. On the average, a farm manager earns 8 times as much as a director in the public sector; an unskilled worker's salary is 1.2 times that of a high school teacher.

17. The overall local employment creation capacity of the industry was 0.59/ton, including 0.31 on-farm and 0.28 in secondary activities. The average employment multiplier effect of shrimp farming was about 0.91, implying that for every on-farm job created, the industry generates an additional employment in downstream and upstream farm activities. At full employment of productive resources, the industry would employ approximately 137650 local workers, including 72030 on farms and 65620 in secondary activities.

18. The industry has a government revenue generating capacity of US $208/ton produced. It contributed close to US $1,080,500 to public treasury, or 2.4% of the 2001 total government revenues. This contribution was in the form of social benefits and tax revenues (on land and/or enterprise income, permits/licenses). If available resources for shrimp farming were fully utilised, the sector could generate about US $48,428,400 in public funds per year.

19. The industry provides a number of social amenities to its workers and local communities, such as schools, clinics, freshwater wells and roads. In some instances, it contributes to teachers' salaries, hires nurses and doctors and pays their honoraria. It has also created employment opportunities for women, especially in processing plants, where in many cases about 50% of workers are women.

20. Besides a limited number of cases such as in Mozambique, Namibia, Senegal, South Africa and Tanzania where a few marine species including sea moss, mussels, oysters, abalone and seaweed are cultivated, mariculture is practically inexistent in sub-Saharan Africa in spite of the region's vast suitable physical environment.

21. Seaweed is the most dominant marine aquaculture product. In 2002, marine aquaculture produced approximately 10007 tones, or 13% of the total aquaculture production. Of these, seaweed[10] represented 72% (7191 tons).

22. While the economics of mariculture in sub-Saharan Africa is poorly documented, evidence from elsewhere shows that this form of aquaculture presents important economic opportunities. In Asia and the Pacific for example, molluscs (oysters, mussels, clams, cockles and scallops), seaweeds and pearl oysters are popularly maricultured. Mainly the domain of small-scale farmers, mariculture has provided employment to coastal populations, increased their food supply, and contributed significantly to the producing countries' foreign exchange earnings[11].

23. The vast coastal waters of many countries in sub-Saharan Africa, from the west to the south and east coasts, are conducive to mariculture; they generally offer good accessibility and present low pollution levels. In particular, because of its high labour intensity, seaweed farming could become an important economic niche for sub-Saharan Africa.

24. From a macro-economic standpoint, high labour intensity implies that seaweed aquaculture could be an ideal source of employment for most sub-Saharan African countries with dense and unemployed or underemployed coastal communities. In addition, it could contribute to improving the balance of trade as it does not require imported inputs such as fertilizers, chemicals and feeds, and yet can become a major export item as is the case in many Asian countries such as the Philippines.

[10] Mostly from Tanzania which accounted for 97% of the region's total production.

[11] Samonte, GPB, SV Siar, RS Ortega and LT Espada. 1994. "Socio-economics of oyster and mussel farming in Western Visayas, Philippines. In: The Third Asian Fisheries Forum (Chou, LM, AD Munro, TJ Lam, TW Chen, LKK Cheong, JK Ding, KK Hooi, HW Khoo, VPE Phang, KF Shim and CH Tan, eds). Asian Fisheries Society, Manila, Philippines.

25. Evaluated from a micro-economic angle, seaweed aquaculture can be an economically viable activity. In Indonesia, it has been successfully farmed commercially since the 1960s. Economic analyses revealed a 153% rate of return on investment and a 7.8-month payback period. Returns on investment ranging from 93% to 243% were reported in the Philippines.[12]

## III. OPPORTUNITIES IN SEED PRODUCTION

26. Economic opportunities also exist in hatchery operations.

27. Traditionally, in sub-Saharan Africa, most fingerlings were produced by government hatcheries. Seeds were either distributed free or sold at subsidised prices to farmers. Because of the lack of economic rigor in the management of these stations and the change in government priorities following a widespread financial austerity, most of these hatcheries could not be continued[13]. The situation has usually resulted in sustained shortages and/or supplies of poor quality seeds. Seed availability in terms of quantity and especially strong, disease-free and disease resistant continues to be cited as a major constraint to freshwater, brackishwater and marine aquaculture expansion.

28. Gradually, the private sector is taking the seed problem into hands, but at a limited scale. In Madagascar, Tilapia and Carp fingerling production is entirely in the hands of the private small-scale fingerling producers whose hatcheries are operated on a profit-making-small businesses ground. Private large-scale shrimp farmers also produce shrimp larvae.

29. In a few countries, seed production as a business is emerging. Examples include catfish fingerling production in Nigeria and Uganda, and catfish and tilapia hatcheries in Ghana and Uganda. The motive is profit.

30. Rough economic estimates completed on tilapia and catfish hatchery systems in Ghana, Nigeria and Uganda showed an average profitability index of 0.84[14] with lower and upper limits of 0.22 and 1.48 for Tilapia, and 1.28 varying from 0.49 and 2.52 for Catfish. Other things being equal, variations can be attributed to the scale of operations and to differences in management practices.

## IV. OPPORTUNITIES IN FEED PRODUCTION

31. For aquaculture in sub-Saharan Africa to continue attracting investors, both domestic and foreign, it has to be competitive. Competitiveness seems difficult to achieve unless the sector modernises. That is, the sector must make more use of modern production technologies which often requires intensive feeding.

32. In modern aquaculture, feed generally accounts for more than half the operating costs[12]. When feed is imported, its share of the production cost can even be more important. For internationally traded products such as farmed shrimp, tilapia and catfish, high costs of feed can place farmers at an international competitive disadvantage. Readily available complete feeds at a reasonable cost is one of the essential conditions for an aquaculture industry to

[12] Possadas, BC. 1988. "An economic and social analysis of the seaweeds industry in selected areas in the Philippines". Asian Fisheries Social Science Research Network. Research Report, University of the Philippines in the Visayas, Iloilo City, Philippines, May 1988.

[13] Ridler, N. and N. Hishamunda. "Promotion of sustainable commercial aquaculture in sub-Saharan Africa. A Policy framework". FAO Fisheries Technical Paper. No. 408/1. Rome, FAO.2001.67p.

[14] A profitability index of, say, 0.84 means that a profit of 84 cents is obtained for every dollar invested.

remain competitive, which often requires the existence of a domestic feed manufacturing industry.

33. The fish feed industry in sub-Saharan Africa is poorly developed and the demand remains high. Where aquaculture is practiced at a commercial scale, feed used is imported either totally or partially to complement the domestic supply[15], and mainly from outside the region. Nearly 100% of the feed used in shrimp farming is imported; Mauritius, Seychelles, Belgium, France, Mainland China and Taiwan, Province of China are the chief suppliers. Denmark and the Netherlands provide a good percentage of the feed used in Nigeria, the main catfish producing country in the region. Important opportunities in the feed industry remain unexplored in the region.

## V. CONCLUSION

34. Although limited, the breakthroughs of the tilapia, catfish and shrimp aquaculture industries have shown the potential of aquaculture products as attractive domestic and international commodities. However, much of the potential in inland aquaculture in sub-Saharan Africa remains unexplored. Brackishwater and marine productive resources virtually lay idle. Many economic opportunities are overlooked.

35. Diversification of culture environments such as growing fish in concrete tanks, cages, pens and raceways, and cultured species beyond freshwater aquaculture species, especially to molluscs, shellfish and seaweed could open the door to creation of wealth for investors, the countries and society.

36. A high quality seed is crucial in the sustainable development of the aquaculture industry. Although government ownership of hatcheries is gradually changing into private ownership, the productive capacity of private hatcheries is still very limited as most are small-scale; they fail to meet the expressed demand. It is desirable for Governments to speed up policies which encourage a further development of private investment in hatcheries. These policies could especially favour investments targeting high commercial value species and those in high demand by the consuming public.

37. The increasing demand for fish for local consumption, and, particularly, for export for some species, is expected to drastically change the landscape of sub-Saharan Africa's aquaculture in the coming decades. The use of modern production technologies through intensive culture seems inevitable. In addition to important amounts of infrastructure and equipment capital and technical expertise, intensive culture systems require complete feeds to enhance the productivity, economic and ecological efficiency of the farming practices. The development of domestic private feed industries, where economically justified, should be encouraged. Efficient import substitution feed industries could lessen the problem of high production costs, rendering sub-Saharan Africa's aquaculture more competitive at home and internationally.

38. The gradual changing approach to aquaculture production processes in the region is likely to increase fish susceptibility to disease outbreaks. If this was to happen, it would increase the likelihood of failure of aquaculture businesses, which would add to the already popular perception that aquaculture is a high risk activity. It is important that Governments in sub-Saharan Africa set up mechanisms to educate farmers, especially medium-scale commercial entrepreneurs of the need, the benefits and the mechanisms of securing insurance for their aquaculture businesses. It is equally important for Governments to assist insurance seekers in convincing insurers that aquaculture is not any riskier than many other businesses.

[15]With the exception of few countries such as Zambia, Zimbabwe and South Africa.

39. Through capital and technology inflows and openness to trade, the emerging globalization process is creating great potential for aquaculture development in the sub-Saharan Africa. As economies of most sub-Saharan African countries continue to deteriorate and consumers find their purchasing power steadily eroding, this trend is likely to continue, at least in the medium run, as most producers are likely to focus more on export markets.

40. Today's global market for fish and fishery products has become so competitive that creating a niche in international markets requires research which can be costly in time and financially. Investors need a wide range of elaborate and up-to-date market information such as on trade opportunities, product acceptability and willingness to pay for cultured fish, fish commodity prices, price elasticities, market trends, market penetration, tariffs, the relations of market strategies to profitability indexes and distribution chains.

41. While this information can be provided through other channels such as trade support agencies including as National Chambers of Commerce, Export Promotion Councils, Fish Exporters' Associations and INFOPECHE, private consulting firms can play an important role in providing these services. There is a need to set up policies which encourage the emergence of this type of initiatives.

42. There are many economic opportunities, but there are also risks, especially ecological risks[16]. In order to make way for shrimp and fish farms, important areas of mangrove forests were cleared in parts of the world. The consequences of destroying mangrove forests and their conversion into ponds have ranged from the destruction of fish habitat resulting into depriving coastal communities of their source of food and livelihood, the erosion, siltation and exposure to the dangers of floods and typhoons. Water pollution has also resulted in the instant mass kill of aquatic animals and plants, or given rise to diseases that have caused slow growth and mass kill.

43. Because the major developments in sub-Saharan African aquaculture in the next decades will probably take place in coastal areas owing to their productive ecosystems and other factors, in search for economic opportunities, especially in coastal aquaculture, it is advisable to learn from history so as to avoid the mistakes experienced elsewhere. Where they do not exist, right policies need to be put in place to guide the development of the sector.

## VI. RECOMMENDED ACTION BY THE COMMITTEE

The Committee is invited to:

- revise as appropriate and endorse ideas explored in this paper;
- identify actions which Governments, FAO and the international community could undertake to develop aquaculture as an economically profitable and socially beneficial business in sub-Saharan Africa.

[16] In aquaculture, risks can be ecological, meteorological, economic, social and political.